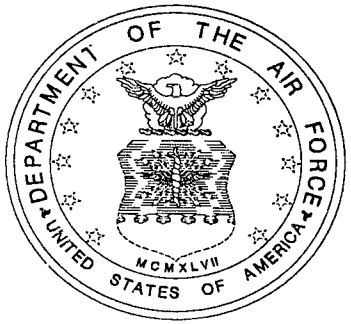
DEPARTMENT OF THE AIR FORCE

SUPPORTING DATA FOR FISCAL YEAR 1996

RESEARCH, DEVELOPMENT, TEST AND EVALUATION

DESCRIPTIVE SUMMARIES



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DESCRIPTIVE SUMMARIES FOR PROGRAM ELEMENTS OF THE DEPARTMENT OF THE AIR FORCE RESEARCH AND DEVELOPMENT PROGRAM FY 1996 BUDGET ESTIMATES FEBRUARY 1995

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 Congress committees during the Fiscal Year 1996 hearings. This information is in addition to the testimony given by DOD witnesses.

a. (U) Exhibits R-2 and R-3 (formerly called Descriptive Summaries) provide narrative information for all RDT&E program elements and projects, except those listed in paragraph 4b, within the USAF FY95 RDT&E program. The formats and contents of this documents are in accordance with the guidelines and requirements of the Congressional committees insofar as possible.

b. (U) The "Other Program Funding Summary" portion of the R-2 includes, in 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.

c. (U) There are no FY96 "Facilities Exhibits" that contain information on major improvement to and construction of government owned facilities funded by RDT&E.

d. (U) The FY95 reduction for the Small Business Innovative Research program is reflected in the R-2's FY95 column. The FY95 R-2 column differs from the R-1 column by the SBIR reduction amount with the exception of the Science and Technology Programs (6.1, Basic Research; 6.2, Exploratory Development; 6.3A, Advanced Development; and PE 0605306F, Ranch Hand).

2. (U) COMPARISON OF FISCAL YEARS 1995 AND 1996 DATA. A direct comparison of Fiscal Years 1995 and 1996 data shown in this document with corresponding data in the Descriptive Summaries dated February 1994 will reveal differences. Many of the differences are attributable to the following:

a. (U) FY95 funding changes as a result of congressional action on the appropriation and/or proposed RDT&E reprogramming actions.

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b. (U) FY94 funding changes between October 1, 1993 and September 30, 1994 due to RDT&E reprogramming actions, supplemental appropriations and rescissions.

c. (U) Reclassification of FY94 and FY95 data to achieve comparability with the program structure for FY96.

3. (U) Relationship of FY96 budget structure to the FY95 Budget approved by the Congress:

PE	TITLE	REMARKS
0101213F	Minuteman Squadrons	Terminated; transferred resources to PE 0604851 ICBM, EMD, and PE 0603851F ICBM Dem/Val
0207136F	Manned Destruction Suppression	Transferred-in project 2671- FY95 and prior funded under another (classified) PE Terminated project 3777 was incorrectly put in ABIDES the correct project number is 4375 which is terminated in FY96
0207160F	Tri-Service Standoff attack Missile	Terminated FY95
0207422F	Deployable C3 Systems	Transferred-in FY96 to 0207423F, project 1013
0207423F	Advanced Communications Sytems	Transferred-in project 1013- FY95 program funded in PE0207422F
0207590F	Seek Eagle	Transferred-in project 2784- FY95 and prior funded in PE 0604602F
0303110F	Defense Satellite Communications System (DSCS)	New Start project 2638 begins subproject Service Life Extension Program
0303144F	Electromag Compatability Analysis Center (ECAC)	Transfer to Joint Spectrum Center (DISA) PE 033144K
0303605F	MILSATCOM	Zero transfer to 3400 by Congressional direction
0305119F	Medium Launch Vehicles	Transferred a portion of funds to PE 0603853F EELV
0305128F	Security Investigative Activities	New Start FY96

0305145F	Arms Control Implementation	New Start project 4190
0305158F	Constant Source	Eliminated project 4071 and transferred funds to start two new projects, 4394 and 4395 for better visibility
0305906F	NCMC TW/AA System	New Start; Congressional transfer in FY95
0305910F	Spacetrack	Eliminated project 2296-was not started in FY95
0401119F	C-5 Airlift Squadrons	New Start FY97 only
0401218F	KC-135s	Terminated project 2214 FY96 Transfer funds from 4285 to 4286 New Start project 4403 FY96
0404102F	Aerospace Rescue and Recovery	New Start FY96
0602201F	Aerospace Flight Dynamics	Transferred-in resources to project 4397 from PE 0602206F, project 2673
0602202F	Human Systems Technology	Combined PE 0602205F and 0602206F into this PE Transferred project 1121 to project 1123 Transferred project 2673 to PE 0602201 project 4397 Transferred project 6302 to project 7757 Transferred project 6893 to project 7184 Transferred project 7231 to projects 7184 & 7757 Transferred project 7719 to project 1123 Transferred project 7930 to project 7184
0602205F	Personnel, Training & Simulation	PE 0602205F & 0602206F were combined into 0602202F
0602206F	Civil Engineering & Environmental Quality	
0602602F	Conventional Munitions	Transferred resources from project 2567 to project 2068

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0603205F	Flight Vehicle Technologies	Transferred resources from project 2506 to project 2978 Transferred resources from PE 0603723F project 2104 to project 4398
0603250F	Lincoln Laboratory	Terminated PE in FY96
0603253F	Advanced Avionics Integration	Transferred project 3833 to PE 0603800F (JAST) in FY95 & out as it was denied by Congress in FY94 Restructured PE to address aging aircraft & obsolescence of avionics inventory
0603302F	Space & Missile Rocket Propulsion	Transferred a portion of project 6340 & 6341 to project 4373 Transferred a portion of project 6341 to project 6339 Transferred-in project 0003 from PE 0603401F
0603308F	Strategic Missile Modernization	Terminated; resources transferred to PE 0603851F ICBM Dem/Val
0603311F	Ballistic Missiles Technology	Terminated project 4092 FY96
0603401F	Advanced Spacecraft Technology	Transferred-in resources to project 4400 from PE 0603438F Transferred project 0003 to PE 0603302F
0603438F	Satellite Systems Survivability	Transferred resources to PE 0603401F project 4400
0603723F	Civil & Environmental Engineering Technology	Transferred project 2104 to PE 0603205F project 4398
0603851F	Intercontinental Ballistic Missile Dem/Val	New Start PE and project initiated by Congress
0603853F	Evolved Expendable Launch Vehicle	New Start project 0006 funds EELV which was initated by Congress in FY95
0604201F	Aircraft Avionics Equipmrnt Development	New Start project 2050 JHMCS is currently in phase 0 (concept exploration)
0604227F	Training Systems Development	Transferred project 3135 to PE 0604243F, project 4369, for FYs 96-98. FY99 and outyears remain in PE0604227F project 2325
0604233F	Specialized Undergraduate Pilot Training	New Start project 4376

	Training	
0604256F	Threat Simulator Development	Terminated project 1006 Transferred from PE 0605708F to project 2900 Transferred from PE 0305887F to project 2907
0604270F	Electronic Warfare Development	Terminated project 2066 (EF-111A SIP) in FY96 with retirement of EF-111A in FY97 Combined project 3896 and project 4077 to project 3891 beginning in FY96
0604441F & 0603441F	SBIRS EMD & DEM/VAL	New Start; project 0002 continues funding of MSTI from PE 0603402F. Funding initated by Congress in FY95
0604480F	GPS IIF	New Start PE and project 0005; resources from PE 0305165F Satellite Replenishment effort
0604600F	Munitions Dispenser Development	New PE. Prior to FY95, project 1015 was funded in PE 0604604F
0604601F	C/B Defense Equipment	FY96 and out resources transferred to RDT&E Defensewide PE
0604602F	Armament/Ordnance Development	Transferred project 2784 to PE 0207590F (Seek Eagle)
0604609F	R&M Maturation/Technology Insertion	PE eliminated; effort and resources transferred to PE 0708026F
0604617F	Air Base Operability	Combined projects 2621, 3141, 4057, and 4058 were consolidated under project 2895 beginning FY96
0604704F	Common Support Equipment Development	Transferred project 3759 to PE 0708611F
0604711F	Systems Survivability Nuclear Affects	Terminated FY96. Funding on R-1 is an administrative error
0604851F	EMD	New start PE and project initiated by Congress in FY95
0605708F	NAVSLED Radar Track	PE eliminated. Effort and resources transferred to 0605807F (project 06TG) and 0604256F Threat Simulator Development

0605807F	Test & Evaluation Support	Transferred a portion of funds to 0605896F Base Operations RDT&E projects 06BS, 06CE, & 06UT from project 06TS. Transferred in resources from PEs 0605708F, 0605863F, 0605876F, and 0605878F
0604853F	Environmental Conservation	New PE. Effort and resources transferred from PE 060585 6F
0605854F	Pollution Prevention	Transferred-in resources from PE 0708054F
0605856F	Environmental Compliance	Transferred a portion of funds to start PE 0605853F
0605863F	Aircraft Support	PE eliminated. Effort and resources transferred to 060508 07F project 06AS
0605876F	Minor Construction	PE eliminated. Effort and resources transferred to 060508 07F project 06MC
0605878F	Maintenance & Repair	PE eliminated. Effort and resources transferred to 060580 7F project 06MR
0708012F	Logistic Support Activities	Transferred resources to PE 0708611F Support Systems Development and 0604740F Product Data Systems Modernization
0708026F	Productivity, Reliability, Availability, Maintainability (PRAM)	Transferred-in resources from PE 0604609F
0708054F	Pollution Prevention	Transferred resources to 0605854F
0708611F	Support Systems Development	New Start consolidated resources transferred from portions of 0708012F, 0604704F and 0604740F

Budget Activities 6.1, 6.2, 6.3, and Ranch Hand II Epidemiology Study (PE 0605306F); reference the FY95 projects that begin with "06." For FY96 and beyond, resources were transferred to the appropriate technical project within the PE.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: FEBRUARY 1995

BUDGET ACTIVITY: 7 - Operational Systems Development

PE NUMBER AND TITLE: PE 11113F - B-52 Squadrons

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	6167	0	16505	7457	995	0	0	0	0	31124
4258 Have Lite Study	6167	0	0	0	0	0	0	0	0	6167
4401 Air Force Mission Planning System	0	0	2983	2386	995	0	0	0	0	6364
4370 Wind Corrected Munitions Dispenser Kit	0	0	3977	0	0	0	0	0	0	3977
4371 Global Positioning System TACAN Emulation	0	0	9545	0	0	0	0	0	0	9545
4402 Electronic Countermeasures Improvement	0	0	0	5071	0	0	0	0	0	5071

A. Mission Description and Budget Item Justification

The B-52H is the primary nuclear roled bomber in the USAF inventory. It provides the only air launched cruise missile carriage within the USAF. The B-52H also provides theater CINCs with long range strike capability. The B-52H is currently undergoing a conventional enhancement modification which will allow it to carry MIL-STD 1760 weaponry. The current service life of the B-52H extends past 2030. The HAVE LITE Study and Wind Corrected Munitions Dispenser Kit support the conventional enhancement of the B-52H. Air Force Mission Planning System supports the Air Force movement of all mission planning to a common system. GPS TACAN Emulation provides support of Congressionally-directed GPS 2000. Electronic Countermeasures Improvement supports a DESERT STORM identified deficiency. This program is in the Operational Systems Development/Research Category budget activity because it supports a currently operational system. B-52 program management is provided by Air Force Material Command's Oklahoma Air Logistics Center. The prime contractor for HAVE NAP is Rafael Industries. The prime contractor for all other projects is Boeing Defense & Space Group.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: FEBRUARY 1995

BUDGET ACTIVITY: 7 - Operational Systems Development

PE NUMBER AND TITLE: PE 11113F - B-52 Squadrons

(U) B. Program Change Summary ($ in Thousands)

	1994	1995	1996	1997	Total Cost
(U) Previous President's Budget	0	0	0	0	0
(U) Appropriated Value	6300	0			6300
(U) Adjustments to Appropriated Value					
(U) a. Undistributed General Reductions	-133	0	0	0	-98
(U) Current Budget Submit/President's Budget	6167	0	16505	7457	30129

(U) Change Summary Explanation:

(U) Funding: The FY94 funding reduced due to other programmatic needs.

(U) Schedule: None

(U) Technical: None

(U) C. Other Program Funding Summary ($ in Thousands)

	1994	1995	1996	1997	1998	1999	2000	2001	To Compl	Total Cost
(U) Acft Procurement(PE11113F)	37203	33300	4908	9961	26950	65482	48673	38117	n/a	n/a
(U) Missile Procurement(PE11113F)	2068	2175	2150	1855	1926	2002	2062	2125	n/a	n/a
(U) Mission Planning Systems (PE280006F)	1895	180	0	0	0	0	0	0	n/a	n/a

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: FEBRUARY 1995

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT NO.
7 - Operational Systems Development	PE 11113F - B-52 Squadrons	4258

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Have Nap Study	6167	0	0	0	0	0	0	0	0	6167

(U) A. Mission Description and Budget Item Justification

Congressional language inserted funding for the Air Force to continue Have Lite technology improvements to the AGM-142 (Have Nap) missile. The Have Lite missile was a proposal by Rafael of Israel to develop an improved smaller variant of the AGM-142 missile. The AGM-142 precision standoff missile is currently employed on the B-52 aircraft.

(U) FY 1994
- (U) - FY1994 Plans:
  - -- (U) Develop an improved electronic section to reduce cost and increase operational capability ($3.1M) -- 4QFY94
  - -- (U) Funding submitted for reprogramming in Omnibus Reprogramming Bill ($3.0M) -- 4QFY9
    - -- (U) This request was denied by Congress.
  - -- (U) $750 released from FY94 funds for System Program Office improvements to the electronic section. $2250 is still excess to the HAVE NAP producibility enhancement effort. AF/XOFW is requesting funds reprogramming to use excess funds for additional missile procurement.

(U) FY 1995
- (U) No activity

(U) FY 1996
- (U) No activity

(U) FY 1997
- (U) No activity

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: FEBRUARY 1995

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT NO.
7 - Operational Systems Development	PE 11113F - B-52 Squadrons	4258

(U) B. Program Change Summary ($ in Thousands)

	1994	1995	1996	1997	Total Cost
(U) Previous President's Budget	6300	0	0	0	0
(U) Appropriated Value	6300	0	0	0	6300
(U) Adjustments to Appropriated Value					
(U) a. Undistributed General Reductions	-133	0	0	0	133
(U) Current Budget Submit/President's Budget	6167	0	0	0	6167

(U) Change Summary Explanation:

(U) Funding: Funding reduced to support higher priority Air Force RDT&E funding

(U) Schedule: None

(U) Technical: None

(U) C. Other Program Funding Summary ($ in Thousands)

	1994	1995	1996	1997	1998	1999	2000	2001	To Compl	Total Cost
(U) Acft Procurement(BP11000)	5000	5100	0	0	0	0	0	0	0	10100
(U) Missile Procurement(BP25000)	2068	0	0	0	0	0	0	0	0	2068
(U) Missile Procurement (PE11128F)	4972	25817								54427

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: FEBRUARY 1995

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT NO.
7- Operational Development Systems	PE 11113F - B-52 Squadrons	4258

(U) D. Schedule Profile

	1994				1995				1996				1997			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
(U) Contract Award				X												
(U) Electronic Section Development					X	—	—	—	—	—	—	—	X			

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: FEBRUARY 1995

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT NO.
7 - Operational Systems Development	PE 11113F - B-52 Squadrons	4258

(U) A. Project Cost Breakdown ($ in Thousands)

	1994	1995	1996	1997
(U) Government Engineering	750	0	0	0
(U) Software Development	1055	0	0	0
(U) Systems Engineering	2112	0	0	0
(U) Total	3917	0	0	0

(U) B. Budget Acquisition History and Planning Information ($ in Thousands)

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to 1994	Budget 1994	Budget 1995	Budget 1996	Budget 1997	Budget to Complete	Total Program
(U) Product Development Organizations											
ASC OL/LIW-B	FFP	16 Sep 94	7000	0	7900	6167					11817

(U) **Government Furnished Property: None**

(U) C. Funding Profile ($ in Thousands)
Not applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: FEBRUARY 1995

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT NO.
7 - Operational Systems Development	PE 11113F - B-52 Squadrons	4401

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Air Force Mission Planning System	0	0	2983	2386	995	0	0	0	0	6364

(U) A. Mission Description and Budget Item Justification

Air Force Mission Planning System (AFMSS) develops an aircraft specific avionics/weapons/electronic countermeasure (A/W/E) module to be used in conjunction with the core AFMSS system. AFMSS is the replacement mission planning system for the current B-52 legacy system, Mission Data Preparation System. AFMSS will provide the B-52 with its future ground and inflight mission planning capability. Block 1 of this project will provide capability to plan conventional gravity missions at the unit level. Block 1 funding is under the overall AFMSS Core Development effort within the AFMSS PE 28006F. Block 2 of this project will provide capability to plan nuclear weapons via AFMSS. Block 3 of this project will add smart weapon (like TSSAM replacement and JDAM) capabilities and enhancements to the first two AFMSS blocks.

(U) FY 1994
- (U) No activity under this project

(U) FY 1995
- (U) No activity under this project

(U) FY 1996
- (U) Block 2 Nuclear Capable Software Development ($2983)

(U) FY 1997
- (U) Block 3 Conventional Software Development for advanced weapons ($2386)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: FEBRUARY 1995

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT NO.
7 - Operational Systems Development	PE 11113F - B-52 Squadrons	4401

(U) B. Program Change Summary ($ in Thousands)

	1994	1995	1996	1997	Total Cost
(U) Previous President's Budget	0	0	0	0	0
(U) Current Budget Submit/President's Budget	0	0	2983	2386	6364

(U) Change Summary Explanation: N/A

(U) C. Other Program Funding Summary ($ in Thousands)

	1994	1995	1996	1997	1998	1999	2000	2001	To Compl	Total Cost
(U) Other Procurement(BP83000)	0	0	0	0	497	0	0	0	0	497
(U) AFMSS PE28006F	1895	180	0	0	0	0	0	0	2075	3797

(U) D. Schedule Profile

	1994				1995				1996				1997			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
(U) Contract Award Block 2									X							
(U) Software Development Block 2									X	—	—	—	X			
(U) Contract Award Block 3													X			
(U) Software Development Block 3													X	—	—	X

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: FEBRUARY 1995

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT NO.
7 - Operational Systems Development	PE 11113F - B-52 Squadrons	4401

(U) A. Project Cost Breakdown ($ in Thousands)

	1994	1995	1996	1997
(U) Software Development	0	0	2883	2286
(U) System Program Office Support	0	0	100	100
(U) Total	0	0	2983	2386

(U) B. Budget Acquisition History and Planning Information ($ in Thousands)

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to 1994	Budget 1994	Budget 1995	Budget 1996	Budget 1997	Budget to Complete	Total Program
Product Development Organizations											
Oklahoma City Air Logistics Center/LAS								2883	2286	945	6114
Support and Management Organizations											
Oklahoma City Air Logistics Center/LAH								100	100	50	250
Total Program								2983	2386	995	6364

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: FEBRUARY 1995

BUDGET ACTIVITY: 7 - Operational Systems Development

PE NUMBER AND TITLE: PE 11113F - B-52 Squadrons

PROJECT NO.: 4370

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Wind Corrected Munitions Dispenser	0	0	3977	0	0	0	0	0	0	3977

(U) A. Mission Description and Budget Item Justification

The requirement exists for the integration of the Wind Corrected Munitions Dispenser (WCMD) onto the B-52H platform. The B-52H is designated the bomber test platform with the objective of meeting WCMD testing requirements.

(U) FY 1994
- (U) No activity

(U) FY 1995
- (U) No activity

(U) FY 1996
- (U) Software Requirements/Documentation development ($1400)
- (U) Contractor Interface Establishment ($1400)
- (U) Software Development initiation ($277)
- (U) Technical data development ($500)
- (U) Test planning documentation development ($200)
- (U) Ground/flight testing support ($200)

(U) FY 1997
- (U) No activity

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: FEBRUARY 1995

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT NO.
7 - Operational Systems Development	PE 11113F - B-52 Squadrons	4370

(U) B. Program Change Summary ($ in Thousands)

	1994	1995	1996	1997	Total Cost
(U) Previous President's Budget	0	0	7000	0	0
(U) Adjustments to Budget Years Since FY95 PB			-3023		
(U) Current Budget Submit/President's Budget	0	0	3977	0	3977

(U) Change Summary Explanation:

(U) Funding - PBD 161 "Air Force Combat Aircraft" directed that the $3000 remaining in the HAVE LITE study money (modification 4258) be used in FY96 to support RDT&E efforts. OSD determined the money would come from the WCMD line. PBD 604 "NON-PAY PURCHASES INFLATION took an additional $23. The HAVE LITE study money cannot be used for the WCMD project.

(U) Schedule - None

(U) Technical - None

(U) C. Other Program Funding Summary ($ in Thousands)

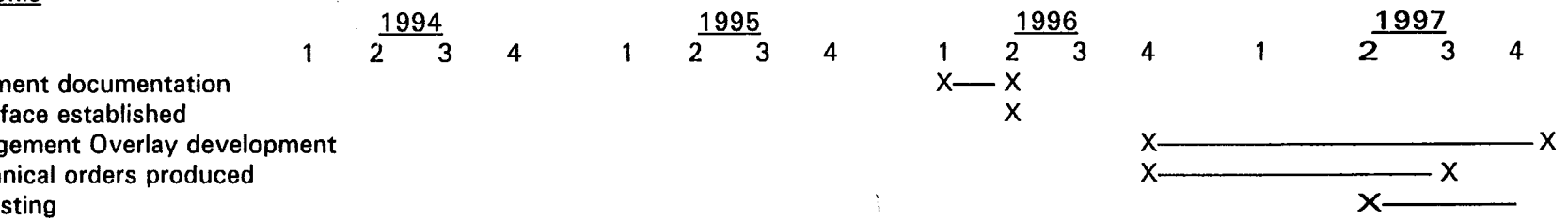
	1994	1995	1996	1997	1998	1999	2000	2001	To Compl	Total Cost
(U) Aircraft Procurement(BP11000)	0	0	0	4600	0	0	0	0	0	4600
(U) Weapon Procurement/PE27600	0	0	0	0	16707	25817	82107	82126	1,171,741	1,378,100

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: FEBRUARY 1995

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT NO.
7- Operational Development Systems	PE 11113F - B-52 Squadrons	4370

(U) D. Schedule Profile



RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: FEBRUARY 1995

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT NO.
7 - Operational Systems Development	PE 11113F - B-52 Squadrons	4370

(U) A. Project Cost Breakdown ($ in Thousands)

	1994	1995	1996	1997
(U) System requirement documentation	0	0	1400	0
(U) Contractor interface	0	0	1400	0
(U) Software Management Overlay develop	0	0	277	0
(U) Preliminary technical orders	0	0	500	0
(U) Ground/flight testing	0	0	200	0
(U) System Program Office Support			200	0
(U) Total	0	0	3977	0

(U) B. Budget Acquisition History and Planning Information ($ in Thousands)

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to 1994	Budget 1994	Budget 1995	Budget 1996	Budget 1997	Budget to Complete	Total Program
Product Development Organizations											
Boeing Space & Defense Group in Wichita, KS	FFP	FY96/1	3777		0			3777		0	3777
Support and Management Organizations											
Oklahoma Air Logistics Center/LAH, Tinker AFB, OK				200				200		0	200
Total Program								3977			3977

Government Furnished Property: None

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: FEBRUARY 1995

BUDGET ACTIVITY: 7 - Operational Systems Development

PE NUMBER AND TITLE: PE 11113F - B-52 Squadrons

PROJECT NO.: 4371

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Global Positioning System TACAN Emulation	0	0	9545	0	0	0	0	0	0	9545

(U) A. Mission Description and Budget Item Justification

The requirement exists to fully integrate GPS onto all DoD aircraft. Congressionally mandated to have this capability by 2000. This project provides GPS signals data to the pilot's station to replace current TACAN flight data. This project will use GPS bombing and navigation data currently being installed on the B-52H as the basis for this upgrade.

(U) FY 1994
- (U) No activity

(U) FY 1995
- (U) No activity

(U) FY 1996
- (U) System Requirement Review completion ($1600)
- (U) Preliminary Design Review completion ($200)
- (U) Fabrication of lab demonstration system ($2000)
- (U) Fabrication of system mock-up ($3345)
- (U) Fabrication of prototype unit ($2100)
- (U) Critical Design Review ($100)
- (U) Test and evaluation ($200)

(U) FY 1997
- (U) No activity

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: FEBRUARY 1995

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT NO.
7 - Operational Systems Development	PE 11113F - B-52 Squadrons	4371

(U) B. Program Change Summary ($ in Thousands)

	1994	1995	1996	1997	Total Cost
(U) Previous President's Budget	0	0	9600	0	9600
(U) Adjustments to Budget Years Since FY95 PB			-55		-55
(U) Current Budget Submit/President's Budget	0	0	9545	0	9545

(U) Change Summary Explanation:

(U) Funding - PBD 604 "NON-PAY PURCHASE INFLATION took $55 from the program.

(U) Schedule - none

(U) Technical - none

(U) C. Other Program Funding Summary ($ in Thousands)

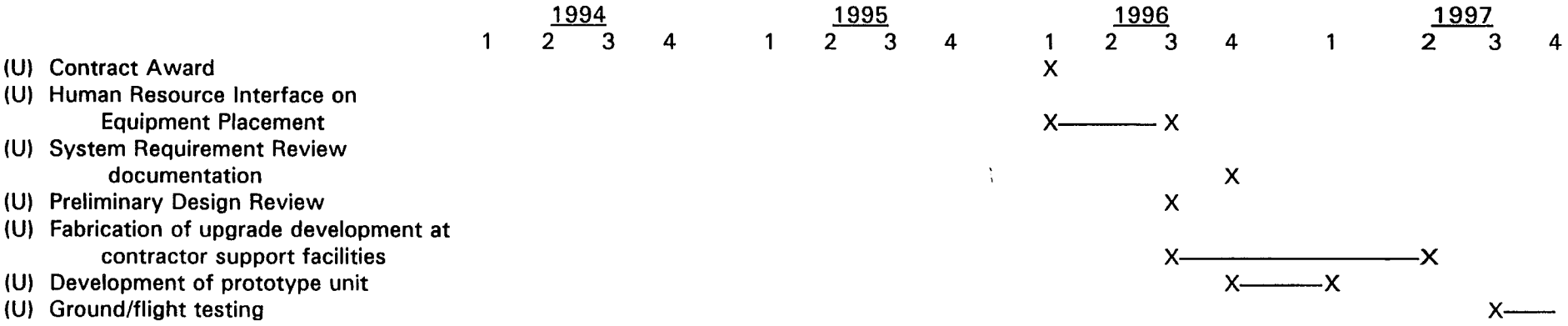
	1994	1995	1996	1997	1998	1999	2000	2001	To Compl	Total Cost
(U) Aircraft Procurement(BP11000)	0	0	0	3800	8100	12900	7700	1500	0	34000

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: FEBRUARY 1995

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT NO.
7- Operational Development Systems	PE 11113F - B-52 Squadrons	4371

(U) D. Schedule Profile



RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: FEBRUARY 1995

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT NO.
7 - Operational Systems Development	PE 11113F - B-52 Squadrons	4371

(U) A. Project Cost Breakdown ($ in Thousands)

	1994	1995	1996	1997
(U) Human Resource Interface	0	0	200	0
(U) System Requirement Review/ Preliminary Design Review		0	1500	0
(U) Fabrication of upgrade development	0	0	5245	0
(U) Development of prototype unit	0	0	2100	0
(U) Ground/flight testing	0	0	200	0
(U) System Program Office Support	0	0	300	0
(U) Total	0	0	9545	0

(U) B. Budget Acquisition History and Planning Information ($ in Thousands)

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to 1994	Budget 1994	Budget 1995	Budget 1996	Budget 1997	Budget to Complete	Total Program
Product Development Organizations											
Boeing Space & Defense Group in Wichita, KS	FFP	Oct 95	9245		0			9245		0	9245
Support and Management Organizations											
Oklahoma Air Logistics Center/LAH				300	0			300		0	300
Warner Robins Air Logistics Center/LKN											
Ogden Air Logistics Center/LIR											
Total Program								9545			9545

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: FEBRUARY 1995

BUDGET ACTIVITY: 7 - Operational Systems Development

PE NUMBER AND TITLE: PE 11113F - B-52 Squadrons

PROJECT NO.: 4402

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Electronic Countermeasures Improvement	0	0	0	5071	0	0	0	0	0	5071

(U) A. Mission Description and Budget Item Justification

There exists a requirement to provide improved electronic countermeasures to the B-52H ALQ-172 ECM suite. This requirement was identified during DESERT STORM. The project adds a third ALQ-172 to the ECM suite. This improvement provides for the increased memory capability to handle advanced threats as well as correcting a coverage capability problem.

(U) FY 1994
- (U) No activity

(U) FY 1995
- (U) No activity

(U) FY 1996
- (U) No activity

(U) FY 1997
- (U) System Requirement Review ($200)
- (U) Fabrication of lab mock-up ($300)
- (U) Developmental kit fabrication ($4571)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: FEBRUARY 1995

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT NO.
7 - Operational Systems Development	PE 11113F - B-52 Squadrons	4402

(U) B. Program Change Summary ($ in Thousands)

	1994	1995	1996	1997	Total Cost
(U) Previous President's Budget	0	0	0	5100	5100
(U) Adjustments to Budget Years Since FY95 PB				-55	-55
(U) Current Budget Submit/President's Budget	0	0	0	5071	5071

(U) Change Summary Explanation:

(U) Funding - PBD 604 "NON-PAY PURCHASE INFLATION" took $55 from the program.

(U) Schedule - none

(U) Technical - none

(U) C. Other Program Funding Summary ($ in Thousands)

	1994	1995	1996	1997	1998	1999	2000	2001	To Compl	Total Cost
(U) Aircraft Procurement (B52 Mods)	0	0	0	0	4700	22100	31300	30300	3100	91500

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: FEBRUARY 1995

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT NO.
7- Operational Development Systems	PE 11113F - B-52 Squadrons	4402

(U) D. Schedule Profile

	1994				1995				1996				1997			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
(U) Contract Award													X			
(U) Kit Proof																X
(U) System Requirement Review																X

OTHER MILESTONES BEYOND FY97

1. ITO&E FY98/3

2. Full scale installation FY98/4

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: FEBRUARY 1995

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT NO.
7 - Operational Systems Development	PE 11113F - B-52 Squadrons	4402

(U) A. Project Cost Breakdown ($ in Thousands)

	1994	1995	1996	1997
(U) System Requirement Review	0	0	0	200
(U) Mockup Fabrication	0	0	0	300
(U) Developmental Kit Proof	0	0	0	4371
(U) System Program Office Support	0	0	0	200
(U) Total	0	0	0	5071

(U) B. Budget Acquisition History and Planning Information ($ in Thousands)

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to 1994	Budget 1994	Budget 1995	Budget 1996	Budget 1997	Budget to Complete	Total Program
Product Development Organizations											
Boeing Space & Defense Group, Wichita, KS	FFP	Oct 96	4471		0				4471	0	4471
ITT Avionics, Nutley NJ	FFP	Oct 96	300		0				300	0	300
Support and Management Organizations											
Oklahoma Air Logistics Center/LAH, Tinker AFB, OK									300	0	300
Warner Robins Air Logistics Center/LNR, Robins AFB, GA											
Total Project									5071		5071

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE FEBRUARY 1995

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT NO.
7- Operational Systems Development	PE 11113F - B-52 Squadrons	4402

(U) B. Budget Acquisition History and Planning Information Continued ($ in Thousands)

(U) **Government Furnished Property:** not applicable

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: **#7 - Operational Systems Development**

PE NUMBER AND TITLE: **#0101120F Advanced Cruise Missile (ACM)**

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Actual	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	20,978	0	7,060	0	0	0	0	0	0	28,038

A. (U) Mission Description and Budget Item Justification

The ACM is a low-observable, air-launched, strategic cruise missile with significant improvements over the ALCM-B in range, accuracy, and survivability. Armed with a W80 warhead, it is designed to evade air and ground-based defenses in order to strike heavily defended, hardened targets at any location within any potential enemy's territory. The ACM is designed for B-52H external carriage. Missile procurement is complete. FY96 and FY97 funds are required to complete the last 15% of mission support development work. Because the program effort involves depot development, all work is budgeted in the budget activity/research category Operational Systems Development.

(U) FY 1994
- (U) CompleteTest Set Payload Kits ($1,515)
- (U) Complete Radar Cross Section (RCS) Depot Development ($438)
- (U) Continue Sensor Depot Development ($2,512)
- (U) Begin Software Depot Development ($3,235)
- (U) Continue Guidance Depot Development ($3,547)
- (U) Redesign Test Payloads ($625)
- (U) Mission Support/Other ($9,106)

(U) FY 1995
- (U) Continue Sensor Depot Development
- (U) Continue Software Depot Development
- (U) Continue Guidance Depot Development

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: **#7 - Operational Systems Development**

PE NUMBER AND TITLE: **#0101120F Advanced Cruise Missile (ACM)**

(U) FY 1996
- (U) Complete Sensor Depot Development ($1,401)
- (U) Continue Software Depot Development ($1,800)
- (U) Complete Guidance Depot Development ($2,064)
- (U) Mission Support/Other ($1,795)

(U) FY 1997
- (U) Complete Software Depot Development

B. (U) Program Change Summary ($ in Thousands)

	1994	1995	1996	1997	Total Cost
(U) Previous President's Budget	25,251	0	0	0	25,393
(U) Appropriated Value	25,393	0			25,393
(U) Adjustments to Appropriated Value					
(U) Congressional General Reductions	(142)				
(U) SBIR	(394)				
(U) Below Threshold Reprogrammings	(3,879)				
(U) Adjustments to Budget Years Since FY95 PB			7,060		
(U) Current Budget Submit/President's Budget	20,978	0	7,060	0	48,341

(U) Change Summary Explanation:

(U) Funding: The FY95 President's Budget did not contain program funding pending decision on depot support strategy. FY96/FY97 funding is required to complete development of sensor, guidance and flight control software repair capabilities at the depot.

(U) Schedule: None

(U) Technical: None

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #7 - Operational Systems Development

PE NUMBER AND TITLE: #0101120F Advanced Cruise Missile (ACM)

PROJECT NO.: 3844

C. (U) Other Program Funding Summary ($ in Thousands)

	1994	1995	1996	1997	1998	1999	2000	2001	To Compl	Total Cost
(U) Weapon Procurement (3020)										
(U) Budget Activity										
(U) 2. Air Vehicle	3,537	0	1,873	1,888	1,894	2,093	2,156	2,221		15,658
(U) 4. Spares	285	1,293	951	842	808	758	746	687		6,370
(U) Operations and Maintenance (3400)	520	15,159	1,049	990	1,016	1,033	1,064	1,095		21,926

(U) Related RDT&E (3600): None

D. (U) Schedule Profile

	1994				1995				1996				1997			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
(U) Contract Milestones																
(U) Weapon System Support (WSS) Award	X*															
(U) WSS Option 1 Award				X*												
(U) Test Instrumentation Kit Award						X										
(U) Other Program Events																
(U) Depot Activation															X	

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February 1995

BUDGET ACTIVITY: #7 - Operational Systems Development

PE NUMBER AND TITLE: #0101120F Advanced Cruise Missile (ACM)

PROJECT NO.: 3844

A. (U) Project Cost Breakdown ($ in Thousands)

	1994	1995	1996	1997
(U) Depot Activation				
(U) Sensor Depot Test/Repair	2,512		1,401	
(U) Guidance Depot Test/Repair	3,547		2,064	
(U) Software Compiler Rehost	3,235		1,800	
(U) Surveillance	438			
(U) Operational Test Launch Payloads	1,515			
(U) Redesign Test Payloads	625			
(U) Other Efforts	4,229			
(U) Support Contracts	1,712		295	
(U) Mission Support	3,165		1,500	
(U) Total	20,978		7,060	

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February 1995

BUDGET ACTIVITY: #7 - Operational Systems Development

PE NUMBER AND TITLE: #0101120F Advanced Cruise Missile (ACM)

PROJECT NO.: 3844

B. (U) Budget Acquisition History and Planning Information ($ in Thousands)

(U) **Performing Organizations:**

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to 1994	Budget 1994	Budget 1995	Budget 1996	Budget 1997	Budget to Complete	Total Program
(U) Product Development Organizations											
Hughes MSC Tucson, AZ	SS/FPIF	May 92	16914	16914	14093	1853		968			16914
Kearfott Wayne, NJ	SS/FFP	Aug 93	8077	8077	4300	1900		1877			8077
AGMC	PO	Oct 94/Sep 96			1055	2306		620			3981
OC-ALC	PO	Oct 94/Dec 96				3135		1800			4935
SA-ALC	PO	Oct 94/Dec 96			25						25
MISCELLANEOUS						6907					6907
TOTAL PRODUCT DEVELOPMENT					19473	16101	0	5265			40839
(U) Support and Management Organizations											
Logistics SETA	Time/Material	Jan 95			830	1113		295			2238
Miscellaneous SETA		Dec 94				599					599
SPO Mission Support						3165		1500			4665
TOTAL SUPPORT MANAGEMENT					830	4877	0	1795			7502
(U) TOTAL PROJECT					20303	20978	0	7060			48341

(U) **Government Furnished Property:** Not Applicable

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #7 - Operational System Development

PE NUMBER AND TITLE: #0102325F Joint Surveillance System (JSS)

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	3024	2,662	4,711	4,400	2,674	2,698	2,352	2,421	0	31,960
2976 Joint Surveillance System-Connectivity	718	648	650	640	654	668	714	735	0	7,566
2996 FAA/Air Force Radar Replacement	2,306	2,014	4,061	3,760	2,020	2,030	1,638	1,686	0	24,394

(U) A. Mission Description and Budget Item Justification

The Joint Surveillance System (JSS) provides command, control and communications (C^3) capability in support of NORAD's Atmospheric Tactical Warning and Attack Assessment (ATW/AA) air sovereignty, and air defense requirements. The JSS Connectivity (JSS-C) program provides improvements to this capability by integrating new sensor data and enhancing communications capabilities via the Advance Interface Control Unit (AICU). The FAA/Air Force Radar Replacement (FARR) program will replace 39 existing JSS radars with solid-state, three-dimensional ARSR-4 radars to improve mission performance and reduce operation and maintenance costs. The JSS-C portion of this PE falls under research category Operational System Development, as it is a system being deployed to the operational community to solve an operational deficiency in the existing operational system and is post Milestone Three. The FARR portion of this program element also falls under research category Operational System Development as it has received approval for production. Reference individual projects for budget item justification.

(U) Acquisition Strategy:

Air Force program management for the JSS Region and Sector Operations Control Centers (ROCCs/SOCCs) is provided by the Air Force Materiel Command, Wright-Patterson AFB, OH. The prime contractor for the JSS ROCCs/SOCCs is Hughes Aircraft Corporation, Fullerton, CA. Management of the JSS Connectivity is by the Electronic Systems Center, Air Force Materiel Command, Hanscom AFB, MA. The prime contractor for the AICU is TRW, Aurora, CO. Enhanced Traffic Management System (ETMS), Department of Transportation, Cambridge, MA provides the AICU with flight plan information from FAA sources. The Federal Aviation Administration (FAA) is the lead acquisition agency for the FAA/AF Radar Replacement Program in accordance with a 19 November 1984 sub-agreement (as amended by Amendment 1, dated 1 September 1988) to FAA/AF National Agreement (NAT) 711. The FAA and the Air Force have established a joint Program Office at HQ, FAA, Washington, DC for this procurement. Westinghouse Corporation, Linthicum, MD is the prime contractor for the FARR program.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #7 - Operational System Development

PE NUMBER AND TITLE: #0102325F Joint Surveillance System (JSS)

(U) B. Program Change Summary ($ in Thousands)

	1994	1995	1996	1997	Total Cost
(U) Previous President's Budget	3,089	2,770	4,581	4,400	31,960
(U) Appropriated Value	3,089	2,770			
(U) Adjustments to Appropriated Value					
a. General Congressional Reductions		-51			
b. Below Threshold Reprogramming	-17				
c. SBIR	-48	-57			
(U) Adjustment to Budget Years Since FY95 PB			244		
(U) Current Budget Submit/President's Budget	3,024	2,662	4,711	4,400	31,960

(U) Change Summary Explanation:

Funding: None.

Schedule: Funding change in FY96 due to schedule slip for radar and flight fests at Eglin and Tinker.

Technical: None.

(U) C. Other Program Funding Summary ($ in Thousands)

	1994	1995	1996	1997	1998	1999	2000	2001	To Compl	Total Cost
(U) Other Procurement AF Total	,7,430	14,213	5,443	1,299	1,475	1132	593	222	0	31,807
Budget Activity 3, WSC 838010	'7,321	14,059	4,898	0	0	0	0	0	0	26,278
Budget Activity 3, WSC 83790A	82	0	0	0	0	0	0	0	0	82
Budget Activity 4, WSC 84590A	0	154	0	0	0	0	0	0	0	154
Budget Activity 6, WSC 86190A	0	0	545	1,299	1,475	1132	593	222	0	5,266

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: January 1995

BUDGET ACTIVITY: #7 - Operational System Development

PE NUMBER AND TITLE: #0102325F Joint Surveillance System (JSS)

PROJECT NO.: 2976

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
2976 Joint Surveillance System-Connectivity	718	648	650	640	654	668	714	735	0	7,566

(U) A. Mission Description and Budget Item Justification

The JSS Connectivity provides improvements to Atmospheric Tactical Warning and Attack Assessment (ATW/AA), air sovereignty, and air defense command, control, and communications (C^3) by integrating new sensor data and enhancing communications capabilities.

(U) FY 1994
- (U) Provide program office support. ($112)
- (U) Provide system engineering support. ($394)
- (U) Provide system integration support for Automatic Air Movement Data System (AAMDS). ($212)

(U) FY 1995
- (U) Provide program office support. ($237)
- (U) Provide system engineering support. ($269)
- (U) Provide system integration and test support for AAMDS. ($142)

(U) FY 1996
- (U) Provide program office support. ($154)
- (U) Provide system engineering support for AAMDS. ($437)
- (U) Provide system engineering support for ETMS in support of AAMDS. ($59)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: January 1995

BUDGET ACTIVITY: #7 - Operational System Development

PE NUMBER AND TITLE: #0102325F Joint Surveillance System (JSS)

PROJECT NO.: 2976

(U) FY 1997
- (U) Provide program office support. ($151)
- (U) Provide system engineering support for AAMDS. ($456)
- (U) Provide system engineering support for Enhanced Traffic Management System (ETMS) in support of AAMDS. ($33)

B. Program Change Summary ($ in Thousands)

	1994	1995	1996	1997	Total Cost
(U) Previous President's Budget	636	662	662	647	2,689
(U) Appropriated Value	636	662			
(U) Adjustments to Appropriated Value	None				
a. General Congressional Reduction					
b. Below Threshold Reprogramming	82				
c. SBIR		-14			
(U) Adjustment to Budget Years Since FY95 PB			-12	-7	
(U) Current Budget Submit/President's Budget	718	648	650	640	7,566

(U) Change Summary Explanation:

Funding. FY96 and FY97 change is due to realignment of funds to Project 2996 within the PE due to revised cost estimate for testing.

Schedule: Due to the addition of the Automatic Air Movement Data System (AAMDS) requirement, FOC has been extended 24 months.

Technical:

(U) C. Other Program Funding Summary ($ in Thousands)

Not applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #7 - Operational System Development

PE NUMBER AND TITLE: #0102325F Joint Surveillance System (JSS)

PROJECT NO.: 2976

(U) D. Schedule Profile

	1994				1995				1996				1997			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
(U) ECP-5 (Config Record)		X														
(U) QOT&E					X											
(U) FQT&E						X										
(U) CONUS FOC							X									
(U) Automated Air Movement Data System IOC						X										
(U) Advanced Interface Control Unit FOC													X			

U) A. Project Cost Breakdown ($ in Thousands)

	1994	1995	1996	1997
(U) System Engineering Support	606	569	496	489
(U) Program Office Support	112	79	154	151
(U) Total	718	648	650	640

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February 1995

BUDGET ACTIVITY: #7 - Operational System Development

PE NUMBER AND TITLE: #0102325F Joint Surveillance System (JSS)

PROJECT NO.: 2976

(U) B. Budget Acquisition History and Planning Information ($ in Thousands)

(U) Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to 1994	Budget 1994	Budget 1995	Budget 1996	Budget 1997	Budget to Complete	Total Program
Product Development Organizations											
None											
Support and Management Organizations											
TEMS	Various Contracts	Ongoing			2,139	462	406	449	463	1,301	5,220
Miscellaneous	Various Contracts	Ongoing				256	242	201	177	1,470	2,346
Test and Evaluation Organizations											
None											
Subtotal Product Development											
Subtotal Support and Management					2,139	718	648	650	640	2,771	7,566
Subtotal Test and Evaluation											
Total Project					2,139	718	648	650	640	2,771	7,566

(U) Government Furnished Property: Not applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #7 - Operational System Development

PE NUMBER AND TITLE: #0102325F Joint Surveillance System (JSS)

PROJECT NO.: 2996

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
2996 FAA/Air Force Radar Replacement	2,306	2,014	4,061	3,760	2,020	2,030	1,638	1,686	0	24,394

(U) A. Mission Description and Budget Item Justification

The FAA/Air Force Radar Replacement (FARR) program will replace 39 existing JSS radars with solid-state, three-dimensional ARSR-4 radars to improve mission performance and reduce operation and maintenance costs. This includes technical radar site surveys and interface engineering in preparation for system installation, test and checkout.

(U) FY 1994
- (U) Provide program office and engineering support. ($425)
- (U) Continue test support for FARR Joint Program Office (JPO). ($963)
- (U) Continue site preparation, radar production, installation, test and system checkout. ($418)
- (U) Continue development of site design engineering packages. ($400)
- (U) Provide interoperability evaluations and commissioning support. ($100)

(U) FY 1995
- (U) Provide program office and engineering support. ($392)
- (U) Continue test support for FARR JPO. ($1,079)
- (U) Continue site preparation, radar production, installation, test and system checkout. ($543)

(U) FY 1996
- (U) Provide program office support. ($420)
- (U) Continue test support for FARR JPO. ($1,395)
- (U) Continue radar production, installation, test and system checkout. ($691)
- (U) Continue interoperability evaluations and commissioning support. ($1,555)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #7 - Operational System Development

PE NUMBER AND TITLE: #0102325F Joint Surveillance System (JSS)

PROJECT NO.: 2996

(U) FY 1997
- (U) Provide program office support. ($650)
- (U) Continue test support for FAA/Air Force Radar Replacement (FARR) Joint Program Office (JPO). ($1,300)
- (U) Continue radar production, installation, test and system checkout. ($607)
- (U) Continue interoperability evaluations and commissioning support. ($1,203)

(U) B. Program Change Summary ($ in Thousands)

	1994	1995	1996	1997	Total Cost
(U) Previous President's Budget	2,388	2108	3,919	3,753	12,168
(U) Appropriated Value	2,388				
(U) Adjustments to Appropriated Value					
a. General Congressional Reduction		-51			
b. Below Threshold Reprogramming	-82				
c. SBIR		-43			
(U) Adjustments to Budget Years Since FY95 PB			142	-7	
(U) Current Budget Submit/President's Budget	2,306	2014	4,061	3,760	24,394

(U) Change Summary Explanation:

Funding: FY96 and FY97 change is due to inflation adjustment and realignment of funds from Project 2976 but within the PE to support revised cost estimate for testing.

Schedule: Commissioning of the first system will be delayed 15 months as the time to accomplish contractor factory and field test and repair activities has taken longer than planned. Resolution of test open items, preconditions for start of operational testing and a contractor requested engineering change proposal have further delayed completion of testing.

Technical: None.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #7 - Operational System Development

PE NUMBER AND TITLE: #0102325F Joint Surveillance System (JSS)

PROJECT NO.: 2996

(U) C. Other Program Funding Summary ($ in Thousands)
Not applicable.

(U) D. Schedule Profile

	1994				1995				1996				1997			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
(U) Factory Test Complete	X															
(U) Preliminary Acceptance 1st Test Site			X													
(U) Reliability Test 1st Test Site				X												
(U) Developmental Testing & Evaluation (DT&E)					X											
(U) Operational Testing & Evaluation (OT&E)					X											
(U) First Operational Readiness Date							X									
(U) Final Acceptance of Systems 21-26									X							
(U) Final Acceptance of Systems 27-33										X						
(U) Final Acceptance of Systems 34-40											X					
(U) Final Acceptance of Systems 41-42												X				
(U) Operational Readiness Date														X		

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February 1995

BUDGET ACTIVITY: #7 - Operational System Development

PE NUMBER AND TITLE: #0102325F Joint Surveillance System (JSS)

PROJECT NO.: 2996

(U) A. Project Cost Breakdown ($ in Thousands)

	1994	1995	1996	1997
(U) Systems Engineering	400	356	184	190
(U) Contractor Engineering Support	963	723	1,211	1,300
(U) Installation/Tests	518	543	2,246	1,304
(U) Program Management Support	425	392	420	966
(U) Total	2,306	2,014	4,061	3,760

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February 1995

BUDGET ACTIVITY: #7 - Operational System Development

PE NUMBER AND TITLE: #0102325F Joint Surveillance System (JSS)

PROJECT NO.: 2996

(U) B. Budget Acquisition History and Planning Information ($ in Thousands)

(U) Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to 1994	Budget 1994	Budget 1995	Budget 1996	Budget 1997	Budget to Complete	Total Program
Product Development Organizations											
None											
Support and Management Organizations											
MITRE	F19628-94-C-0001	Ongoing			2,194	418	356	377	380	598	4,323
TEMS	Various Contracts	Ongoing			1,526	143					1,669
Martin Marietta	MDA903-89-C-0059	Ongoing			2,655	820	723	1,211	1,300	1,501	8,210
Miscellaneous	Various Contracts	Ongoing				507	392	227	776	455	2,357
Test and Evaluation Organizations											
Various Test Organizations		Ongoing			1,828	418	543	2,246	1,304	1,496	7,835
Subtotal Product Development					0	0	0	0	0	0	0
Subtotal Support and Management					6,375	1,888	1,471	1,815	2,456	2,554	16,559
Subtotal Test and Evaluation					1,828	418	543	2,246	1,304	1,496	7,835
Total Project					8,203	2,306	2,014	4,061	3,760	4050	24,394

(U) Government Furnished Property: Not applicable.

(U) C. Funding Profile ($ in Thousands)
Not applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #7 - Operational System Development

PE NUMBER AND TITLE: #0102411F Surveillance Radar Stations/Sites (SRS)

PROJECT NO.: 2980

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	7,159	3,771	9,351	5,532	5,486	5,359	5,521	5,686	0	84,268

(U) A. Mission Description and Budget Item Justification

This program element provides improvements to command, control, and communications (C3) and air surveillance capabilities in Iceland. The Control Reporting Center (CRC) and air surveillance radars support of air defense requirements in the strategically important Greenland-Iceland-Norwegian gap. The program is a joint program with NATO funding infrastructure while the U.S. funds cryptographic capabilities, system engineering and integration activities. The category of research being performed in this program element is Operational System Development. Program provides upgrades for fielded system.

(U) FY 1994
- (U) Provided Program Office Support. ($2,699)
- (U) Provided systems engineering support for Icelandic Air Defense System (IADS). ($4,450)
- (U) Began in plant Developmental Test & Evaluation (DT&E). ($10)

(U) FY 1995
- (U) Provide Program Office Support. ($963)
- (U) Provide systems engineering support for IADS. ($2,408)
- (U) Complete in plant DT&E. ($400)

(U) FY 1996
- (U) Provide Program Office Support. ($2,202)
- (U) Provide systems engineering support for IADS. ($3,880)
- (U) Perform on island DT&E. ($3,269)

(U) FY 1997
- (U) Provide Program Office Support. ($1,698)
- (U) Provide systems engineering support for IADS. ($3,000)
- (U) Complete support for Operational Testing & Evaluation (OT&E). ($834)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #7 - Operational System Development

PE NUMBER AND TITLE: #0102411F Surveillance Radar Stations/Sites (SRS)

PROJECT NO.: 2980

(U) Acquisition Strategy:
NATO Programs: International Competitive Bids, Firm Fixed Price (FFP); US Interim Programs: Sole Source, FFP.

(U) B. Program Change Summary ($ in Thousands)

	1994	1995	1996	1997	Total Cost
(U) Previous President's Budget	7,305	4,191	5,896	5,564	23,957
(U) Appropriated Value	7,305				
(U) Adjustments to Appropriated Value					
a. Congressional General Reduction	-32	-339			
b. Below Threshold Reprogramming					
c. SBIR	-114	-81			
(U) Adjustment to Budget Years Since FY95 PB			3,455	-32	
(U) Current Budget Submit/President's Budget	7,159	3,771	9,351	5,532	84,268

(U) Change Summary Explanation:

Funding: FY94 funds were reduced due to various congressional cuts. FY96 additional funds added to cover test requirements. FY97 reflects inflation adjustment.

Schedule: No impact to program.

Technical: No impact to program.

(U) C. Other Program Funding Summary ($ in Thousands)

	1994	1995	1996	1997	1998	1999	2000	2001	To Compl	Total Cost
(U) Other Procurement Total	0	0	7,460	3,275	1,608	803	0	0	0	13,146
Budget Activity 4, WSC 84590A	0	0	0	0	0	0	0	0	0	0
Budget Activity 6, WSC 86190A	0	0	7,460	3,275	1,608	803	0	0	0	13,146

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #7 - Operational System Development

PE NUMBER AND TITLE: #0102411F Surveillance Radar Stations/Sites (SRS)

PROJECT NO.: 2980

(U) D. Schedule Profile

	1994				1995				1996				1997			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
(U) First Computer Software Config. Test	X															
(U) Ground-Air-Ground Radio Checkout			X													
(U) Control Reporting Center Building Complete			X													
(U) Tech Manual Validation						X										
(U) Inplant Test Complete							X									
(U) Initial Software Delivery							X									
(U) First Intercept Complete										X						
(U) Developmental Test & Evaluation Complete											X					
(U) Functional Configuration Audit (CA)/Physical CA													X			
(U) Begin Operator Training													X			
(U) Complete Operational Test & Evaluation														X		
(U) System Acceptance														X		

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February 1995

BUDGET ACTIVITY: #7 - Operational System Development

PE NUMBER AND TITLE: #0102411F Surveillance Radar Stations/Sites (SRS)

PROJECT NO.: 2980

(U) A. Project Cost Breakdown ($ in Thousands)

	1994	1995	1996	1997
(U) Engineering Support	4,450	2,408	3,880	3,000
(U) Test and Evaluation Support	10	400	3,269	834
(U) Program Support	2,699	963	2,202	1,698
(U) Total	7,159	3,771	9,351	5,532

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February 1995

BUDGET ACTIVITY: #7 - Operational System Development

PE NUMBER AND TITLE: #0102411F Surveillance Radar Stations/Sites (SRS)

PROJECT NO.: 2980

(U) B. Budget Acquisition History and Planning Information ($ in Thousands)

(U) Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to 1994	Budget 1994	Budget 1995	Budget 1996	Budget 1997	Budget to Complete	Total Program
Product Development Organizations:											
Electronic Systems Command (Funds unallocated.)										15,896	15,896
Support and Management Organizations											
MITRE	F19628-94-C-0001	Oct 94			25,176	4,450	2,408	3,880	3,000	1,650	40,564
TEMS	Various Contracts	Jun 94			11,227	1,161	963	927	604	877	15,759
Miscellaneous	Various Contracts					1,538		1,275	1,094	3,129	7,036
Test and Evaluation Organizations											
Hughes						10	400	3,269	834	500	5,013
Subtotal Product Development:					0	0	0	0	0	15,896	15,896
Subtotal Support and Management:					36,403	7,149	3,371	6,082	4,698	5,656	63,359
Subtotal Test and Evaluation:					0	10	400	3,269	834	500	5,013
Total Project:			n/a	n/a	36,403	7,159	3,771	9,351	5,532	22,052	84,268

(U) Government Furnished Property: Not applicable.

(U) C. Funding Profile ($ in Thousands)
Not applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #7 - Operational Systems Development

PE NUMBER AND TITLE: #0102412F Distant Early Warning (DEW) Stations

PROJECT NO.: 2710

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	2,529	1,992	1,015	930	909	888	914	941	0	17,401

(U) A. Mission Description and Budget Item Justification

This PE provides air surveillance capability and tactical warning of bomber or cruise missile attack against the North American continent through a Distant Early Warning (DEW) Line extending from Alaska to Labrador. This warning provides the National Command Authorities with time for decision making and survival actions, permitting the launch of strategic retaliatory and command and control aircraft for survival, as well as the ability to alert air defense fighters to intercept attacking aircraft. Due to its age (1957 initial deployment), the DEW Line is increasingly difficult and costly to operate and maintain. The North Warning System (NWS) program replaces the aging DEW Line and will eliminate low-altitude coverage gaps, improve radar performance, and reduce operation and maintenance costs. RDT&E funds provide for the deployment, installation, integration and testing of Unattended Radars (UARs) and Minimally Attended Radars (MARS) in order to provide tactical warning/attack assessment for northern air attack approaches to North America. The continuing requirement for NWS coverage was revalidated by CINCNORAD in FY93. The NWS is a joint US/Canadian program with Full Operation Capability (FOC) in early 1995. Research category is Operational Systems Development; development efforts support upgrades to currently operational systems.

(U) FY 1994
- (U) Continue program office, system and technical engineering support. ($1,171)
- (U) Continue program support for deployment and site integration for Canadian and Alaskan UAR systems - 21 sites. ($677)
- (U) Activate UAR depot maintenance facility. ($681)

(U) FY 1995
- (U) Continue system and technical engineering support. ($396)
- (U) Continue deployment/site integration. ($329)
- (U) Support post-deployment activities, residuals, and contract deficiencies. ($1,267)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: Februar 1995

BUDGET ACTIVITY: #7 - Operational Systems Development

PE NUMBER AND TITLE: #0102412F Distant Early Warning (DEW) Stations

PROJECT NO.: 2710

(U) FY 1996
- (U) Continue technical engineering support. ($268)
- (U) Provide support for studies leading to system modernization and commercialization to prevent obsolescence. ($401)
- (U) Commence study to reduce multiple-display and human interfaces at the Maintenance Control Facility (MCF) control centers (Alaska & Canada) to reduce critical manpower requirements. ($346)

(U) FY 1997
- (U) Continue technical engineering support. ($278)
- (U) Continue providing support for studies leading to system modernization and commercialization to prevent obsolescence. ($348)
- (U) Trade-offs & final redesign of multiple display and human interfaces at the MCF centers in Alaska & Canada. ($304)

(U) Acquisition Strategy:
UNISYS (formerly Paramax), Great Neck, NY was selected in FY91 as the production contractor for the Unattended Radar (UAR) and overall systems engineering. This contract was awarded as a follow-on design technical competition. Canadian North Warning System efforts are managed by a Canadian program office located in Ottawa.

(U) B. Program Change Summary ($ in Thousands)

	1994	1995	1996	1997	Total Cost
(U) Previous President's Budget	2,578	2,068	2,043	1,873	8,562
(U) Appropriated Value	2,578				
(U) Adjustments to Appropriated Value		-33			
a. Congressional General Reduction					
b. Below Threshold Reprogramming	-9				
c. SBIR	-40	-43			
(U) Adjustments to Budget Years Since FY95 PB			-1028	-943	
(U) Current Budget Submit/President's Budget	2,529	1,992	1,015	930	17,401

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #7 - Operational Systems Development

PE NUMBER AND TITLE: #0102412F Distant Early Warning (DEW) Stations

PROJECT NO.: 2710

(U) Change Summary Explanation:

Funding: FY96/97 funding reflects reductions in studies and analyses efforts.

Schedule: No impact to program.

Technical: Reduction in studies and analyses.

(U) C. Other Program Funding Summary ($ in Thousands)

	1994	1995	1996	1997	1998	1999	2000	2001	To Compl	Total Cost
(U) Other Procurement AF Total	3,780	0	5,855	8,788	0	0	0	0	0	14,643
Budget Activity 3, WSC 838010	3,780	0	5,855	8,788	0	0	0	0	0	14,643

NOTE: All Other Procurement, AF funds are for Comm Elect Mods - modifications to AN/FPS-117 Long Range Radar. Radar modifications will take place in FY96 and FY97.

(U) D. Schedule Profile

	1994				1995				1996				1997			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
(U) AN/FPS-124 Production (Complete)				X												
(U) Alaska Facilities Construction				X												
(U) System Testing (Less Antenna) (Complete)		X														
(U) Antenna Testing (Complete)			X													
(U) Alaskan Communications				X												
(U) Deployment					X											
(U) Alaskan (AK) Facilities Construction/Checkout					X											
(U) AK Comm Installed					X											
(U) AK Radars Installation & Checkout					X											
(U) AK MC^3 Construction (Complete)			X													
(U) AK MC^3 Equipment Install				X												
(U) Spare part procurements									X	X	X	X	X	X	X	X
(U) RMS Testing/Evaluation/Studies									X	X	X	X				

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February 1995

BUDGET ACTIVITY: #7 - Operational Systems Development

PE NUMBER AND TITLE: #0102412F Distant Early Warning (DEW) Stations

PROJECT NO.: 2710

(U) A. Project Cost Breakdown ($ in Thousands)

	1994	1995	1996	1997
(U) Program Management Support	809	655	279	280
(U) Systems Engineering	0	0	346	358
(U) Contractor Engineering Support	1,720	932	390	292
(U) Reliability, Maintainability & Availability	0	405	0	0
(U) Total	2,529	1,992	1,015	930

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February 1995

BUDGET ACTIVITY: #7 - Operational Systems Development

PE NUMBER AND TITLE: #0102412F Distant Early Warning (DEW) Stations

PROJECT NO.: 2710

(U) B. Budget Acquisition History and Planning Information ($ in Thousands)

(U) Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to 1994	Budget 1994	Budget 1995	Budget 1996	Budget 1997	Budget to Complete	Total Program
Product Development Organizations											
UNISYS	Firm Fixed Price	Oct 90				577	1,224			0	1,801
Electronic Systems Command										1,855	1,855
(Funds unallocated.)											
Support and Management Organizations											
MITRE	F19628-94-C-0001	Ongoing			4,289			217	224	468	5,198
TEMS	Various Contracts	Ongoing			2,994	1,110	304	530	278	291	5,507
Miscellaneous		Ongoing				842	464	268	428	1,038	3,040
Test and Evaluation Organizations: None.											
Subtotal Product Development					0	577	1,224	0	0	1,855	3,656
Subtotal Support and Management					7,283	1,952	768	1,015	930	1,797	13,745
Subtotal Test and Evaluation					0	0	0	0	0	0	0
Total Project					7,283	2,529	1,992	1,015	930	3,652	17,401

(U) Government Furnished Property: Not applicable.

(U) C. Funding Profile ($ in Thousands)
Not applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: 7 -- Operational System Development

PE NUMBER AND TITLE: PE 0207129F - F-111 Squadrons

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	9,638	4,522	597						0	127,684
3079 Digital Flight Control System (DFCS)	1,943	4,002	597						0	75,279
1332 Back Injury Reduction Program (BIRP)	1,890	20	0						0	9,243
1930 Stores Management System (SMS)	5,805	500	0						0	39,162

A. (U) Mission Description and Budget Item Justification

(U) The F-111 is the premier long range precision guided weapon delivery platform in the United States. This program provides funds to develop improved systems for the F-111 Aircraft. These improvements maintain the weapon system as a safe, reliable, and maintainable aircraft The F-111F fleet will be retired in FY 96. The EF-111A is programmed to retire in FY 97. Requested funding completes corrections to flight test discrepancies on a safety modification and pays RDT&E related termination costs. This program is Operational System Development because it develops upgrades to an operational system.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: 7 -- Operational System Development

PE NUMBER AND TITLE: PE 0207129F - F-111 Squadrons

B. (U) Program Change Summary ($ in Thousands)

	1994	1995	1996	1997	Total Cost
(U) Previous President's Budget	25,679	11,019	5,073	0	154,698
(U) Appropriated Value	25,679			0	138,606
(U) Adjustments to Appropriated Value	-16,041				-16,041
a. (U) OSD Omnibus Reprogramming Request	-15,000				-15,000
b. (U) Congressional Reduction	-143				-143
c. (U) Small Business Innovative Research Set-aside	-398				-398
d. (U) AF Withhold, pending Congressional Approval	-500				-500
e. (U) Adjustments to Budget Years Since FY 95 PB		-6,497	-4,476		10,973
(U) Current Budget Submit/President's Budget	9,638	4,522	597	0	127,684

(U) Change Summary Explanation:

(U) Funding: Back Injury Reduction Program tasks are fully funded with FY 94 dollars, except FY 95 travel to support testing and conduct final briefings to ACC. Stores Management System program termination and aggressive management of program termination actions result in observed funding requirement changes. Digital Flight Control funding increases are a result of changes required to resolve problems identified in DT&E.

(U) Schedule: N/A.

(U) Technical: DFCS incorporates a hardware/software change which improves the Ground Collision Avoidance System characteristics. Additionally, there are several improvements to self-test and fault monitoring functions. Scope of this engineering change reduced to absolute minimum due to impending weapon system retirement.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: 7 -- Operational System Development

PE NUMBER AND TITLE: PE 0207129F - F-111 Squadrons

C. (U) Other Program Funding Summary ($ in Thousands)

	1994	1995	1996	1997	1998	1999	2000	2001	To Compl	Total Cost
(U) Aircraft Procurement (BP 11000)	207	200	600						0	55,300

(U) (for RDT&E related programs, additional procurement programs listed on P-3)

D. (U) Schedule Profile

	1994				1995				1996				1997			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
(U) Back Injury Reduction Program	X	==========	==========	==========	==========	==========	==========	==========	==========	==========	==========	==========	==========	==========	==========	X
(U) DFCS Flight Test Program					X	==========	==========	==========	==========	==========	==========	==========	==========	==========	==========	X
(U) Stores Management System - N/A, program terminated.																

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: 7 -- Operational System Development

PE NUMBER AND TITLE: PE 0207129F - F-111 Squadrons

PROJECT NO.: 1930

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Stores Management System	5,805	500	0	0					0	39,162

A. (U) Mission Description and Budget Item Justification

(U) The decision to retire the F-111F has resulted in termination of this development. Termination includes canceling sub-contracts, restoring some test equipment to original configuration, and eliminating the organic work force.

(U) FY 1994
- (U) Initiate program termination. ($5,805)

(U) FY 1995
- (U) Complete program termination. ($500)

(U) FY 1996 N/A.

(U) FY 1997 N/A.

(U) Acquisition Strategy: Terminate program at minimum cost to the government.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: 7 -- Operational System Development

PE NUMBER AND TITLE: PE 0207129F - F-111 Squadrons

PROJECT NO.: 1930

B. (U) Program Change Summary ($ in Thousands)

	1994	1995	1996	1997	Total Cost
(U) Previous President's Budget	21,504	9,881	5,073	0	69,449
(U) Appropriated Value	21,504				54,562
(U) Adjustments to Appropriated Value	-15,699				-15,699
a. (U) Omni-bus Reprogramming Request	-15,000				-15,000
b. (U) Congressional General Reductions	-643				-643
c. (U) Small Business Innovative Research Set-aside	-56				-56
(U) Current Budget Submit/President's Budget	5,805	500	0	0	39,363

(U) Change Summary Explanation:

(U) Funding: Decreased requirements in FY 94, FY 95, and FY 96 are a result of program termination.

(U) Schedule: Program terminated.

(U) Technical: N/A.

C. (U) Other Program Funding Summary ($ in Thousands): Not Applicable.

D. (U) Schedule Profile: Not Applicable.

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February 1995

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT NO.
7 -- Operational System Development	PE 0207129F - F-111 Squadrons	1930

A. (U) Project Cost Breakdown ($ in Thousands)

	1994	1995	1996	1997
(U) Primary Hardware Reconfiguration	1,982	365	0	0
(U) Program Management Support	72	25	0	0
(U) Program Management Personnel	303	110	0	0
(U) Training Development	71	0	0	0
(U) Systems Engineering	707	0	0	0
(U) Software Development	1,736	0	0	0
(U) Tech Data	54	0	0	0
(U) Operational Test & Evaluation	880	0	0	0
(U) Total	5,805	500	0	0

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February 1995

BUDGET ACTIVITY: 7 -- Operational System Development

PE NUMBER AND TITLE: PE 0207129F - F-111 Squadrons

PROJECT NO.: 1930

B. (U) Budget Acquisition History and Planning Information ($ in Thousands)

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to 1994	Budget 1994	Budget 1995	Budget 1996	Budget 1997	Budget to Complete	Total Program
Product Development Organizations											
(U) SM-ALC			31,575	31,575	31,575	0	0	0	0	0	31,575
(U) Various, <$1M each			3,281	3,281	0	2,916	365	0	0	0	3,281
(U) SM-ALC/TIS	PO	Oct 94	1,567	1,567	0	1,567	0	0	0	0	1,567
Support and Management Organizations											
(U) Various, <$1M each			1,095	1,095	518	442	135	0	0	0	1,095
Test and Evaluation Organizations											
(U) Various, <$1M each			1,644	1,644	764	880	0	0	0	0	1,644

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February 1995

BUDGET ACTIVITY: 7 -- Operational System Development

PE NUMBER AND TITLE: PE 0207129F - F-111 Squadrons

PROJECT NO.: 1930

B. (U) Budget Acquisition History and Planning Information Continued ($ in Thousands)

Government Furnished Property:

Item Description	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Delivery Date	Total Prior to 1994	Budget 1994	Budget 1995	Budget 1996	Budget 1997	Budget to Complete	Total Program
(U) N/A										
(U) Product Development Property	N/A									
(U) Support and Management Property	N/A									
(U) Test and Evaluation Property	N/A									
(U) Subtotal Product Development				31,575	4,425	365	0	0	0	36,360
(U) Subtotal Support and Management				518	500	135	0	0	0	1,153
(U) Subtotal Test and Evaluation				764	880	0	0	0	0	1,644
(U) Total Project				32,857	5,805	500	0	0	0	39,162

C. (U) Funding Profile ($ in Thousands): Not applicable. Requested funding is less than $10 Million in FY 96 and FY 97.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: 7 -- Operational System Development

PE NUMBER AND TITLE: PE 0207129F - F-111 Squadrons

PROJECT NO.: 3079

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Digital Flight Control System	1,943	2,919	3,073						0	76,663

A. (U) Mission Description and Budget Item Justification

(U) Digital Flight Control System (DFCS) is a permanent safety modification that replaces the electronic portion of the F/EF-111A/E/F flight control system with a modern state-of-the-art digital computer and sensors. It improves the critical interfaces to the flight control system by incorporating the on-board autopilot and low altitude monitor and monitoring terrain following radar systems. DFCS is undergoing additional flight test in order to correct DT&E deficiencies during the summer of '94. Improvements will be incorporated into a change to Engineering Change Proposal (ECP) 3326 under the current contract.

(U) FY 1994
- (U) Flight test corrected deficiencies from DT&E and ECP 3326 OFT. ($1,900)
- (U) Complete development of Test Program Set. ($43)

(U) FY 1995
- (U) Incorporate FY 94 flight test results into ECP 3326. ($700)
- (U) ECP 3326 Kitproof and DT&E. ($84)
- (U) Complete flight test on hardware. ($200)
- (U) Initiate flight test of ECP 3326 Operational Flight Program. ($1,435)
- (U) Initiate program termination. ($500)

(U) FY 1996
- (U) Complete flight test of ECP 3326 Operational Flight Program. ($2,373)
- (U) Incorporate FY 95 flight test results into ECP 3326. ($200)
- (U) Complete program termination. ($500)

(U) Acquisition Strategy: Air Force program management is provided by the program office at the Sacramento Air Logistics Center. The prime contractor for DFCS is Lockheed, Ft Worth. It is anticipated ECP 3326 will be the final change on this upgrade. Program termination due to pending weapon system retirement is initiated in FY 95, completed in FY 96.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: 7 -- Operational System Development

PE NUMBER AND TITLE: PE 0207129F - F-111 Squadrons

PROJECT NO.: 3079

B. (U) Program Change Summary ($ in Thousands)

	1994	1995	1996	1997	Total Cost
(U) Previous President's Budget	2,285	0	0	0	71,103
(U) Appropriated Value	2,285	0	0	0	71,103
(U) Adjustments to Appropriated Value	-342	0	0	0	-342
a. (U) Small Business Innovative Research Set-aside	-342				-342
b. (U) Adjustments to Budget Years Since FY 95 PB		2,919	3,073		5,992
(U) Current Budget Submit/President's Budget	1,943	2,919	3,073	0	76,663

(U) Change Summary Explanation:

(U) Funding: Funding required to flight test corrections to deficiencies discovered in DT&E and incorporate corrections into Engineering Change Proposal (ECP) 3326. Funding request includes initial estimate of program termination costs.

(U) Schedule: See below.

(U) Technical: ECP 3326 is a hardware/software change to DFCS which improves the Ground Collision Avoidance System characteristics. Additionally, there are several improvements to self-test and fault monitoring functions. Scope of this engineering change reduced to absolute minimum due to impending weapon system retirement.

C. (U) Other Program Funding Summary ($ in Thousands)

	1994	1995	1996	1997	1998	1999	2000	2001	To Compl	Total Cost
(U) Aircraft Procurement (BP 11000).	207	200	600						0	55,700

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

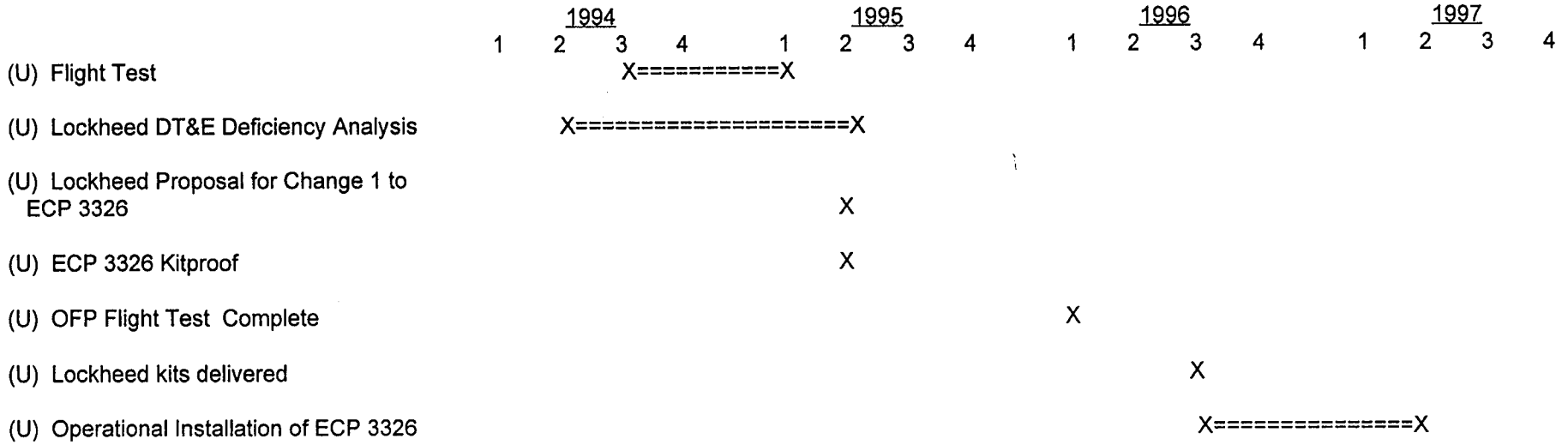
DATE: February 1995

BUDGET ACTIVITY: 7 -- Operational System Development

PE NUMBER AND TITLE: PE 0207129F - F-111 Squadrons

PROJECT NO.: 3079

D. (U) Schedule Profile



RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February 1995

BUDGET ACTIVITY: 7 -- Operational System Development

PE NUMBER AND TITLE: PE 0207129F - F-111 Squadrons

PROJECT NO.: 3079

A. (U) Project Cost Breakdown ($ in Thousands)

	1994	1995	1996	1997
(U) Contractor Engineering Support	390	384	200	
(U) Flight Test	449	1,635	2,163	
(U) Travel	289	75	30	
(U) Program Management Support	626	50	50	
(U) Government Engineering Support	179	40	120	
(U) Miscellaneous	10	35	10	
(U) Contract and Program Termination		500	500	
(U) Operational Test and Evaluation	0	200	0	
(U) Total	1,943	2,919	3,073	

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February 1995

BUDGET ACTIVITY: 7 -- Operational System Development

PE NUMBER AND TITLE: PE 0207129F - F-111 Squadrons

PROJECT NO.: 3079

B. (U) Budget Acquisition History and Planning Information ($ in Thousands)

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to 1994	Budget 1994	Budget 1995	Budget 1996	Budget 1997	Budget to Complete	Total Program
(U) Lockheed Ft. Worth	FFPI	23 Jan 86	35,481	35,481	35,481	0	0	0	0	0	35,481
Product Development Organizations											
(U) Lockheed Ft. Worth	CET	FY 94/3	974	974	0	390	384	200	0	0	974
Support and Management Organizations											
(U) SM-ALC	Form 206	FY 94/4	35,834	35,834	34,320	1,104	700	210	0	0	37,769
Test and Evaluation Organizations											
(U) SM-ALC	Form 206	FY 94/4	2,239	2,239	1,400	449	1,635	2,663	0	0	4,712
(U) 27 FW (OT&E)	Form 616	FY 95/2	200	200	0	0	200	0	0	0	200

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February 1995

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT NO.
7 -- Operational System Development	PE 0207129F - F-111 Squadrons	3079

B. (U) Budget Acquisition History and Planning Information Continued ($ in Thousands)

Government Furnished Property:

Item Description	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Delivery Date	Total Prior to 1994	Budget 1994	Budget 1995	Budget 1996	Budget 1997	Budget to Complete	Total Program
N/A										

(U) Product Development Property N/A

(U) Support and Management Property N/A

(U) Test and Evaluation Property N/A

(U) Subtotal Product Development	390	384	200
(U) Subtotal Support and Management	762	700	210
(U) Subtotal Test and Evaluation	791	1,835	2,663
(U) Total Project	1,943	2,919	3,073

C. (U) Funding Profile ($ in Thousands): Not applicable. Requested funding is less than $10 Million in FY 96 and FY 97.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: 7 -- Operational System Development

PE NUMBER AND TITLE: PE 0207129F - F-111 Squadrons

PROJECT NO.: 1332

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Back Injury Reduction Program	1,890	20	0						0	9,243

A. (U) Mission Description and Budget Item Justification

(U) The Back Injury Reduction Program (BIRP) complies with ACC/CC direction to investigate means of reducing F-111 aircrew ejection-related back injuries following termination of the earlier Main Recovery Parachute program (this earlier program was terminated due to high technical, cost, and schedule risk). BIRP analyzes crew module weight reduction, energy absorbing crew seats, an improved impact attenuation bag, and stability enhancements (a gliding descent parachute) as potential alternatives to reduce aircrew back injuries.

(U) FY 1994
- (U) Begin testing of modified 70' diameter main recovery parachutes (enhanced stability). ($195)
- (U) Obtain and evaluate impact attenuation bag and energy absorbing seat proposals and prototypes. ($850)
- (U) Conduct crew module weight reduction study. ($140)
- (U) Test prototype impact attenuation bag and energy absorbing seats. ($350)
- (U) Analyze test data and write program final report. ($355)

(U) FY 1995
- (U) Complete prototype testing on impact attenuation bag and energy absorbing seats, funded in FY 94.
- (U) Complete test data analysis and complete program final report, funded in FY 94.
- (U) Program support, to report program results to ACC. ($20)

(U) FY 1996 N/A.

(U) FY 1997 N/A.

(U) Acquisition Strategy: This study will not result in an acquisition under this program. If study results indicate promising alternatives, they will be acquired as part of a new program that would be addressed in subsequent budgets.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: 7 -- Operational System Development

PE NUMBER AND TITLE: PE 0207129F - F-111 Squadrons

PROJECT NO.: 1332

B. (U) Program Change Summary ($ in Thousands)

	1994	1995	1996	1997	Total Cost
(U) Previous President's Budget	1,890	1,004	0	0	11,231
(U) Appropriated Value	1,890	0	0	0	10,227
(U) Adjustments to Appropriated Value	0		0	0	
(U) Adjustments to Budget Years Since FY 95 PB		-984	0		-984
(U) Current Budget Submit/President's Budget	1,890	20	0	0	9,243

(U) Note: Total program cost includes development and test of previous Main Parachute Replacement program.

(U) Change Summary Explanation:

(U) Funding: Program tasks fully funded using FY 94 funds. Actual costs were less than original estimate. Remaining FY 95 funding is required to support/attend test events funded in FY 94 but not conducted until FY 95.

(U) Schedule: N/A.

(U) Technical: N/A.

C.(U) Other Program Funding Summary ($ in Thousands): Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: 7 -- Operational System Development

PE NUMBER AND TITLE: PE 0207129F - F-111 Squadrons

PROJECT NO.: 1332

D. (U) Schedule Profile

	1994				1995				1996				1997			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
(U) F-111 Back Injury Reduction Program	X	=	=	=	=	=	=	=	=	=	=	X				
(U) Issue Task to Lockheed Ft. Worth	X															
(U) Issue Project Orders to Test Centers	X															
(U) Request & Evaluate Prototype Proposals		X	=	=	X											
(U) Conduct Parachute Testing	X	=	=	=	=	=	=	=	=	X						
(U) Conduct Impact Attenuation Bag Testing						X	=	=	X							
(U) Conduct Energy Absorbing Seat Testing						X	=	=	X							
(U) Conduct Crew Module Weight Reduction Study			X	=	=	=	=	=	=	=	=	=	=	=	=	X
(U) Issue Program Final Report																X
(U) Brief ACC on Program Findings																X

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February 1995

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT NO.
7 -- Operational System Development	PE 0207129F - F-111 Squadrons	1332

A. (U) Project Cost Breakdown ($ in Thousands)

	1994	1995	1996	1997
(U) Contract Engineering Task (Lockheed Ft. Worth)	1,415	0	0	0
(U) Travel	20	20	0	0
(U) NASA Testing	225	0	0	0
(U) Government Engineering	215	0	0	0
(U) Miscellaneous	15	0	0	0
(U) Total	1,890	20	0	0

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February 1995

BUDGET ACTIVITY: 7 -- Operational System Development

PE NUMBER AND TITLE: PE 0207129F - F-111 Squadrons

PROJECT NO.: 1332

B. (U) Budget Acquisition History and Planning Information ($ in Thousands)

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to 1994	Budget 1994	Budget 1995	Budget 1996	Budget 1997	Budget to Complete	Total Program
Product Development Organizations											
(U) Lockheed Ft. Worth CET		14 Jun 94	1,415	1,415	0	1,415	0	0	0	0	1,415
(U) General Dynamics CET		14 May 92	3,547	3,547	3,547	0	0	0	0	0	3,547
(U) Ervin Industries	Service Contract	24 Feb 92	1,315	1,315	1,315	0	0	0	0	0	1,315
Support and Management Organizations											
(U) SM-ALC/LAF	TDY Orders	Various	95	95	40	35	20	0	0	0	95
Test and Evaluation Organizations											
(U) NASA Testing	Project Order (PO)	14 Mar 91	843	843	618	225	0	0	0	0	843
(U) Wright Labs	PO	28 Jun 91	40	40	20	20	0	0	0	0	40
(U) China Lake NAWC	PO	27 Mar 91	1,801	1,801	1,606	195	0	0	0	0	1,801
(U) Holloman AFB	PO	4 Jan 91	187	187	187	0	0	0	0	0	187

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February 1995

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT NO.
7 -- Operational System Development	PE 0207129F - F-111 Squadrons	1332

B. (U) Budget Acquisition History and Planning Information Continued ($ in Thousands)

Government Furnished Property:

Item Description	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Delivery Date	Total Prior to 1994	Budget 1994	Budget 1995	Budget 1996	Budget 1997	Budget to Complete	Total Program
(U) N/A										
(U) Product Development Property	N/A									
(U) Support and Management Property	N/A									
(U) Test and Evaluation Property	N/A									
(U) Subtotal Product Development				4,862	1,415	0	0	0	0	6,277
(U) Subtotal Support and Management				40	35	20	0	0	0	95
(U) Subtotal Test and Evaluation				2,431	440	0	0	0	0	2,871
(U) Total Project				7,333	1,890	20	0	0	0	9,243

C. (U) Funding Profile ($ in Thousands): Not applicable. Requested funding is less than $10 Million in FY 96 and FY 97.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: FEBRUARY 1995

BUDGET ACTIVITY: 7 Operational System Development

PE NUMBER AND TITLE: 0207133F F-16 Squadrons

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	59,715	134,236	175,600	152,785	135,322	129,256	191,715	267,317	0	2,921,413
Project Number 2671 Subtotal Cost	59,715	134,236	175,600	152,785	135,322	129,256	191,715	267,317	0	2,921,413

A. (U) Mission Description and Budget Item Justification:

(U) There is a continuing need for modernization of the USAF and allied multimission tactical fighter forces. The F-16C/D is intended to fulfill these requirements. The F-16 is a single-engine, single-seat, multirole tactical fighter with full air-to-air and air-to-surface combat capabilities. It is employed in a complementary role to the F-15 in counter-air missions and as the primary aircraft in the surface attack role. 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.

(U) These improvements are grouped into a comprehensive, cost-effective Multinational Staged Improvement Program (MSIP). This project develops enhanced night, under-the-weather attack capability in the air-to-ground role. Improvements include a higher maximum take off weight, improved air-to-air gunsight algorithms, digital flight controls, and improved pilot interface. Combat capability and versatility have been increased by integration of an Increased Performance Engine, and enhanced with the addition of advanced air-to-surface and air-to-air missiles and munitions. It develops Close Air Support (CAS) enhancements for Block 40 C/D by integrating and improving Laser Spot Tracker-equipped Low Altitude Navigation and Targeting InfraRed System for Night pod, Advanced Missile Warning, Improved Data Modem (IDM), and Night Vision lighting.

(U) MSIP also develops CAS enhancements for 200 Block 30 C/D, including Advanced Pave Penny and IDM. To continue to meet the need beyond the turn of the century, a Mid-Life Update (MLU) of aircraft avionics is being conducted by our European partners. MLU involves various mods to European F-16 A/B, including the Modified Modular Mission Computer (MMMC), which USAF Block 50s will eventually employ. The MMMC will extend the cost effective life of the F-16 through replacement of three Line Replaceable Units and the addition of significant memory and processing growth provisions. The latest version of the F-16C/D has significantly improved display processors, enabling increased pilot situational awareness. MSIP will also upgrade the IDM data link capability on the Block 50 aircraft and fully integrate the IDM's targeting capability with the latest version of the High Speed Anti-Radiation Missile (HARM). The project includes enhancements to the HARM Targeting System to enable the F-16 Block 50 to better complement the F-4G Wild Weasel in the Suppression of Enemy Air Defenses role.

(U) The F-16, which received Milestone III approval in FY 1977, is an operational aircraft. Since the development activities in this PE support an operational aircraft, these development activities funds are included in the Operational System Development PE.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE FEBRUARY 1995
BUDGET ACTIVITY 7 Operational System Development	PE NUMBER AND TITLE 0207133F F-16 Squadrons

A. (U) Mission Description and Budget Item Justification - CONTINUED ($ in Thousands):

(U) FY 1994 ($59,715)

- (U) Continued Block 50 Modified Modular Mission Computer (MMMC) Upgrade (32,400)
- (U) Continued Mid-Life Update (MLU) program Engineering and Manufacturing Development (EMD) (13,300)
- (U) Government Test / Support (14,015)
- (U) Close Air Support (CAS) efforts utilize FY 1993 fenced CAS funds (released on 23 June 1994)

(U) FY 1995 ($134,236)

- (U) Continue Block 50 MMMC ($25,800)
- (U) Continue MLU EMD ($15,900)
  - (U) Install MLU kits in trial verification installation aircraft
- (U) Government Test / Support ($12,636)
- (U) Start Block 40 CAS EMD ($31,500)
- (U) Start Flight Tests Developmental Test & Evaluation (DT&E) ($43,900)
- (U) Other ($4,500)

(U) FY 1996 ($175,600)

- (U) Continue Block 50 MMMC ($29,984)
- (U) Continue MLU EMD ($17,274)
- (U) Continue Block 40 CAS EMD ($27,997)
- (U) Continue Operational Flight Program (OFP) Software Development ($35,145)
  - (U) Includes OFP Updates (18 - 24 Months), Radar OFPs, and ARWR OFPs
  - (U) OFP Development was previously funded under BP 3400 (Operation and Maintenance)
- (U) Continue Flight Tests DT&E ($30,776)
- (U) Special Projects Lab ($4,070)
- (U) Joint Direct Attack Munition OFP Integration ($6,950)
- (U) Initiate Block 30 Global Positioning System Integration ($12,906)
- (U) Other ($10,498)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE FEBRUARY 1995
BUDGET ACTIVITY 7 Operational System Development	PE NUMBER AND TITLE 0207133F F-16 Squadrons

A. (U) Mission Description and Budget Item Justification - CONTINUED ($ in Thousands):

(U) FY 1997 ($152,785)

- (U) Continue Block 50 Modified Modular Mission Computer ($16,700)
- (U) Complete Mid-Life Update Engineering and Manufacturing Development ($2,680)
- (U) Continue Block 40 Close Air Support Engineering and Manufacturing Development ($20,860)
- (U) Continue Operational Flight Program (OFP) Software Development ($56,619)
  - (U) Includes OFP Updates (18 - 24 Months), Radar OFPs, and ARWR OFPs
- (U) Continue Flight Tests Developmental Test & Evaluation ($27,515)
- (U) Special Projects Lab ($4,073)
- (U) Continue Joint Direct Attack Munition OFP Integration ($12,020)
- (U) Continue Block 30 Global Positioning System Integration ($7,940)
- (U) Other ($4,378)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: FEBRUARY 1995

BUDGET ACTIVITY	PE NUMBER AND TITLE
7 Operational System Development	0207133F F-16 Squadrons

(U) B. Program Change Summary ($ in Thousands)

	FY94	FY95	FY96	FY97	Total Cost
Previous President's Budget	60,929	93,157	171,870	59,278	2,233,622
Appropriated Value	61,524	138,657			
Adjustments to Appropriated Value:					
a. General Undistributed Congressional Reductions	-618	-1,528			
b. Below Threshold Reprogrammings (BTR)	-241				
c. Small Business Innovative Research (SBIR)	-950	-2,893			
Adjustments to Budget Years Since FY95 President's Budget			3,730	93,507	
Current Budget Submit / President's Budget	59,715	134,236	175,600	152,785	2,921,413

Change Summary Explanation:

Funding: Adds net of $687,791 RDT&E funds. This net add includes:

- $459,032 for FY 2000 - 2001 values to extend the Previous President's Budget (FY 1995 APB) by two years to the current President's Budget
- $154,374 in approved new development efforts (i.e., Block 30 Close Air Support, Block 30 Global Positioning System Integration, Joint Direct Attack Munition Integration and associated support) in the FY 1996 through FY 1999 time frame
- $49,332 in FY 1995 and prior year appropriation and reprogramming increases
- $25,053 to more appropriately re-align development efforts within the 3600 Appropriation (RDT&E) vice the 3400 Appropriation (Operations & Maintenance) and to reflect miscellaneous estimating changes.

Schedule: In order to maintain other higher priority programs on time, some Block 30 Close Air Support (CAS) development tasks slip 3 years, Modified Modular Mission Computer retrofit slips 2 years, and Joint Standoff Weapon slips 1 year.

Technical: Key technical changes which align with the funding and schedule information shown above delete Block 25/30 Joint Direct Attack Munition (JDAM) integration, delete Block 25/30 Core Computer Upgrade (which uses Embedded Global Positioning System Inertial Navigation System [EGI GPS] and meets FY 00 requirement), and cancel Probe & Drogue effort.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: FEBRUARY 1995

BUDGET ACTIVITY: 7 Operational System Development

PE NUMBER AND TITLE: 0207133F F-16 Squadrons

(U) C. Other Program Funding Summary ($ in Thousands)

Years	Prior 1995	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY Complete	Cost to Total Cost	
Aircraft Procurement, Budget Activity #1, Aircraft Weapon System, F-16 Squadrons*										
	32,178,181	75,019	0	0	0	0	0	0	0	32,253,200
Aircraft Procurement, Budget Activity #6, Initial Weapon System Spares, F-16 Squadrons										
	2,822,925	7,796	6,452	6,895	20,885	15,964	16,444	16,939	Continuing	Continuing
Aircraft Procurement, Budget Activity #7, Post Production Support, F-16 Squadrons										
	0	0	194,672	84,311	19,889	29,658	16,886	13,987	0	359,403
Related RDT&E, Budget Activity #5, Engineering and Manufacturing Development, Night / Precision Attack (PE# 0604249F)										
• Project 3920, Night Attack Program										
	25,700	0	0	0	0	0	0	0	0	25,700
• Project 2693, Low Altitude Navigation and Targeting InfraRed for Night										
	560,390	21,029	8,708	4,803	1,990	1,194	1,293	1,194	Continuing	Continuing

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

Date: FEBRUARY 1995

BUDGET ACTIVITY: 7 Operational System Development

PE NUMBER AND TITLE: 0207133F F-16 Squadrons

(U) D. Schedule Profile

	1994				1995				1996				1997			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
ENGINEERING MILESTONES:																
Mid-Life Update (MLU) Hardware CDR	X															
Modified Modular Mission Computer (MMMC) PDR	X															
Block 50 Tape-3 FCA/PCA Complete					X											
Block 50 Tape-4 SDR				X												
MLU CDR					X											
MMMC Avionics CDR									X							
Block 50 Tape-4 CDR					X											
Block 25/30 Software Configuration Update-2					X											
F-16 Close Air Support (CAS) SRR					X											
F-16 A/B Software Update Block 15Z Tape-2 FCA/PCA									X							
Block 50 Tape-5 and MMMC-2 Authorization Start											X					
Block 40 CAS CDR									X							
Block 25/30 Software Configuration Update-3									X							
Block 50 Tape-4 FCA/PCA Complete													X			
Block 50 Tape-5 CDR															X	
T & E MILESTONES:																
Block 50D Tape-2 Integration Complete	X															
Flight Tests Developmental Test & Evaluation (DT&E) Start					X	X	X	X	X	X	X	X	X	X	X	X
Block 40 CAS DT&E Start													X			
MLU DT&E Start							X									
MMMC DT&E Start										X						
CONTRACT MILESTONES:																
Continue F-16 A/B MLU (Started 4Qtr91, Est Compl 4Qtr98)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Continue MMMC (Started 2Qtr92, Est Compl 3Qtr98)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Block 40 CAS Engineering and Manufacturing Development Start (Est Compl 1Qtr02)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

CDR=Critical Design Review, **PDR**=Preliminary Design Review, **FCA/PCA**=Functional Configuration Audit/Physical Configuration Audit, **SDR**=System Design Review, **SSR**=System Specification Review

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: FEBRUARY 1995

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT NO.
7 Operational System Development	0207133F F-16 Squadrons	2671

(U) A. Project Cost Breakdown ($ in Thousands)

	1994	1995	1996	1997
Pratt & Whitney 229 Engine	1,400	3,000	1,092	993
Support Equipment			5,957	
Weapon System Trainer			3,375	3,377
Government Test / Support	11,115	12,636	74	8
Radar / Electronic-Counter Counter Measures	100			
Flight Tests Developmental Test & Evaluation		43,900	30,776	27,515
Mid-Life Update	13,300	15,900	17,274	2,680
Block 40 Close Air Support		31,500	27,997	20,860
Block 50 Modified Modular Mission Computer	32,400	25,800	29,984	16,700
Special Projects Lab			4,070	4,073
Main Fuel Shutoff Valve	1,400			
Operational Flight Program Software Development			35,145	56,619
Joint Direct Attack Munition Integration			6,950	12,020
Block 30 Global Positioning System (GPS) pre-Integration		1,500		
Block 30 GPS Integration			12,906	7,940
TOTAL	59,715	134,236	175,600	152,785

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February 1995

BUDGET ACTIVITY: 7 Operational System Development

PE NUMBER AND TITLE: 0207133F F-16 Squadrons

PROJECT NO.: 2671

(U) B. Budget Acquisition History and Planning Information ($ in Thousands)

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to 1994	Budget 1994	Budget 1995	Budget 1996	Budget 1997	Budget to Complete	Total Program
Product Development Organizations											
Mid-Life Update (MLU) Airframe Kit Development (auth), Lockheed											
	SS/CPIF	Jan 92	73,300	75,527	47,454	3,803	11,346	12,924	0	0	75,527
MLU Airframe Kit Development (unauth), Lockheed											
			N/A	10,951	394	6,611	1,566	2,340	40	0	10,951
MLU Radar Kit Development (auth), Westinghouse Electric											
	SS/CPIF	Mar 92	11,149	11,870	7,173	2,077	1,693	385	542	0	11,870
Other MLU (auth and unauth), Lockheed											
					0	809	1,295	1,625	2,098	0	5,827
All other MLU-related development, Misc Contractors											
					5,329	0	0	0	0	0	5,329
Modified Modular Mission Computer (MMMC), Lockheed											
	SS/CPIF	Jan 92	244,400	254,400	166,059	29,900	24,300	23,850	8,650	1,641	254,400
Other MMMC (auth and unauth)											
					11,389	2,500	1,500	6,134	8,050	2,173	31,746
Propulsion (Pratt & Whitney)											
	SS/FFP	Dec 94			90,000	1,400	3,000	1,092	993	0	96,845
Comet / ASIF (Support Equipment), Contractor TBD											
		1Q96*			157,900	0	0	5,957	0	7,660	180,166
Weapon System Trainer, Contractor TBD											
		1Q96*						3,375	3,377	15,514	22,266
Block 40 Close Air Support (CAS), Lockheed											
	SS/CPIF	1Q95			3,648		31,500	27,997	20,860	6,063	90,068

*Estimated date

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February 1995

BUDGET ACTIVITY: 7 OPERATIONAL SYSTEM DEVELOPMENT

PE NUMBER AND TITLE: 0207133F F-16 SQUADRONS

PROJECT NO.: 2671

(U) B. Budget Acquisition History and Planning Information - CONTINUED ($ in Thousands)

Performing Organizations - CONTINUED:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to 1994	Budget 1994	Budget 1995	Budget 1996	Budget 1997	Budget to Complete	Total Program
Product Development Organizations - CONTINUED											
Block 30 Close Air Support, Contractor TBD		1Q98*								69,332	69,332
Special Projects Lab, Contractor TBD		1Q96*						4,070	4,073	16,311	24,454
Operational Flight Program (OFP) Software Development, Lockheed		1Q96*						23,231	51,056	159,534	233,821
Main Fuel Shut Off Valve, Lockheed	SS/FPIF	2Q95*				1,400					1,400
Radar OFP, Westinghouse Electric		1Q96*						9,928	2,980	29,535	42,443
Advanced Radar Warning Receiver, Loral / Litton		1Q96*						1,986	2,583	8,354	12,923
Smart Weapons Integration, Contractor TBD		1Q96*						6,950	12,020	36,303	55,273
Avionics Upgrades, Contractor TBD		1Q96*			5,000					134,092	139,092
Block 30 Global Positioning System (GPS) Integration, Contractor TBD		1Q96*						12,906	7,940	8,353	29,199
Block 30 GPS Pre-Integration, Contractor TBD		3Q95*					1,500				1,500
Other Complete Contracts					943,630						943,630

*Estimated date

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February 1995

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT NO.
7 OPERATIONAL SYSTEM DEVELOPMENT	0207133F F-16 SQUADRONS	2671

(U) B. Budget Acquisition History and Planning Information - CONTINUED ($ in Thousands)

Performing Organizations - CONTINUED:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to 1994	Budget 1994	Budget 1995	Budget 1996	Budget 1997	Budget to Complete	Total Program
Support and Management Organizations											
Mission Support					155,044	7,730	9,223	74	8	70	172,149
Other Test & Support					82,447	3,485	3,413				89,345
Test and Evaluation Organizations											
Flight Tests, Government											
	Proj Order	2Q95*					34,900	20,518	18,343	152,450	226,211
Flight Tests, Lockheed											
	SS/CPIF	2Q95*					9,000	10,258	9,172	76,225	104,655
TOTALS											
Subtotal Product Development					1,437,976	48,500	77,700	144,750	125,262	494,865	2,329,053
Subtotal Support and Management					237,491	11,215	12,636	74	8	70	261,494
Subtotal Test and Evaluation							43,900	30,776	27,515	228,675	330,866
TOTAL PROJECT					1,675,467	59,715	134,236	175,600	152,785	723,610	2,921,413

* Estimated Date

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: # 7 - Operational Systems Development

PE NUMBER AND TITLE: # 0207134F F-15E Squadrons

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	63.568	105,111	171,337	130,061	116,301	107,270	123,396	121,412	CONT	TBD

A. Mission Description and Budget Item Justification

(U) The F-15E is the most versatile fighter in the world today. Configured with conformal fuel tanks (CFTs), the F-15E can deploy worldwide with minimal tanker support and arrive combat-ready. The F-15E retains air superiority capability and adds systems, such as Low Altitude Navigation Targeting Infrared for Night (LANTIRN), to meet the requirement for all-weather, deep penetration, and night/under-the-weather, air-to-surface attack. However, the threat includes a new generation of aircraft possessing all-weather detection and kill capabilities. The F-15E's avionics, armament, airframe, and engines must be improved to maintain its superiority against the threat into the next century. Avionics updates, exploiting proven technological advances, are being incorporated into the F-15E providing expanded capability and supporting an updated and fully integrated electronic warfare suite. As a result, this project develops enhanced offensive and defensive capability and survivability. Additionally, overall combat capability is increased by integration of a Very High Speed Integrated Circuit (VHSIC) Central Computer (CC). (The F-15E PE also funds RDT&E activities for PE # 0207130, F-15A-D, under a single BPAC-670131). The F-15E, which received contract award approval in FY84, is an operational aircraft and therefore the development activities in the PE are included in research category Operational Systems Development.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: # 7 - Operational Systems Development

PE NUMBER AND TITLE: # 0207134F F-15E Squadrons

B. Program Change Summary ($ in Thousands)

	1994	1995	1996	1997	Total Cost
Previous President's Budget	65,829	116,562	127,495	74,570	TBD
Appropriated Value	65,829	108,562			
Adjustments to Appropriated Value					
a. BTR	-1,234				
b. Cong Red		-1185			
c. SBIR	-1,027	-2266			
d. Adjustments to Budget Years Since FY95 PB			43,842	55,491	
Current Budget Submit/President's Budget	63,568	105,111	171,337	130,061	TBD

Change Summary Explanation:

Funding: The increases in RDT&E funds from the previous President's Budget are due to plus ups in Programmable Armament Control System , Joint Direct Attack Munition, and the transfer of funds previously programmed under the O&M account.

Schedule: None
Technical: None

C. Other Program Funding Summary ($ in Millions)

	1994	1995	1996	1997	1998	1999	2000	2001	Compl	Cost
Aircraft Procurement F-15 (BA-1)	28.6	20.3							TBD	TBD
Aircraft Procurement F-15 (Post Production Support, BA-7)			14.0	11.6	8.7	8.8	8.8	8.9		
Aircraft Procurement F-15 MODS (includes both PE27130 and PE27134)	264.9	184.8	79.5	143.1	241.2	316.6	308.7	313.4	TBD	TBD

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: # 7 - Operational Systems Development

PE NUMBER AND TITLE: # 0207134F F-15E Squadrons

D. Schedule Profile

	1994				1995				1996				1997			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
(U)AF Mission Support System Training Completion										x (Mar 96-Sep 96)						
(U)GPS Production Decision														x(Mar97)		
(U)APG-63U LRIP Buy																(Jul 97)x
(U)ECCM OT&E Flight Test							x (Jun 95)									
(U)OFP Flight Test	(Jul94-Sep95) x				(Sep95-Nov96)x				(Sep 96-Feb97)x				(Sep 97-Feb 98)x			
(U)VHSIC Retrofit Start						x (Mar 95)										

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: # 7 - Operational Systems Development

PE NUMBER AND TITLE: # 0207134F F-15E Squadrons

A. Mission Description and Budget Item Justification ($ in thousands)

(U) FY 1994

(U) - Continued development and testing of the improvements initiated in FY 1993 and prior ($3,268).
(U) - Completed Standard Flight Data Recorder (SFDR); continued development and testing of F-15 improvements including AF Mission Support System (AFMSS), VHSIC Central Computer, Electronic Counter-Counter Measures (ECCM), APG-63 R&M upgrade and Global Positioning System (GPS) ($16,900).
(U) - Continued development and flight test of the operational flight program (OFP) and flight testing of improvements initiated in prior years ($25,400).
(U) - Provided program office support ($8,500).
(U) - Initiated development of improvements attributed to parts obsolescence ($4,300).
(U) - Continued R&D engineering efforts to support F-15E Avionics Integrated Support Facility (AISF) ($3,300)
(U) - Conducted research of -229 engine improvements ($1,400).
(U) - Repaired government furnished equipment used for R&D ($0,500).

(U) FY 1995

- (U) - Continue development and testing of the improvements initiated in FY 1994 and prior ($0,111).
(U) - Continue development and testing of F-15 improvements including ECCM, GPS, APG-63 radar, and VHSIC ($63,500).
(U) - Continue R&D engineering efforts to support F-15E AISF ($3,400).
(U) - Provide program office support ($7,300).
(U) - Continue development and flight test of the OFP and flight testing of improvements initiated in prior years ($30,800).

(U) FY 1996

- (U) - Continue development and testing of F-15 improvements including GPS, ECCM, and APG-63 radar ($81,900).
(U) - Continue OFP development efforts ($35,100).
(U) - Continue development of improvements attributed to parts obsolescence ($7,700).
(U) - Repair government furnished equipment used for R&D ($837).
(U) - Begin development of -229 engine improvements ($1,100).
(U) - Continue flight test of the OFP and flight testing of improvements initiated in prior years ($25,200).
(U) - Initiate development of the ALQ-135 Band 1.5 modification ($6,500).
(U) - Expand development of the PACS Upgrade ($13,000).

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: # 7 - Operational Systems Development

PE NUMBER AND TITLE: # 0207134F F-15E Squadrons

A. Mission Description and Budget Item Justification ($ in thousands)

(U) FY 1997

(U) - Continue development and testing of F-15 improvements including ECCM and APG-63 radar ($62,200).
(U) - Continue OFP development efforts ($24,000).
(U) - Continue improvements attributed to parts obsolescence ($7,200).
(U) - Repair government furnished equipment used for R&D ($861).
(U) - Continue development of -229 engine improvements ($1,000).
(U) - Continue flight test of the OFP and flight testing of improvements initiated in prior years ($24,800).
(U) - Continue PACS Upgrade ($10,000).

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February 1995

BUDGET ACTIVITY: # 7 - Operational Systems Development

PE NUMBER AND TITLE: # 0207134F F-15E Squadrons

A. Project Cost Breakdown ($ in thousands)

	1994	1995	1996	1997
Flight Test/OFP	26,688	31,730	60,300	48,800
ECCM	2,409	4,734	1,100	900
Mission Support	8,480	7,300		
APG-63U/Antenna Study	8,080	53,600	78,200	61,300
AF Mission Support System (AFMSS)	4,000			
GPS (A-D)	2,300	7,178	2,100	
VHSIC Central Computer		400		
Miscellaneous	2,381	169	500	
SFDR	1,280			
GFE/GFP Repair	500		837	861
Falcon -229	1,400		1,100	1,000
Parts Obsolescence	4,300		7,700	7,200
ALQ Band 1.5			6,500	
PACS Upgrade	1,750		13,000	10,000
TOTAL	**63,568**	**105,111**	**171,337**	**130,061**

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February 1995

BUDGET ACTIVITY: # 7 - Operational Systems Development

PE NUMBER AND TITLE: # 0207134F F-15E Squadrons

B. Budget Acquisition History and Planning Information ($ in Thousands)

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to 1994	Budget 1994	Budget 1995	Budget 1996	Budget 1997	Budget to Complete	Total Program
Product Development Organizations						3,642	0,560				4,202
McAir/Eglin/Wright Labs						2,409	4,391	1,100	0,900		10,500
McAir (ECCM)	CPFF	Feb 94	10,500	10,500	1,700	4,000	0,600				12,100
McAir (AFMSS)	CPFF	Aug 92	11,500	11,500	7,500	1,280					5,575
McAir (SFDR)	CPFF	Jun 88			4,295	2,300	7,149	2,100			11,549
McAir (GPS)	FFP	Mar 94	11,549	11,549		1,400		1,100	1,000		3,500
P&W (-229 Eng)	CPAF	Sep 94	3,500	3,500		0,500	1,600	0,837	0,861	5,850	9,648
McAir (GFE/GFP)	FFP	Dec 93	10,078	10,078		3,300	4,540	35,100	24,000		66,940
OFP Development											
McAir APG63											778
(Feas. Study)	CPFF	Feb 94	0,780	0,780	0,443	0,335					9,892
(Risk Red)	CPFF	Feb 94	10,000	10,000	6,350	3,542					235,336
(EMD)	CPAF	Sep 94	235,336	235,336		4,336	53,600	78,200	61,300	37,900	3,700
(Wpn System Trainer)								0,500		3,200	25,000
PACS Upgrade								13,000	10,000	2,000	6,500
ALQ-135 Band 1.5								6,500			37,946
Wright Lab (Parts Obs) MIPR/PRs		Sep 94				4,346		7,700	7,200	18,700	TBD
Support and Management Organizations											
(Mission Support)	Misc.	93-94	8,480	8,480		8,480	7,300			CONT	
Test and Evaluation Organizations											52,945
McAir (Flt Test)	FFP	Mar 94			12,985	13,160	12,300	3,000	11,500		1,400
Loral (Flt Test)	FFP	Mar 94				1,400					52,202
Edwards (OFP)	PO	Jul 94				7,592	11,181	20,500	12,929		5,507
Eglin (Flt Test)	PO	Mar 94				1,546	1,890	1,700	0,371		TBD
TOTAL PROJECT						**63,568**	**105,111**	**171,337**	**130,061**	**CONT**	

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE: February 1995
BUDGET ACTIVITY: # 7 - Operational Systems Development	PE NUMBER AND TITLE: # 0207134F F-15E Squadrons

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #7 Operational Systems Development

PE NUMBER AND TITLE: #0207136F Manned Destructive Suppression (MDS)

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	4,284	36,233	2,908	30	30	30	30	30	34,219	166,458
4375 F-15 Manned Destructive SEAD (MDS)	4,284	36,233	20	0	0	0	0	0	0	56,231
2671 F-16 HARM Targeting System (HTS)	10	10	22,908	30	30	30	30	30	34,219	110,227

(U) A. Mission Description and Budget Item Justification

This program provides funds for the development and procurement of the Air Force's Manned Destructive Suppression of Enemy Air Defenses (SEAD) (MDS) capability. The AGM-88 High-Speed Anti-Radiation Missile (HARM) is the primary munition for MDS. The program provides certain F-16 aircraft the capability to carry and employ the HARM. The F-16C/Blk 50D has been modified to carry the AN/ASQ-213 HARM Targeting System (HTS). This system allows real-time, "range known" HARM employment. This capability is necessary due to the phase out of the F-4G Wild Weasel. The F-15 was to be modified with a Precision Direction Finding (PDF), but this effort has been terminated in the FY96/97 BES due to fiscal constraints and better than expected capability reports from units equipped with the fielded F-16 HTS. Also, the AF began a Concept Exploration (Phase 0) of Pre-emptive Destruction of Enemy Air Defenses (PDEAD) in Jan 94 within PE 0605808F. The Pre-emptive Destruction program is scheduled for a Milestone I/II review in 4Q FY96 and will be transitioned to this PE in FY97. This PE also funds program support and management by the Assistant Secretary of the Air Force (Acquisition) and Air Staff for Electronic Warfare planning. As this program element provides for the development of upgrades to the F-15 and F-16, operational weapons systems that have received Milestone III approval, funding is included in the Budget Activity/Research Category Operational Systems Development.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #7 Operational Systems Development

PE NUMBER AND TITLE: #0207136F Manned Destructive Suppression (MDS)

(U) B. Program Change Summary ($ in Thousands)

	1994	1995	1996	1997	Total Cost
(U) Previous President's Budget (PB)	4,352	38,422	50,207	52,631	304,200
(U) Appropriated Value	4,352	37,422			
(U) Adjustments to Appropriated Value					
(U) a. General Congressional Reductions:		(408)			
(U) b. SBIR:	(68)	(781)			
(U) Adjustments to Budget Years Since FY95 PB			(47,299)	(52,019)	
(U) Current Budget Submit/President's Budget	4,284	36,233	2,908	[3]0	47,644

(U) Change Summary Explanation:

Funding: F-15C Manned Destructive Suppression (MDS) has been zeroed at the end of the Dem/Val phase; F-16 HARM Targeting System (HTS) project transferred to this PE from a classified PE. Therefore, the prior PB shown above and the FY94-95 current PB only reflect the F-15 MDS program. All funds for 1996 and beyond are for HARM Targeting System (HTS).

Schedule: F-15C MDS has been canceled at the end of the Dem/Val phase.

Technical: An additional $3,100 FY93 RDT&E funding was reprogrammed into this PE from PE 0207134, F-15E Squadrons, to develop a prototype of an enhanced F-16 AN/ASQ-213 HTS to meet the Operational Requirements Document (ORD) for HARM Targeting to the maximum extent practical. Performance and Cost data will be used to support the Cost and Operational Effectiveness Analysis (COEA) for the Jet Emitter Targeting System and Combat Identification. Also, this is effectively a Dem/Val for future enhancements to the HTS pod.

(U) C. Other Program Funding Summary ($ in Thousands)

	1994	1995	1996	1997	1998	1999	2000	2001	To Compl	Total Cost
(U) HTS Aircraft Procurement, AF	0	0	3,142	[3]812	[3]750	[3]672	[3]705	[3]619	900	[3]7,600
(U) HTS Operations & Maintenance	0	0	[4]3,000	[4]4,847	[4]3,694	[4]3,827	[4]2,849	[4]2,845	[4]11,950	[4]33,012

Related RDT&E: PE 0207134, F-15E Squadrons; PE 0207133, F-16 Squadrons; PE 0605808, Development Planning.

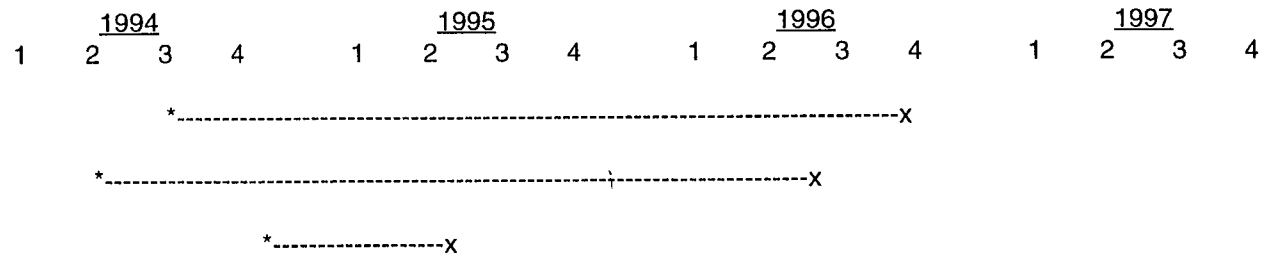
RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #7 Operational Systems Development

PE NUMBER AND TITLE: #0207136F Manned Destructive Suppression (MDS)

(U) D. Schedule Profile



PDF = Precision Direction Finding
HTS = HARM Targeting System
P2I = Planned Product Improvement

NOTES:

1 *FY95 and prior funding reported under a separate program element, with the exception of $3,100 FY93 RDT&E reprogrammed into this PE during FY94.*

2 *FY96 HTS RDT&E funds incorrectly shown under F-15 PDF in the ABIDES database.*

3 *F-16 HTS FY97-01 RDT&E funding mistakenly provided under APAF. AF will correct during the FY97 POM cycle. Corrected funding lines are:*

	1997	1998	1999	2000	2001	To Compl	Tot Cost
HTS RDT&E, AF	*612*	*547*	*465*	*493*	*402*	*1,700*	*7,127*
HTS Aircraft Procurement, AF	*200*	*203*	*207*	*212*	*217*	*900*	*5,081*

4 *All F-16 HTS FY96-01 O&M funding mistakenly provided under PE 0207128, F-4 Squadrons. AF will correct during the FY97 POM cycle and FY96 execution.*

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #7 - Operational System Development

PE NUMBER AND TITLE: #0207136F Manned Destructive Suppression

PROJECT NO.: 4375

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
4375 F-15 Manned Destructive SEAD (MDS)	4,284	36,233	0	0	0	0	0	0	0	56,231

(U) A. Mission Description and Budget Item Justification

This program provides funds for the development and procurement of the Air Force's Manned Destructive Suppression of Enemy Air Defenses (SEAD) (MDS) capability. The AGM-88 High-Speed Anti-Radiation Missile (HARM) is the primary munition for MDS. This project provides the F-15 aircraft the capability to carry and employ the HARM. This capability was deemed necessary due to the phase out of the F-4G Wild Weasel. The F-15 was to be modified with a Radio Frequency (RF) Precision Direction Finding (PDF) to allow real-time HARM employment, but this effort was terminated due to fiscal constraints and better than expected capability reports from units equipped with the fielded F-16 HTS.

(U) FY 1994
- (U) Begin PDF Demonstration/Validation. ($3,800)
- (U) Continue MS II PDF COEA. ($484)

(U) FY 1995
- (U) Complete PDF Demonstration/Validation. (Jun 96, $12,400)
- (U) Begin the Programmable Armament Control Set (PACS) upgrade portion of the HARM Integration project. ($7,000)
- (U) Complete MS II PDF COEA (expanded scope to include Pre-emptive Destruction of Enemy Air Defenses (PDEAD). (Sep 95, $1,400)
- (U) Begin technology demonstrations in support of PDEAD. ($3,583)
- (U) Mission Support. ($750)
- (U) Funds withheld pending Omnibus Reprogramming Bill to transfer to PE 0207134F, F-15E Squadrons, for the F-15E/F100-GE-129 Improved Performance Engine (IPE) Qualification Flight Test. ($11,100)

(U) FY 1996
- (U) Not applicable (PACS Upgrade continues and is transferred to PE 0207134F, F-15E Squadrons).

(U) FY 1997
- (U) Not applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #7 - Operational System Development

PE NUMBER AND TITLE: #0207136F Manned Destructive Suppression

PROJECT NO.: 4375

(U) B. Program Change Summary ($ in Thousands)

	1994	1995	1996	1997	Total Cost
(U) Previous President's Budget (PB)	4,352	38,422	50,207	52,631	304,200
(U) Appropriated Value	4,352	37,422			
(U) Adjustments to Appropriated Value					
(U) a. General Congressional Reductions:		(408)			
(U) b. SBIR:	(68)	(781)			
(U) Adjustments to Budget Years Since FY95 PB			(50,207)	(52,631)	
(U) Current Budget Submit/President's Budget	4,284	36,233	0	0	56,231

(U) Change Summary Explanation:

Funding: F-15C Manned Destructive Suppression (MDS) has been zeroed at the end of the Dem/Val phase.

Schedule: F-15C MDS has been canceled at the end of the Dem/Val phase.

Technical: Not applicable.

(U) C. Other Program Funding Summary ($ in Thousands)

Related RDT&E: PE 0605808, Development Planning.

(U) D. Schedule Profile

	1994				1995				1996				1997			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
(U) F-15 PDF Demonstration/Validation	*															x

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February 1995

BUDGET ACTIVITY: #7 - Operational System Development

PE NUMBER AND TITLE: #0207136F Manned Destructive Suppression

PROJECT NO.: 4375

(U)A. Project Cost Breakdown ($ in Thousands)

	1994	1995	1996	1997
(U) Precision Direction Finding (PDF):			Program Terminated	
Hardware Development	1,364	3,800		
Software Development	2,240	7,300		
Sys Engineering/Pgm Mgmt		1,300		
Travel		200		
Miscellaneous	680	200		
(U) Programmable Armament Control Set (PACS) Upgrade:			Program Terminated	
Hardware Development		2,300		
Software Development		3,700		
Sys Engineering/Pgm Mgmt		800		
Integrated Logistics Support		200		
Travel		200		
Miscellaneous		150		
(U) Cost & Operational Effectiveness Analysis (COEA):		1,400		
(U) Pre-emptive Destruction of Enemy Air Defenses (PDEAD) Demonstrations:			Program Terminated	
Hardware Development		2,227		
Software Development		1,356		
(U) Withheld for Reprogramming		11,100		
(U) Total	4,284	36,233		

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February 1995

BUDGET ACTIVITY: #7 - Operational System Development

PE NUMBER AND TITLE: #0207136F Manned Destructive Suppression

PROJECT NO.: 4375

(U) B. Budget Acquisition History and Planning Information ($ in Thousands)

(U) Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to 1994	Budget 1994	Budget 1995	Budget 1996	Budget 1997	Budget to Complete	Total Program
(U) Product Development Organizations											
McDonnell Douglas Aerospace, St Louis, MO (SS/CPAF)					9,800	3,604	22,983		Program Terminated		36,387
(U) Support and Management Organizations											
Air Force Materiel Command, ASC, F-15 Program Office					5,914	680	750		Program Terminated		7,344
Air Force Materiel Command, ASC, F-16 Program Office							800		Program Terminated		800
Air Force Air Combat Command, Plans & Requirements							600		Program Terminated		600
(U) Test and Evaluation Organizations Not Applicable											
(U) Withheld pending reprogramming for F-15E/F100-GE-129 Flight Qualification							11,100		Program Terminated		11,100
Total Project					15,714	4,284	36,233		Program Terminated		56,231

(U) Government Furnished Property: Not applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #7 - Operational System Development

PE NUMBER AND TITLE: #0207136F Manned Destructive Suppression

PROJECT NO.: 2671

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
2671 F-16 HARM Targeting System (HTS)	[1]3,100*	[1]0	2,908	[2]0	[2]0	[2]0	[2]0	[2]0	[2]4,219	10,227*

(U) A. Mission Description and Budget Item Justification

The program provides F-16 aircraft the capability to carry and employ the AGM-88 High-speed Anti-Radiation Missile (HARM). The F-16C/Blk 50D has been modified to carry the AN/ASQ-213 HARM Targeting System (HTS). This capability allows real-time, "range known" HARM employment and is necessary due to the phase out of the F-4G Wild Weasel.

(U) FY 1994
- (U) Effort reported under a classified Program Element.

(U) FY 1995
- (U) Effort reported under a classified Program Element.

(U) FY 1996
- (U) Completes R5 software upgrade and the developmental flight test support. (Mar 96, $1,000)
- (U) Funds HTS Air Force Mission Support System (AFMSS) development. (Dec 96, $1,200)
- (U) Mission support. ($708)

(U) FY 1997
- (U) Continue software development for new F-16 Operational Flight Program (OFP) releases. [2](cont., $412)
- (U) Continue mission support. [2](cont., $200)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #7 - Operational System Development

PE NUMBER AND TITLE: #0207136F Manned Destructive Suppression

PROJECT NO.: 2671

(U) B. Program Change Summary ($ in Thousands)

	1994	1995	1996	1997	Total Cost
(U) Previous President's Budget (PB)	0	0	0	0	0
(U) Appropriated Value	0	0			
(U) Adjustments to Appropriated Value	0	0			
(U) Adjustments to Budget Years Since FY95 PB			2,908		
(U) Current Budget Submit/President's Budget	0	0	2,908	20	10,227

(U) Change Summary Explanation:

Funding: All funds for HARM Targeting System (HTS) for 1996 and beyond were reprogrammed from a classified Program Element.

Schedule: None.

Technical: An additional $3,100 FY93 RDT&E funding was reprogrammed into this PE from PE 0207134, F-15E Squadrons, to develop a prototype of an enhanced F-16 AN/ASQ-213 HTS to meet the Operational Requirements Document (ORD) for HARM Targeting to the maximum extent practical. Performance and Cost data will be used to support the Cost and Operational Effectiveness Analysis (COEA) for the Jet Emitter Targeting System and Combat Identification. Also, this is effectively a Dem/Val for future enhancements to the HTS pod.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #7 - Operational System Development

PE NUMBER AND TITLE: #0207136F Manned Destructive Suppression

PROJECT NO.: 2671

(U) C. Other Program Funding Summary ($ in Thousands)

	1994	1995	1996	1997	1998	1999	2000	2001	To Compl	Total Cost
(U) Aircraft Procurement, AF	0	0	3,142	[2]812	[2]750	[2]672	[2]705	[2]619	900	[2]7,600

NOTE: FY96 funding includes interim contractor support (ICS), mission support system (MSS) sustainment, and replenishment spares. FY97-FY01 funding primarily covers replenishment spares.

(U) Operations & Maintenance	0	0	[3]3,000	[3]4,847	[3]3,694	[3]3,827	[3]2,849	[3]2,845	[3]11,950	[3]33,012

NOTE: FY96-FY01 funding includes Air Force MSS (AFMSS) sustaining support, contractor sustaining support, depot repair, Field Reprogramming Equipment (FRE) maintenance, and other related support activities.

(U) Other Procurement, AF	0	0	0	0	0	0	0	0	0	0

Related RDT&E: PE 0207133, F-16 Squadrons.

(U) D. Schedule Profile

	1994				1995				1996				1997			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
(U) F-16 HTS R5 Software Development		*											x			
(U) R5/T3 Flight Test Begins						x										
(U) R5 Fielded										x						
(U) F-16 HTS P[2]I Prototype Development						*				x						

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February 1995

BUDGET ACTIVITY: #7 - Operational System Development

PE NUMBER AND TITLE: #0207136F Manned Destructive Suppression

PROJECT NO.: 2671

(U) A. Project Cost Breakdown ($ in Thousands)

	1994	1995	1996	1997
(U) Test & Evaluation	0	0	500	0
(U) Software Development	0	0	1,700	[2]412
(U) Program Support	0	0	708	[2]200
(U) Total	[1]0	[1]0	2,908	[2]612

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February 1995

BUDGET ACTIVITY: #7 - Operational System Development

PE NUMBER AND TITLE: #0207136F Manned Destructive Suppression

PROJECT NO.: 2671

(U) B. Budget Acquisition History and Planning Information ($ in Thousands)

(U) Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to 1994	Budget 1994	Budget 1995	Budget 1996	Budget 1997	Budget to Complete	Total Program
(U) Product Development Organizations											
Texas Instruments	SS/CPAF	Various	Classified	Classified	[1]3,100	[1]0	[1]0	1,700	[2]412	[2]2,088	[1]7,300
(U) Support and Management Organizations											
Prog Office Spt	Various	Various	Classified	Classified	[1]0	[1]0	[1]0	708	[2]200	[2]1,519	[1]2,427
(U) Test and Evaluation Organizations											
Eglin	PO	Various	Classified	Classified	[1]0	[1]0	[1]0	500	0	0	[1]500
Total Project			Classified	Classified	[1]3,100	[1]0	[1]0	2,908	[2]612	[2]4,219	[1]10,227

(U) Government Furnished Property: Not Applicable

NOTES:

[1] *FY95 and prior funding reported under a separate program element.*

[2] *F-16 HTS FY97-01 RDT&E funding mistakenly provided under APAF. AF will correct during the FY97 POM cycle. Corrected funding lines are:*

	1997	1998	1999	2000	2001	To Compl	Tot Cost
HTS RDT&E, AF	*612*	*547*	*465*	*493*	*402*	*1,700*	*7,127*
HTS Aircraft Procurement, AF	*200*	*203*	*207*	*212*	*217*	*900*	*5,081*

[3] *All F-16 HTS FY96-01 O&M funding mistakenly provided under PE 0207128, F-4 Squadrons. AF will correct during the FY97 POM cycle and FY96 execution.*

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #7 - Operational System Development

PE NUMBER AND TITLE: #0207141F, F-117A Squadrons

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	6,122	0	3,881	12,478	5,210	4,173	10,958	11,286	continuing	2,083,208

A. Mission Description and Budget Item Justification

(U) BRIEF DESCRIPTION OF ELEMENT: The F-117A is the world's only operational low-observable (LO) combat aircraft. Its combination of stealth and precision weapons delivery capability allows the United States Air Force to hold even the most highly defended targets at risk. This program provides funds to develop improved systems for the F-117A aircraft. These improvements will enhance combat capability while maintaining a safe, reliable, and supportable aircraft. The F-117A is currently planned to be in service at least through the year 2015. The major research budget activitiy category is operational systems development; in addition, some research being performed is engineering and manufacturing development (EMD). The final F-117A delivery to the Air Force (number 59) was July 1990. The program is well past production; currently the single operational F-117A unit is stationed at Holloman AFB. The program uses Aircraft Procurement Air Force (APAF) modification (BA-5) money for an extensive modification program to keep the F-117A current with operational system and reliability/maintainability upgrades. Some of the modification projects require development efforts before they are integrated into the fleet (RDT&E money). In addition, small amounts of F-117A RDT&E funding, support quick look integration, threat system, and technology quick look studies as required by the user.

- New RDT&E Effort: Mid-Life Improvement/Uprgrade
  - Response to ACC Mission Need Statement
  - Studies will address: Surviveablilty, Mission Effectiveness, Maintainablilty

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #7 - Operational System Development

PE NUMBER AND TITLE: #0207141F, F-117A Squadrons

B. Program Change Summary ($ in Thousands)

	1994	1995	1996	1997	Total Cost
Previous President's Budget	6,740	0	1,430	12,549	20,719
Appropriated Value	6,740				
Adjustments to Appropriated Value					-618
a. non-FFRDC reduction	-38				
b. Small Business Investment Research	-105				
c. DoD higher priority and Reprogramming	-513				
d. Adjustments to Budget Years			2,451	-71	2,380
Current Budget Submit/President's Budget	6,122	0	3,881	12,478	22,481

Change Summary Explanation($ in Thousands):

Funding: No FY95 RDT&E funding programmed. FY96 RDT&E was initially adjusted to 1,430 by FY95 PB. This forced schedule slips in RAM recoat and others explained below. Current Budget Submittal reflects $2,540 added back to FY96 by realignment from the F-111 PE. These funds respond to Air Combat Command's Mission Need Statement concerning F-117A deficiencies, and will be used to begin study efforts towards a Mid-Life Upgrade. FY97 changes reflect adjustment for inflation.

Schedule: Development funds for avionics fixes for the Offensive Capabilities Improvement Program were deleted and the common mapping system (CMS) upgrade to AFMSS was slipped two years to better align with the overall AFMSS schedule. Development of redesigned LO UHF and IFF antennas was moved out two years to accommodate budget cuts and work on a new RAM recoating was moved up one year to align the work with the existing RNIP+ (GPS & ring laser gyro INS) mod effort. Life limited skin panel replacement was slipped out three yrs & replacement of current halon fuel tank inerting system with a nitrogen generating system as part of eliminating ozone depleting chemicals was slipped out two years.

Technical: FY 95 has no funding. FY94 PB; Cancellation of several aircraft modifications. Reflects funding for outyear mod projects that require development efforts before fleet integration. Studies required in FY96 for risk assessment and possible solutions to ACC's Mission Need Statement regarding aircraft survivability, mission effectiveness, and maintainability deficiencies. Technological feasibility will be addressed.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

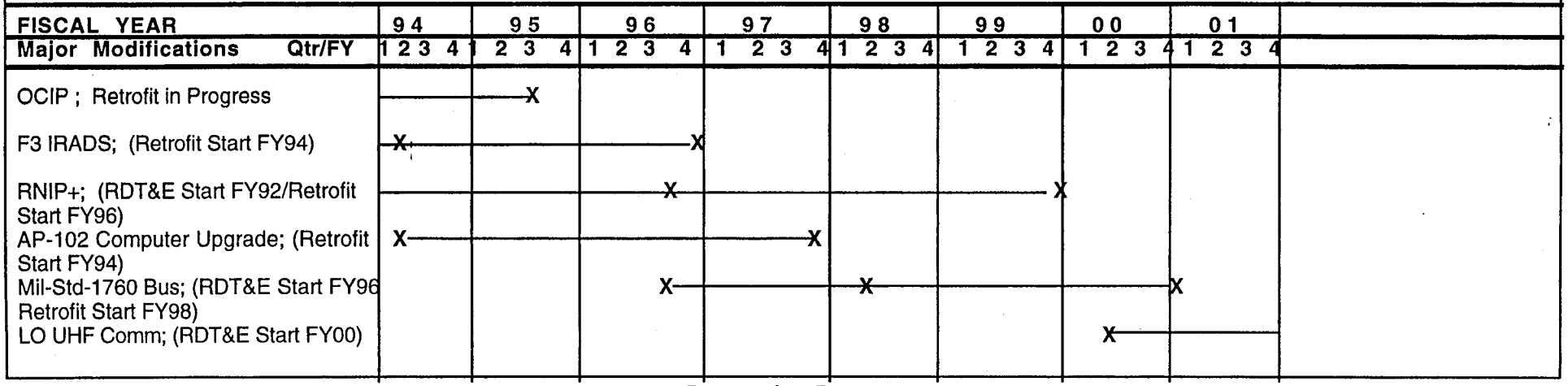
BUDGET ACTIVITY: #7 - Operational System Development

PE NUMBER AND TITLE: #0207141F, F-117A Squadrons

C. Other Program Funding Summary ($ in Thousands)

	To 1994	Total 1995	1996	1997	1998	1999	2000	2001	Compl	Cost
Aircraft Procurement (BA-5):										
F-117 Modifications:	132,015	63,573	68,593	67,974	69,722	57,503	57,492	57,725	continuing	5,055,406
Other Procurement (BA-5):										
F-117A Squadrons:	574	1,596	491	510	523	541	557	574	continuing	14,732
Operations and Maintenance(BA-2):										
F-117A Squadrons:	217,961	222,819	225,407	224,999	234,365	237,324	240,816	242,395	continuing	2,987,916

D. Schedule Profile



RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #7 - Operational System Development

PE NUMBER AND TITLE: #0207141F, F-117 Squadrons

PROJECT NO.: 3956

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
3956: F-117A	6,122	0	3,881	12,478	5,210	4,173	10,958	11,286	continuing	2,083,208

A. Mission Description and Budget Item Justification

(U) This project currently provides research and development for multiple modifications for the F-117A weapons system. The first modification enables a transition from the current Mission Planning Data System (MPDS) through development of the F-117A Avionics Electronics Weapons (A/W/E) module to interface with the new Air Force Mission Support System (AFMSS), which will become the USAF standard planning system. This also includes development of a common low observable auto-router (CLOAR) for AFMSS (managed by ESC/YV). Second is the development and field installation of a diagnostic imaging radar (DIR) to help maintain signature levels at baseline specification values. Third modification is the development of new panels and supports to replace areas of the aircraft skin that have been analytically determined to have a service life less than that of the basic aircraft. Fourth effort is a study to investigate technical problems associated with integration of the Joint Direct Attack Munition (JDAM) & the Joint Standoff Weapon (JSOW) onto the F-117. Fifth is the development of a new fuel tank inerting system which will conform to environmental standards. The current aircraft inerting system uses halon, an ozone layer depleting chemical which is being withdrawn from service. Sixth is development work for MIL-STD 1760 installation and eighth is development work for a new radar absorbent material (RAM) recoating. Miscellaneous efforts include work on the development testing and evaluation (DT&E) of a new lower enhancer; developmental work associated with efforts to fabricate and install specialized communications gear; work on support equipment upgrades.

(U) FY 1994 :

(U) Issue F-117A AFMSS Phase II contract, CLOAR & A/W/E work ($5,530)

(U) Support initial integration and DT&E of DIR ($500)

(U) Miscellaneous efforts ($90)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #7 - Operational System Development	PE NUMBER AND TITLE: #0207141F, F-117 Squadrons / PROJECT NO.: 3956

A. Mission Description and Budget Item Justification

(U) FY 1995
- (U) No FY95 funding is programmed, continuation of FY94 program

(U) FY 1996
- (U) Mid-life Upgrade Studies and related efforts ($1,500)
- (U) Development work on MIL-STD-1760 ($600)
- (U) Development work on new RAM recoating ($1,800)

(U) FY 1997
- (U) Continue MIL-STD-1760 work ($3,400)
- (U) Continue RAM recoating work ($4,300)
- (U) Leading edge low-frequency survivability work ($1,100)
- (U) Environmental tests for life-limited skin panels ($1,500)
- (U) Development work on fuel tank inerting ($1,200)
- (U) Miscellaneous efforts ($1,000)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT NO.
#7 - Operational System Development	#0207141F, F-117 Squadrons	3956

B. Program Change Summary ($ in Thousands)

	1994	1995	1996	1997	Total Cost
Previous President's Budget	6,740	0	1,430	12,549	20,719
Appropriated Value	6,740				
Adjustments to Appropriated Value					-618
a. Non-FFRDC reduction	-38				
b. Small Business Investment Research	-105				
c. DoD higher priority and Reprogramming	-513				
d. Adjustments to Budget Years			2,451	-71	2,380
Current Budget Submit/President's Budget	6,122	0	3,881	12,478	22,481

Change Summary Explanation:

Funding: No FY95 RDT&E funding programmed. FY96 RDT&E was initially adjusted to 1,430 by FY94 PB. This forced schedule slips in RAM recoat and others explained below. Current Budget Submittal reflects $2,540 added back to FY96 by realignment from the F-111 PE. These funds respond to Air Combat Command's Mission Need Statement concerning F-117A deficiencies, and will be used to begin study efforts towards a Mid-Life Upgrade. FY97 changes reflect adjustment for inflation.

Schedule: Development funds for avionics fixes for the Offensive Capabilities Improvement Program were deleted and the common mapping system (CMS) upgrade to AFMSS was slipped two years to better align with the overall AFMSS schedule. Development of redesigned LO UHF and IFF antennas was moved out two years to accommodate budget cuts and work on a new RAM recoating was moved up one year to align the work with the existing RNIP+ (GPS & ring laser gyro INS) mod effort. Life limited skin panel replacement was slipped out three yrs & replacement of current halon fuel tank inerting system with a nitrogen generating system as part of eliminating ozone depleting chemicals was slipped out two years.

Technical: FY 95 has no funding. FY94 PB; Cancellation of several aircraft modifications. Reflects funding for outyear mod projects that require development efforts before fleet integration. Studies required in FY96 for risk assessment and possible solutions to ACC's Mission Need Statement regarding aircraft survivability, mission effectiveness, and maintainability deficiencies. Technological feasibility will be addressed.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #7 - Operational System Development

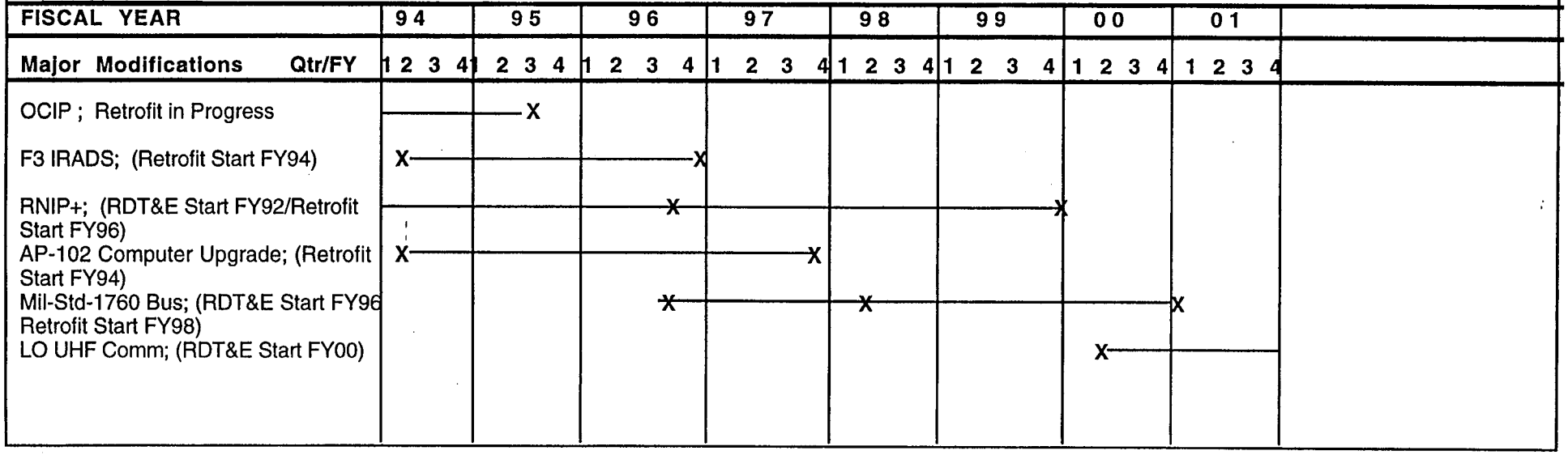
PE NUMBER AND TITLE: #0207141F, F-117 Squadrons

PROJECT NO.: 3956

C. Other Program Funding Summary ($ in Thousands)

	1994	Total 1995	1996	1997	1998	1999	2000	2001	Compl	Cost
Aircraft Procurement (BA-5):										
Modifications:	132,015	63,573	68,593	67,974	69,722	57,503	57,492	57,725	continuing	5,055,406
Other Procurement (BA-5):										
	574	1,596	491	510	523	541	557	574	continuing	14,732
Operations and Maintenance (F-117A Squadrons):										
	217,961	222,819	225,407	224,999	234,365	237,324	240,816	242,395	continuing	2,987,916

D.Schedule Profile



RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February 1995

BUDGET ACTIVITY: #7 - Operational System Development

PE NUMBER AND TITLE: #0207141F, F-117 Squadrons

PROJECT NO.: 3956

A. Project Cost Breakdown ($ in Thousands)

Project 3956: F-117 Squadrons

	1994	1995	1996	1997
O & M	217,961	222,819	225,407	224,999
RDT&E	6,122	0	3,881	12,478
Proc	132,600	65,169	69,084	68,484
Total	356,683	287,988	298,372	305,961
RDT&E(3600)				
Developmental Testing	1,501	N/A	1,250	2,545
Test Support Hardware/Equipment	1,002		550	2,870
Software Development	761		0	485
Resarch Studies and Technical Data	1,594		1,500	1,000
Eng Chg Proposals/Engineering Support	934		150	1,560
Travel/Security	330		0	285
Flight Test			431	1,860
Systems Engineering				373
Environmental testing				1,500
Total	6,122	N/A	3881	12,478

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February 1995

BUDGET ACTIVITY: #7 - Operational System Development

PE NUMBER AND TITLE: #0207141F, F-117 Squadrons

PROJECT NO.: 3956

B. Budget Acquisition History and Planning Information ($ in Thousands)

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to 1994	Budget 1994	Budget 1995	Budget 1996	Budget 1997	Budget to Complete	Total Program
Product Development Organizations											
F-117 Office, SM-ALC/QL, Sacramento Air Logistics Center, McClellan AFB, CA											
	Allot	1 Oct 94	contin.	contin.		235	0	3,881	12,478	contin.	
GDE Systems Incorporated											
	C/CPFF	29 Apr 94	12,200	12,200	8,345	3,137	0	0	0	0	11,462
Massachusetts Inst of Technology, Lincoln Laboratories											
	SS/CPFF	28 Jun 94	4,250	4,000	0	886	0	0	0	0	900
CALSPAN Corporation											
	RQMTS/CPAF	12 Sep 94	3,400	3,400	522	600	0	0	0	0	1,122
Lockheed Sanders, Inc.											
	C/CPAF	14 Mar 94	3,200	3,200	2,525	676	0	0	0	0	3,201
Bonn Corporation	CPFF	02 Nov 94	523	523	229	114	0	0	0	0	343
Support and Management Organizations											
Development System Program Office, ASC/SD, Wright-Patterson AFB, OH											
	Allot	1 Oct 94	contin.	contin.		70	0			contin.	
Miscelllaneous						404	0			contin.	

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE
	February 1995

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT NO.
#7 - Operational System Development	#0207141F, F-117 Squadrons	3956

B. Budget Acquisition History and Planning Information Continued ($ in Thousands)

Government Furnished Property:
Not Applicable. No GFE funded.

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February 1995

BUDGET ACTIVITY: #7 - Operational System Development

PE NUMBER AND TITLE: #0207141F, F-117 Squadrons

PROJECT NO.: 3956

C. Funding Profile ($ in Thousands)

Funds Profile	1994 Obs	1995 Obs	1996 Obs	1997 Obs	1994 Exp	1995 Exp	1996 Exp	1997 Exp
1994Q1	100	0 funding			100	0 funding		
1994Q2	1,269				1,245			
1994Q3	1,705				690			
1994Q4	506				710			
1994 Tot	3,580				2,745			
1995Q1	985				845			
1995Q2	1,320				930			
1995Q3	137				1,220			
1995Q4	100				382			
1995 Tot	6,122				6,122			
1996Q1			343				185	
1996Q2			1,829				690	
1996Q3			678				691	
1996Q4			694				620	
1996 Tot			3,544				2,186	
1997Q1			337	2,886			632	1,631
1997Q2			0	3,012			634	1,757
1997Q3			0	2,886			215	1,757
1997Q4			0	2,510			214	1,255
1997 Tot			3,881	11,294			3,881	6,400
1998Q1				1,184				1,254
1998Q2				0				1,184
1998Q3				0				2,754
1998Q4				0				886
1998 Tot				12,478				12,478

Total of fiscal year funds

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0207160F Tri-Service Standoff Attack Missile (TSSAM)

PROJECT: 1006

COST (*In Thousands*)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
1006 Tri-Serv Stndoff Attk Mssl (TSSAM)	258,481	131,290	0	0	0	0	0	0	0	389,771

(U) A. Mission Description and Budget Item Justification

The Tri-Service Standoff Attack Missile (TSSAM) was a joint service program with the Air Force as the executive Service. The program objective was to develop a family of highly survivable, conventional, stealthy cruise missiles to satisfy tri-service requirements to effectively engage a variety of high value land and sea targets. The technical approach to develop a modular stealth cruise missile which can employ several payloads and guidance systems to engage the required targets. All variants used a GPS aided inertial navigation system. The Navy and Air Force (unitary variant) missiles used an imaging infrared terminal sensor for autonomous recognition and homing on fixed land targets and sea targets. The other Air Force variant contained the Combined Effects Bomblet (CEB) submunition to attack land targets. Integration efforts were planned for the Air Force's B-52H, F-16C/D (Block 50), B-2 and B-1 and the Navy's F/A-18C/D. On 9 Dec 94 SECDEF announced cancellation of the TSSAM program. DEPSECDEF Program Decision Memorandum (PDM) IV, 16 Dec 94, canceled the TSSAM program and associated contracts. No funding is provided for a follow-on weapon system. The program described in this Descriptive Summary implements the program termination under PDM IV.

NOTE: Program termination costs are unknown.

NOTE: Many TSSAM program specifics remain Secret - Special Access Required (SAR) per the 31 March 1993 Program Security Guide. Separate justification will be provided to appropriately cleared individuals.

(U) FY 1994

- (U) Provides required funding for the Northrop prime contract ($140,080[1])
- (U) Provides required funding for the B-52H and F-16 integration contracts ($38,320[2])
- (U) Provides required funding of the test sites ($56,810[3])
- (U) Provides required funding of associate/support contracts and program office support ($23, 271[4])

[1]$18,000,000 needed to fund Sensor REA/new tasks (flight termination, PIP III, Production Transition Plan, etc.). Added $48,000 in termination expenses (H-25 clause, STCC).

[2]Remaining FY95 activity and termination expenses comprise $12,000 cost delta from 95 PB. No costs will be paid by FY95 funds for the Boeing or Lockheed contracts.

[3]Most FY95 shut-down activity to be paid with $9,000 in FY95 funds.

[4]Revised requirements reduced associate/support contract costs $1,000.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207160F Tri-Service Standoff Attack Missile (TSSAM)
	PROJECT 1006

(U) FY 1995
- (U) Completes funding on the Northrop prime contract ($55,700[1])
- (U) Completes funding of test sites ($3,100[2])
- (U) Completes funding of associate/support contracts and program office support ($17,953[3])
- (U) Funding on withhold pending termination plan ($54,537)

[1]$36,000 needed to complete funding of termination expensed (H-25 clause, STCC, potential REAs).
[2]Completes close-down, but with the termination, reduces FY95 funding requirements $36,000.
[3]Revised requirements reduced associate/support contract costs $1,000.

(U) **Acquisition Strategy:** The Air Force and Navy, with OSD concurrence, is immediately beginning an orderly program withdrawal at the least expense to the government.

(U) **B. Program Change Summary ($ in Thousands)**

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
(U) Previous President's Budget	268,075	135,600	159,706	97,674	661,055
(U) Appropriated Value	268,075	135,600			
(U) Adjustments to Appropriated Value					
a. General Congressional Reduction	-2,691	-1,480			
b. Below Threshold Reprogramming	-2,763				
c. SBIR	-4,140	-2,830			
d. Adjustment to Budget Years Since FY95 PB			-159,707	-97,674	
(U) Current Budget Submit/President's Budget	258,481	131,290			389,771

(U) Change Summary Explanation:

Funding: The current budget reflects the impact of Program Decision Memorandum IV, 16 Dec 94, terminating the TSSAM program. All funding in FY96 and out has been zeroed. It is anticipated that the unobligated FY94 and FY95 funding will be adequate to cover the Air Force's share of contract termination costs and other shut down expenses.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207160F Tri-Service Standoff Attack Missile (TSSAM)
	PROJECT 1006

Schedule: Not Applicable

Technical: Not Applicable

(U) C. **Other Program Funding Summary ($ in Thousands)**

	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	To Compl	Total Cost
(U) AF Missile Procurement	86,244									86,244
Related RDT&E:										
(U) RDT&E	0									0

(U) D. **Schedule Profile**

	FY 1994				FY 1995				FY 1996				FY 1997			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
(U) Termination Plan																
(U) -- Prime Contract Settlement							X									
(U) -- Complete Program Termination								X								

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207160F Tri-Service Standoff Attack Missile (TSSAM)
	PROJECT 1006

(U) A. Project Cost Breakdown ($ in Thousands)

	FY 1994	FY 1995	FY 1996	FY 1997
(U) Major Contracts	178,400	55,700		
(U) Associated Contracts	14,570	1,800		
(U) Support Contracts	3,650	4,223		
(U) In-House Support	5,051	11,930		
(U) Test Sites	56,810	3,100		
(U) Total	258,481	131,290	0	0

(U) B. Budget Acquisition History and Planning Information ($ in Thousands)

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1994	Budget FY 1994	Budget FY 1995	Budget FY 1996	Budget FY 1997	Budget to Complete	Total Program
Product Development Organizations			***NOTE: FY93 and prior years are classified Special Access Required.**								
Northrop	FPIF	FY86			*	140,080	55,700	TBD	TBD	TBD	195,780
Boeing	FFP	FY85			*	24,020					24,020
Lockheed	FPIF	FY86			*	14,300					14,300
Misc Contracts	Misc	Various			*	14,570	1,800	TBD	TBD	TBD	16,370
Support and Management Organizations											
Support Contracts	Misc	Various			*	3,650	4,223	TBD	TBD	TBD	7,873
Program Office Support	N/A	N/A			*	4,696	11,603				16,299
ANSER Support					*	355	327	TBD	TBD	TBD	682

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0207160F Tri-Service Standoff Attack Missile (TSSAM)

PROJECT: 1006

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1994	Budget FY 1994	Budget FY 1995	Budget FY 1996	Budget FY 1997	Budget to Complete	Total Program
Test and Evaluation Organizations											
AFOTEC	Allot				*	1,000	1,000	TBD	TBD	TBD	2,000
AFFTC/EAFB	PO				*	16,200					16,200
Utah TR/Hill AFB	PO				*	14,600		TBD	TBD	TBD	14,600
Tonapah Range	MIPR				*	6,500					6,500
Eglin AFB	PO				*	8,400	2,100	TBD	TBD	TBD	10,500
Naval Air Warfare Center	MIPR				*	4,690					4,690
Misc	Misc				*	5,420		TBD	TBD	TBD	5,420
Government Furnished Property: None											
Subtotal Product Development					*	192,970	57,500				250,470
Subtotal Support and Management					*	8,701	16,153				24,854
Subtotal Test and Evaluation					*	56,810	3,100	TBD	TBD	TBD	59,910
Total Project					*	258,481	131,290	TBD	TBD	TBD	389,771

NOTE: Breakout of costs do not reflect full availability of funds, pending termination discussions.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: 7 - Operational Systems Development

PE NUMBER AND TITLE: 0207161F - Tactical Air Intercept Missile (AIM)

PROJECT NO.: 4132

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	0 *	0 *	20,082	31,088	67,377	84,906	64,137	29,169	10,621	307,380

* FY 1995 and prior year funding appropriated and consolidated with Navy funding in Defense Agencies' Program Element #0603715D.

A. (U) Mission Description and Budget Item Justification

{U} The AIM-9 Sidewinder short-range air-to-air missile (SRM) is a launch and leave, air combat munition that uses passive infrared (IR) energy for acquisition and tracking and compliments the Advanced Medium Range Air-to-Air Missile. Air superiority in the SRM arena is essential and includes first shot, first kill opportunity against an enemy employing IR countermeasures. The AIM-9X is a long-term evolution to the AIM-9, a fielded system, qualifying this as research category operational systems development. Evolutionary improvements in missile seeker, fuze/warhead, and kinematics allow retrofit of components to current missiles to the maximum extent possible. Retrofitting of components will extend the operational effectiveness of existing inventories at an affordable cost while continuing evolution of the AIM-9 series.

(U) FY 1994 (FY 94 funded in OSD PE 0603715D)

(U) FY 1995 (FY 95 funded in OSD PE 0603715D)

(U) FY 1996

- (U) Continue DEM/VAL for missile seeker prototype and other elements to support a Milestone II Engineering and Manufacturing Development (EMD) decision. Conduct Systems Design Review ($11,917).
- (U) Continue engineering support from China Lake and other agencies for DT&E/OT&E program ($8,165).
- (U) Prepare Request for Proposal for AIM-9X EMD (Not Separately Priced (NSP)).
- (U) Begin preparation and analysis for Milestone II decision to enter Phase II, EMD (NSP).

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: 7 - Operational Systems Development

PE NUMBER AND TITLE: 0207161F - Tactical Air Intercept Missile (AIM)

PROJECT NO.: 4132

(U) FY 1997
- (U) Award Contract for EMD ($27,155).
- (U) Continue sustaining engineering support in-house and begin Development Test (DT-IIA) ($3,933).
- (U) Start EMD captive flight testing with brassboard hardware (NSP).

B. (U) Program Change Summary ($ in Thousands)

	1994	1995	1996	1997	Total Cost
Previous President's Budget	33,887	26,944	21,997	31,465	281,800
Appropriated Value	0 *	0 *			
Adjustments to Appropriated Value	0	0			
Adjustments to Budget Years Since FY95 PB			-1,915	-377	
Current Budget Submit/President's Budget	0	0	20,082	31,088	307,380

* NOTE: FY 1995 and prior year funding requests appropriated and consolidated with Navy funding in Defense Agencies Program Element #0603715D.

Change Summary Explanation:

Funding: Changes from the FY 1995 President's Budget to the FY1996 President's Budget were due to program restructuring and inflation adjustments.

Schedule: The Demonstration and Validation (DEM/VAL) Request for Proposal (RFP) was delayed until a strategy to incorporate potential cooperative international development was agreed to and incorporated into the RFP. A six month source selection period has been placed between DEM/VAL, and Engineering and Manufacturing Development (EMD), to ensure an orderly transition between the two program phases. This source selection period will be used to maintain continuity of the government team and conduct pre-EMD activities.

Technical: None.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: 7 - Operational Systems Development

PE NUMBER AND TITLE: 0207161F - Tactical Air Intercept Missile (AIM)

PROJECT NO.: 4132

C. (U) Other Program Funding Summary ($ in Thousands)

Missile Procurement, Budget Activity 2, Program Element: 0207161F, Program Title: AIM-9X Production

	1994	1995	1996	1997	1998	1999	2000	2001	To Compl	Total Cost
	0	0	0	0	0	0	0	71,146	1,706,854	1,778,000
Quantity	0	0	0	0	0	0	0	71	4929	5000

Missile Procurement, Budget Activity 2, Program Element: 0207590F, SEEK EAGLE

0	0	0	0	0	0	0	7,210	Continuing	Continuing

Related Activities:

RDT&E, Navy; Budget Activity 7, Program Element: 0207161N, Program Title: Tactical Air Intercept

* 0	* 0	29,721	60,304	65,566	86,411	64,145	28,920	10,533	345,600

* NOTE: FY 1994 RDT&E, Navy funding appropriated in Defense Agencies Program Element 0603715D

RDT&E, Defense Agencies, Program Element: 0603715D, Program Title: AIM-9 Consolidated Program

** 16,400	** 26,944	0	0	0	0	0	0	0	57,100

** NOTE: Reflects Air Force share of funding only.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: 7 - Operational Systems Development

PE NUMBER AND TITLE: 0207161F - Tactical Air Intercept Missile (AIM)

PROJECT NO.: 4132

D. (U) Schedule Profile

		1994				1995				1996				1997			
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Acquisition Milestones																	
MS IV/I						X											
MS II														X			
MS III	4Q/FY02																
Engineering Milestones																	
SRR								X									
SDR											X						
PDR																	X
CDR	3Q/FY98																
TRR for TECHEVAL	2Q/FY00																
T&E Milestones																	
DT-1							X										
Fly Brassboards										X							
DT-IIA															X		
Captive carry															X		
DT-IIB	4Q/FY98																
DT-IIC	3Q/FY99																
DT-IID	2Q/FY00																
OT-IIA	1Q/FY00																
OT-IIB	2Q/FY01																
Contract Milestones																	
DEM/VAL						X											
RFP Release (EMD)										X							
EMD Award															X		
LRIP Award	4Q/FY01																
Production	1Q/FY03																

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February 1995

BUDGET ACTIVITY: 7 - Operational Systems Development

PE NUMBER AND TITLE: 0207161F - Tactical Air Intercept Missile (AIM)

PROJECT NO.: 4132

A. (U) Project Cost Breakdown ($ in Thousands)

Project Cost Categories	1994 *	1995 *	1996	1997
a. Primary Hardware Development	0	0	11,917	27,155
b. Government Engineering Support	0	0	5,341	2,234
c. Ancillary Hardware Development	0	0	0	0
d. Contractor Engineering Support	0	0	189	136
e. Miscellaneous	0	0	1,134	842
f. Development Test and Evaluation	0	0	1,110	545
g. Travel	0	0	391	176
Total	0	0	20,082	31,088

* NOTE: FY 1995 and prior year funding requests appropriated and consolidated with Navy funding in Defense Agencies Program Element #0603715D.

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February 1995

BUDGET ACTIVITY: 7 - Operational Systems Development

PE NUMBER AND TITLE: 0207161F - Tactical Air Intercept Missile (AIM)

PROJECT NO.: 4132

B. (U) Budget Acquisition History and Planning Information ($ in Thousands)

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to 1994 *	Budget 1994 *	Budget 1995	Budget 1996	Budget 1997	Budget to Complete	Total Program
Product Development Organizations											
Hughes	C/CPIF	Dec 94	5,958	5,958	0	0	0	5,958	0	0	5,958
Raytheon	C/CPIF	Dec 94	5,959	5,959	0	0	0	5,959	0	0	5,959
Contract (EMD)	C/CPIF	Jan 97	TBD	198,540	0	0	0	0	27,155	171,385	198,540
McDon-Doug	C/CPFF	Jan 95	TBD	22,743	0	0	0	189	136	22,418	22,743
NAWC CL	WR	Oct 95	65,181	65,181	0	0	0	6,451	2,779	55,951	65,181
Misc In-house (Efforts < $1.0M)			6,429	6,429	0	0	0	940	823	4,666	6,429
Support and Management Organizations											
TBD Contract	TBD	Oct 95	TBD	2,570			0	585	195	1,790	2,570

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February 1995

BUDGET ACTIVITY: 7 - Operational Systems Development

PE NUMBER AND TITLE: 0207161F - Tactical Air Intercept Missile (AIM)

PROJECT NO.: 4132

Test and Evaluation Organizations (Included in Product Development)

GOVERNMENT FURNISHED PROPERTY (Not Applicable)

Subtotal Product Development	0	0	0	19,497	30,893	254,420	304,810
Subtotal Support and Management	0	0	0	585	195	1,790	2,570
Total Project	0	0	0	20,082	31,088	256,210	307,380

* NOTE: FY 1995 and prior year funding requests appropriated and consolidated with Navy funding in Defense Agencies Program Element #0603715D. USAF share of appropriations through FY 1995 is $57.1M.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: # 7 - Operational Systems Development

PE NUMBER AND TITLE: 0207163F Advanced Medium Range Air-to-Air Missile

PROJECT NO.: 3777

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	65,807	68,467	42,311	49,232	55,423	41,161	42,434	43,742	209,000	716,579
AMRAAM Pre-Planned Product Improvement	65,807	68,467	42,311	49,232	55,423	41,161	42,434	43,742	209,000	716,579

A. (U) Mission Description and Budget Item Justification

The Air Force and Navy developed the baseline AMRAAM as a high performance, all weather missile to counter existing air vehicle threats operating at high or low altitude and having advanced electronic countermeasures capabilities. The AMRAAM Pre-Planned Product Improvement (P3I) program provides for a continuing, Joint Air Force/Navy research and development program which enables AMRAAM to be compatible 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 use many baseline missile attributes. AMRAAM P3I is in the Research Category, Operational Systems Development, because it provides upgrades to the AIM-120C missile now in production.

(U) FY 1994

- (U) Continued the development of P3I Phase 1 improvements begun in FY 1991 and continue P3I Phase 1 free flight tests against targets (ECD: 2Q/FY95)(USAF $39.1).
- (U) Initiated efforts to enhance ECCM and improve lethality/weapon effectiveness including P3I Phase 2 contract award. (ECD: 3Q/FY98)(USAF $23.3).
- (U) Updated the COEA Operational Assessment in support of P3I Phase 3. (ECD: 4Q/FY94)(USAF $3.4).

(U) FY 1995

- (U) Continue Phase 2 of P3I EMD for ECCM and weapons effectiveness improvements. (ECD: 3Q/FY98)(USAF $64.3).
- (U) Initiate first of four stages of Phase 3 incremental EMD to enhance ECCM and kinematic performance including contract award. (ECD: 1Q/FY99)(USAF $4.2).
- (U) Continue Navy participation in AMRAAM P3I Phase 1, 2, & 3 program with emphasis on Navy unique requirements and aircraft integration compatibility (ECD: continuing)(Funded by USN).

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: # 7 - Operational Systems Development

PE NUMBER AND TITLE: 0207163F Advanced Medium Range Air-to-Air Missile

PROJECT NO.: 3777

(U) FY 1996
- (U) Continue Phase 2 EMD for ECCM and weapons effectiveness improvements. (ECD: 3Q/FY98)(USAF $31.3).
- (U) Continue stage 1 of Phase 3 incremental EMD to enhance ECCM and kinematic performance (ECD: 1Q/FY99)(USAF $11.0).
- (U) Continue Navy participation in AMRAAM P3I Phase 2 & Phase 3 program with emphasis on Navy unique requirements and aircraft integration compatibility (ECD: continuing). (Funded by USN)

(U) FY 1997
- (U) Continue Phase 2 EMD for ECCM and weapons effectiveness improvements. (ECD: 3Q/FY98)(USAF $41.1).
- (U) Continue stage 1 of Phase 3 incremental EMD to enhance ECCM and kinematic performance (ECD: 1Q/FY99)(USAF $8.1).
- (U) Continue Navy participation in AMRAAM P3I Phase 2 and Phase 3 program with emphasis on Navy unique requirements and aircraft integration compatibility (ECD: continuing). (Funded by USN)

B. (U) Program Change Summary ($ in Thousands)

	1994	1995	1996	1997	Total Cost
Previous President's Budget	69,785	70,715	54,284	51,673	716,579
Appropriated Value	67,785	70,715			
Adjustments to Appropriated Value					
a. Cong Gen reductions	-1,728	-772			
b. BTR	-250				
c. SBIR		-1,476*			
Adjustments to Budget Years Since FY95 PB			-11,973	-2,441	
Current Budget Submit/President's Budget	65,807	68,467	42,311	49,232	716,579

* SBIR adjustment not reflected in the ABIDES data base

Change Summary Explanation:

Funding: PAP-56 initiative reallocated FY96 (-2,130) and FY97 (-2,160) in mission support funds to the AMRAAM procurement line. Non-Pay Purchases Inflation reduced FY96 (-243) and FY97 (-281). AF realigned funds due to delayed contract award for Phase 2 (FY96: -9,600).

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: # 7 - Operational Systems Development

PE NUMBER AND TITLE: 0207163F Advanced Medium Range Air-to-Air Missile

PROJECT NO.: 3777

Schedule: Congressional reductions in FY94 caused a one month delay of the Phase 2 lethality improvements (per Apr 92 ADM) for production implementation. Phase 1 Functional Configuration Audit and Production Readiness Review delayed from May 1994 to August 1994 due to Hughes facility earthquake damage. Phase 2 contract award delayed from Feb 94 to Jun 94 due to a slip in contractor proposal submittal, Hughes facility damage and an extension of the government technical evaluation due to proposal content discussions. Remaining Phase 2 contract milestones realigned based on Phase 2 contract proposal.

Technical: As a result of these reductions and constrained out-year funding, the original phase 3 program was restructured. This restructured program is an incremental combat improvement effort with multiple EMD stages which fit within the current funding through FY00. Each stage provides some level of system improvement and is a building block for the following stage. Based on Cost and Operational Effectiveness Analysis results and projected funding constraints, the Air Force's incremental approach for Phase 3 will address critical seeker and propulsion related improvements. The FY95 program addressing a modification study was deleted due to funding prioritization by the user.

C. (U) Other Program Funding Summary ($ in Thousands)

	1994	1995	1996	1997	1998	1999	2000	2001	To Compl	Total Cost
Missile Procurement, Budget Activity: #2										
BP20 AMRRM	449,329	286,298	190,672	177,534	171,409	171,538	178,883	210,938	1,265,800	7,895,054
BP25 Replen Spares	20,429	22,277	21,416	22,846	22,530	22,717	23,402	24,109	105,409	298,611
BP26 Init Spares	8,287	7,413	7,878	6,633	5,695	2,957	3,007	2,991	19,924	105,484
QTY	983	412	291	240	200	200	200	200	1,150	8,433
Missile Procurement, Budget Activity: #2, Program Title: SEEK EAGLE, (PE: 0207590F)										
BP20	9,546	1,102*	0	0	0	0	0	0	0	15,357
QTY	24	0	0	0	0	0	0	0	0	36

* SEEK EAGLE requirement for one (1) missile was deleted in FY95. However, there is a SEEK EAGLE requirement for 18 Captive Air Training Missiles in FY95. The excess SEEK EAGLE funds were taken from AMRAAM BP20 instead of SEEK EAGLE BP20.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: # 7 - Operational Systems Development

PE NUMBER AND TITLE: 0207163F Advanced Medium Range Air-to-Air Missile

PROJECT NO.: 3777

D. (U) Schedule Profile

	1994				1995				1996				1997			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
P3I Phase 1 FCA/PRR				X*												
P3I Phase 2 Tape 7A PDR/CDR						X		X								
P3I Phase 2 Tape 7B PDR/CDR									X		X					
P3I Phase 2 FCA(A)									X							
P3I Phase 1 Flight Test	X*	X	X	X	X	X										
P3I Phase 2 EMD Contract Award			X*													
P3I Phase 2 Flight Test (Includes ACE)						X	X	X	X	X	X	X	X	X	X	X
P3I Phase 3 Stage 1 Contract Award							X									

P3I Phase 3 Stage 2 Contract Award	2Q FY 98
P3I Phase 3 Stage 3 Contract Award	2Q FY 01
P3I Phase 3 Follow-on	2Q FY 05

* Actual start date

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February 1995

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT NO.
#7 - Operational Systems Development	0207163F Advanced Medium Range Air-to-Air Missile	3777

A. (U) Project Cost Breakdown ($ in Thousands)

	1994	1995	1996	1997
APPROVED TOTALS	65,807	68,467	42,311	49,232
CONTRACT/COEA	49,602	45,875	33,287	32,503
GOVERNMENT COSTS (TEST, SUPT)	14,695	16,502	5,229	12,820
GFE	246	2,340	0	0
CONTRACTOR SUPPORT	1,264	3,750	3,795	3,909
TOTAL	65,807	68,467	42,311	49,232

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February 1995

BUDGET ACTIVITY: #7 - Operational Systems Development

PE NUMBER AND TITLE: 0207163F Advanced Medium Range Air-to-Air Missile

PROJECT NO.: 3777

B. (U) Budget Acquisition History and Planning Information ($ in Thousands)

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to 1994	Budget 1994	Budget 1995	Budget 1996	Budget 1997	Budget to Complete	Total Program
Product Development Organizations											
F08638-90-C-0149 Hughes	FFP	Dec 89	N/A	N/A	4,557	93	126				4,776
F08635-90-C-0201 Hughes	FFP	Aug 90	N/A	N/A	5,200						5,200
F08626-91-C-0034 Hughes	CPIF	Mar 91	88,589	93,507	71,413	22,094					93,507
F08626-93-C-0044 Hughes	CPAF	Jun 94	98,072	122,874	0	24,051	41,534	22,260	24,358	10,671	122,874
Phase 3 Stage 1 EMD Contract		3QFY95					4,215	11,027	8,145	13,600	36,987
Phase 3 Stage 2 EMD Contract		2QFY98								109,262	109,262
Phase 3 Stage 3 EMD Contract		2QFY01								80,724	80,724
Phase 3 Follow-on		2QFY05								82,698	82,698
Support and Management Organizations											
COEA	PO/MIPR	Jan 94				3,364	0	0	0	0	3,364
Contractor Support	PR	Oct-Jul 95			2,540	1,264	3,750	3,795	3,909	19,196	34,454
JSPO Operations	PO/MIPR	Oct-Sep 95			8,332	4,517	4,303	1,232	1,095	11,753	31,232

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February 1995

BUDGET ACTIVITY: #7 - Operational Systems Development

PE NUMBER AND TITLE: 0207163F Advanced Medium Range Air-to-Air Missile

PROJECT NO.: 3777

B. (U) Budget Acquisition History and Planning Information Continued ($ in Thousands)

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to 1994	Budget 1994	Budget 1995	Budget 1996	Budget 1997	Budget to Complete	Total Program
Test and Evaluation Organizations											
Gov't Test	PO/MIPR				6,760	10,178	12,199	3,997	11,725	57,980	102,839
Government Furnished Property											
Item Description	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Delivery Date		Total Prior to 1994	Budget 1994	Budget 1995	Budget 1996	Budget 1997	Budget to Complete	Total Program
Test and Evaluation Property											
TM/ECM Pods	MIPR/PO				200	246	2,340	0	0	5,876	8,662
Subtotal Product Development					81,170	46,238	45,875	33,287	32,503	296,955	536,028
Subtotal Support and Management					10,872	9,145	8,053	5,027	5,004	30,949	69,050
Subtotal Test and Evaluation					6,960	10,424	14,539	3,997	11,725	63,856	111,501
Total Project					99,002	65,807	68,467	42,311	49,232	391,760	716,579

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0207247F Air Force Tencap

PROJECT: 0001

COST (*In Thousands*)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
0001	14,410	20,464	21,966	21,079	19,860	21,059	21,691	22,341	Continuing	Continuing

(U) A. **Mission Description and Budget Item Justification.** Air Force TENCAP is a Congressionally directed program to provide the Tactical Exploitation of National Capabilities (TENCAP). The objective of TENCAP is to improve warfighting capabilities and effectively leverage the billions invested in our national systems for the warfighter. TENCAP demonstrates concepts designed to improve existing systems already in operation and influence the design of future systems. Since TENCAP expedites improvements to Air Force combat capabilities, it is not conducive to the normalized acquisition process. To enhance combat effectiveness, TENCAP focuses in three areas:

(U) 1) Exploit existing national systems for the tactical warfighter (TENCAP will conceive and demonstrate capabilities to exploit national systems).
(U) 2) Educate warfighters about national systems capabilities (in the form of training, exercises, and readiness activities).
(U) 3) Influence the design and operation of new national systems for the warfighter by advocating tactical impacts of the new systems (in the form of analysis and integration of national systems into roadmaps and architectures for AF weapons/C4I systems).

(U) FY 1994

- (U) Exploited the tactical use of existing national systems for the warfighter		$ 10.407M
- (U) Talon Command (Support command and control)	$2.967M	
- (U) Talon Ready (Support mission planning)	$1.600M	
- (U) Talon Shooter (Support for weapons delivery)	$1.625M	
- (U) Talon Night (Support Special Operations)	$1.240M	
- (U) Talon Touch (Disseminate TENCAP information)	$1.679M	
- (U) Talon Vision (Integrate real-time national system information)	$1.296M	
- (U) Supported training, education, exercises and readiness of national systems		$0.635M
- (U) Exercise support activities	$0.420M	
- (U) Readiness/contingency activities (Red/Blue/Green Flag exercises)	$0.215M	
- (U) Analyzed the influence and impact new national systems		$0.965M
- (U) Identified requirements, developed plans, and integrated TENCAP technology into C4I/Weapons systems	$0.350M	
- (U) Evaluated Air Force and national systems	$0.170M	
- (U) Purchased Project Shield software improvements	$0.230M	
- (U) Defined Air Force systems interface to national systems (baseline knowledge)	$0.215M	
- (U) Supported Space Applications Program Office (SAPO)		$0.200M

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207247F Air Force Tencap	PROJECT 0001

- (U) Demonstrated and integrated TENCAP efforts		$2.203M
(U) FY 1995		
- (U) Exploit the tactical use of existing national systems for the warfighter through ongoing programs.		$19.233M
- (U) Talon Command	$4.775M	
- (U) Talon Ready	$2.700M	
- (U) Talon Shooter	$4.030M	
- (U) Talon Night	$2.340M	
- (U) Talon Touch	$2.160M	
- (U) Talon Vision	$3.228M	
- (U) Training, education, exercises and readiness of national systems		$0.200M
- (U) Program support and related efforts to influence and impact new national systems		$1.031M
(U) FY 1996		
- (U) Exploit the tactical use of existing national systems for the warfighter		19.032M
- (U) Talon Command	$5.088M	
- (U) Talon Ready	$2.624M	
- (U) Talon Shooter	$4.268M	
- (U) Talon Night	$2.226M	
- (U) Talon Touch	$2.148M	
- (U) Talon Vision	$2.678M	
- (U) Training, education, exercises and readiness of national systems		$0.188M
- (U) Program support and related efforts to influence and impact new national systems		$2.746M
(U) FY 1997		
- (U) Exploit the tactical use of existing national systems for the warfighter		$18.453M
- (U) Talon Command	$4.916M	
- (U) Talon Ready	$2.550M	
- (U) Talon Shooter	$4.127M	
- (U) Talon Night	$2.188M	
- (U) Talon Touch	$2.120M	
- (U) Talon Vision	$2.552M	
- (U) Training, education, exercises and readiness of national systems		$0.280M
- (U) Program support and related efforts to influence and impact new national systems		$2.346M

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207247F Air Force Tencap
	PROJECT 0001

(U) **Acquisition Strategy:**

(U) **B. Program Change Summary ($ in Thousands)**

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
(U) Previous President's Budget	14,410	21,183	21,966	21,079	Continuing
(U) Appropriated Value	14,410	21,183			Continuing
(U) Adjustments to Appropriated Value	-312	-719			Continuing
a. Cong Gen Reduction	82	34			
b. Small Business Innovative Research	230				
(U) Current Budget Submit/President's Budget	14,410	20,464	21,966	21,079	Continuing

(U) Change Summary Explanation: Not Applicable

(U) **C. Other Program Funding Summary ($ in Thousands)**

	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	To Compl	Total Cost
(U) Other Proc, BA 3, BPAC 2070	0	608	204	205	207	210	216	223	Cont	1,873

(U) **Related RDT&E:**
0305158F, Constant Source
0304111F, Special Activities
0301313F, Defense Dissemination System

(U) **D. Schedule Profile:** Not Applicable. TENCAP is not organized as an acquisition program.

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207247F Air Force Tencap PROJECT 0001

(U) A. **Project Cost Breakdown ($ in Thousands):** Not Applicable. TENCAP is not subdivided by project.

(U) B. **Budget Acquisition History and Planning Information ($ in Thousands)**

(U) **Performing Organizations:**

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1994	Budget FY 1994	Budget FY 1995	Budget FY 1996	Budget FY 1997	Budget to Complete	Total Program
(U) Product Development Organizations											
None.											
(U) Support and Management Organizations											
ESC	F1968-93-D0026	Ongoing			0	2,065	2,025	2,000	0	0	6,090
Various		Ongoing			4,100	12,345	18,439	19,966	21,079	Continue	Continue
(U) Test and Evaluation Organizations											
None.											

(U) **Government Furnished Property:** Not Applicable. No government property is furnished to non-government entities.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #7 - Operational System Development

PE NUMBER AND TITLE: #0207412F Theater Air Control System Improvements 7485L

PROJECT NO.

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	27,671	6,776	290	651	747	840	865	890	Continuing	TBD

(U) A. Mission Description and Budget Item Justification:

The Ground Theater Air Control System (GTACS) 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 Theater Air Control System Improvements (TACSI) RDT&E program consists primarily of the Modular Control Equipment (MCE) Pre-Planned Product Improvements (P3I) program which replaces obsolete equipment (operator consoles, shelters, computers, radios, etc.) in the (GTACS). The modernization upgrades C2 interoperability, flexibility, mobility, communications and worldwide operations. The P3I program is structured into multiple-phases. The first phase consisted of the integration of secure anti-jam UHF radios, an upgrade to the weapons control and Joint Tactical Air Operations data link software (S/W), and development of a Chemical, Biological and Radiological protection capability. These improvements have already been incorporated into the MCE production line. The current R&D includes the integration of a Joint Tactical Information Distribution System (JTIDS)/Tactical Digital Information Link-J (TADIL-J) capability, the integration of an Automated Air Tasking Order (AATO) capability, integration of secure anti-jam VHF (SINCGARS) radios and upgrades to the Ground Mobile Forces/Satellite Communications digital communications interfaces. The TACSI program element also includes production funding for JTIDS terminals, JTIDS Modules (JMs), JTIDS Interface Boxes (JIBs) and Operations Modules (OM) Interface Kits, all of which are required to integrate JTIDS/COMM into the MCE. The next planned phase includes a software interoperability upgrade to the TADIL-J Reissue 2 baseline, which works towards a Theater Missile Defense capability and the implementation of the Interim JTIDS Message Specification capability. Research Category is Operational Systems Development. GTACS is a fielded, operational system currently undergoing major modifications/upgrades.

(U) FY 1994

- (U) Continue MCE P3I OM Interface Kit development. ($19,500)
- (U) Start JTIDS Interface Box (JIB) development. ($1,600)
- (U) Start JTIDS Module (JM) development. ($780)
- (U) Complete AATO development.(Work to be done in FY95) ($1,200)
- (U) Continue program support, test, and other miscellaneous efforts. ($4,591)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #7 - Operational System Development

PE NUMBER AND TITLE: #0207412F Theater Air Control System Improvements

PROJECT NO.: 7485L

(U) FY 1995
- (U) Complete Modular Control Equipment (MCE) Pre-Planned Product Improvements (P3I) Operations Modules (OM) Interface Kit development. ($720)
- (U) Complete JTIDS Interface Boxes (JIB) development. ($580)
- (U) Continue JTIDS Modules (JM) development. Effort completed 1QTR FY96. ($810)
- (U) Start development of interoperability upgrades to the MCE P3I system. ($2,500)
- (U) Continue program support, test, and other miscellaneous efforts. ($2,166)

(U) FY 1996
- (U) Continue development of interoperability upgrades to the MCE P3I system. ($200)
- (U) Continue program support, test, and other miscellaneous efforts. ($90)

(U) FY 1997
- (U) Continue development of interoperability upgrades to the MCE P3I system. ($274)
- (U) Continue program support, test, and other miscellaneous efforts. ($377)

(U) Acquisition Strategy:
Air Force has been designated lead for this program by SAF/AQ. Increase of funds in FY97 is to support software upgrades to ensure compatability with JTIDS and other C2 systems.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #7 - Operational System Development

PE NUMBER AND TITLE: #0207412F Theater Air Control System Improvements

PROJECT NO.: 7485L

(U) B. Program Change Summary ($ in Thousands)

	1994	1995	1996	1997	Total Cost
(U) Previous President's Budget	28,913	7,383	291	654	37,241
(U) Appropriated Value	28,215				
(U) Adjustments to Appropriated Value					
a. General Congressional Reductions		-461			
b. Below Threshold Reprogramming	-544				
c. SBIR		-146			
(U) Current Budget Submit/President's Budget	27,671	6,776	290	651	TBD

(U) Change Summary Explanation:

Funding: FY96 and FY97 revised for inflation adjustment.

Schedule: No impact to program.

Technical: No impact to program.

(U) C. Other Program Funding Summary ($ in Thousands)

	1994	1995	1996	1997	1998	1999	2000	2001	To Compl	Total Cost
(U) Other Procurement AF Total	5,750	56,718	23,312	12,217	34,154	26,536	24,038	22,134	Continuing	TBD
Budget Activity 3, WSC 833040	0	47,955	12,587	4,383	23,947	23,367	21,871	21,386	Continuing	TBD
Budget Activity 3, WSC 834010	3,020	0	0	0	0	0	0	0	0	3,020
Budget Activity 3, WSC 83790A	2,730	0	0	0	0	0	0	0	0	2,730
Budget Activity 4, WSC 84590A	0	8,763	0	0	0	0	0	0	0	8,763
Budget Activity 6, WSC 86190A	0	0	10,725	7,834	10,207	3,169	2,167	748	Continuing	TBD

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #7 - Operational System Development

PE NUMBER AND TITLE: #0207412F Theater Air Control System Improvements

PROJECT NO.: 7485L

(U) D. Schedule Profile

	1994				1995				1996				1997			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
(U) MCE P3I OM Interface Kit First Art. Award					X											
(U) MCE P3I OM Interface Kit EMD DT&E							X									
(U) MCE P3I OM Interface Kit Development															X	
(U) MCE P3I OM Interface Kit Follow-on Production Award								X								
(U) Interoperability Software Upgrade Award											X					
(U) MCE P3I OM Interface Kit Article IOT&E															X	
(U) MCE P3I Initial Operation Capability																X
(U) JIB Development Complete							X									
(U) JM Development Award			X													
(U) JM Development Complete									X							
(U) AATO Development Complete						X										
(U) AATO Initial Operation Capability (IOC)						X										

(U) Out Year Events

(U) MCE P3I Full Operation Capability - FY 99

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February 1995

BUDGET ACTIVITY: #7 - Operational System Development

PE NUMBER AND TITLE: #0207412F Theater Air Control System Improvements

PROJECT NO.: 7485L

(U) A. Project Cost Breakdown ($ in Thousands)

	1994	1995	1996	1997
(U) Product Development	23,142	4,499	200	274
(U) Support and Management	3,829	1527	90	177
(U) Test and Evaluation	700	750		200
(U) Total	27,671	6,776	290	651

(U) B. Budget Acquisition History and Planning Information ($ in Thousands)
Not applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY: 7 - Operational System Development	PE NUMBER AND TITLE: 0207417F Air Borne Warning & Control Sys — PROJECT: 411L

COST (*In Thousands*)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
411L Airborne Warning & Control Sys	83,233	82,208	96,696	38,753	12,949	16,414	17,338	18,276	Continuing	TBD

(U) A. Mission Description and Budget Item Justification

This program develops and integrates system improvements which enable the E-3 AWACS to remain an effective, survivable airborne surveillance system for command and control of tactical forces and for strategic defense of the U.S. These improvements include Electronic Support Measures (ESM), Central Computer memory Upgrade, Joint Tactical Information Distribution System (JTIDS) Class 2H/Tadil J and Navstar Global Positioning System (GPS) terminal integrations (collectively known as Block 30/35); The Radar System Improvement Program (RSIP); and Extend Sentry efforts. RSIP will increase radar reliability and maintainability, restore required E-3 surveillance capability against the evolving threats posed by low radar cross section fighters and cruise missiles, improve electronic counter measures (ECCM), and enhanced man-machine interface. Extend Sentry consists of 108 separate projects that will reduce maintenance costs of aircraft while increasing operational effectiveness by reducing the number of aborts. Category of research: Operational Systems Development, AWACS is a fielded, operational system currently undergoing major modifications/block upgrades.

(U) Acquisition Strategy:

Block 30/35: ESM is joint development with NATO. Priced FPIF options with Boeing for ESM and 30/35 Group A hardware. CC-2E contract with LORAL Federal Systems with fixed price options. JTIDS and GPS acquired via respective program office-awarded contracts. RSIP is a joint development with NATO. Boeing is prime integrating contractor, Westinghouse is sub for radar equipment items. FFP contract planned sole source to Boeing for production. Extend Sentry acquisition strategy in work.

(U) FY 1994

- (U) Blk 30/35 activities included completion of FCA, completion of deferred tasks and trial install kits. ($37,561)
- (U) RSIP activities included continuation of DT&E ground testing including reliability verification test and environmental qualification tests, test system (TS-3) I&CO. Begin DT&E flight test program. ($36,518)
- (U) TS-3 aircraft support, program sustaining efforts. ($9,154)

(U) FY 1995

- (U) Blk 30/35 includes completion of Full Rate Production Milestone, starting trial install of mod kit into operational aircraft, complete ESM PCA, begin upgrade of FIT and Mission Simulator #1, start upgrade of Avionics Integration Support Facility (AISF) to provide an ESM software maintenance capability. ($31,374)
- (U) RSIP activities include completion of the Joint US/NATO DT flight tests, start of US Operational Test and Evaluation (OT&E) flight program, and depot maintenance program, FCA/PCA and continuation of the depot maintenance capability development. ($42,100)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY: 7 - Operational System Development	PE NUMBER AND TITLE: 0207417F Air Borne Warning & Control Sys / PROJECT: 411L

- (U) TS-3 aircraft support, program sustaining efforts. ($8,734)

(U) FY 1996
- (U) Blk 30/35 will complete EMD including Electronic library File (ELF) restructure. ($22,446)
- (U) RSIP activities include the completion of FCA/PCA and IOT&E, Low Rate Production (LRIP) milestone decision planned. ($31,802)
- (U) Extend Sentry efforts. ($29,500)
- (U) TS-3 aircraft support, program sustaining efforts. ($12,948)

(U) FY 1997
- (U) Blk 30/35 will continue production/install and closeout of EMD contract actions. ($4,399)
- (U) RSIP activities include a production buy of two additional kits. EMD closeout actions. ($300)
- (U) Extend Sentry ($18,300)
- (U) TS-3 aircraft support, program sustaining efforts. ($15,754)

(U) B. Program Change Summary ($ in Thousands)

	FY 1994	FY1995	FY 1996	FY 1997	Total Cost
(U) Previous President's Budget	87,066	85,643	66,688	19,992	TBD
(U) Appropriated Value	87,066	85,643			
(U) Adjustments to Appropriated Value					
a. Undistributed Congressional reductions	-3,595	-1,663			
b. Below Threshold Reprogramming	-238				
c. SBIR		-1,772			
(U) Adjustments to Budget Years Since FY95 PB			30,008	18,761	
(U) Current Budget Submit/President's Budget	83,233	82,208	96,696	38,753	TBD

(U) Change Summary Explanation:

Funding: FY96-FY97 increases fund Extend Sentry efforts.

Schedule: None

Technical: None

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0207417F Air Borne Warning & Control Sys

PROJECT: 411L

(U) C. Other Program Funding Summary ($ in Thousands)

	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	To Compl	Total Cost
(U) Aircraft Procurement, AF, AWACS, Mod	4,627	136,604	230,400	270,300	92,400	79,300	81,100	82,900	CONT.	TBD

Related RDT&E: None

(U) D. Schedule Profile

	FY 1995				FY 1996				FY 1997				FY 1998			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
(U) RSIP DT & E Flight Test Complete		X														
(U) RSIP IOT & E Start				X												
(U) RSIP IOT & E Complete					X											
(U) RSIP PCA					X											
(U) RSIP LRIP Decision					X											
(U) RSIP Trial Install													X			
(U) RSIP RAA 1QTR00																
(U) RSIP IOC 1QTR00																
(U) BLK 30/35 Full Rate Prod Decision	X															
(U) ESM Full Rate Contract Award		X														
(U) ESM PCA		X														
(U) BLK 30/35 PCA Complete						X										
(U) BLK 30/35 Trial Install Complete					X											
(U) BLK 30/35 LRIP Kit Proof Complete									X							
(U) Support Level capability - O Level							X									
(U) - I Level									X							
(U) - D Level												X				
(U) BLK 30/35 RAA												X				
(U) BLK 30/35 IOC												X				

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207417F Air Borne Warning & Control Sys PROJECT 411L

(U) A. **Project Cost Breakdown ($ in Thousands)**

	FY 1994	FY 1995	FY 1996	FY 1997
(U) Contracts	59,679	54,397	30,648	14,364
(U) MITRE/TEMS	11,048	5,317	14,185	1,785
(U) GFE	7,048	15,648	16,541	3,115
(U) Travel	901	754	650	650
(U) Other	4,557	6,092	34,672	18,839
(U) Total	83,233	82,208	96,696	38,753

(U) B. **Budget Acquisition History and Planning Information ($ in Thousands)**

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1994	Budget FY 1994	Budget FY 1995	Budget FY 1996	Budget FY 1997	Budget to Complete	Total Program
Product Development Organizations											
(U) Boeing(RSIP)	C/FPIF	9/89	88,500	82,400	53,200	15,824	4,945	0	0	0	73,969
(U) WECO(RSIP)	C/FPIF	9/89	327,400	306,900	222,505	3,325	18,816	4,710	0	0	249,356
(U) Boeing(Blk 30/35)	SS/FPIF	5/87	N/A	N/A	354,203	37,561	31,374	22,446	4,399	0	449,983
(U)TBD (Extend Sentry)	TBD	N/A	N/A	N/A	0	0	0	29,500	18,300	CONT.	TBD
Support and Management Organizations											
(U) MITRE/TEMS					44,927	8,519	14,047	15,685	1,785	8,925	93,888

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0207417F Air Borne Warning & Control Sys

PROJECT: 411L

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1994	Budget FY 1994	Budget FY 1995	Budget FY 1996	Budget FY 1997	Budget to Complete	Total Program
Test and Evaluation Organizations											
(U) Test System-3 ADAPT Contract/Other test Activities					29,330	18,004	13,026	24,355	14,269	39,976	138,960

(U) B. **Budget Acquisition History and Planning Information Continued ($ in Thousands)**

Government Furnished Property: None

Subtotal Product Development	629,908	56,710	55,135	56,656	22,699	CONT.	TBD
Subtotal Support and Management	44,927	8,519	14,047	15,685	1,785	8,925	93,888
Subtotal Test and Evaluation	29,330	18,004	13,026	24,355	14,269	39,976	138,960
Total Project	704,165	83,233	82,208	96,696	38,753	CONT.	TBD

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0207419F Tactical Airborne Cmd & Control Sys

PROJECT: 4133

COST (*In Thousands*)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
4133 Abn Battlefield Cmd & Ctl Ctr Imp	0	2,620	2,093	358	0	0	0	0	0	5,071

(U) A. Mission Description and Budget Item Justification

The Airborne Battlefield Command and Control Center (ABCCC) provides rapid worldwide Command, Control, Communications and Computer (C4) capabilities to the Joint Force Air Component Commander or Joint Task Force Commander. During combat or contingency operations, ABCCC extends ground based C4I capabilities and can function in a stand alone mode during the absence of ground based units.The primary mission of the ABCCC is to provide on-scene theater battle management for the Combat Air Forces. It receives target nominations from the Air Operations Center (AOC) or other C4I systems(Joint Surveillance Target Attack Radar System (JSTARS), Air Support Operations Center (ASOC), etc,) and directs attack from air, sea and/or land assets to targets in the theater of operations. It can also function as a direct extension of the AOC, and airborne ASOC, or the Air Component Commander's operations center. ABCCC supports functions across a broad spectrum of operations; from Forward Battle Coordination and coordination of Joint Forces, to Close Air Support, Air Drops, Search and Rescue and Crisis Management. Category of research: Operational Systems Development, ABCCC is a fielded, operational system currently undergoing pre-planned product improvements (P3I) which includes integration of the Joint Tactical Information Distribution System (JTIDS), integration of the Air Force Single Channel Ground and Airborne Radio System (SINCGARS), and upgrade of the Satellite Communications capabilities.

(U) FY 1994
- (U) No FY 1994 RDT&E funds.

(U) FY 1995
- (U) SINCGARS Source Selection efforts - $200
- (U) Start SINCGARS design effort - $2,235
- (U) Antenna location study - $185

(U) FY 1996
- (U) Complete SINCGARS design - $566
- (U) Complete documentation and acceptance of SINCGARS First Article - $1,270
- (U) Conduct SINCGARS system verification, validation and test - $257

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207419F Tactical Airborne Cmd & Control Sys PROJECT 4133

(U) FY 1997
- (U) Conduct SATCOM study - $300
- (U) Pre-Planned product improvements cost estimates - $52
- (U) Travel - $6

(U) B. Program Change Summary ($ in Thousands)

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
(U) Previous President's Budget	0	2,779	2,106	360	5,245
(U) Appropriated Value		2,779			
(U) Adjustments to Appropriated Value					
a. General Congressional Reductions		-103			
b. SBIR		-56			
(U) Adjustments to Budget Years Since FY95 PB			-13	-2	
(U) Current Budget Submit/President's Budget	0	2,620	2,093	358	5,071

(U) Change Summary Explanation:

Funding: Funding decrease in FY96 and FY97 is due to non-pay purchases inflation.

Schedule:

Technical:

(U) C. Other Program Funding Summary ($ in Thousands)

	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	To Compl	Total Cost
(U) Appropriation Aircraft procurement Air Force, Budget Activity 5, C-130 Mods	1,912	4,035	7,061	0	0	0	0	0	0	10,883

Related RDT&E: None

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207419F Tactical Airborne Cmd & Control Sys

(U) D. **Schedule Profile**

	FY 1994				FY 1995				FY 1996				FY 1997			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
SINCGARS EMD Contract Award (Aug 95)								X								
PDR (Nov 95)									X							
CDR (Apr 96)											X					
DT&E (Jun 96)											X					
Operational Capabilities Demonstration (Aug 96)												X				
First Article Delivery (Aug 96)												X				
Production (Sep 96)												X				
Initial Operational Capability (Mar 97)														X		
Last Kit Delivery (Jun 97)															X	

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207419F Tactical Airborne Cmd & Control Sys
	PROJECT 4133

(U) A. **Project Cost Breakdown ($ in Thousands)**

	FY 1994	FY 1995	FY 1996	FY 1997
Development		590	136	
Systems Engineering		522	430	
Technical Data		0	181	
Test		306	307	
Engineering/ Management Support		1,042	1022	
Travel		11	11	6
Research Personnel		141	0	298
Miscellaneous		8	6	54
Total	0	2,620	2,093	358

(U) B. **Budget Acquisition History and Planning Information ($ in Thousands):** Not required.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0207423F Adv Comm Sys

COST (*In Thousands*)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	369	444	1,934	1,908	3,251	3,230	3,326	3,426	Continuing	TBD
1013 Theater Deployable Communications (TDC) *	0	0	1,713	1,699	3,042	2,997	3,086	3,179	Continuing	TBD
2982 Anti-Jam Radio Communications	369	444	221	209	209	233	240	247	Continuing	TBD

* There are no FY94 TDC RDT&E funds, FY95 funds are in PE 0207422F ($2,581K). Beginning FY96, funds are in PE 0207423F.

(U) A. Mission Description and Budget Item Justification

The Advanced Communication Systems program procures commercially available ground communications equipment for deployment to theaters of operations and develops and procures jam resistant UHF and VHF frequency hopping tactical radios. The HAVE QUICK UHF radios provide the primary Air Force and DOD UHF Electronic Counter-Countermeasures (ECCM) voice communications. SINCGARS (Single Channel Ground and Airborne Radio System) provides anti-jam, VHF frequency hopping voice and data communications and is the primary means of ECCM communications between Air Force, Army, USMC aircraft and ground units involved in close air support and joint battlefield operations. RDT&E funds in this program element are used to examine appropriate emerging technologies; provide software development support for the fielded HAVE QUICK family of radios; and determine and resolve integration issues pertaining to commercial-off-the-shelf (COTS) equipment, making this program research category 6.7, Operational System Development. The TDC program provides funding for the research, development, test and evaluation for the modernization of deployable communications, COTS equipment that support tactical air operations in a combat environment. This includes deployable communications equipment for active duty, Air National Guard combat communications and Theater Air Control System units.

(U) B. Program Change Summary ($ in Thousands)

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
(U) Previous President's Budget	377	459	444	420	TBD
(U) Appropriated Value	377	459			
(U) Adjustments to Appropriated Value					
a. General Congressional Reductions	6	5			
b. Below Threshold Reprogrammings	2	0			
c. SBIR	0	10*			
(U) Current Budget Submit/President's Budget	369	444	1,934	1,908	TBD

* SBIR adjustment not reflected in R-1.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207423F Adv Comm Sys

(U) Change Summary Explanation:

Funding: Funding increase in FY96 and out is due to the combination of the transfer of Theater Deployable Communications funds from PE 0207422F to PE 0207423F, and reductions due to non-pay purchases inflation.

Schedule: N/A

Technical: N/A

(U) C. Other Program Funding Summary ($ in Thousands)

	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	To Compl	Total Cost
(U) Other Procurement AF, Budget Activity 3, Weapon System Code 837100, PE 0207422F	25,787	25,395	0	0	0	0	0	0	0	51,182
(U) Other Procurement AF, Budget Activity 3, Weapon System Code 837100, PE 0207423F			24,628	25,277	32,876	33,097	33,483	33,725	Cont.	TBD
(U) Other Procurement AF, Budget Activity 3, Weapon System Code 837290, PE 0207423F	8,478	0	0	0	0	0	0	0	0	8,478
(U) Aircraft Procurement AF, Budget Activity 5, Weapon System Code OTHACF, PE 0207423F	18,398	1,556	1,921	1,355	0	0	0	0	0	23,230
(U) Operations and Maintenance AF, PE 0207422F	0	779	1,081	1,896	2,563	3,341	4,470	5,715	Cont.	TBD

Related RDT&E: N/A

(U) D. Schedule Profile: See individual projects

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0207423F Adv Comm Sys

PROJECT: 1013

COST (*In Thousands*)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
1013 Theater Deployable Communications	0	0	1,713	1,699	3,042	2,997	3,086	3,179	Continuing	TBD

(U) A. **Mission Description and Budget Item Justification**

As clearly demonstrated during Desert Shield/Desert Storm (DS/DS), today's generation of deployable communications equipment is bulky, inflexible in design and does not meet today's projected airlift availability or interoperability standards. Air Force planning calls for initial communications assets to be in place prior to the arrival of flying forces. Deployment priorities for DS/DS did not allow timely arrival of communications assets. Funds requested in this program element are to complete joint interoperability certification testing, begin development and implementation of integrated network management software, and to support field activities and conduct integration activities. This program will research COTS equipment that will, with minimal development, either augment existing assets or replace tactical communications packages. The resulting TDC packages will reduce airlift requirements and be designed to support a wide range of operational scenarios during deployment/employment, expansion and sustaining operations. Communications packages will be used by theater air control, combat communications, and special operations units as well as deployed air wings and mobility forces worldwide. Theater Deployable Communications (TDC) funds are accounted for in PE 0207422F in FY95 and PE 0207423F after FY95.

(U) FY 1994 Not Applicable.

(U) FY 1995 Not Applicable.

(U) FY 1996
- (U) Continue implementation of Integrated Network Management software. ($870)
- (U) Support field activities and conduct integration activities. ($843)

(U) FY 1997
- (U) Continue implementation of Integrated Network Management software. ($861)
- (U) Support field activities and conduct integration activities. ($838)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207423F Adv Comm Sys PROJECT 1013

(U) B. Program Change Summary ($ in Thousands)

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
(U) Previous President's Budget	0	0	0	0	TBD
(U) Appropriated Value					
(U) Adjustments to Appropriated Value					
(U) Current Budget Submit/President's Budget	0	0	1,713	1,699	TBD

(U) Change Summary Explanation:

Funding: Increases in FY96 and FY97 are due to combination of the transfer of funding from PE 27422 to PE 27423, and non-purchases pay inflation.

Schedule: N/A

Technical: N/A

(U) C. Other Program Funding Summary ($ in Thousands)

	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	To Compl	Total Cost
(U) Other Procurement AF, Budget Activity 3, Weapon System Code 837100, PE 0207422F	25,787	25,395	0	0	0	0	0	0	0	51,182
(U) Other Procurement AF, Budget Activity 3, Weapon System Code 837100, PE 0207423F			24,628	25,277	32,876	33,097	33,483	33,726	Cont.	TBD
(U) Operations and Maintenance AF, PE 0207422F	0	779	1,081	1,896	2,563	3,341	4,470	5,715	Cont.	TBD

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207423F Adv Comm Sys PROJECT 1013

(U) D. Schedule Profile

	FY 1994				FY 1995				FY 1996				FY 1997			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
1013 Theater Deployable Comm																
(U) Acquisition Milestones		0/I*						II/ III								
(U) Contract Milestones																
(U) Evaluation Packages Contract Award	X*															
(U) Production SATCOM Contract Award								X								
(U) Production SATCOM Deliveries Start											X					
(U) Production Packages Contract Award										X						
(U) Production Packages Deliveries Start														X		
(U) Integrated Net Mgt Contract Award						X										
(U) Test and Evaluation Milestones																
(U) Complete SATCOM Operational Assessment (OA)		I		X												
(U) Complete Packages OA								X								
(U) Complete SATCOM OA II											X					

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207423F Adv Comm Sys PROJECT 1013

(U) A. Project Cost Breakdown ($ in Thousands)

	FY 1994	FY 1995	FY 1996	FY 1997
(U) Software Support			875	865
(U) Engineering Support			385	331
(U) Integration Activities			383	438
(U) Travel			45	40
(U) Miscellaneous			25	25
(U) Total	0	0	1,713	1,699

(U) B. Budget Acquisition History and Planning Information ($ in Thousands)

Performing Organizations: ESC/TG - No contract or Government activity effort in excess of One Million dollars.

Government Furnished Property: Not Applicable

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0207423F Adv Comm Sys

PROJECT: 2982

COST (*In Thousands*)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
2982 Anti-Jam Radio Communications	369	444	221	209	209	233	240	247	Continuing	TBD

(U) **A. Mission Description and Budget Item Justification**

The fast paced development of new frequency hopping radio technologies by potentially hostile nations dictates that the U.S. maintain a technological lead. UHF frequency hopping voice radios are needed for jam resistant communications between tactical aircraft and airborne and ground control elements. The HAVE QUICK wave form used in these radios is the NATO standard for UHF anti-jam communications. The HAVE QUICK UHF radios provide the primary Air Force and DOD UHF Electronic Counter-Countermeasures (ECCM) voice communications. SINCGARS (Single Channel Ground and Airborne Radio System) provides anti jam, VHF frequency hopping radios and data communications and is the primary means of ECCM communications between Air Force, Army, USMC aircraft and ground units involved in close air support and joint battlefield operations.

(U) FY 1994
- (U) Continued software support for the HAVE QUICK II radios. ($100)
- (U) Investigate improvements in anti-jam performance and other anti-jam techniques. ($100)
- (U) Begin support for SINCGARS Phase II Qualification Testing and support platform integration analyses. ($80)
- (U) Funds reallocated for Federally Funded R&D Centers (FFRDC) and non FFRDC's ($89)

(U) FY 1995
- (U) Continued software support for the HAVE QUICK II radios. ($100)
- (U) Investigate improvements in anti-jam performance and other anti-jam techniques. ($259)
- (U) Continue support of SINCGARS Phase II Qualification Testing and support platform integration analyses. ($85)

(U) FY 1996
- (U) Continued software support for the HAVE QUICK II radios. ($50)
- (U) Investigate improvements in anti-jam performance and other anti-jam techniques ($111)
- (U) Continue support of SINCGARS Phase II Qualification Testing and support platform integration analyses. ($60)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207423F Adv Comm Sys
	PROJECT 2982

(U) FY 1997
- (U) Continued software support for the HAVE QUICK II radios. ($50)
- (U) Investigate improvements in anti-jam performance and other anti-jam techniques ($100)
- (U) Continue support of SINCGARS Phase II Qualification Testing and support platform integration analyses. ($59)

(U) B. Program Change Summary ($ in Thousands)

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
(U) Previous President's Budget	377	459	444	420	TBD
(U) Appropriated Value	377	459			
(U) Adjustments to Appropriated Value					
a. General Congressional Reductions	6	5			
b. Below Threshold Reprogrammings	2	0			
c. SBIR	0	10*			
(U) Current Budget Submit/President's Budget	369	444	221	209	TBD

* SBIR adjustment not reflected in R-1.

(U) Change Summary Explanation:

Funding: Funding decreases in FY96 and FY97 are due to reduction in the scope of planned RDT&E activities.

Schedule: N/A

Technical: N/A

(U) C. Other Program Funding Summary ($ in Thousands)

	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	To Compl	Total Cost
(U) Other Procurement AF, Budget Activity 3, Weapon System Code 837290, PE 0207423F	8,478	0	0	0	0	0	0	0	0	8,478
(U) Aircraft Procurement AF Budget Activity 5, Weapon System Code OTHACF, PE 0207423F	18,398	1,556	1,921	1,355	0	0	0	0	0	23,230

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207423F Adv Comm Sys PROJECT 2982

(U) D. **Schedule Profile**

	FY 1994				FY 1995				FY 1996				FY 1997			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
(U) Software Support Efforts					X				X				X			
(U) Platform Integration analyses	X*					X				X				X		
(U) Contract Milestones																
(U) SINCGARS Production Option								X								

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)		DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207423F Adv Comm Sys	PROJECT 2982

(U) **A. Project Cost Breakdown ($ in Thousands)**

	FY 1994	FY 1995	FY 1996	FY 1997
(U) a. Software Support	100	100	50	50
(U) b. Engineering Support	40	46	35	34
(U) c. Evaluation Analysis	60	199	77	77
(U) d. Test and Evaluation	55	38	30	20
(U) e. Travel	25	26	14	13
(U) f. R&D Centers payments	89	0	0	0
(U) g. Miscellaneous	0	35	15	15
(U) Total	369	444	221	209

(U) **B. Budget Acquisition History and Planning Information ($ in Thousands)**

Performing Organizations: ESC/TG - No contract or Government activity effort in excess of One Million dollars.

Government Furnished Property: Not Applicable

(U) **C. Funding Profile ($ in Thousands)** Not applicable

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0207438F Theater Battle Management (TBM) C4I

COST (*In Thousands*)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	12,864	28,483	24,813	25,748	9,367	7,997	7,007	7,217	Continuing	TBD
3330 Cmd Cntrl Info Process Sys (C2IPS)**	0	6,491	5,991	5,051	0	0	0	0	0	17,533
4287 Contingency Theater Auto Plan Sys (CTAPS)	9,523	*	*	*	*	*	*	*	Continuing	TBD
4288 Wing C2 System (WCCS)	3,341	*	*	*	*	*	*	*	Continuing	TBD

*Data is Source Selection Sensitive. Data available upon appropriate request.

(U) A. **Mission Description and Budget Item Justification**

The Theater Battle Management Core Systems (TBMCS) develop force-level and wing-level Command & Control and Intelligence Systems which utilize the Air Force TBM C4I standards. The acquisition of these systems will allow the execution of TBM planning, intelligence and operational functions of the Joint Force Air Component Commander (JFACC). Components included in this document/program element are Command & Control Information Processing System (C2IPS), Contingency Theater Automated Planning System (CTAPS), and Wing Command & Control System (WCCS). This is in Research is in Category Operational Systems Development. This is a Post Milestone III effort.

(U) **Acquisition Strategy:**

ESC will manage the overall TBM Core Systems program (in this case it includes CTAPS and WCCS). An outside contractor will perform the actual software integration and, when directed by the government, develop individual applications consistent with the TBM Architecture. C2IPS efforts will continue under the current prime contractor, Computer Sciences Corporation (CSC).

**C2IPS FY94 funding ($10,497) in PE41840F

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207438F Theater Battle Management (TBM) C4I

(U) B. **Program Change Summary ($ in Thousands)**

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
(U) Previous President's Budget	12,518	33,957	18,556	19,315	TBD
(U) Appropriated Value	12,518	29,957			
(U) Adjustments to Appropriated Value					
a. General Congressional Reductions	(589)	(860)			
b. Below Threshold Reprogramming	1,121				
c. SBIR	(186)	(614)			
(U) Adjustments to Budget Years Since FY95 PB			6,257	6,433	
(U) Current Budget Submit/President's Budget	12,864	28,483	24,813	25,748	TBD

(U) Change Summary Explanation:

Funding: FY94/FY95 funds reductions made for Federally Funded Research and Development Centers (FFRDC), non-FFRDC, SBIR university research and travel reduction. Funds increase in FY94 was in support of the Systems Integration efforts. FY 96-97 funds increased to provide full integration with the Combat Intel System (CIS).

Schedule:

Technical:

(U) C. **Other Program Funding Summary ($ in Thousands)**

	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	To Compl	Total Cost
(U) Other Procurement (3080)	52,017	32,299	53,040	51,716	33,690	24,327	24,891	25,459	TBD	TBD
(U) Operations and Maintenance (3400)	22,452	23,812	16,613	17,707	18,429	17,473	19,139	19,621	TBD	TBD

Related RDT&E:
See Individual Projects

(U) D. **Schedule Profile** - See Individual Project Schedules

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY: 7 - Operational System Development	PE NUMBER AND TITLE: 0207438F Theater Battle Management (TBM) C4I / PROJECT: 3330

COST (*In Thousands*)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
3330 Cmd Cntrl Info Process Sys (C2IPS)**	0	6,491	5,991	5,051	0	0	0	0	0	17,533

*C2IPS FY94 Funding ($10,497) in PE41840F

(U) A. **Mission Description and Budget Item Justification** The Command & Control Information Processing System (C2IPS) program develops communications and information processing hardware and software for all echelons of the Air Mobility Command (AMC) Command and Control (C2) System. It satisfies essential elements of the AMC C2 architecture validated in AMC Statement of Need (SON) 3-81. The integration of IPS computer resources and software with improved High Frequency (HF) equipment, new Ultra High Frequency (UHF) satellite networks, and other available communications media will result in unified AMC C2 System. The IPS will be developed and installed in four increments. Increment 1 provides 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 Satellite Communications (SATCOM) communications interfaces and multi-level security features. As a result of the Chief of Staff, United States Air Force (CSAF) Command, Control, Communications, Computers, and Intelligence (C4I) Broad Area Review (BAR), an initiative was set forth to improve theater C4I by coordinating and integrating on-going and planned computer systems. Air Force directed the development and implementation of an incremental migration strategy to merge the best features of IPS and two other MAJCOM initiatives into the design for a single wing level C2 system. This is in Research Category Operational Systems Development. This is a Post Milestone III effort.

(U) FY 1994 (Funding($10,497) in PE 41840F)

-- (U) Completed Increment 2A software development and upgraded software at installed nodes to increment 2A ($2,788)
-- (U) Continued Increment 3 software development ($5,809)
-- (U) Began implementation of force and unit level migration strategies ($1,900)

(U) FY 1995

- (U) Complete Increment 2 software development ($2,270)
- (U) Continue Increment 3 software development ($2,000)
  - -- (U) Complete Increment 3 software Preliminary and Critical Design Reviews
- (U) Continue implementation of force and unit level migration strategies ($2,121)
- (U) Initiate Increment 4 software development ($100)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207438F Theater Battle Management (TBM) C4I
	PROJECT 3330

(U) FY 1996
- (U) Complete Increment 3 software development ($1,667)
- (U) Continue Increment 4 software development ($4,000)
  -- (U) Complete Increment 4 Software Spec and Preliminary Design Reviews
- (U) Continue implementation of force and unit level migration strategies ($324)

(U) FY 1997
- (U) Complete CDR for Increment 4 ($800)
- (U) Complete Increment 4 software development ($1,000)
- (U) Complete force and unit level migration ($3,034)
- (U) Complete OT&E force and unit level migration ($217)

(U) B. Program Change Summary ($ in Thousands)

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
(U) Previous President's Budget	11,361	8,827	2,025	5,080	31,832
(U) Appropriated Value	11,361	6,827			
(U) Adjustments to Appropriated Value					
a. General Congressional Reductions	(647)	(196)			
b. SBIR	(167)	(140)			
c. BTR	(50)				
(U) Adjustments to Budget Year Since FY95 PB			3,966	(29)	
(U) Current Budget Submit/President's Budget	10,497	6,491	5,991	5,051	28,093
*FY94 funding in PE41840F					

(U) Change Summary Explanation:

Funding: FY94 and FY95 funds reduced due to Federally Funded Research and Development (FFRDC) and non-FFRDC cuts.
FY 96-97 funds increased to provide C2IPS interoperability with TBM systems and to increase the number of users per node (40 to 100).
Schedule: None

Technical: None

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207438F Theater Battle Management (TBM) C4I
	PROJECT 3330

(U) C. **Other Program Funding Summary ($ in Thousands)**

	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	To Compl	Total Cost
(U) Other Procurement , AF, WSC 834070	4,863									4,863

(U) D. **Schedule Profile**

	FY 1994				FY 1995				FY 1996				FY 1997			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
(U) Increment 2																
(U) Test Readiness Review (TRR) 2A		X														
(U) DT&E Completed 2A			X													
(U) Test Readiness Review (TRR) 2B				X												
(U) DT&E Complete 2B				X												
(U) Test Readiness Review (TRR) 2C						X										
(U) DT&E Complete 2C							X									
(U) INC2 OT&E Complete									X							
(U) Increment 3																
(U) Software Spec Review (SSR)							X									
(U) Preliminary Design Review (PDR)							X									
(U) Critical Design Review (CDR)								X								
(U) Test Readiness Review									X							
(U) DT&E Complete										X						
(U) MAISARC Milestone IIIB review							X									
(U) Increment 4																
(U) Software Spec Review (SSR)										X						
(U) Preliminary Design Review (PDR)										X						
(U) Critical Design Review (CDR)																X
(U) Test Readiness Review (TRR)																X
(U) DT&E Complete																X
(U) OT&E Complete																X
(U) FOC																X

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0207438F Theater Battle Management (TBM) C4I

PROJECT: 3330

(U) A. **Project Cost Breakdown ($ in Thousands)**

	FY 1994	FY 1995	FY 1996	FY 1997
(U) Major Contract	7,053	3,960	4,660	4,063
(U) Support Contract	2,830	1,953	1,074	758
(U) In-house Contract	614	578	257	230
(U) Total	10,497	6,491	5,991	5,051

(U) B. **Budget Acquisition History and Planning Information ($ in Thousands)**

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1994	Budget FY 1994	Budget FY 1995	Budget FY 1996	Budget FY 1997	Budget to Complete	Total Program
Product Development Organizations											
CSC	C/FFIP/FFP	Dec 88	56,304	63,501	36,628	7,053	3,960	4,660	4,063	0	56,364
Support and Management Organizations											
MITRE Contract	SS/T&M	Oct 94			16,564	2,121	1,753	944	758	0	22,140
TEMS Contract					8,880	709	200	130	0	0	9,919
In-House Contract					3,560	614	578	257	230	0	5,239
Subtotal Product Development					36,628	7,053	3,960	4,660	4,063	0	56,364
Subtotal Support and Management					29,004	3,444	2,531	1,331	988	0	37,298
Subtotal Test and Evaluation					0	0	0	0	0	0	0
Total Project					65,632	10,497	6,491	5,991	5,051	0	93,662

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207438F Theater Battle Management (TBM) C4I PROJECT 4287

COST (*In Thousands*)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
4287 Contingency Theater Auto Plan Sys (CTAPS)	9,523	*	*	*	*	*	*	*	Continuing	TBD

*Data is Source Selection Sensitive. Data available upon appropriate request.

(U) A. **Mission Description and Budget Item Justification**

The Contingency Theater Automated Planning System (CTAPS) program directly supports the Joint Forces Air Component Commander (JFACC) in the planning and execution of the theater air campaign down to the unit level. The system is designed to open systems standards promoting interoperability among USAF, Services, and Allied command and control systems. The air tasking order generation and dissemination capabilities of CTAPS are the standard for all DoD command and control systems. The program utilizes an evolutionary acquisition strategy that accommodates changes in user requirements and improvements in commercial technology through a series of planned incremental software releases. In FY94, this program began implementing force and unit level migration strategies to merge the best features of existing systems, eliminate redundancy, and improve interoperability. FY95 RDT&E funding ramp-up addresses the $9.3M shortfall identified in the 26 May 93 CTAPS In-Process Review. The shortfall would delay automation of the Air Support Operations Center and initial fielding; delay fielding of the common view of the battlefield in the JFACC headquarters; delay implementation of DoD data standards which will impact joint systems integration and interoperability; and delay development of an imagery processing and distribution capability (imagery limited to force level intelligence only, limited unit level distribution). This is in Category Research Operational System Development. This program is a Post Milestone III effort.

(U) FY 1994

- (U) Continued software version 5 development
  - -- (U) CTAPS Core System Upgrades ($1,900)
  - -- (U) APS Pre-Planned Product Improvements Development (P3I) ($1,007)
  - -- (U) Completed Joint Tactical Information Distribution System (JTIDS) integration to the Modular Air Operations Center (MAOC) Phase I development ($410).
- (U) Began application software development targeted for TBMCS Version 1.0 (formerly CTAPS V6.0): Battlefield Situation Display (BSD) architecture and Air Support Operations Center (ASOC) upgrade and integration planning ($1,828)
- (U) Systems Interoperability efforts ($1,200)
- (U) Systems engineering and support ($3,178).

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY: 7 - Operational System Development	PE NUMBER AND TITLE: 0207438F Theater Battle Management (TBM) C4I — PROJECT: 4287

(U) FY 1995
- (U) Complete and field CTAPS Version 5.1 ($1,735)
- (U) Continue software CTAPS Version 5.2 development ($5,944).
- (U) Begin Core software development targeted for TBMCS Version 1.0.
- (U) Continue ASOC software and hardware development ($2,646).
- (U) Complete BSD S/W development ($1,950)
- (U) Systems engineering and support ($4,431).

(U) FY 1996
- (U) Complete/Field Version 5.2 ($800)
- (U) Continue software development targeted for TBMCS Version 1.0.
- (U) Initiate software development targeted for TBMCS Version 2.0 (formerly CTAPS Version 7.0).
- (U) Continue ASOC software development.
- (U) Complete ASOC System EMD Phase ($1,000).
- (U) Continue implementation of force and unit level migration strategies.
- (U) Systems engineering and support.
- (U) Begin full CIS/CTAPS Intelligence/Interoperability efforts.

(U) FY 1997
- (U) Continue software development targeted for TBMCS Version 2.0.
- (U) Complete ASOC software development.
- (U) Continue implementation of force and unit level migration strategies.
- (U) Systems engineering and support ($3,347).
- (U) Complete/Field TBMCS Version 1.0.
- (U) Continue full CIS/CTAPS Intelligence/Interoperability efforts.

NOTE: ALL DOLLAR AMOUNTS ASSOCIATED WITH TBMCS VERSIONS 1.0 AND 2.0 ARE SOURCE SELECTION SENSITIVE.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207438F Theater Battle Management (TBM) C4I PROJECT 4287

(U) B. Program Change Summary ($ in Thousands)

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
(U) Previous President's Budget	9,177	21,538	12,754	15,624	TBD
(U) Appropriated Value	9,177	*			
(U) Adjustments to Appropriated Value					
a. General Congressional Reductions	(589)	*			
b. Funds Increase	1,121				
c. SBIR	(186)	*			
(U) Adjustments to Budget Years Since FY95 PB			*	*	
(U) Current Budget Submit/President's Budget	9,523	*	*	*	TBD

(U) Change Summary Explanation:

Funding: FY94 funds increase provided for Systems Integration efforts. FY95 Generic Cuts for Federally Funded Research and Development Centers (FFRDC), Non-FFRDC, SBIR , university research and travel reduction. FY 96-97 funds increased to provide full integration with the Combat Intelligence System.

Schedule: TBMCS Version 1 schedule slipped due to consolidation of contractual vehicles to include all CTAPS, WCCS, and Combat Intelligence Systems (CIS) upgrades under 1 contract.

Technical: None

*Data is Source Selection Sensitive. Data available upon appropriate request.

(U) C. Other Program Funding Summary ($ in Thousands)

	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	To Compl	Total Cost
(U) Other Procurement, AF, WSC833040	25,490									25,490
(U) Other Procurement, AF, WSC834520		18,454	42,069	34,795	23,189	13,227	13,625	14,036	TBD	TBD
(U) Other Procurement, AF, WSC83790A	308									308
(U) Other Procurement, AF, WSC84590A		126								126
(U) Other Procurement, AF, WSC86190A			424	802	769	675	262	122	TBD	TBD
(U) Operations and Maintenance, AF, PE27438F			14,808	15,982	16,825	15,867	17,531	18,008	TBD	TBD

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207438F Theater Battle Management (TBM) C4I PROJECT 4287

(U) D. **Schedule Profile**

	FY 1994				FY 1995				FY 1996				FY 1997			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
(U) Begin TBMCS Source Selection					X											
(U) CTAPS Version 5.0.6 Release				X												
(U) CTAPS Version 5.1 Release					X											
(U) CTAPS Version 5.2 Release									X							
(U) TBMCS Integration & Development Contract Award							X									
(U) TBMCS S/W Version 1								X*						X**		
(U) Version 1 Release														X		
(U) Version 1 OT&E														X		
(U) TBMCS S/W Version 2												X*				

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207438F Theater Battle Management (TBM) C4I PROJECT 4287

(U) A. **Project Cost Breakdown ($ in Thousands)**

	FY 1994	FY 1995	FY 1996	FY 1997
(U) Total	9,523	18,575	*	*
(U) System Integration and Development	5,145	14,144	*	*
(U) System Engineering	2,728	2,755	2,422	2,003
(U) TEMS	720	665	780	803
(U) SPO Support	930	1,011	1,035	541

(U) B. **Budget Acquisition History and Planning Information ($ in Thousands)**

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1994	Budget FY 1994	Budget FY 1995	Budget FY 1996	Budget FY 1997	Budget to Complete	Total Program
Product Development Organizations											
I&D CONTRACT *	C/CPAF/PR	May 95	N/A	N/A	0	0	*	*	*	Cont	TBD
SAIC (S/W INTEG) (Hampton VA)	C/CPFF/FCA	Mar 94	N/A	N/A	0	1,900	7,479	0	0	0	9,379
SAIC (ASOC/BSD) (Hampton VA/Anchorage AK)	C/CPAF/FCA	Feb 94	N/A	N/A	0	1,828	1,950	0	0	0	3,778
PARAMAX (APS) (St Paul MN)	C/CPFF/FCA	Mar 94	N/A	N/A	0	1,007	200	0	0	0	1,207
INEL (ASOC) (Idaho Falls, ID)	C/SPFF/FCA	Oct 94	N/A	N/A	0	0	2,646	0	0	0	2,646
Miscellaneous	Various	Various	N/A	N/A	0	410	Unk	Unk	Unk	Unk	TBD

***Data is Source Selection Sensitive. Data available upon appropriate request.**

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0207438F Theater Battle Management (TBM) C4I

PROJECT: 4287

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1994	Budget FY 1994	Budget FY 1995	Budget FY 1996	Budget FY 1997	Budget to Complete	Total Program
Support and Management Organizations											
MITRE	SS/T&M	Oct 94				2,728	2,755	2,422	2,003	Cont	TBD
TEMS	C/T&M	Various				720	665	780	803	Cont	TBD
Misc Contracts	Various	Various				930	1,011	1,035	541	Cont	TBD
Test and Evaluation Organizations											
Not Applicable											
Subtotal Product Development						5,145	*	*	*	Cont	TBD
Subtotal Support and Management						4,378	4,431	4,237	3,347	Cont	TBD
Subtotal Test and Evaluation						0	0	0	0	0	0
Total Project						9,523	*	*	*	Cont	TBD

***Data is Source Selection Sensitive. Data available upon appropriate request.**

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207438F Theater Battle Management (TBM) C4I	PROJECT 4288

COST (*In Thousands*)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
4288 Wing C2 System (WCCS)	3,341	*	*	*	*	*	*	*	Continuing	TBD

***Data is Source Selection Sensitive. Data available upon appropriate request.**

(U) A. Mission Description and Budget Item Justification: This program includes development of mission critical application software for WCCS operating on commercially available hardware and system software. Wing commanders require an accurate, composite picture of their wing's total resources to effectively command, control, and manage their forces in support of their combat sortie generation and reporting responsibilities. The introduction of increasingly sophisticated weapon systems, with their need for and ability to produce large amounts of data, require an automated C2 system to bring meaningful, consolidated information to the commander in near real-time. Today, this information is relayed over secure and unsecure telephones, radios, and other communications devices, as well as by runners to update multi-user status displays (grease boards) or hand written logs. These techniques, which have not changed substantially since World War II, are cumbersome, error prone, may compromise sensitive information, and involve duplication of effort. Disparate efforts have led to the proliferation of stovepipe systems which inherently do not provide interoperability and do not adequately meet the needs of today's air operations. The WCCS program will design, develop and implement an automated, standard wing level C2 system that will be tailored to meet unique MAJCOM and wing requirements, in order to provide interoperability and reduce training and development costs. Key functional areas (operations, maintenance, mission planning, intelligence, weather, etc.) use WCCS to support the wing commander in mission execution and reporting process by exchanging critical command and control and intelligence information with functional counterparts located throughout the wing. This is in Research Category Operational Systems Development. This program is a post Milestone III effort.

(U) FY 1994
- (U) Continued WCCS application software release 1.1 ($3,341)
  - (U) -- Release to enhance scheduling and Air Tasking Order processing capabilities.
  - (U) -- Release to include graphic user interface and other "user-friendly" improvements.
  - (U) -- Release to include interface to critical unit and force-level systems.
  - (U) -- Release to include unit/force level interfaces.

(U) FY 1995
- (U) Complete software development for WCCS Version 1.1 ($1,850K)
  - (U) -- Enhance graphic user interfaces.
  - (U) -- Continue to update unit/force level interfaces.
  - (U) -- Update Databases.
  - (U) -- Technical upgrades (Oracle 7, Ovation).

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY: 7 - Operational System Development	PE NUMBER AND TITLE: 0207438F Theater Battle Management (TBM) C4I / PROJECT: 4288

(U) -- On-line help capability.
(U) -- Release & Deploy WCCS Version 1.1
(U) -- Enhance system security.
(U) -- Begin Force/Unit level migration.
- (U) Begin software development budgeted for TBMCS Version 1.0
- (U) Systems engineering and support ($1,067K)

(U) FY 1996
- (U) Continue software development TBMCS Version 1.0
  (U) -- Complete graphic user interfaces.
  (U) -- Continue Decision Support System (DSS) Module.
  (U) -- Continue first phase of security enhancement implementation.
  (U) -- Continue unit/force level interfaces.
  (U) -- Begin Force/Unit level migration.
- (U) Systems engineering and support ($1,135K)

(U) FY 1997
- (U) Complete TBMCS Version 1.0
- (U) Continue TBMCS software Version 2.0
  (U) -- Phase II Decision Support System (DDS) Module.
  (U) -- Continue first phase of security enhancement implementation.
  (U) -- Include/modify unit/force level interfaces (AFMSS, AWDS,BRCS, CAS-B).
  (U) -- P3I efforts.
  (U) -- Continue force/unit level migration
- (U) Systems engineering and support ($1,173K)

***Data is Source Selection Sensitive. Data available upon appropriate request.**

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY: 7 - Operational System Development	PE NUMBER AND TITLE: 0207438F Theater Battle Management (TBM) C4I / PROJECT: 4288

(U) B. Program Change Summary ($ in Thousands)

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
(U) Previous President's Budget	3,341	3,592	3,777	3,691	TBD
(U) Appropriated Value	3,341	*			
(U) Adjustments to Appropriated Value					
a. General Congressional Reductions		*			
b. SBIR		*			
(U) Adjustments to Budget Years Since FY95 PB			*	*	
(U) Current Budget Submit/President's Budget	3,341	*	*	*	TBD

(U) Change Summary Explanation:

Funding: FY94/FY95 reductions made for Federally Funded Research and Development Centers (FFRDC), Non-FFRDC, SBIR, university research and travel reduction.

Schedule: None

Technical: None

(U) C. Other Program Funding Summary ($ in Thousands)

	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	To Compl	Total Cost
(U) Other Procurement AF, WSC837100	21,356									21,356
(U) Other Procurement AF, WSC834070		13,719	10,547	16,119	9,732	10,425	11,004	11,301	Cont	Cont
(U) Operations and Maintenance, AF	22,452	23,812	1,805	1,725	1,604	1,696	1,608	1,613	Cont	Cont

***Data is Source Selection Sensitive. Data available upon appropriate request.**

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207438F Theater Battle Management (TBM) C4I PROJECT 4288

(U) D. Schedule Profile

	FY 1994				FY 1995				FY 1996				FY 1997			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
(U) Software release Version 1.0				X												
(U) Software release Version 1.1							X									
(U) Deployment Version 1.1								X								
(U) Begin TBMCS Source Selection					X											
(U) TBMCS Integration & Development Contract Award							X									
(U) TBMCS S/W Version 1								X*						X**		
(U) Version 1 Release														X		
(U) Version 1 OT&E														X		
(U) TBMCS S/W Version 2												X*				

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0207438F Theater Battle Management (TBM) C4I

PROJECT: 4288

(U) A. **Project Cost Breakdown ($ in Thousands)**

	FY 1994	FY 1995	FY 1996	FY 1997
(U) Total	3,341	*	*	*
(U) System Integration and Development	3,341	*	*	*
(U) System Engineering	0	698	660	682
(U) TEMS	0	0	0	0
(U) SPO Support	0	369	475	491

(U) B. **Budget Acquisition History and Planning Information ($ in Thousands)**

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1994	Budget FY 1994	Budget FY 1995	Budget FY 1996	Budget FY 1997	Budget to Complete	Total Program
Product Development Organizations											
SAIC	C/CPFF	Jan 94				3,000	1,800				4,800
Integ. & Dev. Efft.	C/CPAF	May 95					*	*	*	Cont	TBD
Support and Management Organizations											
MITRE	SS/T&M	Oct 94					654	660	682	Cont	TBD
Miscellaneous	Various	Various					369	475	491	Cont	TBD
Test and Evaluation Organizations											

***Data is Source Selection Sensitive. Data available upon appropriate request.**

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207438F Theater Battle Management (TBM) C4I PROJECT 4288

(U) B. Budget Acquisition History and Planning Information Continued ($ in Thousands)

Government Furnished Property:

Item Description	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Delivery Date	Total Prior to FY 1994	Budget FY 1994	Budget FY 1995	Budget FY 1996	Budget FY 1997	Budget to Complete	Total Program
Product Development Property										
Local P.O.s*	Various	Various			28	50	50	50	Cont	TBD
Support and Management Property										
Test and Evaluation Property										
*Various small contracts/delivery orders based on requirements.										
Subtotal Product Development					3,028	*	*	*		*
Subtotal Support and Management						1,023	1,135	1,173		3,331
Subtotal Test and Evaluation										
Total Project					3,028	*	*	*	Cont	TBD

***Data is Source Selection Sensitive. Data available upon appropriate request.**

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: # 7 - Operational Systems Development

PE NUMBER AND TITLE: 0207590 SEEK EAGLE

PROJECT NO.

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	14,719	15,474	17,390	18,059	18,695	19,451	20,216	21,010	Cont.	TBD
2784/Armament Standardization/Control/ Munitions Material Handling Equipment	0	0	1,175	1,187	1,160	1,214	1,248	1,278	Cont.	TBD
4037/SEEK EAGLE Certification	14,719	15,474	16,215	16,872	17,535	18,237	18,968	19,732	Cont.	TBD

(U) A. Mission Description and Budget Item Justification

The Air Force has a variety of combat aircraft and numerous stores (munitions, missiles, fuel tanks, electronic countermeasures pods, etc.). Aircraft carry these stores in countless different loading combinations determined by operational scenarios, missions, and tactics. Loading configurations change as operational plans and tactics change, and as new aircraft and stores are developed. Before operational use, the Air Force must certify these configurations for safe loading, carriage, and separation (jettison and normal release), and must verify ballistics accuracy under the user-specified carriage and employment parameters. The Air Force SEEK EAGLE program completes these certifications through any combination of ground and flight testing, wind tunnel testing, and engineering analysis. Over 700 aircraft-store configurations exist to be certified, with new ones added on a regular basis. Depending upon the complexity, certification takes from months to years. The SEEK EAGLE program is also responsible for insertion of new and emerging technologies into the SEEK EAGLE process and providing resources for sustainment of a viable Air Force aircraft-store certification capability. The Armament Standardization/Control/Munitions Material Handling Equipment (MMHE), Project 2784, satisfies several USAF and tri-service requirements for standardization of armament and support equipment and eliminates unnecessary duplication of MMHE. (Funding for Project 2784 for FY96 and beyond was transferred to SEEK EAGLE from PE 64602F, Armament/Ordnance Development.) The RDT&E Research Category/Budget Activity is Operational Systems Development because the PE supports fielded systems.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: # 7 - Operational Systems Development

PE NUMBER AND TITLE: 0207590 SEEK EAGLE

PROJECT NO.

(U) B. Program Change Summary ($ in Thousands):

	1994	1995	1996	1997	Total Cost
Previous President's Budget	15,171	15,982	16,215	14,302	TBD
Appropriated Value	15,171	15,982			
Adjustments to Appropriated Value					
a. General Congressional Reductions	-152	-174			
b. Below Threshold Reprogramming	-66				
c. SBIR	-234	-334			
Adjustments to Budget Years Since FY95 PB			1,175	3,757	
Current Budget Submit/President's Budget	14,719	15,474	17,390	18,059	TBD

Change Summary Explanation:

Funding: FY95 General Congressional Reductions result from FFRDC, non-FFRDC, University research, and Travel reductions. FY96/97 changes result from inflation adjustment and transfer of Project 2784 (Armament/Standardization/Control/Munitions Material Handling Equipment) from PE 64602F (Armament/Ordnance Development) to PE 27590F (SEEK EAGLE).

Schedule: N/A

Technical: N/A

(U) C. Other Program Funding Summary ($ in Thousands):

Appropriation:	1994	1995	1996	1997	1998	1999	2000	2001	To Compl	Total Cost
Other Procurement	2,000									
Missile Procurement	13,788	1,102	5,874	12,065	16,094	9,737	8,094	8,545	Cont.	TBD
Procurement of AF Ammunition		6,251								

(Note: $4,242 of Missile Procurement, AF FY94 funding was declared excess due to lower than budgeted AMRAAM test article cost. Original amount was $13,788.)

(U) D. Schedule Profile

SEEK EAGLE program does not execute in accordance with (IAW) established acquisition program milestones. Each aircraft-store configuration requested by the user goes through the SEEK EAGLE process IAW the designated user priority.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: # 7 - Operational Systems Development

PE NUMBER AND TITLE: 0207590 SEEK EAGLE

PROJECT NO.: 2784

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Armament Standardization/Control/Munitions Material Handling Equipment	N/A	N/A	1,175	1,187	1,160	1,214	1,248	1,278	Cont	TBD

(U) A. Mission Description and Budget Item Justification

Armament Standardization/Control/Munitions Material Handling Equipment (MMHE): This continuing project develops and improves the standardization and commonality of improved munitions handling and armament equipment to preclude duplication and proliferation. This project's effort are limited to the study, design and development of MMHE and armament control systems. Any Procurement will be performed and funded by the applicable weapons system project. (Funding for Project 2784 for FY96 and beyond is transferred to PE 27590F, SEEK EAGLE from PE 64602F, Armament/Ordnance Development.)

FY 1994 Accomplishments ($ in Thousands):
- FY94 funding and plans located in PE 64602, Armament/Ordnance Development

FY 1995 Plans ($ in Thousands):
- FY95 funding and plans located in PE 64602, Armament/Ordnance Development

FY 1996 Plan ($ in Thousands):
- Initiate/continue/complete design/development of various MMHE projects, including completing design of the B-2 Bomb Rack Assembly Cross-load Adapter, GBU Fin Rack, B-1 Nuclear Ram Assembly and completing testing of the B-1B Preloading Adapter, F-22 Pylon Adapter, and T-Bar Adapter. ($633)
- Initiate construction of the Robotic Advanced Technology Demonstrator. ($267)
- Continue design of MHU-110 trailer upgrades. ($245)
- Continue design/prototype B-1/B-52/B-2 Rotary Launcher Load Adapter and B-52H Pylon Load Adapter. ($30)

FY 1997 Plan ($ in Thousands):
- Initiate/continue/complete design/development of various MMHE projects, including completing design GBU Fin Rack, B-1 Nuclear Ram Assembly and completing testing of the B-2 Bomb Rack Assembly Cross-load Adapter. ($814)
- Complete design/prototype MHU-110 Trailer upgrades. ($100)
- Complete construction and initiate evaluation of the Robotic Advanced Technology Demonstrator. ($243)
- Complete testing B-1/B-52/B-2 Rotary Launcher Load Adapter and B-52H Pylon Load Adapter. ($30)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: # 7 - Operational Systems Development

PE NUMBER AND TITLE: 0207590 SEEK EAGLE

PROJECT NO.: 2784

(U) B. Program Change Summary ($ in Thousands)

	1994	1995	1996	1997	Total Cost
Previous President's Budget	N/A	N/A	0	0	Cont.
Appropriated Value	N/A	N/A			
Adjustments to Appropriated Value	N/A	N/A			
Adjustments to Budget Years Since FY95 PB			1,175	1.187	
Current Budget Submit/President's Budget	N/A	N/A	1,175	1,187	Cont.

Change Summary Explanation:

Funding: Project funding for FY96 and beyond was transferred to SEEK EAGLE from PE 64602F, Armament/Ordnance Development. Adjustments to previous funding due to inflation for FY96 and beyond (FY96 $1,275; FY97 $1,290).

Schedule: N/A

Technical: N/A

(U) C. Other Program Funding Summary ($ in Thousands): Not Applicable

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

(U) D. Schedule Profile: Not Applicable

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February 1995

BUDGET ACTIVITY: # 7 - Operational Systems Development

PE NUMBER AND TITLE: 0207590 SEEK EAGLE

PROJECT NO.: 2784

(U) A. Project Cost Breakdown ($ in Thousands)

	1994	1995	1996	1997
Robotics	N/A	N/A	267	243
MHU-110 Trailer Upgrade	N/A	N/A	245	100
Contractor support	N/A	N/A	280	320
Management Support	N/A	N/A	150	222
Testing	N/A	N/A	20	70
Other	N/A	N/A	23	92
BRA Adapter			100	50
Launcher/Pylon Adapters		N/A	30	30
Nuclear RAM Assembly			60	60
Total	N/A	N/A	1,175	1,187

NOTE: Projected costs for items listed as N/A in 1994 and 1995 above can be found in PE 64602F, Armament/Ordnance Development

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February 1995

BUDGET ACTIVITY: # 7 - Operational Systems Development

PE NUMBER AND TITLE: 0207590 SEEK EAGLE

PROJECT NO.: 2784

(U) B. Budget Acquisition History and Planning Information ($ in Thousands)

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to 1994	Budget 1994	Budget 1995	Budget 1996	Budget 1997	Budget to Complete	Total Program
Product Development Organizations:											
Naval Air Warfare Center	T&M	Sep 93	830	880		N/A	N/A	0	0	0	0
Dept of Energy/NASA	T&M	Mar 94	960	960		N/A	267	243	CONT	TBD	
Support and Management Organizations:											
TEAS/TEAMS	CP	Oct 93	CONT	CONT		N/A	N/A	400	405	CONT	TBD
ASC/ALZ	CP	Oct 93	CONT	CONT		N/A	N/A	249	252	CONT	TBD
Other	CP	Oct 93	CONT	CONT		N/A	N/A	219	242	CONT	TBD
Test and Evaluation Organizations											
46th Test Wing			CONT	CONT		N/A	N/A	40	45	CONT	TBD
Subtotal Product Development						N/A	N/A	267	243		
Subtotal Support and Management						N/A	N/A	868	899		
Subtotal Test and Evaluation						N/A	N/A	40	45		
Total Project						N/A	N/A	1,175	1,187	CONT	TBD

Government Furnished Property: Not Applicable

(U) C. Funding Profile ($ in Thousands): Not Applicable

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: # 7 - Operational Systems Development

PE NUMBER AND TITLE: 0207590 SEEK EAGLE

PROJECT NO.: 4037

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
SEEK EAGLE Certification	14,719	15,474	16,215	16,872	17,535	18,237	18,968	19,732	Cont.	TBD

(U) A. Mission Description and Budget Item Justification

Air Force aircraft carry variety of combat stores (munitions, missiles, fuel tanks, electronic countermeasures pods, etc.) in countless different loading combinations determined by operational scenarios, missions, and tactics. Loading configurations change based on operational plans and tactics and as new aircraft and stores are developed. Before operational use, the Air Force must certify these configurations for safe loading, carriage, and separation (jettison and normal release), and must verify ballistics accuracy under the user-specified carriage and employment parameters. The SEEK EAGLE program completes these certifications through any combination of ground and flight testing, wind tunnel testing, and engineering analysis. More than 700 aircraft-store configurations exist to be certified, with new ones added on a regular basis. Certification may take months to years to complete because of the diversity and interaction among systems being tested. The SEEK EAGLE program is also responsible for insertion of new and emerging technologies into the SEEK EAGLE process and providing resources to sustain a viable Air Force aircraft/store certification capability.

FY 1994 Accomplishments ($ in Thousands):

- Continued aircraft-store certification of conventional weapons on bomber aircraft, including the certification of the CBU-87/89/97 on the B-1B. ($5,341)
- Initiated/continued/completed aircraft-stores certification on fighter aircraft, including F-111 mixed loads certification and completing F-16 C/D AIM-120 flutter testing and F-16 Block 50 instrumentation ($7,487)
- Maintained SEEK EAGLE Engineering Analysis Capability ($1,891)

FY 1995 Plans ($ in Thousands):

- Complete certification of conventional weapons on bomber aircraft, including the CBU-87/89/97 on the B-1B ($2,679)
- Continue F-111 mixed load testing ($1,131)
- Develop and manage the Combat Stores Loading Software (CSLS) and standard configuration load builder for the Air Force's Combat Weapons Delivery System ($203)
- Initiate/continue/complete aircraft-stores certification on fighter aircraft, including beginning F-16 C/D Block 50/52D and AGM-88B/C (4 HARM) ($9,918)
- Maintain SEEK EAGLE Engineering Analysis Capability ($1,543)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT NO.
# 7 - Operational Systems Development	0207590F SEEK EAGLE	4037

(U) A. Mission Description and Budget Item Justification (cont)

FY 1996 Plans ($ in Thousands):

- Complete certification of F-16 C/D Block 50/52D and AGM-88 B/C (4 HARM) ($193)
- Continue F-15 mixed loads testing ($81)
- Initiate/continue/complete aircraft-stores certification on fighter aircraft ($14,238)
- Maintain SEEK EAGLE Engineering Analysis Capability ($1,703)

FY 1997 Plans ($ in Thousands):

- Complete F-15 mixed load certification ($317)
- Initiate certification of F-15 A/B/C/D and AMRAAM P3I ($1,300)
- Initiate certification of B-52H and JDAM ($260)
- Initiate/continue/complete aircraft-stores certification on fighter and bomber aircraft ($12,835)
- Maintain SEEK EAGLE Engineering Analysis Capability ($2,160)

(U) B. Program Change Summary ($ in Thousands)

	1994	1995	1996	1997	Total Cost
Previous President's Budget	15,171	15,982	16,215	14,302	TBD
Appropriated Value	15,171				
Adjustments to Appropriated Value					
a. General Congressional Reductions	-152	-174			
b. Below Threshold Reprogrammings	-66				
c. SBIR	-234	-334			
Adjustments to Budget Years Since FY95 PB				2,570	
Current Budget Submit/President's Budget	14,719	15,474	16,215	16,872	TBD

Change Summary Explanation:

Funding: FY95 General Congressional Reductions result from FFRDC, non-FFRDC, University research, and travel reductions. FY97 increase from a zero balance transfer from the Missile Procurement, AF appropriation to support engineering analysis, wind tunnel testing, and flight testing of aircraft stores on fighter and bomber aircraft.

Schedule: N/A

Technical: N/A

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: # 7 - Operational Systems Development

PE NUMBER AND TITLE: 0207590F SEEK EAGLE

PROJECT NO.: 4037

(U) C. Other Program Funding Summary ($ in Thousands)

Appropriation:	1994	1995	1996	1997	1998	1999	2000	2001	To Compl	Total Cost
Other Procurement	2,000									
Missile Procurement	13,788	1,102	5,874	12,065	16,094	9,737	8,094	8,545	Cont.	TBD
Procurement of AF Ammunition		6,251								

(Note: $4,242 of Missile Procurement, AF FY94 funding was declared excess due to lower than budgeted AMRAAM test article cost. Original amount was $13,788.)

(Note: Procurement of Combined Effects Munitions and Gator Cluster Bomb Units submunitions was accelerated into FY95 and FY96 from FY97 to coincide with the termination of manufacturing capability.)

(U) D. Schedule Profile

SEEK EAGLE program does not execute in accordance with (IAW) established acquisition program milestones. Each aircraft-store configuration requested by the user goes through the SEEK EAGLE process IAW the designated user priority.

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February 1995

BUDGET ACTIVITY: # 7 - Operational Systems Development

PE NUMBER AND TITLE: 0207590F SEEK EAGLE

PROJECT NO.: 4037

(U) A. Project Cost Breakdown ($ in Thousands)

	1994	1995	1996	1997
Process Sustainment	1,000	1,087	1,100	1,100
Engineering Analysis	1,315	1,543	1,689	1,726
Flight Testing	3,336	5,878	5,743	5,945
Wind Tunnel Testing	3,572	2,150	2,782	2,969
Other	3,717	2,895	2,885	2,972
- Ballistic/Safe Escape Analysis				
- Tech Order/P.C. Floppy Disk				
- Loading Process Development/Verification				
Mission Support	1,779	1,921	2,016	2,160
Total	14,719	15,474	16,215	16,872

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February 1995

BUDGET ACTIVITY: # 7 - Operational Systems Development

PE NUMBER AND TITLE: 0207590F SEEK EAGLE

PROJECT NO.: 4037

(U) B. Budget Acquisition History and Planning Information ($ in Thousands)

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to 1994	Budget 1994	Budget 1995	Budget 1996	Budget 1997	Budget to Complete	Total Program
Product Development Organizations											
Support and Management Organizations											
Mission Support	PO	Continuous		Continuous	2,934	1,779	1,921	2,016	2,160	Cont.	TBD
Test and Evaluation Organizations											
46 Test Wing Eglin	PO	Continuous		Continuous	50,801	4,836	5,486	6,200	6,900	Cont.	TBD
AEDC	PO	Continuous		Continuous	4,900	2,000	2,041	2,282	2,569	Cont.	TBD
Other Gov't	PO	Continuous		Continuous	14,513	6,104	6,026	5,717	5,243	Cont.	TBD
Government Furnished Property:	**N/A**										
GRAND TOTAL					73,148	14,719	15,474	16,215	16,872	Cont.	TBD

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #7 Operational System Development

PE NUMBER AND TITLE: 0207601F - USAF Wargaming and Simulation

PROJECT NO(S).: (see below)

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Current	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
PE 0207601F TOTAL	10,829	13,306	19,762	25,624	24,732	19,100	19,100	19,100	Continuing	Continuing
National Air and Space Warfare Model (NASM) Project # 1008	10,829	13,306	6,700	6,562	5,662	0	0	0	65,100	108,159
Theater Air Def Battle Mgmt C4I (TAD BMC4I) Project # 4474			13,062	19,062	19,070	19,100	19,100	19,100	Continuing	Continuing

A. Mission Description and Budget Item Justification

This PE provides RDT&E funding for Air Force and Joint wargaming architecture and model development, primarily in support of battlestaff training, education, and military operations. The PE also includes O&M and Procurement funding entirely for the operation of three Air Force wargaming centers (i.e., the Warrior Preparation Center (WPC), Einsiedlerhof AS, Germany; the Air Force Wargaming Institute, Maxwell AFB, AL; and the USAF Battlestaff Training School (BLUE FLAG), Hurlburt Field, FL). First year of execution for the PE was FY94.

In addition, this PE includes RDT&E funding for Theater Air Defense Battle Management C4I (TAD BMC4I). The TAD BMC4I project involves study, analysis, and demonstration of integrated TAD BMC4I to support the theater CINCs. This involves architecture development, modeling and analysis of joint and allied interoperability issues, and demonstration of integrated TAD BMC4I capabilities.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #7 Operational System Development

PE NUMBER AND TITLE: 0207601F - USAF Wargaming and Simulation

PROJECT NO.:

B. Program Change Summary ($ in Thousands)

	PY (FY94)	CY (FY95)	BY1 (FY96)	BY2 (FY97)	TOTAL
Previous President's Budget (95 PB)	11,509	19,110	6,700	6,562	49,543
Appropriated Value	11,509	14,110			
Adjustments to Appropriated Value:					
a. Congressional General Reductions	-680	-517	-38	-38	
b. SBIR		-287			
c. Omnibus or Other Above Threshold Reprog			13,100	19,100	108,600
d. Below Threshold Reprogramming					
Adjustments to Budget Years Since FY95 PB	-680	-5,804	13,062	19,062	
Current Budget Submit/President's Budget	10,829	13,306	19,762	25,624	

Change Summary Explanation:

Funding:

FY94: • $680K is a part of a general reduction directed by Congress

FY95: • Appropriations Committee cut $5M in FY95 due to what they called "an unjustifiably large spike in funding"
• $517K is this PE's portion of misc general reductions (i.e., FFRDC, non-FFRDC, travel, and University Research)

FY96: • TAD BMC4I funding added

FY97: • TAD BMC4I funding added

Schedule: See individual R-2s attached

Technical: See individual R-2s attached

C. Other Program Funding Summary: See individual R-2s attached

D. Schedule Profile: See individual R-2s attached

Cover Exhibit R-2

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #7 Operational System Development

PE NUMBER AND TITLE: 0207601F - USAF Wargaming and Simulation

PROJECT NO.: 1008

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Current	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
National Air and Space Warfare Model (NASM)	10,829	13,306	6,700	6,562	5,662	0	0	0	65,100	108,159

A. Mission Description and Budget Item Justification

This PE provides RDT&E funding for Air Force and Joint wargaming architecture and model development, primarily in support of battlestaff training, education, and military operations. A new wargaming model, NASM, is being developed to replace the existing Air Force standard Air Warfare Simulation (AWSIM). NASM will expand the use and role of M&S in support of operational and acquisition decision making, and increase the interoperability between Air Force and joint efforts.

The PE also includes O&M and Procurement funding entirely for the operation of three Air Force wargaming centers (i.e., the Warrior Preparation Center (WPC), Einsiedlerhof AS, Germany; the Air Force Wargaming Institute, Maxwell AFB, AL; and the USAF Battlestaff Training School (BLUE FLAG), Hurlburt Field, FL). By centralizing O&M and Procurement funding, the Air Force more efficiently manages existing wargaming and simulation resources while ensuring developmental activities are responsive to evolving Air Force, Joint, and DoD Modeling and Simulation (M&S) requirements and capabilities. First year of execution for the PE was FY94. For FY 95/96, the NASM development project consists entirely of RDT&E funds and is completely separate from ongoing O&M for the three wargaming centers.

NASM includes an overall USAF M&S architecture and provides a reusable, portable, scalable, robust distributed core for other simulations. It includes an air combat resolution model to meet the needs of USAF MAJCOMs and Unified/Specified Command air components to train Air Component Commanders and their battle staffs. Primary users will be unified command air components, CINCs, JFACCs, and Service components, as supported by BLUE FLAG and WPC for use in joint exercises involving air, ground, and sea campaigns. NASM is the air component portion of the evolving DoD, Joint Staff and Services Joint Simulation System (JSIMS) initiative.

(U) FY 1994

- (U) Investigate/test higher risk M&S requirements (500)
- (U) Initiate rapid prototyping of M&S architectural elements (4,000)
- (U) Establish a NASM program management office, including USAF change management component (1,320)
- (U) Participate in Joint M&S Architecture development activities (1,000)
- (U) Establish the Joint Simulation System (JSIMS) Joint Program Office (1,000)
- (U) Re-Engineer the Air Warfare Simulation (AWSIM) to increase functionality and bridge into JSIMS (2,509)
- (U) Interface M&S systems to real world C3 and C3I systems (500)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #7 Operational System Development	PE NUMBER AND TITLE: 0207601F - USAF Wargaming and Simulation / PROJECT NO.: 1008

(U) FY 1995
- (U) Continue rapid prototyping of M&S architecture elements (1,000)
- (U) Continue development of NASM prototypes and operate the program management office (2,306)
- (U) Continue to participate in Joint M&S Architecture development activities (1,500)
- (U) Support the Joint Simulation System (JSIMS) Joint Program Office (5,000)
- (U) Continue to Re-Engineer the Air Warfare Simulation into final deliverable system (3,000)
- (U) Expand interfaces of M&S systems and real world C3 and C3I systems (500)

(U) FY 1996
- (U) Begin development of specific air objects to support JSIMS architecture (1,000)
- (U) Begin NASM integration effort and operate the program management office (1,000)
- (U) Continue to participate in Joint M&S Architecture development activities (1,500)
- (U) Support the Joint Simulation System (JSIMS) Joint Program Office (1,700)
- (U) Support/configuration manage the Re-Engineered AWSIM (500)
- (U) Expand interfaces of M&S systems and real world C3 and C3I systems (1,000)

(U) FY 1997
- (U) Continue development of specific air objects to support JSIMS architecture (1,000)
- (U) Continue NASM integration effort and operate the program management office (1,000)
- (U) Continue to participate in Joint M&S Architecture development activities (1,000)
- (U) Support the Joint Simulation System (JSIMS) Joint Program Office (1,862)
- (U) Support/configuration manage the Re-Engineered AWSIM (700)
- (U) Expand interfaces of M&S systems and real world C3 and C3I systems (1,000)

(U) Program to Completion
- (U) Complete NASM integration effort, field, and provide configuration management
- (U) Continue to participate in Joint M&S Architecture development activities
- (U) Support the Joint Simulation System (JSIMS) Joint Program Office
- (U) Support/configuration manage the Re-Engineered AWSIM
- (U) Continue development of specific air objects to support JSIMS and NASM architecture
- (U) This will be a continuing program (must address shortfall in FY98 POM)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #7 Operational System Development

PE NUMBER AND TITLE: 0207601F - USAF Wargaming and Simulation

PROJECT NO.: 1008

B. Program Change Summary ($ in Thousands)

	PY (FY94)	CY (FY95)	BY1 (FY96)	BY2 (FY97)	TOTAL
Previous President's Budget (95 PB)	11,509	19,110	6,700	6,562	49,543
Appropriated Value	11,509	14,110			
Adjustments to Appropriated Value:					
a. Congressional General Reductions	-680	-517			
b. SBIR		-287			
c. Omnibus or Other Above Threshold Reprog					
d. Below Threshold Reprogramming					
Adjustments to Budget Years Since FY95 PB	-680	-5,804			
Current Budget Submit/President's Budget	10,829	13,306	6,700	6,562	43,059

Change Summary Explanation:

Funding: Appropriations Committee cut $5M in FY95 due to what they called "an unjustifiably large spike in funding"

Schedule: $5.804M reduction in FY95 resulted in NASM's inability to perform several rapid prototypes. This did not have a direct impact on the NASM program schedule; however, the program office was unable to participate in several joint M&S architecture development activities

Technical: Technical risk was increased due to the inability to perform several rapid prototypes

Exhibit R-2

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #7 Operational System Development

PE NUMBER AND TITLE: 0207601F - USAF Wargaming and Simulation

PROJECT NO.: 1008

C. Other Program Funding Summary ($ in Thousands)

Appropriation	1994	1995	1996	1997	1998	1999	2000	2001	Total to Completion
O&M (AF 3400)	8,640	11,352	13,414	13,199	13,553	14,229	14,477	14,530	Continuous
Other Procurement (AF 3080)									
834010 Automated Data Proc Equip	683	664	673	701	719	746	768	791	Continuous

(U) Related RDT&E Activities:

- (U) J-MASS is the tri-Service Joint Modeling and Simulation System Program. The program goals include providing the DoD with the structure and software tools necessary to reduce modeling and simulation (M&S) development and operating costs, increase performance and credibility of models, increase responsiveness to user requirements, and decrease duplication.

  J-MASS is an object-oriented modeling system designed to support engineers, model developers, analysts, and decision makers. It implements a series of standards and provides software tools supporting the development, configuration, operation, and analysis of models and simulation at varying levels of complexity and detail. In addition, J-MASS provides a library of verified and validated software components for the model designers to use. J-MASS uses Ada, the DoD standard software language, and an object based design. J-MASS was originally developed for analysis models to support the Test and Evaluation community; however, it is now being investigated as a possible framework for constructive models with multiple resolutions and scalable execution time frames.

- (U) Louisiana Maneuver (LAM) is the Army's pathway of change from acquisition to warfighting. The charter of LAM is to energize and guide the restructuring of the Army while simultaneously keeping it combat ready. LAM is an evaluation vehicle to assess new ideas in real time and shortcut Cold War policy decision methodologies. The Battle Laboratories practice roles and missions to develop and explore options for decision making by senior leaders.

- (U) MAGTF (Marine Air Ground Task Force) Tactical Warfare Simulation (MTWS) is a computer- assisted Command and Control combat training system for use with command post exercise (CPX) and field exercises (FEX). MTWS provides the marine commander and his staff with a realistic combat environment for them to plan and conduct amphibious, ground, and air operations.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #7 Operational System Development	PE NUMBER AND TITLE: 0207601F - USAF Wargaming and Simulation / PROJECT NO.: 1008

- (U) WARSIM 2000 is a replacement of the Corps Battle Simulation (CBS) which provide the warfighters the simulation tools they can use to create realistic operational conditions for training commanders and battle staffs to win the information war. It provides STRICOM with a baseline for technical analysis and program planning. WARSIM 2000 defines the training environment as a complete system of models, hardware, databases, and support. The goals are to link distributed simulations that support joint force training; representations of combat that have been tested and are trusted by the warfighters; and expanding infrastructure of equipment and knowledge for employing simulations.

- (U) Distributed Interactive Simulation (DIS) is a set of standards for linking independently developed simulation systems which include live, virtual, and constructive systems. It defines and describes the Protocol Data Units (PDU). The overall concept of DIS is to support multiple distance location simultaneously; provide a valid, coherent synthetic environment; and support the broadest range of user needs. Primary focus is on connectivity of virtual simulations, with planned extensions to live and constructive simulations.

- (U) ENWGS (Enhanced Navy Wargaming System) is the Navy's standard wargaming model to replace the interim Research, Evaluation, and Systems Analysis (RESA) model. RESA is a research and evaluation tool for systems analysis and testing associated with naval command, control, and communications systems. It is also used for operation plan evaluation, command and control training support for senior officers, joint C3 interoperability assessment, warfare systems architecture analysis, and wargaming support. The domain is naval and air operations with limited land warfare modeling. The focus is on naval battle group/force operations in the theater context.

- (U) Aggregate Level Simulation Protocol (ALSP), an Army led program with multi-service participation to develop and field constructive simulation interface protocols, coordinate Service and Joint Agency simulation enhancements, and provide ALSP system level software to support an integrated multi-function training environment for joint and combined exercises. ALSP will only be used for interim inter-model interoperability with legacy, Joint Service and DoD agency models to comply with the Joint M&S Architecture. NASM will provide a distributed robust core standards-based object communications for new and evolving threats.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #7 Operational System Development

PE NUMBER AND TITLE: 0207601F - USAF Wargaming and Simulation

PROJECT NO.: 1008

D. Schedule Profile

NASM Initial Operational Capability (IOC) 4QFY99
NASM Final Operating Capability (FOC) 4QFY03

NOTE: NASM development schedule coincides with the Joint Simulation System (JSIMS) schedule of IOC in FY99 and FOC in FY03.

Exhibit R-2

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February 1995

BUDGET ACTIVITY: #7 Operational System Development

PE NUMBER AND TITLE: 0207601F - USAF Wargaming & Simulation

PROJECT NO.: 1008

A. Project Cost Breakdown ($ in Thousands)

National Air & Space Warfare Model (NASM)	PY (1994)	CY (1995)	BY1 (1996)	BY2 (1997)
Cost Categories:				
a. Software Development	7,625	9,140	3,384	3,184
b. Contractor Support	2,205	2,292	2,692	2,692
c. Program Management Support	929	1,774	524	586
d. Travel	70	100	100	100
Total	10,829	13,306	6,700	6,562

B. Budget Acquisition History and Planning Information ($ in Thousands)

N/A

C. Funding Profile ($ in Thousands)

N/A

Exhibit R-3

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0207601F USAF Wargaming And Simulation

PROJECT: 4474

COST (*In Thousands*)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
4474 Theater Air Defense BMC4I	0	0	13,062	19,062	19,070	19,100	19,100	19,100	Continuing	TBD

(U) **A. Mission Description and Budget Item Justification**

This project was established in response to a charter from ASD/C3I identifying the Air Force as the Executive Agent for Theater Air Defense Battle Management Command, Control, Communications, Computers, and Intelligence (TAD BMC4I). It supports the study, analysis, demonstration and establishment of integrated TAD BMC4I which fuses and expands on existing capabilities to support the theater CINCs. This project involves defining baseline TAD BMC4I architectures and developing objective architectures; analyzing TAD BMC4I issues in a coordinated Joint Staff/Services/CINCs/Defense Agencies manner; reviewing requirements, programs, systems, architectures, studies, modeling and any associated impacts on TAD BMC4I interoperability; identifying TAD BMC4I shortfalls and proposed solutions; establishing and maintaining a TAD BMC4I requirements database; assessing allied TAD BMC4I issues; and supporting exercises and demonstrations of integrated TAD BMC4I capabilities.

(U) FY 1994
- (U) Not Applicable

(U) FY 1995
- (U) Not Applicable

(U) FY 1996
- (U) Establish and maintain TAD BMC4I requirements database (170)
- (U) Perform initial interoperability reviews for requirements, programs, systems, architectures, modeling affecting TAD BMC4I (2,800)
- (U) Develop and manage baseline TAD BMC4I Integrated Architectures (3,760)
- (U) Conduct studies and analysis on TAD/BMC4I issues for the Joint Oversight Committee (6,162)
- (U) Track and assess Executive Agent activities and produce semi-annual Joint Oversight Committee updates (170)

(U) FY 1997
- (U) Maintain and update TAD BMC4I requirements database (170)
- (U) Perform expanded interoperability reviews for requirements, programs, systems, architectures, modeling affecting TAD BMC4I (4,112)
- (U) Develop and manage interim and objective TAD BMC4I Integrated Architectures (5,528)
- (U) Conduct studies and analysis on TAD/BMC4I issues for the Joint Oversight Committee, including allied interoperability (9,082)
- (U) Track and assess Executive Agent activities and produce semi-annual Joint Oversight Committee updates (170)

Exhibit R-2

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
7 - Operational System Development	0207601F USAF Wargaming And Simulation	4474

(U) **B. Program Change Summary ($ in Thousands)**

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
(U) Previous President's Budget	0	0	0	0	0
(U) Appropriated Value	0	0	13100	19100	TBD
(U) Adjustments to Appropriated Value	0	0	-38	-38	TBD
(U) Current Budget Submit/President's Budget	0	0	13062	19062	TBD

(U) Change Summary Explanation:

Funding: Reduction due to inflation adjustment.

Schedule:

Technical:

(U) **C. Other Program Funding Summary ($ in Thousands):** Not Applicable

(U) **D. Schedule Profile:** Not Applicable

Exhibit R-2

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #7 - Operational Systems Development

PE NUMBER AND TITLE: #0208006F Mission Planning Systems - 3858

PROJECT

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Mission Planning Systems Total Cost	23,546	13,867	20,585	19,386	16,953	16,685	16,760	17,350	Continuing	TBD
Project 3858, Air Force Mission Support System	23,546	13,867	20,585	19,386	16,953	16,685	16,760	17,350	Continuing	TBD

A. (U) Mission Description and Budget Item Justification

The Mission Planning System program was established in 1990 to consolidate mission planning system development efforts into a single unit-level mission planning system. This program maintains and preserves combat capability on old existing "legacy" planning systems which will migrate into a USAF wide standard mission planning system known as the Air Force Mission Support System (AFMSS). AFMSS acquisition strategy leverages military and commercial software integrated on Commercial-Off-The-Shelf (COTS) hardware. AFMSS encompasses evolutionary software and hardware development in an open systems architecture with planned annual software releases. AFMSS is the single unit-level mission planning system supporting all current/future aircraft and associated weapons: A/OA-10, F-15, F-16, F-22, F/EF-111, F-117, JSTARS, AWACS, ABCCC, U-2, AGM-130/GBU-15, TSSAM, JDAM, JSOW, B-1, B-2, B-52, KC-10, KC/EC/RC-135, C-5, C-17, C-141, MH/AH-6, MH-47, MH-53, MH-60, and C/AC/EC/MC-130. AFMSS is currently being fielded by the USAF and is in daily use by the US Special Operations Command (USSOCOM). In addition, AFMSS was recently selected by the US Army as their aviation mission planning system starting in FY95.

Mission Planning Systems is in the Operational Systems Development research category. The Mission Planning Systems program currently supports deployed AFMSS Block A and B systems. AFMSS Block C1.0 software is currently being operationally fielded to the Combat Air Forces (CAF). Subsequent AFMSS Block C software releases and systems, including a portable laptop workstation, are in engineering and manufacturing development with production imminent.

The AFMSS program is managed by the Directorate for Mission Planning Systems, Electronic Systems Center, Hanscom AFB, Massachusetts. Contractor for the AFMSS projects is Lockheed Sanders, Nashua, New Hampshire. In-house (Government) work is performed by Oklahoma City-Air Logistics Center (OC-ALC), Tinker AFB, Oklahoma, Sacramento Air Logistics Center (SM-ALC), McClellan AFB, Sacramento, California, Warner Robins Air Logistics Center, (WR-ALC), Warner Robins AFB, Georgia, and Ogden Air Logistics Center (OO-ALC), Hill AFB, Utah.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE February 1995
BUDGET ACTIVITY #7 Operational Systems Development	PE NUMBER AND TITLE #0208006F Mission Planning Systems - 3858 PROJECT NO.

A. Mission Description and Budget Item Justification

(U) FY 1994

- (U) The FY94 RDT&E program reflected the funding required to meet continuing ACC, AMC, and USSOCOM multistage requirements for Air Force Mission Support System (AFMSS) core functions (strike, air drop and air delivery planning, air refueling, special operations and combat rescue) to support Air Force airlift, bomber, electronic combat, fighter, rescue, tanker aircraft, and USSOCOM aviation assets; continuing development of C2.0 and initiating development of C3.0 software; and integrating additional aircraft/weapons/electronic system mission planning modules. Additionally, the US Army agreed on 29 Jul 94 to use AFMSS as the core software for Army Aviation Mission Planning Systems (AMPS).
- (U) Began integration of B-1, B-52, F-15, F-16, F-111, C-5, C-141, AGM-130, and MH-60 mission planning modules. Began module development for RC-135 and MH/AH-6. Completed module development for A/OA-10, C-17, C-130, E-3B/C/D, KC-135. ($2,151)
- (U) Continued AFMSS Block C1.0 software development; resolved testing deficiencies with release scheduled for early 95. ($5,795)
- (U) AFMSS Block C2.0 software development continued. ($11,900) (continuing)
- (U) Began AFMSS Block C3.0 design, to include: enhanced air drop and air refueling; expanded weapons and delivery tactics planning; initial interoperability with Navy mission planning systems; initial nuclear weapons delivery; add Common Low Observable Autorouter (CLOAR); add full Small Computer System Interface (SCSI-2) interface. ($ 500)
- (U) Began development of Data Transfer Unit Cartridge (DTUC) processing and loading, mission materials production, and developed associated for B-52. ($2,100)
- (U) Awarded contract to Logicon for development of B-1 specific A/W/E software module. ($1,100)
- (U) Started integration efforts of AFMSS with US Army aviation requirements. ($ 700- US Army funded)

(U) FY 1995 Planned Program

- (U) AFMSS Block C3.0 software development continues. ($1,389) (continuing)
- (U) AFMSS Block C2.0 software development continues with release rescheduled for no earlier than Oct 95. ($4,895)
- (U) Complete integration of B-52, F-15A/B/C/D, F-16, F-111, C-5, C-141, AGM-130, and MH-60 planning modules. Begin development of the Tri-Command (TRICOMS) to AFMSS interface. Complete module development for RC-135, MH/AH-6, and C-17 with Data Transfer Device (DTD). Begin integration of MH/AH-6, MH-47, MH-60, F-117, and EF-111. ($3,483)
- (U) Acquire and begin deployment of Portable Mission Planning System (PMPS). ($ 800)
- (U) AFMSS Block C4.0 requirements definition begins: composite strike planning; enhanced nuclear delivery planning; support for electronic jamming and air defense suppression; initial air-to-air planning; integration in Theater C4I; interoperability with Army /Navy mission planning systems. ($ 500)
- (U) Continue B-52 unique planning efforts and DTUC capability. ($200)
- (U) Continue B-1B unique planning efforts and DTUC capability. ($2,600)
- (U) Continue integration of US Army Aviation mission planning module on AFMSS. (TBD - Army funded) (continuing)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: January 1995
BUDGET ACTIVITY: #7 Operational Systems Development	PE NUMBER AND TITLE: #0208006F Mission Planning Systems - 3858 — PROJECT NO.

A. (U) Mission Description and Budget Item Justification - Continued

(U) FY 1996 Planned Program

- (U) AFMSS Block C3.0 software development continues with release scheduled for Sep 96. ($7,300)
- (U) AFMSS Block C4.0 software development continues. ($6,785)
- (U) AFMSS Block C5.0 software design begins: full air-to-air capability; enhanced Composite Strike Package planning; enhanced weaponeering and weapons delivery planning, with full support for Precision Guided Munitions and autonomous weapons; enhanced nuclear delivery planning, further support for electronic jamming and air defense suppression; complete integration with Theater C4I; further interoperability with Navy unit level mission planning system. ($1,500)
- (U) Begin integration of F-16 and AGM-130. Continue integration of MH/AH-6, MH-47, MH-60, F-117, and EF-111. ($2,000)
- (U) Continue AFMSS software and hardware enhancements to satisfy A/OA-10, F-15, F-16, F-22, F-111, F-117, JSTARS, AWACS, ABCCC, AGM-130/GBU-15, TSSAM, JDAM, JSOW, B-1, B-2, B-52, KC-10, KC/EC/RC-135, C-5, C-17, C-141, MH-47, MH-53, MH-60, U-2, and C/AC/EC/MC-130 requirements. ($3,000)
- (U) Continue integration of Army module on AFMSS (Army funded)

(U) FY 1997 Planned Program

- (U) AFMSS Block C4.0 software development continues, with release scheduled for Sep 97. ($6,900) (Oct 96)
- (U) AFMSS Block C5.0 software development continues. ($6,686)
- (U) Begin integration of B-2, JSTARS, and U-2. Continue integration of F-16 and AGM-130. Complete integration of MH/AH-6, MH-47, MH-60, F-117, and F/EF-111. ($2,000)
- (U) Continue AFMSS enhancements to support A/OA-10, F-15, F-16, F-22, F/EF-111, F-117, JSTARS, AWACS, ABCCC, AGM-130/GBU-15, TSSAM, JDAM, JSOW, B-1, B-2, B-52, KC-10, KC/EC/RC-135, C-5, C-17, C-141, MH/AH-6, MH-47, MH-53, MH-60, U-2, and C/AC/EC/MC-130, requirements. ($3,800)

(U) Acquisition, Management, and Contracting Strategies

In accordance with the concept of evolutionary development, AFMSS capabilities are being delivered through annual system software releases (C1.0 through C5.0) over a 5-year period, FY94 through FY98. Versions C1.0 and C2.0 are defined in detail in AFMSS Block C System and Segment Specifications and have been implemented through options in a basic contract addressing immediate operational requirements. Longer term AFMSS requirements are described in general terms in the AFMSS System Specification but will need further definition at the segment level, prioritization and allocation to specific software releases. Versions C3.0 through C5.0, therefore, will be acquired by contract modification, following requirements analysis/rapid prototyping and content scoping for each increment.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: January 1995

BUDGET ACTIVITY: #7 Operational Systems Development

PE NUMBER AND TITLE: #0208006F Mission Planning Systems - 3858

PROJECT NO.

A. (U) Mission Description and Budget Item Justification - Continued

(U) Acquisition, Management, and Contracting Strategies - Continued

Block C, as structured, best meets the need for evolutionary software development, system growth, system integration, and the acquisition of additional subsystems and components. Block C minimizes risk, capitalizing fully on combined Government and contractor experience in developing, testing, and producing AFMSS Block B. Competition was limited for the award of the basic Block C contract to the Block B development contractors. Subsequent Block C Versions (3.0 through 5.0) will be acquired either on a sole source basis from the selected contractor, Lockheed Sanders, or through a full and open source selection.

B. (U) Program Change Summary ($ in Thousands)

	Totals FY94	Totals FY95	FY96	FY97	Total
Previous President's Budget	24,249	14,483	19,714	17,967	76,413
Appropriated Value	24,249	14,483			
Adjustments to Appropriated Value	(changes apply to prior and current year only)				
a. General Congressional Reductions	-243	-313			
b. Below Threshold Reprogramming	-86	-4			
c. Small Business Innovative Research (SBIR)	-374	-299			
Adjustments to Budget Years Since FY95 PB			871	1,419	
Current Budget Submit/President's Budget	23,546	13,867	20,585	19,386	TBD

Change Summary Explanation:

Funding: FY94 and FY95 funding reduced due to Congressional adjustments: SBIR, Federally Funded Research & Development Centers (FFRDC) and Non-FFRDC. Mission planning efforts for the B-52 and B-1 were previously accomplished under PE 11313F, Strategic War Planning System (SWPS) and consolidated under PE 0208006F in FY94. There was no change in scope for these efforts.

Schedule: Annual software releases realigned for September of each year. C1.0 software release rescheduled from Sep 94 to Jan 95 to fix testing deficiencies. This delay has rippled into the delivery schedule for C2.0. The C2.0 software release is being re-evaluated with an anticipated six month schedule delay. There should be little to no funding impacts however.

Technical: B-52/B-1 AFMSS integration realigned by six months to resolve problems with software module development done by Oklahoma ALC. AFMSS C1.0 software release is awaiting ACC Director of Operations approval for release following Air Warfare Center testing.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #7 Operational Systems Development

PE NUMBER AND TITLE: #0208006F Mission Planning Systems - 3858

PROJECT NO.: 3858

C. (U) Other Program Funding Summary ($ in Thousands)

	Totals 1994	Total 1995	1996	1997	1998	1999	2000	2001	Compl	Cost
Other Procurement, AF, 28006F	20,061	23,407	20,382	18,842	18,760	18,854	17,557	18,165	Cont	TBD
AFMSS procurement comes under BPAC 833040, Theater Air Control System Improvement (TACSI)										
Operations & Maintenance,28006F	22,688	21,857	20,196	23,231	20,527	21,281	20,742	20,666	Cont	TBD

O&M funds (3400) for PE 28006F support the software and hardware maintenance costs of AFMSS. These funds also support the maintenance of the following existing operational systems until replaced by AFMSS. Mission Support System II (MSS IIA) supports existing combat capability for the F-15, F-16, F/RF-4, and F-111 aircraft mission planning. Mission Data Preparation System (MDPS) supports conventional and nuclear mission planning, aircraft/weapons avionics loading, compatibility between evolving B-1B, B-52H avionics, their weapons systems, and USSTRATCOM. Conventional Mission Planning and Production System (CMPPS) supports near-term B-52/TSSAM mission planning requirements.

There is no other related RDT&E activities for unit level mission planning in the USAF. Over 40 individual aircraft and weapons programs develop their respective software that is used in conjunction with the AFMSS core software. The aircraft and weapons software is a complimentary, synergistic effort that provides specific aircraft and weapons information and functionality to the core AFMSS software. The combined software gives the warfighter the full spectrum of mission planning and combat capabilities for their aircraft or weapon.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: 3600 #7 - Operational Systems Development

PE NUMBER AND TITLE: #0208006F Mission Planning Systems - 3858

PROJECT NO.

D. (U) Schedule Profile

	1994				1995				1996				1997			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
AFMSS Block B Workstation Deliveries		X	X	X												
AFMSS Block C1.0 Development	X	X	X													
AFMSS Block C1.0 Software Release						X										
AFMSS Block C Workstation Deliveries						X	X	X	X	X	X	X	X	X	X	X
AFMSS Block B Operational Assessment			X	X												
AFMSS/Army Development and Integration					X	X	X	X	X	X	X	X	X	X	X	X
AFMSS Block C2.0 Development	X	X	X	X	X	X	X									
AFMSS Block C2.0 Engineering Software Releases					X	X										
AFMSS Block C2.0 FQT							X									
AFMSS Block C2.0 Software Release									X							
AFMSS Portable Deliveries Begin								X	X	X	X	X	X	X	X	X
AFMSS Block C OT&E (Estimate)							X	X								
AFMSS Block C3.0 Software Development				X	X	X	X	X	X	X	X					
AFMSS Block C3.0 Engineering Software Releases									X	X						
AFMSS Block C3.0 FQT											X					
AFMSS Block C3.0 Software Release												X				
AFMSS/Navy Mission Planning Integration								X	X	X	X	X	X	X	X	X
AFMSS Block C4.0 Task Requirement Notice Turn-on							X									
Contract Modification Award										X						
System Requirement Review											X					
AFMSS Block C4.0 Software Development								X	X	X	X	X	X	X	X	
AFMSS Block C4.0 Engineering Software Release													X			
AFMSS Block C4.0 FQT															X	
AFMSS Block C4.0 Software Release																X
AFMSS Block C5.0 Software Development												X	X	X	X	X

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February 1995

BUDGET ACTIVITY: #7 Operational Systems Development

PE NUMBER AND TITLE: #0208006F Mission Planning Systems - 3858

PROJECT NO.: 3858

A. (U) Project Cost Breakdown ($ in Thousands)

	1994	1995	1996	1997
Primary Software Development	14,146	4,767	14,685	13,686
Aircraft/Weapons/Electronics (A/W/E) Development Support	4,800	5,500		
Systems Engineering	1,800	1,800	3,600	3,400
Program Management	1,300	900	900	1,000
Miscellaneous	1,500	900	1,400	1,300
Total	23,546	13,867	20,585	19,386

B. (U) Budget Acquisition History and Planning Information: Not Applicable.

C. (U) Funding Profile: Not Required.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: Budget Activity 7 - Operational Systems Support

PE NUMBER AND TITLE: 028021F Electronic Combat Support

PROJECT NO.: 0374

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
PROJECT 0374: C3 PROTECTION/MULTI-MISSION, TECHNOLOGY AND SUPPORT									CONT	TBD

A. (U) Mission Description and Budget Item Justification This program conducts advanced development research and demonstration/validation where existing technology is applied to field requirements. This program studies and develops IW/C2W prototypical systems to provide warning, self protection, and support to personnel and equipment against combat systems employed by enemy forces. It identifies existing military and commercial research and development efforts which can satisfy unfulfilled operational requirements as identified by the Unified Commands, and quickly bridge the gap between technology developments and meld the technology into the warfighter's operational requirements. The Secretary of Defense identified the need for this capability in 1983, and with unanimous approval of the services and the Unified Commands, JCS made this function a part of the Joint Command and Control Warfare Center (JC2WC) mission (formerly the Joint Electronic Warfare Center (JEWC). The Air Force as executive agent is responsible for the total funding of this effort.

(U) FY 1994

- (U) Off Board Balloon Jamming System; free flight,inflation,extraction,and mass properties tests completed ($105)
- (U) Continued development of four IW/C2W (Comm EA & ES, NonComm Electronic Attack & Electronic Support (EA&ES) payloads for UAV short range platform
- (U) Began development of a INFORMATION DELETED for use by USSOCOM forces
- (U) Developing prototype INFORMATION DELETED training device for USSPACECOM
- (U) Developing Situational Awareness Beacon with Reply (SABRE) for USSPACECOM,USN and Joint Combat ID project Office ($410)
- (U) Developed and tested INFORMATION DELETED device for use during military operations
- (U) Field tested a Communications EA training system for the U.S. Army Intelligence and Security Command (INSCOM)
- (U) With Naval Research Laboratory, developed chaff cartridges for Air Mobility Command,that have significantly reduced visual pyrotechnic signature and enhanced dipole dispersal (no FY 94 $)
- (U) Verifying electromagnetic radiation pattern for the Mobile Communications Countermeasures System prototype for U.S. Army and USMC ($2)

(U) FY 1995 PLANS

- (U) Complete development and testing of Off Board Balloon Jammer (no FY95$)
- (U) Continued development and demonstration bench testing of the four IW/C2W payloads for the UAV Short Range Platform ($140 FY 95$)
- (U) Development of INFORMATION DELETED (piggybacked on INFORMATION DELETED device development in FY94)
- (U) Develop, integrate and test man portable, frequency hopping EA system
- (U) Develop small vehicle mounted Battlefield Surveillance Radar Warning Receiver for use by USACOM Forces
- (U) Flt demos of C2W payloads for Tactical Endurance UAV at U.S.Army Electronic Proving Grounds and Naval Air Warfare Center ($350 FY 95$)
- (U) Development of high power radio frequency emitter for use by USSOCOM ($100)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: Budget Activity 7 - Operational Systems Support

PE NUMBER AND TITLE: 028021F Electronic Combat Support

PROJECT NO.: 0374

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
PROJECT 0374: C3 PROTECTION/MULTI-MISSION, TECHNOLOGY AND SUPPORT									CONT	TBD

(U) FY 1995 Plans Cont.

(U) (Complete development and conduct demos of the Situational Awareness Beacon with Reply (SABRE) beacon.

(U) Complete development and user demos of low visibility/increased dispersal pattern chaff cartridges.

(U) Investigate the development of GPS based reference emitter assemblies for use in precision geolocation enhancements in support of USSPACECOM and Navy Director of Space and Electronic Warfare .

(U) Investigate technologies used in IW/C2W applications including Psyops,Destruction, Deception, EW, and OPSEC

(U) Continue to investigate technologies to support contingencies, low-intensity conflict and special operations forces

(U) Continue investigating latest in Electro-Optics and Infrared technologies and warning systems

(U) FY 1996- 1997 Plans

(U) Continue development of INFORMATION DELETED System

(U) Continue development of the high power radio frequency emitter started in FY 95

(U) The Center will continue to bridge the gap between the lab, the operator, and business in order to introduce cutting edge technology to the field and fleet through rapid prototyping, briefings and demonstrations of state of the art equipment currently underdevelopment. The primary means to accomplish this will be through the sponsorship of symposia and use of electronic data transfer. Efforts will be directed at taking advantage of commercialization of products traditionally thought of as defense related, i.e. MMIC and ASIC chips currently being used in civilian applications

(U) Work performed by: The Joint Command and Control Warfare Center at Kelly AFB TX performs independent studies and analysis leading to development of Pre-Milestone Zero prototypes for field demonstrations and operations. When technology is available in Service and Industry labs, the JC2WC arranges for the development of a prototype and field demonstration of the prototype. Laboratories include Phillips Lab at Hanscom AFB MA, and Kirtland AFB NM, The Naval Research Lab, Washington DC. When required technologies are not available within DOD, JC2WC manages contractual efforts to produce, test and demonstrate prototypes. The Center also facilitates the exchange of information between the operators in the fleet and field and the laboratories, industry and Service program managers. The JC2WC currently has an Engineering Support Contract with Southwest Research Institute (SwRI), San Antonio TX, to perform engineering analysis and design,studies,reports,systems integration,fabrication,and software development. The JC2WC also maintains Cooperative Research and Development Agreements (CRDAs) with Lockheed-Fort Worth,Lockheed-Sanders, and American Electronics Laboratories. Under JC2WC leadership the government and contractor labs work to deliver products that support the warfighting CINCs and address operational IW/C2W shortfalls.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT NO.
Budget Activity 7 - Operational Systems Support	028021F Electronic Combat Support	0374

B.(U) Program Change Summary ($ in Thousands)

	1994	1995	1996	1997	Total Cost
Previous President's Budget					TBD
Appropriated Value					TBD
Adjustments to Appropriated Value					
a. BTR					
b. Inflation					
c. Non FFRDC					
d. FFRDC					
e. Congressional Adj. Def Wide					
Current Budget Submit/President's Budget					TBD

Change Summary Explanation:
Funding: This is a Level of Effort program; RDT&E funds in this PE have decreased in recent years due to fiscal constraints

C.(U) Other Program Funding Summary
(U) JC2WC/OT programs support services and joint electronic combat (EC) program
(U) JC2WC/OT builds upon technologies demonstrated in PE 0604270F, EW Development, and other services related PE's
(U) Technology development is related to that being developed in the following PE's : PE 0603711A, Aircraft Survivability Equipment, PE 00603718A, Vulnerability Susceptibility; PE 0603755A,Tactical ECM Systems ands PE 0603214N, Tactical C3 Countermeasures.
(U) There is no unnecessary duplication of effort within the Air Force or Department of Defense(U) Other Appropriations Funds ($ in Thousands) : not applicable.

D.(U) Schedule Profile

Not Applicable
- This is a Quick Reaction Capability (QRC) program designed to satisfy combatant CINC requirements for IW/C2W capabilities not in current inventories.
- Time between notification of CINC requirement and demonstration of technology/prototype vary from one month to a year.

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February 1995

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT NO.
Budget Activity 7 - Operational Systems Support	028021F Electronic Combat Support	0374

A.(U) Project Cost Breakdown ($ in Thousands)

	1994	1995	1996	1997
Systems Engineering				

B.(U) Budget Acquisition History and Planning Information ($ in Thousands)

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to 1994	Budget 1994	Budget 1995	Budget 1996	Budget 1997	Budget to Complete	Total Program
Product Development Organizations											
Southwest Research Institute	C FP	31 Aug 93			0						
Northrop	C FP	1 Jun 87									
Lockheed Sanders	SS FP	2QFY95			0						
Joint Command and Control Warfare Center (JC2WC) (Prgm Admin.)											
Support and Management Organizations Not Applicable											
Joint Command and Control Warfare Center (JC2WC) Kelly AFB TX											
Test and Evaluation Organizations Not Applicable											

B.(U) Budget Acquisition History and Planning Information Continued ($ in Thousands)

Government Furnished Property: Not Applicable

C.(U) Funding Profile ($ in Thousands) Not Applicable

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0208060F Theater Missile Defense

COST (*In Thousands*)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	16100	26434	25102	22986	46930	47851	49251	50893	0	0
4478 Command, Control, Communications, Computers, and Intelligence Enhancements *	7300	12350	12590	13690	27600	28170	28811	29458	TBD	TBD
4479 Attack Operations Concept Development *	8,800	14,084	12,512	9,296	19,330	19,681	20,440	21,435	TBD	TBD

(U) A. **Mission Description and Budget Item Justification**

Air Force Theater Missile Defense is focused in three areas: Command, Control, Communications, Computers and Intelligence enhancements, Attack Operations concept development, and development of the Airborne Laser Demonstrator. This program element is concerned with C4I and Attack Operations. Enhancements to key C4I assets is closely related to improvement in Attack Operations. C4I improvements also contribute greatly to the effectiveness of the TMD systems of other Services (Patriot, THAAD, etc.), as well as provide greater efficiency for all the CINCs' forces. C4I includes connectivity, interoperable data links, battle management, command and control timelines, cuing schemes, decision aids, mission planning tools and integration of assets within the Air Force and among the Services. Attack Operations focuses on improving the ability to locate, identify, target and destroy theater missiles and supporting infrastructure on the ground. Attack Operations is concerned with the theater missile threat in production, deployment, prior and during launch as well as soon after launch before critical mobile targets are able to egress to hide locations. The foundation for Attack Operations is improved C4I and Automatic Target Recognition (ATR) upgrades to one or more airborne platforms (Joint STARS, F-15, U-2). The Air Force program is based upon taking our defense against the growing theater missile threat to the enemy by making near-term modifications to existing theater assets. The TMD program is concerned with improvements to existing operational capability, evaluating and demonstrating prototypes as well as simulated modifications during operational concept demonstrations. The budget activity is Operational System Development (7), due to the close interaction between operational systems and TMD upgrades.

(U) **Acquisition Strategy:** HQ ASC will provide program management for the concept exploration of TMD Attack Operations. ASC will conduct lab experiments with Wright Labs, simulations of theater scenarios with the Theater Air Command and Control Simulation Facility (TACCSF) at Kirtland AFB, NM and support CONOPS and requirements definition by demonstrating measures of effectiveness for various sensor improvements and cuing schemes. HQ ESC will provide program management for Command, Control, Communications, Computers, and Intelligence (C4I) Enhancements. Prototypes and analysis of improvements to existing C4I assets will compliment the Attack Operations effort with combined participation in Operational Concept Demonstrations. TMD requirements and proposed material solutions will continue beyond concept exploration in the appropriate program element for an upgrade of a particular system. For example, the TMD demonstration and requirements analysis for Joint STARS Automatic Target Recognition (ATR) may transition into a Joint STARS P3I effort within the Joint STARS program element.

*FY94 TMD tasks were funded in PE27411F and PE63617F

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0208060F Theater Missile Defense

(U) **B. Program Change Summary ($ in Thousands)**

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
(U) Previous President's Budget	*21600	79302	80022	79126	TBD
(U) Appropriated Value	*16400	27302			
(U) Adjustments to Appropriated Value					
a. Congressional Reduction	-79	-298			
b. Small Business Innovative Research	-221	-570			
(U) Current Budget Submit/President's Budget	16100	26434	25102	22986	TBD

* FY94 TMD tasks were funded in PE27411F and PE63617F

(U) Change Summary Explanation:

Funding: FY94 TMD funding was provided by PE27411F and PE63617F. The major change to Air Force TMD is the elimination of funds for the Kinetic Energy Air Launched Interceptor. The Air Force effort to conduct a near-term demonstration of a boost phase intercept of a theater missile target was delayed by budget cuts and acquisition strategy agreements. The effort was to develop a contingency capability to provide the CINCs' greater options during theater conflicts. As the schedule and scale of the program changed, the benefits were outweighed by the more robust Airborne Laser Demonstrator effort (funded in PE63319F). The ABL demonstrator cost and schedule was not much more than that of the proposed Kinetic Energy approach. In addition, funding for the Joint STARS automatic target recognition demonstration have been reduced. The program element provides funds for lab analysis, trade studies, and F-15 ATR demonstration. The goal is to define the correct combination of platforms (Joint STARS, U-2, F-15, UAVs , etc.) which provide complete coverage of prepared target areas, and upgrade these platforms with ATR. The ability to locate and identify theater missile targets is paramount to successful TMD as well as essential to improved overall combat capability.

Schedule: N/A

Technical: Joint STARS ATR demonstration will take place as a Wright Labs experiment/demonstration as opposed to an actual flight demonstration due to funding restraints.

(U) **C. Other Program Funding Summary ($ in Thousands)**: None.

(U) **D. Schedule Profile**: See project schedules.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0208060F Theater Missile Defense

PROJECT: 4478

COST (*In Thousands*)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
4478 Command, Control, Communications, Computers, and Intelligence Enhancements	7,300	12,350	12,590	13,690	27,600	28,170	28,811	29,458	TBD	TBD

(U) A. Mission Description and Budget Item Justification

C4I has received very little TMD funding to date. An Intelligence Support Plan and analysis of the unique C4I capabilities needed to conduct effective Offensive Counter-Air (Attack Ops) and Defensive Counter Air (Active Defense) against the theater missile threat have recently identified specific enhancements. These enhancements are intended to ensure that theater interoperability, battle management and Command and Control timelines are improved for the theater CINC.

U) FY 1994
- (U) Upgrade and support Theater Air Command and Control Simulation Facility (TACCSF) operations for C4I simulation and analysis. ($5200)
- (U) Continue upgrade of the MCE/TPS-75 with a hardware/software prototype to provide missile tracking capability to four radars. ($2100

(U) FY 1995
- (U) Continue support for Theater Air Command and Control Simulation Facility (TACCSF) operations for C4I simulation and analysis. ($5500)
- (U) Integration of results of the TMD Intelligence Support Plan into C4I CONOPS and requirements definition. ($250)
- (U) Continue upgrade of the MCE/TPS-75 missile tracker prototype. ($6600)

(U) FY 1996
- (U) Continue support for Theater Air Command and Control Simulation Facility (TACCSF) operations for C4I simulation and analysis. ($5400)
- (U) Continued development and integration of TMD Intelligence Support Plan into C4I requirements. ($250)
- (U) Continue upgrade of the MCE/TPS-75 missile tracker prototype. ($6200)
- (U) Define and integrate C4I requirements into existing C4I upgrades. ($750)

(U) FY 1997
- (U) Continue TACCSF operations support for C4I simulation and analysis. ($6200)
- (U) Continue development and integration of TMD Intelligence Support Plan into C4I requirements. ($250)
- (U) Develop and demonstrate JTIDS TADIL-J Range Extention prototype to support TMD connectivity. ($3200)
- (U) Complete upgrade of the MCE/TPS-75 missile tracker prototype. ($3300)
- (U) Continue integration of C4I requirements into existing C4I upgrades ($740)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0208060F Theater Missile Defense

PROJECT: 4478

(U) **B. Program Change Summary ($ in Thousands)**

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
(U) Previous President's Budget	*12500	12350	12590	13690	TBD
(U) Appropriated Value	*7300	12350	TBD	TBD	TBD
(U) Adjustments to Appropriated Value					
a. Small Business Innovative Research	0	0			
b. Congressional Reductions	0	0			
(U) Current Budget Submit/President's Budget	7300	12350			TBD

* FY94 TMD tasks were funded in PE27411F and PE63617

(U) Change Summary Explanation: None.

(U) **C. Other Program Funding Summary ($ in Thousands)**: None.

(U) **D. Schedule Profile**

	FY 1994				FY 1995				FY 1996				FY 1997			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Intelligence Support Plan Report			X				X				X				X	
CRC TMD Prototype IOC/FOC											X		X			

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0208060F Theater Missile Defense PROJECT 4478

(U) A. Project Cost Breakdown ($ in Thousands)

	FY 1994	FY 1995	FY 1996	FY 1997
(U) TACCSF	*5200	5500	5400	6200
(U) Intelligence Support Plan Integration	0	250	250	250
(U) JTIDS Relay Prototype	0	0	0	3200
(U) CRC TMD Prototype	*2100	6600	6200	3300
(U) Distributed Battle Management Simulation and Analysis	0	0	740	740
(U) Total	*7,300	12,350	12,590	13,690

*FY94 TMD tasks were funded in PE27411F and PE63617F

(U) B. Budget Acquisition History and Planning Information ($ in Thousands)

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1994	Budget FY 1994	Budget FY 1995	Budget FY 1996	Budget FY 1997	Budget to Complete	Total Program
Product Development Organizations											
Martin Marietta						4300	4800	4700	5478	TBD	TBD
Westinghouse		Feb 95				0	4600	2210	2750	0	9,560
HQ ESC						960	1450	2280	3090	TBD	TBD
Support and Management Organizations											
FFRDC						840	765	1963	1600	TBD	TBD
Non-FFRDC						1200	735	1437	772	TBD	TBD
Test and Evaluation Organizations											
TBD											

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0208060F Theater Missile Defense

PROJECT: 4479

COST (*In Thousands*)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
4479 Attack Operations Concept Development	8,800	14,084	12,512	9,296	19,330	19,681	20,440	21,435	TBD	TBD

(U) A. Mission Description and Budget Item Justification

Improvements in Attack Operations are based on improving the ability to locate, identify and destroy theater missiles and associated infrastructure on the ground. In addition to the enhancements to C4I, Attack Operations project focuses on sensor capabilities and CONOPS and requirements development for TMD offensive counter-air. Automatic target recognition (ATR) upgrades to Joint STARS, F-15, and potentially U-2 and UAVs are analyzed in demonstrations and simulation during Operational Concept Demonstrations and CINCs' Experiments. The optimum set of sensor improvements will be proposed as P3I upgrades to within existing program elements.

(U) FY 1994
- (U) Began requirements analysis for Joint STARS ATR Demonstration. ($1600)
- (U) Conducted Operational Concept Demonstrations at White Sands Test Range. ($2200)
- (U) Explored sensor technologies and began prototyping for Automatic Target Recognition upgrades. ($3900)
- (U) Began requirements analysis for F-15 ATR Demonstration. ($1100)

(U) FY 1995
- (U) Continue prototype development of Joint STARS Automatic Target Recognition (ATR) Demonstration. ($4800)
- (U) Conduct Operational Concept Demonstrations with Roving Sands Exercise. ($2598)
- (U) Continue analysis of Attack Operations Sensor capabilities for CONOPS and requirements definition. ($2482)
- (U) Continue prototype development of F-15 Automatic Target Recognition (ATR) Demonstration. ($4202)

(U) FY 1996
- (U) Continue prototype analysis of Joint STARS Automatic Target Recognition (ATR) Demonstration. ($218)
- (U) Conduct Operational Concept Demonstration with Roving Sands Exercise. ($3480)
- (U) Continue analysis of Attack Operations Sensor improvements. ($3050)
- (U) Continue prototype development of F-15 Automatic Target Recognition (ATR) Demonstration. ($5764)

(U) FY 1997
- (U) Conduct demonstration of Joint STARS Automatic Target Recognition prototype. ($1190)
- (U) Conduct Attack Operations Operational Concept Demostration. ($3870)
- (U) Continue Analysis of Sensor prototypes and Attack Operations simulations. ($2996)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY: 7 - Operational System Development	PE NUMBER AND TITLE: 0208060F Theater Missile Defense — PROJECT: 4479

– (U) Conduct demonstration of F-15 Automatic Target Recognition prototype. ($1240)

(U) **B. Program Change Summary ($ in Thousands)**

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
(U) Previous President's Budget	*9100	14952	12512	9296	TBD
(U) Appropriated Value	*9100	14952	TBD	TBD	TBD
(U) Adjustments to Appropriated Value					
a. Small Business Innovative Research	-221	-570			
b. Congressional Reductions	-79	-298			
(U) Current Budget Submit/President's Budget	8800	14084	12512	9296	TBD

* FY94 TMD tasks were funded in PE27411F and PE63617F

(U) Change Summary Explanation:

Funding: Sensor analysis for improved Attack Operations was reduced in funding; delaying the completion of requirements definition.

Schedule: See table below.

Technical: Data collected during the Operational Concept Demonstrations will not be completely analyzed by HQ ASC. Delays in Flight demonstrations are expected.

(U) **C. Other Program Funding Summary ($ in Thousands)**: None.

(U) **D. Schedule Profile**

	FY 1994				FY 1995				FY 1996				FY 1997			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Joint STARS ATR Lab Experiment								X					X			
Operational Concept Demonstration			X				X				X				X	
F-15 ATR Demonstration							X					X				

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0208060F Theater Missile Defense

PROJECT: 4479

(U) **A. Project Cost Breakdown ($ in Thousands)**

	FY 1994	FY 1995	FY 1996	FY 1997
(U) Joint STARS ATR Demonstration	*1600	4800	218	1190
(U) Operational Concept Demonstration	*2200	2598	3480	3870
(U) Sensor Applications	*3900	2482	3050	2996
(U) F-15 ATR Demonstration	*1100	4204	5764	1240
(U) Total	*8,800	14,084	12,512	9,296

*FY94 TMD tasks were funded in PE27411F and PE63617F

(U) **B. Budget Acquisition History and Planning Information ($ in Thousands)**

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1994	Budget FY 1994	Budget FY 1995	Budget FY 1996	Budget FY 1997	Budget to Complete	Total Program
Product Development Organizations											
Boeing		Aug 94				391	750	0	0	TBD	TBD
Hughs		Aug 94				500	200	3900	0	TBD	TBD
Martin/Loral		Mar 95				0	400	0	0	TBD	TBD
MDA		Mar 95				0	1060	2200	1240	TBD	TBD
Norden		Sep 94				490	0	0	0	TBD	TBD
SEMCO		Feb 95				0	200	400	100	TBD	TBD
TBD		Sep 95				0	100	100	100	TBD	TBD
Wright Lab	AF FM 616	Mar 95				0	500	0	0	TBD	TBD
HSC/AL	AF FM 616	Aug 94				975	1495	2000	2297	TBD	TBD
Sandia Nat. Labs	MIPR	Mar 94				3786	4800	0	1190	TBD	TBD

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0208060F Theater Missile Defense

PROJECT: 4479

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1994	Budget FY 1994	Budget FY 1995	Budget FY 1996	Budget FY 1997	Budget to Complete	Total Program
Support and Management Organizations											
FFRDC						400	357	82	648	TBD	TBD
Non-FFRDC						191	280	0	355	TBD	TBD
HQ ASC						0	200	0	200	TBD	TBD
Test and Evaluation Organizations											
28 Test/Txt		Mar 95				16	0	0	0	TBD	TBD
AFSAA	AF FM 616	Feb 95				0	360	300	300	TBD	TBD
Eglin-46Test Wing		May 94				2051	3382	4130	3866	TBD	TBD

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: 7 - Operational Systems Development

PE NUMBER AND TITLE: 0303110F Defense Satellite Communications System

PROJECT NO.: 2638

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	19,857	14,187	32,555	26,693	11,580	7,425	6,719	6,649	10,000	629,334

A. (U) Mission Description and Budget Item Justification

DSCS is the backbone of the Government's satellite communications system, providing both secure voice and high data rate transmissions. DSCS 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. The communciations relayed through DSCS support the National Command Authorities, Worldwide Military Command and Control System, Diplomatic Telecommunications Service, White House Communications Agency, and ground mobile forces of all services. This is an operational systems development program because it is a production system consisting of a fully operational satellite constellation plus satellites awaiting launch as part of the operational system. Any enhancements to the unlaunched satellites will be sole source contract awards. Efforts support fielded systems; therefore, funding is appropriately in Budget Activity Research Category Operational Systems Development.

FY 1994

- Continue DSCS mission support activities ($5,257)
  - -- Support program office operations (TDY, Contractor Support, Supplies)
  - -- Conduct programmatic tradeoffs and analyses
  - -- Pay performance incentives for development satellites that are still on-orbit and operational
- Investigate and develop DSCS III performance enhancements and future architecture requirements ($9,600)
  - -- Continue the upgrade of GTS Simulator software to support operator training for current satellite configuration
  - -- Continue a National study effort to document SHF requirements that must be satisfied by a follow-on system
  - -- Investigate ways of increasing DSCS III satellite mean mission duration (Service Life Extension Program)
  - -- Investigate ways of increasing DSCS III satellite capacity for tactical users (Beam Forming Network)
- Excess to program requirements ($5,000)
  - -- Denied by Congress as FY 94 Omnibus source

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT NO.
7 - Operational Systems Development	0303110F Defense Satellite Communications System	2638

FY 1995
- Continue DSCS mission support activities ($5,987)
  -- Support program office operations
  -- Conduct programmatic tradeoffs and analyses
  -- Pay performance incentives for development satellites that are still on-orbit and operational
- Conduct Service Life Extension Program risk reduction implementation study ($5,000)
- Investigate and develop other DSCS III performance enhancements and future architecture requirements ($3,200)
  -- Complete the upgrade of GTS Simulator software to support operator training for current satellite configuration
  -- Complete the National study effort documenting SHF requirements and potential selection for a follow-on system
  -- Investigate system enhancement that can be made to improve existing jammer detection and nulling

FY 1996
- Continue DSCS mission support activities ($6,555)
  -- Support program office operations
  -- Conduct programmatic tradeoffs and analyses
  -- Pay performance incentives for development satellites that are still on-orbit and operational
- Start Service Life Extension Program modifications ($23,700)
  -- Parts characterizaton and qualification
  -- Procure components for protoflight modification
  -- Complete system PDR and prepare for system CDR
- Investigate and develop other DSCS III performance enhancements ($2,300)
  -- Develop low noise amplifier (LNA) upgrade to enhance performance and increase capacity for tactical users
  -- Increase B6 satellite bandwidth to consistent capacity level of the other SLEP modified satellites
  -- Investigate alternatives to improve jammer location electronics (JLE) performance and reliability

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT NO.
7 - Operational Systems Development	0303110F Defense Satellite Communications System	2638

FY 1997

- Continue DSCS mission support activities ($6,693)
  -- Support program office operations
  -- Conduct programmatic tradeoffs and analyses
  -- Pay performance incentives for development satellites that are still on-orbit and operational
- Continue Service Life Extnesion Program modifications ($18,300)
  -- Complete system CDR
  -- Fabricate and assemble protoflight modification
- Investigate and develop DSCS III performance enhancements ($1,700)
  -- Develop low noise amplifier (LNA) upgrade to enhance performance and increase capacity for tactical users
  -- Increase B6 satellite bandwidth to consistent capacity level of the other SLEP modified satellites

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT NO.
7 - Operational Systems Development	0303110F Defense Satellite Communications System	2638

B. (U) Program Change Summary ($ in Thousands)

	1994	1995	1996	1997
Previous President's Budget	25,522	30,876	34,461	22,467
Appropriated Value	20,522	14,876		
Adjustments to Appropriated Value				
a. Cong Gen Reductions	-116	-379		
b. SBIR	-318	-306		
c. Omnibus or Other Above Threshold Reprogram	(-5,000)*			
d. Below Threshold Reprogramming	-231	-4		
Adjustments to Budget Years Since FY 95 PB			-1,906	4,226
Current Budget Submit/President's Budget	19,857	14,187	32,555	26,693

* Note: $5,000 in FY 94 was identified as an Omnibus source which was denied by Congress; it is currently excess to program requirements.

Change Summary Explanation:

Funding: Changes to FY 96 and FY 97 resulted from deleting the Beam Forming Network upgrade and adding the Service Life Extension Program.

Schedule: Flight #5 will launch satellite B7, Flight #6 will launch satellite A3 due to operational requirements. Flight #6 launch date has moved from 3Q FY98 to 1Q FY98. Flight # 7 launch date has moved from 3Q FY99 to 4Q FY99.

Technical: Telemetry gathering and archiving system upgrade terminated due to FY94 budget adjustments. Modification of four satellites to add the Beam Forming Network upgrade is no longer included. A Service Life Extension Program has been added.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: 7 - Operational Systems Development

PE NUMBER AND TITLE: 0303110F Defense Satellite Communications System

PROJECT NO.: 2638

C. (U) Other Program Funding Summary ($ in Thousands)

	1994	1995	1996	1997	1998	1999	2000	2001	To Compl	Total Cost
Weapons Procurement										
Budget Activity 3										
Defense Satellite Comm System	23,930	20,043	25,666	39,600	72,037	31,153	30,889	27,726	135,500	1,654,457

Related RDT&E
- PE 0303605F, SATCOM Terminals
- PE 0603430F, Advanced MILSATCOM
- PE 0303142A, Defense Satellite Communications System Ground Terminals

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

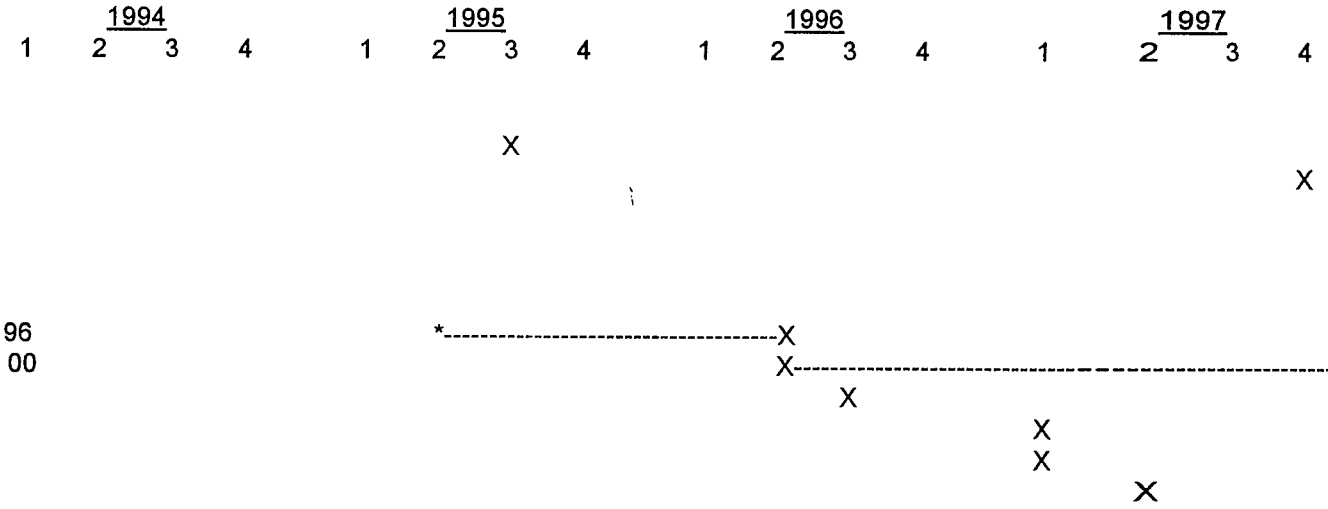
DATE: February 1995

BUDGET ACTIVITY: 7 - Operational Systems Development

PE NUMBER AND TITLE: 0303110F Defense Satellite Communications System

PROJECT NO.: 2638

D. (U) Schedule Profile



Mission	DSCS Vehicle	Date
5	B-7	Jul 95
6	A-3	Oct 97
7	B-6	Jul 99
8	B-8	May 00
9	B-11	May 02
10	B-13	May 03
SLEP Implementation Study		Feb 95 - Jan 96
SLEP Modification Program		Feb 96 - Aug 00
SLEP PDR		Jun 96
SLEP CDR		Dec 96
GTS Upgrade Completion		Oct 96
Technical Order's Delivery		Jan 97

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: **February 1995**

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT NO.
7 - Operational Systems Development	**0303110F Defense Satellite Communications System**	**2638**

A. (U) Project Cost Breakdown ($ in Thousands)

	1994	1995	1996	1997
DSCS III Basic Program Activities	5,257	5,987	6,555	6,693
DSCS III Service Life Extension Program		5,000	23,700	18,300
DSCS III Performance Enhancements	9,600	3,200	2,300	1,700
Excess to Program Requirements	5,000			
Total	19,857	14,187	32,555	26,693

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February 1995

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT NO.
7 - Operational Systems Development	0303110F Defense Satellite Communications System	2638

B. Budget Acquisition History and Planning Information ($ in Thousands)

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to 1994*	Budget 1994	Budget 1995	Budget 1996	Budget 1997	Budget to Complete	Total Program
Product Development Organizations											
Martin Marietta	FFP/AF	Oct 84	437,500	437,500	364,400	3,800	7,800	25,700	20,200	15,600	437,500
Miscellaneous	Various	Various	N/A	N/A	115,369	8,457	3,287	3,655	3,093	2,873	137,044
Support and Management Organizations											
Aerospace Corp	PO	Various	N/A	N/A	9,400	1,600	1,000	1,000	1,100	8,400	22,500
Miscellaneous	Various	Various	N/A	N/A	4,500	1,000	2,100	2,200	2,300	15,500	27,600
Test and Evaluation Organizations											
None											
Subtotal Product Development					479,769	12,257	11,087	29,355	23,293	18,473	574,544
Subtotal Support and Management					13,900	2,600	3,100	3,200	3,400	23,900	50,100
Subtotal Test and Evaluation					0	0	0	0	0	0	0
Total Project					493,669	19,857**	14,187	32,555	26,693	42,373	629,334

Government Furnished Property: N/A

* = Categories only tracked back to FY86. All other prior year funds included in the Miscellaneous line for Product Development Organizations.
** Includes $5,000 which was denied by Congress as FY 94 Omnibus source and is excess to program requirements

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: # 7 - Operational Systems Development

PE NUMBER AND TITLE: # 0303131F Minimum Essential Emergency Communications Network (MEECN)

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Actual	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	3,885	33,090	15,777	12,937	11,708	2,004	2,064	2,127	CONT	CONT
2834 Dual Frequency MEECN Receiver (DFMR)	466	280	0	0	0	0	0	0	0	1,592
2832 VLF/LF	3,419	32,810	15,777	12,937	11,708	2,004	2,064	2,127	CONT	CONT

A. (U) Mission Description and Budget Item Justification ($ in Thousands)

MEECN communications systems provide assured communications connectivity between the National Command Authority and strategic deterrence forces in the Very Low Frequency (VLF) and Low Frequency (LF) bands. MEECN includes the Dual Frequency MEECN Receiver (DFMR) program and several VLF/LF improvement projects. The VLF/LF projects include the Modified Miniature Receive Terminal (MMRT), and the High Data Rate (HIDAR) transmission mode programs. This PE is operational system development because it supports work on a currently operating system.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: # 7 - Operational Systems Development

PE NUMBER AND TITLE: # 0303131F Minimum Essential Emergency Communications Network

B. (U) Program Change Summary ($ in Thousands)

	PY (FY 94)	CY (FY 95)	BY (FY 96)	BY2 (FY 97)	Total Cost
Previous President's Budget	3,960	40,795	27,667	7,011	CONT
Appropriated Value	4,034	34,195			
Adjustments to Appropriated Value					
a. Congressional General Reductions	-74	-392			
b. SBIR	-62	-713			
c. Below Threshold Reprogramming	-13				
Adjustments to Budget Years Since FY95 PB			-11,890	5,926	
Current Budget Submit/President's Budget	3,885	33,090	15,777	12,937	CONT

Change Summary Explanation:

Funding: Funding reflects Congressional direction to terminate the Advanced VLF/LF Receiver (AVR) program, and OSD direction to modify MRTs.
Schedule: Not Applicable.
Technical: Per OSD direction and FY95 Authorization Conference Report, the Air Force will modify existing MRTs for installation in the E-4 and E-6.

C. (U) Other Program Funding Summary ($ in Thousands)

	1994	1995	1996	1997	1998	1999	2000	2001	To Compl	Total Cost
Appropriation 3020, BA 03 Minuteman III Modifications	25,200	0	0	0	0	0	0	0	0	52,400
Appropriation 3010, BA 5 E-4B Class V Mods	0	21,400	0	0	0	0	0	0	0	21,400

D. (U) Schedule Profile

	1994				1995				1996				1997			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Termination of DFMR			X*													
HPTS CDR			X*													
HPTS Termination						X										
HIDAR and MMRT RFP Release				X*												
MMRT EMD Completion														X		

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: # 7 - Operational Systems Development

PE NUMBER AND TITLE: # 0303131F Minimum Essential Emergency Communications Network

PROJECT NO.: 2834

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Actual	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
2834 Dual Frequency MEECN Receiver (DFMR)	466	280	0	0	0	0	0	0	0	1,592

A. (U) Mission Description and Budget Item Justification ($ in Thousands)
DFMR, which was to provide a protected strategic communications link to Minuteman III launch control centers and bomber dispersal bases, was terminated for the convenience of the Government on 1 April 1994. Remaining funds in this project are for contract termination.

(U) FY 1994 Accomplishments:
(U) - Continued DFMR DT&E and initial operational test and evaluation. Terminated DFMR contract 1 April 1994. ($266)
(U) - Completed DFMR functional and physical configuration audits. ($200)
(U) - Terminated GWEN construction.

(U) FY 1995 Plans:
(U) - Complete contract termination for Dual Frequency MEECN Receiver (DFMR). ($280)

(U) FY 1996 Plans: Not applicable.

(U) FY 1997 Plans: Not applicable

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: # 7 - Operational Systems Development

PE NUMBER AND TITLE: # 0303131F Minimum Essential Emergency Communications Network

PROJECT NO.: 2834

B. (U) Program Change Summary ($ in Thousands)

	PY (FY 94)	CY (FY 95)	BY (FY 96)	BY2 (FY 97)	Total Cost
Previous President's Budget	495	280	0	0	1,621
Appropriated Value	495	280			
Adjustments to Appropriated Value					
a. Congressional General Reductions	-29				
Current Budget Submit/President's Budget	466	280	0	0	1,592

Change Summary Explanation:

(U) Funding: N/A

(U) Schedule: N/A

(U) Technical: N/A

C. (U) Other Program Funding Summary ($ in Thousands)

	1994	1995	1996	1997	1998	1999	2000	2001	To Compl	Total Cost
Approp 3020, BA 03 Minuteman III Modifications	25,200	0	0	0	0	0	0	0	0	52,400

D. (U) Schedule Profile

	1994				1995				1996				1997			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Termination of DFMR			X*													

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February 1995

BUDGET ACTIVITY: # 7 - Operational Systems Development

PE NUMBER AND TITLE: # 0303131F Minimum Essential Emergency Communications Network

PROJECT NO.: 2834

A. (U) Project Cost Breakdown ($ in Thousands)

	1994	1995	1996	1997
Contractor Engineering Support	416	245	0	0
Travel	50	35		
Total	466	280	0	0

B. (U) Budget Acquisition History and Planning Information ($ in Thousands)

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to 1994	Budget 1994	Budget 1995	Budget 1996	Budget 1997	Budget to Complete	Total Program
Product Development Organizations:											
Westinghouse	FPI	Sep 89	37,475	39,901	28,100	0	0	0	0	0	28,100
GTE	FFP	Oct 83	235,500	235,500	235,500	0	0	0	0	0	235,500
Support and Management Organizations: Not Applicable											
Test and Evaluation Organizations: Not Applicable											
Government Furnished Property: Not Applicable											
Total			272,975	275,401	263,600	0	0	0	0	0	263,600

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: # 7 - Operational Systems Development

PE NUMBER AND TITLE: # 0303131F Minimum Essential Emergency Communications Network

PROJECT NO.: 2832

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Actual	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
2832 VLF/LF	3,419	32,810	15,777	12,937	11,708	2,004	2,064	2,127	CONT	CONT

A. (U) Mission Description and Budget Item Justification ($ in Thousands)

HPTS is a joint Air Force/Navy program to provide the E-4 and the E-6 aircraft with an improved and supportable VLF transmission capability. HPTS will be terminated for the convenience of the Government in the second quarter FY95.

The MMRT program will modify existing MRTs for installation in the E-4, TACAMO and LCCs with the HIDAR capability. MRT is a VLF receiver already designed, developed and installed in the B-1 and B-52 bombers.

HIDAR is a JCS-directed effort to provide a fast and interoperable MEECN mode. This program will develop and test modifications required to retrofit current MEECN platforms with the HIDAR software and firmware.

(U) FY 1994 Program:

(U) - Completed developmental test and evaluation for E-4B HPTS with critical design review and delivery of final drawings. Production decision. ($475)
(U) - Terminated Advanced Very Low Frequency/Low Frequency (VLF/LF) Receiver (AVR) program. ($100)
(U) - Completed preparation for HIDAR RFP, and MMRT Operational Requirements Document. ($2,844)

(U) FY 1995 Program:

(U) - HIDAR firmware and software development. ($14,100)
(U) -MMRT modification. ($8,840)
(U) - Survivable Low Frequency Communication System (SLFCS) re-engineering. ($4,310)
(U) - IEMATS Replacement Prototyping ($500)
(U) - Emergency War Order classroom training. ($2,500)
(U) - DFMR termination liability. ($2,000)
(U) - Complete contract termination for the E-4B HPTS. ($560)

(U) FY 1996 Planned Program:

(U) - MMRT modification for the E-4 and TACAMO, and HIDAR. ($13,867)
(U) - MMRT modification and integration for the LCCs. ($1,910)

(U) FY 1997 Planned Program:

(U) - MMRT modification for the E-4 and TACAMO. (11,000)
(U) - MMRT modification and integration for the LCCs. ($1,937)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: # 7 - Operational Systems Development

PE NUMBER AND TITLE: # 0303131F Minimum Essential Emergency Communications Network

PROJECT NO.: 2832

B. (U) Program Change Summary ($ in Thousands)

	PY (FY 94)	CY (FY 95)	BY (FY 96)	BY2 (FY 97)	Total Cost
Previous President's Budget	35,139	40,515	27,667	7,011	CONT
Appropriated Value	3,539	33,915			
Adjustments to Appropriated Value					
a. Congressional General Reductions	-45	-392			
b. SBIR	-62	-713			
c. Below Threshold Reprogramming	-13				
Adjustments to Budget Years Since FY95 PB			-11,890	5,926	
Current Budget Submit/President's Budget	3,419	32,810	15,777	12,937	CONT

Change Summary Explanation:

Funding: Funding reflects Congressional direction to terminate the Advanced VLF/LF Receiver (AVR) program, and OSD direction to modify MRTs.

Schedule: Not Applicable.

Technical: Per OSD direction and FY95 Authorization Conference Report, the Air Force will modify existing MRTs with HIDAR for installation in the E-4, TACAMO and LCCs.

C. (U) Other Program Funding Summary ($ in Thousands)

	1994	1995	1996	1997	1998	1999	2000	2001	To Compl	Total Cost
Appropriation 3010, BA 5 E-4B Class V Mods	0	21,400	0	0	0	0	0	0	0	21,400

D. (U) Schedule Profile

	1994				1995				1996				1997			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
HPTS CDR			X*													
HPTS Termination						X										
HIDAR and MMRT RFP Release				X*												
MMRT EMD Completion																X

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February 1995

BUDGET ACTIVITY: # 7 - Operational Systems Development

PE NUMBER AND TITLE: # 0303131F Minimum Essential Emergency Communications Network

PROJECT NO.: 2832

A. (U) Project Cost Breakdown ($ in Thousands)

	1994	1995	1996	1997
Primary Hardware Development		7,500	9,900	11,000
Software Development		4,425	1,700	366
Systems Engineering		3,340	2,032	500
Development Support Systems Acquisition		2,000		
Integrated Logistics Support		860		
Technical Data		620		
Developmental Test and Evaluation		870		
Contractor Engineering Support	1,479	2,985	445	445
Government Engineering Support	1,300	2,425	875	500
Program Management Support		3,800		
Travel	265	415	375	126
Miscellaneous	375	3,570	450	
Total	3,419	32,810	15,777	12,937

B. (U) Budget Acquisition History and Planning Information ($ in Thousands)

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to 1994	Budget 1994	Budget 1995	Budget 1996	Budget 1997	Budget to Complete	Total Program
Product Development Organizations:											
Rockwell	CPAF	Aug 92	13,500	13,500	13,300	0	0	0	0	0	13,300

Support and Management Organizations: Not Applicable

Test and Evaluation Organizations: Not Applicable

Government Furnished Property: Not Applicable

Total	13,500	13,500	13,300	0	0	0	0	0	13,300

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0303140F Information Systems Security Program

PROJECT: 7820

COST (*In Thousands*)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
7820 Information Systems RDT&E: Firestarter	16,131	11,358	11,261	8,980	5,946	6,678	7,185	7,708	Continuing	TBD

(U) A. **Mission Description and Budget Item Justification**

This program element (PE) addresses the development and transition of multilevel information system security for use in new Air Force Information handling systems. The program directs Command Control Communications and Computer Intelligence (C4I) system security research and development with emphasis in multilevel computer security and providing secure voice transmission. The Air Force does not currently have the necessary mechanisms to provide adequate access control, integrity and assured service for today's sophisticated computer systems that host data at multiple levels of classification, and are simultaneously accessed by users with differing clearances and needs to know. With the emergence of the Information Super Highway as an integral DOD resource its imperative that adequate information protection mechanisms be developed to meet the national computer security requirements and standards. Activity within this program element (PE) is considered Operational System Development, because it is performing efforts in support of acquisition programs already produced or in production.

(U) FY 1994

- (U) Transitioned security modeling tools, Ada verification tools, secure data base management systems and guard software from Rome Laboratory (RL) to Electronic Systems Center (ESC) and integrated technology into ESC PRISM demonstration. ($609)
- (U) Initiated security requirements study and security policy development for the F-22 Air Force Mission Support System. ($373)
- (U) Initiated development of trusted real-time distributed computing environment. ($977)
- (U) Transitioned trusted distributed processing technology to Navy and Army as part of the Joint Directors of Laboratories Security Evaluation Program. ($673)
- (U) Completed the development of data base inference/aggregation control tool. ($123)
- (U) Completed security product profile for trusted operating system. ($253)
- (U) Completed design of configurable guard and transitioned guard technology Central Command (CENTCOM). ($1,370)
- (U) Initiated development of trusted distributed database management systems. ($2,570)
- (U) Delivered Non-Stop Receiver Exploratory Development Model for test and evaluation. ($373)
- (U) Complete major upgrades to Baseband Processor. ($1,523)
- (U) Supported Secure Guard transition to CENTCOM, evaluation for Strategic Command (STRATCOM) and several other user evaluations through the Security Transition Analysis Facility. ($2,173)
- (U) Secure Voice narrowband conferencing enhancements including synchronous operation, STU-III compatibility and preliminary video conferencing development. ($977)
- (U) Continue development of encoding and test schemes for improved secure voice transmission. ($523)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0303140F Information Systems Security Program
	PROJECT 7820

(U) FY 1994(Cont)

- (U) Development mechanism to fail soft transmission over fault communications channels, as well as adaptive schemes for combined voice and data transmission. ($616)
- (U) Transitioned the CYPRIS programmable cryptography capability to the Speakeasy radio development program. ($1,516)
- (U) Completed evaluation prototype of advanced TEMPEST signals analysis system. ($1,482)

(U) FY 1995

- (U) Complete the development of the prototype secure guard development environment. ($1,000)
- (U) Continue joint evaluation and secure distributed computing experiments with Army/Navy/Air Force. ($500)
- (U) Continue the technology transition efforts through the Air Force Electronic System Center. ($1,500)
- (U) Complete the security policy and specification for secure data handling capability for the F-22 mission support system. ($600)
- (U) Complete prototype of highly-configurable guard which can be ported/tailored to a multitude of target user environments and applications. ($700)
- (U) Complete a fieldable version of an advanced TEMPEST signal analysis system. ($700)
- (U) Complete the COMFY ASH program. ($150)
- (U) Complete a prototype of signal collection processor with an order of magnitude improvement in performance. ($400)
- (U) Complete the transition of the Cypris programmable cryptography system. ($500)
- (U) Complete a real time demonstration capability for a secure multi speaker conferencing system. ($400)
- (U) Initiate development of narrowband secure video teleconferencing capability. ($600)
- (U) Completed a prototype of a secure real time distributed computing environment. ($500)
- (U) Continue development of mulit rate voice encoding systems to improve quality and performance over noisy channels. ($600)
- (U) Continue development of mechanisms to simultaneously transmit in a secure manner both voice and data over dynamic channels. ($300)
- (U) Continue Test & Evaluation Support for the development of Federal Standards. ($200)
- (U) Complete development of prototype secure distributed database management system. ($900)
- (U) Continue development of high quality encoding schemes for secure transmission for use by F-22, Air Force Space Command (AFSPACECOM) and submission as Federal Standard. ($308)
- (U) Continue Development of Trusted RUBIX system. ($1,500)

(U) FY 1996

- (U) Perform tri service evaluation of the secure real time distributed computing environment. ($471)
- (U) Complete secure data handling for the F-22 mission support system. ($700)
- (U) Demonstrate/transition Multilevel Secure DBMS interoperability techniques and secure guard technologies. ($400)
- (U) Develop security mechanisms to support object oriented multi media database management system. ($750)
- (U) Develop mechanisms to provide security appliqué for COTS products. ($750)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0303140F Information Systems Security Program
	PROJECT 7820

(U) FY 1996(Cont)

- (U) Test/unclassified AF use, includes Firewalls. ($300)
- (U) Evaluate and transition High Assurance and Compartmented Mode Workstations. ($300)
- (U) Develop high quality 2400 bps encoding schemes for secure voice transmission for use by F-22, AFSPACECOM and submission as Federal Standard. ($500)
- (U) Complete the development of capability to perform secure voice transmission over failure prone channels. ($225)
- (U) Continue development of narrowband secure video teleconferencing capability for STU-III applications. ($365)
- (U) Continue development of mechanisms to simultaneously transmit in a secure manner both voice and data over dynamic channels. ($300)
- (U) Continue Test & Evaluation Support for the development of Federal Standards. ($300)
- (U) Initiated low rate (<2400 bps) encoding schemes for satellite and tactical applications. ($300)
- (U) Develop a secure software engineering development environment. ($600)
- (U) Complete the extension of secure distributed computing environment to heterogeneous platforms and transition to operational use. ($700)
- (U) Development of the Air Force Key Managment System. ($4,300)

(U) FY 1997

- (U) Continue prototype of secure object oriented DBMS. ($1,000)
- (U) Complete extension of software engineering environment to incorporate tools to support environment to multilevel information system security development. ($1,000)
- (U) Transition NSA MISSI and network security mechanisms for Air Force use. ($500)
- (U) Transition secure distributed computing environment to fieldable use. ($600)
- (U) Complete the development of narrowband secure video teleconferencing capability for STU III applications. ($600)
- (U) Extend the capability for multi speaker conferencing capability to very low data rates (<2400 bps) compatible with satellite communications and tactical truncking. ($300)
- (U) Complete the development of capability to adaptively manage both voice and data transmission over a dynamic/degraded channels. ($355)
- (U) Continue low rate (<240 bps) encoding schemes for satellite and tactical applications. ($400)
- (U) Continue Test and Evaluation Support for the development of Federal Standards. ($225)
- (U) Updating conferencing, RF communications, and adaptive voice/data platforms to include new 2400 bps Federal Standard. ($100)
- (U) Development of the Air Force Key Managment System. ($3,900)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0303140F Information Systems Security Program

PROJECT: 7820

(U) B. Program Change Summary ($ in Thousands)

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
(U) Previous President's Budget	16,691	10,293	17,326	15,431	TBD
(U) Appropriated Value	16,918	11,793			
(U) Adjustments to Appropriated Value					
a. General Congressional Reductions	-227	-190			
b. SBIR		-245			
c. Omnibus reprogramming	-300				
(U) Adjustments to Budget Years Since FY95 PB			-6,065	-6,451	
(U) Current Budget Submit/President's Budget	16,131	11,358	11,261	8,980	TBD

(U) Change Summary Explanation:

Funding: FY96 & 97 funding adjusted for affordability.

Schedule:

Technical:

(U) C. Other Program Funding Summary ($ in Thousands)

(U) Not Applicable

(U) Related RDT&E:

(U) The research and development efforts pursued under Program Element (PE) 33140F are complementary to work being performed under PE 35167G which is addressing the development of generic technology in the area of information security. Products from PE 33140F transition to other agencies through PE 64740F Computer Resource Management Technology Transition. There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE
	February, 1995
BUDGET ACTIVITY: 7 - Operational System Development	PE NUMBER AND TITLE: 0303140F Information Systems Security Program
	PROJECT: 7820

(U) D. Schedule Profile

	FY 1994				FY 1995				FY 1996				FY 1997			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
(U) Requirements Review Board Approval		X				X				X				X		
(U) Complete Generic Guard Prototype							X									
(U) Initiate Secure Voice Teleconference						X										
(U) Complete F-22 Secure Database System										X						
(U) Deliver Non Stop Receiver				X												

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: 7-Operational Systems Development

PE NUMBER AND TITLE: 0303601F Milstar (AF Terminals)

PROJECT NO.: 2487

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	75,652*	17,664	42,591	8,852	9,072	8,389	8,706	8,969	17,310	1,866,846
3601 MILSTAR Sat Comm Sys (AF Terminals)	75,652*	17,664	42,591	8,852	9,072	8,389	8,706	8,969	17,310	1,866,846

* FY94 funding represents Milstar Terminal portion of the appropriated budget. For an explanation of how the remaining FY94 funds were spent see Milstar LDR/MDR Descriptive Summary, PE 0604479F.

(U) **A. Mission Description and Budget Item Justification**

Milstar is a joint service program to develop and acquire extremely high frequency (EHF) satellites, satellite mission control segment, and new or modified communication terminals to provide survivable, jam-resistant, worldwide, secure communications to the strategic and tactical warfighter up through the early stages of nuclear war. This portion of the program develops Air Force ground and airborne terminals used to communicate through the Milstar satellite. This activity is considered operational systems development because it has completed a Milestone III review and is approved for production. The acquisition strategy for the Milstar Air Force Terminal Program included a competitive development between two contractors with a planned down-select for production. However, due to a decrease in terminal quantities associated with the Milstar program restructure, the down-select was determined not to be cost effective.

(U) FY 1994

- (U) Continue basic activities required to support the Milstar Terminals program. ($3,692)
- (U) Develop Command Post Terminals (CPTs), upgrades, and modifications. ($59,357)
- (U) Develop E-4B installation Kits (A-Kit). ($4,311)
- (U) Continue AFSATCOM modifications and terminal modifications to allow existing UHF terminals to receive Milstar UHF communications. ($2,168)
- (U) Support testing activities and conduct program studies and trades. ($4,794)
- (U) AFSATCOM Payload Integration on Classified Host ($1,330)

(U) FY 1995

- (U) Continue basic activities required to support the Milstar Terminals program. ($4,171)
- (U) Develop Command Post Terminals (CPTs), upgrades, and modifications. ($11,770)
- (U) Continue UHF terminal and AFSATCOM modifications. ($888)
- (U) Support testing activities and conduct program studies and trades. ($835)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: 7-Operational Systems Development	PE NUMBER AND TITLE: 0303601F Milstar (AF Terminals) / PROJECT NO.: 2487

(U) FY 1996
- (U) Continue basic activities required to support the Milstar Terminals program. ($4,826)
- (U) Develop Command Post Terminals (CPTs), upgrades, and modifications. ($33,054)
- (U) Continue UHF terminal and AFSATCOM modifications. ($2,811)
- (U) Support Testing Activities ($1,900M)

(U) FY 1997
- (U) Continue basic activities required to support the Milstar Terminals program. ($4,138)
- (U) Develop Command Post upgrades and mods. ($4,714)

(U) B. Program Change Summary ($ in Thousands)

	1994*	1995	1996	1997
(U) Previous President's Budget	90,000	18,249	45,829	17,507
(U) Appropriated Value	82,900	18,249		
(U) Adjustments to Appropriated Value				
a. Cong Gen Reductions	-1,248	-199		
b. SBIR	-2,000	-381		
c. Omnibus or Other Above Threshold Reprogram	-4,000	0		
d. Below Threshold Reprogramming	0	-5		
(U) Adjustments to Budget Years Since FY95 PB			-3,238	-8,655
(U) Current Budget Submit/President's Budget	75,652	17,664	42,591	8,852

* FY94 funding represents Milstar Terminal portion of the appropriated budget. For an explanation of how the remaining FY94 funds were spent see Milstar LDR/MDR Descriptive Summary, PE #604479F.

(U) Change Summary Explanation

Funding: Adjustments to Budget Years Since FY95 PB reflect a reduction due to Milstar contractor support cut.

Schedule: No change.

Technical: No change.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: 7-Operational Systems Development

PE NUMBER AND TITLE: 0303601F Milstar (AF Terminals)

PROJECT NO.: 2487

(U) C. **Other Program Funding Summary ($ in Thousands)**

	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	To Comp	Total
(U) Aircraft Procurement		9,300							0	205,006
(U) Other Procurement	40,587	3,744	28,086	56,892	10,135	43,148	44,311	45,217	0	773,202

Related RDT&E:

(U) PE #603430F, Advanced Military Satellite Communications

(U) PE #604479F, Milstar LDR/MDR Satellite Communications

(U) D. **Schedule Profile**

	1994				1995				1996				1997			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
(U) Start DFS-1 DT&E		*														
(U) Complete DFS-1 DT&E					*											
(U) Start IOT&E Phase I				*												
(U) Finish IOT&E Phase I							X									
(U) Start IOT&E Phase II										X						
(U) Finish IOT&E Phase II												X				
(U) IOC I														X		
(U) Command Post LRIP Deliveries Complete			*													
(U) Command Post Production Deliveries Begin							X									
(U) Command Post Production Deliveries Complete												X				
(U) SCAMP Production Begins											X					
(U) SMART-T Production Begins															X	

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February 1995

BUDGET ACTIVITY: 7-Operational Systems Development

PE NUMBER AND TITLE: 0303601F Milstar (AF Terminals)

PROJECT NO.: 2487

(U) A. **Project Cost Breakdown ($ in Thousands)**

	1994	1995	1996	1997
Command Post (CPT) Terminal	59,357	11,770	33,054	4,714
Install Kits	4,311			
UHF Upgrades	3,498	888	2,811	
Testing Support/Studies	4,794	835	1,900	
SPO Ops (PSA, TDY, TRNG Sup/Equip, Ktr Conv)	3,692	4,171	4,826	4,138
AFSATCOM Payload Integration	1,330			
Total	75,652	17,664	42,591	8,852

(U) B. **Budget Acquisition History and Planning Information ($ in Thousands)**

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to 1994	Budget 1994	Budget 1995	Budget 1996	Budget 1997	Budget to Complete	Total Program
Product Development Organizations											
Raytheon Corp	FPIF/FFP	Jun 85	866,500	866,500	804,604	46,306	1,140	21,280	1,989		875,319
Rockwell	CPIF	Aug 93	5,000	5,000	2,000	3,000					5,000
Miscellaneous	Various	Various	N/A	N/A	632,842	6,744	2,201	4,650	1,237	31,708	679,382
Support and Management Organizations											
MITRE	Various	Various	N/A	N/A	60,406	9,257	8,450	7,532	2,319	5,279	93,243
Spt Contractors	Various	Various	N/A	N/A	136,179	5,146	3,801	5,600	2,376	6,846	159,948
Tecolote	Various	Various	N/A	N/A	0,200	0,000	0,498	0,664	0,684	2,949	4,995
Miscellaneous	Various	Various	N/A	N/A	13,000	1,477	1,470	1,665	0,247	5,664	23,523

Test and Evaluation Organizations											
Wright-Labs	Various	N/A	N/A	N/A	16,921	2,145		1,050			20,116
Miscellaneous	Various	Various	N/A	N/A	3,489	1,577	0,104	0,150			5,320
Subtotal Product Development					1,439,446	56,050	3,341	25,930	3,226	32,094	1,559,701
Subtotal Support and Management					209,785	15,880	14,219	15,461	5,626	20,738	281,709
Subtotal Test and Evaluation					20,410	3,722	0,104	1,200			25,436
Total Project					1,669,641	75,652	17,644	42,591	8,852	52,832	1,866,846

Government Furnished Equipment: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: 5-Engineering and Manufacturing Development

PE NUMBER AND TITLE: 0303606F UHF Satellite Communications

PROJECT NO.: 2932

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	0	20,254	15,568	8,786	6,720	6,227	6,562	6,906	1,508	95,063*
2932 AF Satellite Comm (AFSATCOM)	0	20,254	15,568	8,786	6,720	6,227	6,562	6,906	1,508	95,063*

*Prior year funding for this project was funded out of PE 0303605F - Satellite Communications.

(U) A. **Mission Description and Budget Item Justification**

UHF Satellite Communications is a program to develop, acquire, and field equipment that improves joint interoperability and implements communication channel efficiency improvements. The major development activities support the design and implementation of the Network Control System (NCS), which implements Demand Assigned Multiple Access (DAMA) to convert dedicated communication channels to time-shared channels and to automate channel allocation to users on an as required basis. There is limited development activity associated with satisfying unique Air Force requirements for the Enhanced Manpack UHF Terminal (EMUT), a man-pack UHF terminal that is DAMA compliant. This activity is considered engineering and manufacturing development because the network controller has yet to be approved for production. The acquisition strategy is to continue to develop the initial DAMA NCS under the existing SBIR and competitive firm fixed price development contracts and then to upgrade and field the developed NCSs under a production contract.

(U) FY 1994
- (U) None.

(U) FY 1995
- (U) Support basic activities required for the UHF Satellite Communications program. ($472)
- (U) Develop initial DAMA capability NCS ($13,639)
- (U) Develop NCS enhancements required for limited operational capability. ($2,407)
- (U) Conduct DAMA modem test and evaluation ($3,736)

(U) FY 1996
- (U) Support basic activities required for the UHF Satellite Communications program. ($311)
- (U) Develop NCS enhancements required for limited operational capability. ($15,257)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: 5-Engineering and Manufacturing Development	PE NUMBER AND TITLE: 0303606F UHF Satellite Communications	PROJECT NO.: 2932

(U) FY 1997
- (U) Support basic activities required for the UHF Satellite Communications program. ($176)
- (U) Develop NCS enhancements required for limited operational capability. ($4,298)
- (U) Upgrade NCS for full operational use. ($4,312)

(U) B. Program Change Summary ($ in Thousands)

	FY 1994	FY 1995	FY 1996	FY 1997
(U) Previous President's Budget	11,457	20,879	34,172	26,506
(U) Appropriated Value	0	20,879		
(U) Adjustments to Appropriated Value				
a. Cong General Reductions	0	-228		
b. SBIR	0	-392		
c. Omnibus and Other Above Threshold Reprogrammings	0			
d. Below Threshold Reprogramming	0	-5		
(U) Adjustments to Budget Years Since FY95 PB			-18,604	- 17,720
(U) Current Budget Submit/President's Budget	0	20,254	15,568	8,786

(U) Change Summary Explanation:

Funding: Adjustments to Budget Years Since FY95 PB in FY96 and FY97 reflect elimination of the development of the Integrated Network Control System.

Schedule: No changes.

Technical: Eliminated development of the Integrated Network Control System.

(U) C. Other Program Funding Summary ($ in Thousands)

	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	To Comp	Total
(U) Aircraft Procurement	10,500	11,221	12,617	20,210	8,596	8,174			0	71,318
(U) Other Procurement			11,563	3,741	12,091	20,187	22,368	24,474	44,443	161,012

Related RDT&E:

(U) PE 0303605F, Satellite Communications Terminals

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

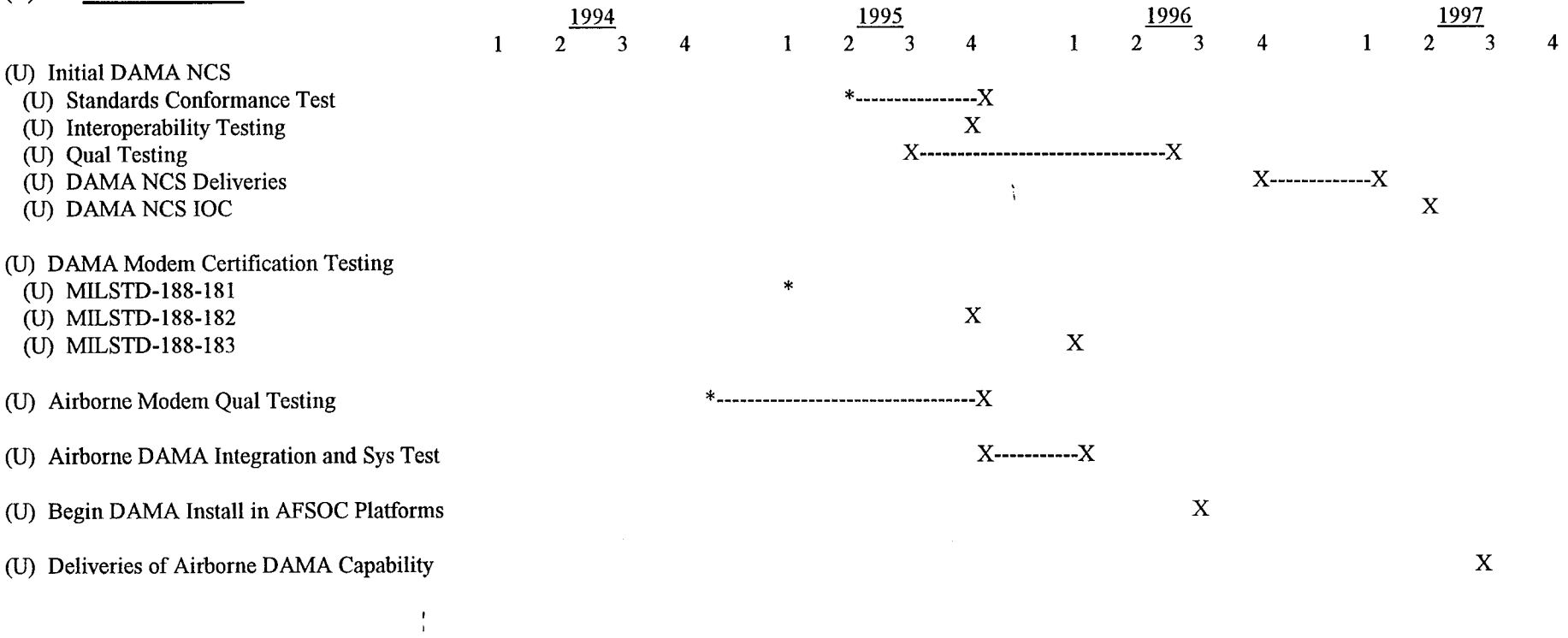
DATE: February 1995

BUDGET ACTIVITY: 5-Engineering and Manufacturing Development

PE NUMBER AND TITLE: 0303606F UHF Satellite Communications

PROJECT NO.: 2932

(U) **D. Schedule Profile**



RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February 1995

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT NO.
5-Engineering and Manufacturing Development	0303606F UHF Satellite Communications	2932

(U) A. Project Cost Breakdown ($ in Thousands

	FY 1994	FY 1995	FY 1996	FY 1997
Initial DAMA NCS Capability		13,639		
NCS Enhancements for Limited Op Cap		2,407	15,257	4,298
NCS Upgrade for Full Op Use				4,312
Modem Development/Test		3,736		
SPO Operations		472	311	176
Total	0	20,254	15,568	8,786

(U) B. Budget Acquisition History and Planning Information ($ in Thousands)

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to 1994*	Budget 1994	Budget 1995	Budget 1996	Budget 1997	Budget to Complete	Total Program
Product Development Organizations											
TBD	C/FFP	Apr 95	TBD	30,851			11,314	11,938	4,490	16,583	44,325
Miscellaneous	Various	Various	N/A	N/A	14,698		2,634				17,332
Support and Management Organizations											
MITRE	Various	Various	N/A	N/A	5,411		3,881	2,309	2,616	6,920	21,137
Spt Contractors	Various	Various	N/A	N/A	1,804		1,953	1,010	1,504	3,386	9,657
Miscellaneous	Various	Various	N/A	N/A	619		472	311	176	1,034	2,612

Test and Evaluation Organizations
Not Applicable.

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February 1995

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT NO.
5-Engineering and Manufacturing Development	0303606F UHF Satellite Communications	2932

	Total Prior to 1994*	Budget 1994	Budget 1995	Budget 1996	Budget 1997	Budget to Complete	Total Program
Subtotal Product Development	14,698		13,948	11,938	4,490	16,583	61,657
Subtotal Support and Management	7,834		6,306	3,630	4,296	11,340	33,406
Subtotal Test and Evaluation							
Total Project	22,532		20,254	15,568	8,786	27,923	95,063

NOTE: Activity prior to FY94 was funded out of PE 0303605F - Satellite Communications.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0305110F Satellite Control Network

PROJECT: 3276

COST (*In Thousands*)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
3276 Satellite Control Network (SCN)	78,884	79,232	89,717	95,435	98,855	112,705	115,532	119,876	Continuing	Continuing

(U) **A. Mission Description and Budget Item Justification**

(U) The AF Satellite Control Network (AFSCN) is a global network of control centers, remote tracking stations, and communications links which provide the earth-to-space connection required for operation of military satellites. The AFSCN provides satellite and payload command and control, and mission data relay using Mission Control Centers in California and Colorado and nine global Remote Tracking Stations (RTS). Because the AFSCN operations are continuous, system improvements must occur in parallel with operations of the growing inventory of national security space vehicles. This AFSCN project funds the development, acquisitions, and engineering needed to continue the evolution of this highly reliable national satellite tracking, telemetry, commanding, and data relay capability to meet the requirements of the operational and developmental DoD, National, Civil, and Allied satellite systems. Since this effort supports a fielded system, it is in the budget activity/research category Operational Systems Development.

(U) Satellite systems must have contact with ground based command & control systems to operate. The AFSCN is the DoD common user satellite control network. The AFSCN is maintained, operated and improved using funding provided in three PE's. The AFSCN provides satellite state-of-health for the following operational satellite systems: DMSP, GPS, DSCS, DSP, FLTSAT, Milstar, GEOSAT, Skynet, NATO III/IV, and Classified Programs. It controls on orbit spares and orbit changes of satellite programs with dedicated mission networks. It also supports these and other systems with mission data relay.

(U) The SCN has an aggressive Improvement & Modernization (I&M) program to reduce the cost of satellite operations in the future and to operate effectively with fewer, lower skilled personnel. The primary focus of the I&M program is upgrades to the Command and Control Segment and the Communications Segment. Both are planned to be accomplished on a time phased approach exploiting commercial developments, using an evolutionary acquisition strategy.

(U) The Command and Control Upgrades, an evolutionary upgrade, will move satellite command and control from a mainframe-based, centralized computer architecture to a workstation-based, open architecture using advanced high speed data links. When developed and fielded, this will facilitate a 30% reduction in O&M for the command and control segment. In addition, the SCN will have greater capability and capacity with increased standardization and interoperability.

(U) The Communications Upgrades eliminate the current, costly point-to-point AFSCN communications network and replaces it with a communications grid system that integrates government and commercial networks. This new architecture will eliminate costly infrastructure, enable surge capability, and provide a minimum 25% savings in O&M costs over the current systems. This will greatly improve capacity, reliability, data quality, and user access to the network.

(U) Research category is Operational Systems Development. Development of new satellite control capabilities is essential to the operational capability of current and new satellite systems. The project number for the entire Program Element is 3276.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY: 7 - Operational System Development	PE NUMBER AND TITLE: 0305110F Satellite Control Network — PROJECT: 3276

(U) FY 1994
- (U) Command and Control Segment (CCS):
  - (U) Continued CCS upgrades by beginning distributed architecture workstation-based control prototyping. Continued developing commercial off-the-shelf (COTS)-based open and distributed system architecture for Falcon AFB Satellite Operations Centers (SOC). Scheduled completion FY 03 ($5,200)
  - (U) Continued developing user-requested modifications to command and control segment ($21,700)
- (U) Communications Segment:
  - (U) Begin design specification for the communication segment upgrades and provide beginning of open architecture to the AFSCN control nodes. Complete definition of new archiving equipment specifications for upgrade of both control nodes. Comm Upgrade scheduled program completion FY 01 ($8,800)
  - (U) Continued developing user-requested modifications to command and control segment ($10,900)
- (U) Range Segment:
  - (U) Continued developing user-requested modifications to the range segment ($3,900)
- (U) Systems Engineering and Integration:
  - (U) Continue system engineering, development and integration of network hardware/software to meet evolving satellite program requirements at Onizuka AFB, Falcon AFB, and the Remote Tracking Stations (RTS) ($28,100)

(U) FY 1995
- (U) Command and Control Segment:
  - (U) C^2 Upgrades: Develop system architecture, documentation, and lab demonstration equipment necessary to support development contract for workstation based, Simplified Satellite Operations System for satellite command and control mission. Objectives: open architecture "plug-and-use," increased efficiency, reduced hardware/software maintenance costs, and reduced manpower to operate. Complete development of functional requirements document and employment concept, identify system implementation alternatives for further technical evaluations. Begin assessments of those satellite control products in the Demonstration Lab. Pursue a system development approach in cooperation with other government efforts. Scheduled program completion FY 01 ($18,300)
  - (U) Continue developing user-requested, priority work group required modifications ($8,600)
- (U) Communications Segment ($25,800):
  - (U) Continue Communications upgrades by completing engineering and integration of standardized telemetry recorders to mission control centers and tracking sites. Initiate development of hardware (H/W) and software (S/W) for Wide Area Interface Unit (WIU) for installation at the control nodes and remote tracking stations. Initiate the development of the Centralized Control and Monitoring (CCM) of network communications at the control nodes and remote tracking stations. Comm Upgrade completion FY01 ($18,900)
- (U) Range Segment: Continue developing user-requested modifications to range segment ($2,000)
- (U) Systems Engineering and Integration: Continue system engineering and development of network hardware/software to meet evolving satellite program requirements at Onizuka AFB, Falcon AFB, and the RTS's ($24,532)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY: 7 - Operational System Development	PE NUMBER AND TITLE: 0305110F Satellite Control Network — PROJECT: 3276

(U) FY 1996
- (U) Command & Control Segment:
  - (U) Complete prototype of workstation-based control environment and perform functional assessments in the Demonstration Lab. Complete development of specification, contract actions, and initiate acquisition of selected distributed architecture Command & Control System Upgrade. These upgrades are consistent with the US Space Command developed "Plug-and-Use" architecture. The four Satellite Operations Centers (SOC) to be modernized are: SOC 31A (GPS), SOC 31B (DSP & DMSP), SOC 33 (Comm Sats), and SOC 34 (Milstar). Work will begin on one in FY 96. CCS Upgrade scheduled completion FY 01 ($27,000)
  - (U) Continue developing priority user-requested modifications to command and control ($3,800)
- (U) Communications Segment:
  - (U) Continue Communications upgrades by completing engineering and integration of standardized telemetry recorders to mission control centers and tracking sites. Initiate development of hardware (H/W) and software (S/W) for Wide Area Network Interface Unit (WANIU) for installation at the control nodes and remote tracking stations. Initiate the development of the Centralized Control and Monitoring (CCM) of network communications at the control nodes and remote tracking stations. Begin voice upgrades and solid state switch replacement. Comm Upgrade scheduled completion FY 01 ($33,900)
  - (U) Continue developing priority user-requested modifications to the communications segment ($1,100)
- (U) Range Segment: Continue developing priority user-requested modifications to range segment ($2,000)
- (U) Systems Engineering and Integration: Continue system engineering and development of network hardware/software to meet evolving satellite program requirements at Onizuka AFB, Falcon AFB, and the RTS's ($21,900)

(U) FY 1997
- (U) Command & Control Segment:
  - (U) Continue acquisition, installation, and test of upgrades to C^2 system for first of four Falcon AFB Satellite Operations Centers (SOC), and begin upgrades on the second SOC. CCS Upgrade scheduled program completion FY 01 ($26,000)
  - (U) Continue developing priority user-requested modifications to command and control segment ($9,800)
- (U) Communications Segment:
  - (U) Complete development of WANIU and CCM H/W and S/W and begin development of voice circuit improvements. Comm Upgrade scheduled completion FY01 ($32,100)
  - (U) Continue developing user-requested modifications to the communications segment ($3,400)
- (U) Range Segment: Continue developing user-requested modifications to range segment ($3,000)
- (U) Systems Engineering and Integration: Continue system engineering and development of network hardware/software to meet evolving satellite program requirements at Onizuka AFB, Falcon AFB, and the RTS's ($21,100)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305110F Satellite Control Network	PROJECT 3276

(U) **B. Program Change Summary ($ in Thousands)**

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
(U) Previous President's Budget	96,095	101,146	96,482	100,957	Continuing
(U) Appropriated Value	100,000	83,000			
(U) Adjustments to Appropriated Value					
a. Cong Gen Reductions	-3,905	-2,213			
b. SBIR	-1,499	-1,534			
c. Omnibus and Other Above Theshold Reprogram	-12,000				
d. Below Threshold Reprogramming	-3,712	-21			
(U) Adjustments to Budget Years since FY 95 PB			-6,765	-5,522	
(U) Current Budget Submit/President's Budget	78,884	79,232	89,717	95,435	Continuing

(U) Change Summary Explanation:

Funding: Reductions due to Omnibus reprogramming action and undistributed Congressional reductions.

Schedule: No changes.

Technical: Not Applicable.

(U) **C. Other Program Funding Summary ($ in Thousands)**

	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	To Compl	Total Cost
(U) Other Procurement, Budget Activity: 83, Program Title: AFSCN, BPAC 83440	30,005	25,629	25,495	28,052	32,551	37,629	39,487	40,380	Continue	Continue

Related RDT&E:

(U) Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305110F Satellite Control Network PROJECT 3276

(U) D. Schedule Profile

	FY 1994				FY 1995				FY 1996				FY 1997			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
(U) Complete spec for archival equip				X												
(U) Relocate Network Status and Scheduling workstations				X												
(U) Provide prototype common workstations/local area network (C2)				X					X							
(U) Prototype SSOP						X										
(U) Initiate development of WIU & CCM						X										
(U) Initiate procurement of communications data archiving equipment for installation at Falcon & Onizuka						X										
(U) Deliver standardized recorders								X								
(U) Complete CCS Cartridge Tape Upgrade							X									
(U) Complete prototype of distributed workstation control architecture										X						
(U) Complete specification development for distributed workstation architecture							X									
(U) RFECP for WIU development										X						
(U) Complete development of Wide Area Network Interface Unite (WIU) and initiate procurement														X		
(U) Install WIU at Colorado Tkg Station																X
(U) Complete Archival equipment installations - FY98																
(U) Install WIU at three remote tracking stations - FY98																

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305110F Satellite Control Network PROJECT 3276

	FY 1994				FY 1995				FY 1996				FY 1997			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
(U) Complete Centralize Control and Monitor development - FY99																
(U) Design spec for Planning and Evaluation side replacement - FY99																

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305110F Satellite Control Network PROJECT 3276

(U) A. **Project Cost Breakdown ($ in Thousands)**

	FY 1994	FY 1995	FY 1996	FY 1997
(U) Command and Control Segment	26,967	26,900	30,800	35,800
(U) Communications Segment	19,769	25,800	35,000	35,500
(U) Range Segment	4,011	2,000	2,000	3,000
(U) Systems Engineering and Integration	28,137	24,532	21,917	21,135
(U) Total	78,884	79,232	89,717	95,435

(U) B. **Budget Acquisition History and Planning Information ($ in Thousands)**

(U) Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0305111F Weather Service

PROJECT: 2738

COST (*In Thousands*)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
2738 Advanced Weather Development Systems	9,191	20,268	5,771	5,308	9,738	9,155	12,720	13,119	Continuing	Continuing

NOTE: FY94 funding is in PE #604707F. Starting in FY95, PE #604707F RDT&E funds were assigned to PE #305111F to consolidate RDT&E, Procurement, and O&M funds for all weather support resources under PE #305111F.

(U) **A. Mission Description and Budget Item Justification**

This Program Element provides for the modification, sustainment, and acquisition of meteorological hardware and software needed to support the observing and forecasting needs of worldwide Air Force and Army operations. Efforts include: (a) Automated Weather Distribution System (AWDS) Pre-Planned Product Improvement (P3I); improves the timeliness of AWDS functions and ensures interoperability with customer command, control, communications, computers and information (C4I) systems; (b) Solar Electro-Optical Network Upgrade (SEON II); improves capability to detect hazardous solar activity for DoD space operations; (c) Combat Weather System (CWS); provides a small, tactical observing and foreasting capability with C4I connectivity for worldwide combat operations; (d) Cloud Depiction and Forecast System II (CDFS II); replaces logistically unsupportable mainframe computers at the Air Force's Global Weather Central (AFGWC) and upgrades satellite data processing, cloud depiction and forecasting, and classified weather support functions for operational commanders and national programs; (e) Global Theater Weather Analysis and Prediction System (GTWAPS); acquires theater weather models and associated hardware to improve AFGWC's theater support capabilities; (f) Satellite Data Handling System II (SDHS II); replaces aging AFGWC SDHS hardware and software to move to a more efficient workstation-based, distributed computing environment; (g) Tactical Weather Radar (TWR); provides lightweight, portable doppler weather radar to support combat flight operations worldwide. This effort is Budget Activity Research Category Operational Systems Development, because RDT&E efforts support software development and system test associated with the upgrade and replacement of currently operational systems, systems already in production, and systems with approved production funds in the DoD budget.

(U) FY 1994

- AWDS/P3I: Completed C2 interface capability; completed development of workstation processing enhancements and remote briefing capabilities. ($3,880)
- SEON II: Completed development/disposition of the solar radio burst locator prototype. ($500)
- CWS: Continued software rehosting and upgrading efforts for the CWS Tactical Forecast System (TFS). ($4,811)

(U) FY 1995

- AWDS/P3I: Complete inter-AWDS capability; complete software development for meteorological satellite interface. ($5,368)
- CWS: Complete TFS software upgrading and testing efforts. ($4,900)
- CDFS II: Begin development of classified support functions and cloud depiction and forecast software. ($10,000)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY: 7 - Operational System Development	PE NUMBER AND TITLE: 0305111F Weather Service / PROJECT: 2738

(U) FY 1996
- CDFS II: Continue development of cloud depiction and forecast software. ($5,021)
- GTWAPS: Complete trade-off studies and begin initial software development efforts. ($500)
- TWR: Begin trade-off studies. ($250)

(U) FY 1997
- CDFS II: Complete development of cloud depiction and forecast software; prepare for FY98 production/integration contract award. ($3,269)
- GTWAPS: Complete software development; prepare for FY98 hardware purchase/integration contract award. ($1,539)
- SDHS II: Begin trade-off studies; conduct Milestone I review. ($250)
- TWR: Complete trade-off studies; conduct Milestone I review. ($250)

(U) **B. Program Change Summary ($ in Thousands)**

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
(U) Previous President's Budget	9,379	20,990	20,404	14,189	Cont
(U) Appropriated Value	9,379	20,990			
(U) Adjustments to Appropriated Value					
a. Cong Gen Reductions	- 188	- 280			
b. SBIR		- 437			
c. Omnibus or Other Above Threshold Reprogram					
d. Below Threshold Reprogramming		- 5			
(U) Adjustments to Budget Years Since FY95 PB			- 14,633	- 8,881	
(U) Current Budget Submit/President's Budget	9,191	20,268	5,771	5,308	Cont

(U) Change Summary Explanation:

Funding: Reductions to the PE are a result of decisions to eliminate funds for the Automated Weather Distribution System Pre-Planned Product Improvement (AWDS P3I) and Combat Weather System (CWS) after FY96, and to restructure the Cloud Depiction and Forecast System starting in FY96.

Schedule: See Funding Explanation.

Technical: No changes.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305111F Weather Service
	PROJECT 2738

(U) C. **Other Program Funding Summary ($ in Thousands)**

	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	To Compl	Total Cost
(U) Other Procurement, BA 83, Weather Service	21,436	15,436	0	0	11,000	7,700	20,100	11,900	Cont	TBD

(Only includes procurement funds for investment programs described in this R-2 exhibit)

Related RDT&E:

(U) PE #603707F, Weather Systems Advanced Development
(U) PE #305160F, Defense Meteorological Satellite Program
(U) PE #207438F, Theater Battle Management C4I
(U) PE #208006F, Air Force Mission Planning Systems

(U) D. **Schedule Profile**

	FY 1994				FY 1995				FY 1996				FY 1997			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
(U) AWDS P3I Contract Award (ECPs)				X		X	X									
(U) CWS TFS Software Complete								X								
(U) SEON II Prototype Complete					X											
(U) CDFS II RFP Release/Contract Award						X	X									
(U) GTWAPS Milestone 0/Milestone 1		X									X					
(U) SDHS II Milestone 0/Milestone 1		X														X
(U) TWR MNS Approved/Milestone 0/ Milestone 1		X								X					X	

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0305111F Weather Service

PROJECT: 2738

(U) **A. Project Cost Breakdown ($ in Thousands)**

	FY 1994	FY 1995	FY 1996	FY 1997
(U) 1st Article Development	2,577	4,021	0	0
(U) System Software Integration	3,045	3,875	0	214
(U) System Engineering Support	1,150	5,400	1,400	900
(U) Contractor Engineering Support	1,009	1,025	150	500
(U) Software Development	603	5,000	3,754	3,100
(U) Travel	213	350	160	175
(U) Program Management Support	419	597	307	419
(U) Laboratory Support	175	0	0	0
(U) Total	9,191	20,268	5,771	5,308

(U) **B. Budget Acquisition History and Planning Information ($ in Thousands)**

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1994	Budget FY 1994	Budget FY 1995	Budget FY 1996	Budget FY 1997	Budget to Complete	Total Program
Product Development Organizations											
Phillips Lab	MIPR	May 94	270	270	95	175	0	0	0	0	270
CalTech	LOE	Apr 93	1,087	1,087	937	150	0	0	0	0	1,087
CSC	LOE	Jan 94	603	603	0	603	0	0	0	0	603
GTE	FFP/PR	Oct 90	15,676	15,676	6,978	3,577	5,121	0	0	0	15,676
PRISM (Raytheon)	LOE	Jan 93	2,555	2,555	247	1,308	1,000	0	0	0	2,555
PRISM (Hughes)	LOE	Jan 93	5,392	5,392	780	1,737	2,875	0	0	0	5,392
CDFS II (TBD)	CPIF/FP						9,300	4,754	3,000	4,400	21,454
GTWAPS (TBD)	CPIF/FP							400	1,214	6,052	7,666

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)											DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0305111F Weather Service							PROJECT 2738
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1994	Budget FY 1994	Budget FY 1995	Budget FY 1996	Budget FY 1997	Budget to Complete	Total Program
Support and Management Organizations											
Electronic Systems Center (ESC)						632	468	167	294	Cont	TBD
Space and Missile Center (SMC)						0	479	300	300	Cont	TBD
MITRE/Aerospace/TEMS						1,009	1,025	150	500	Cont	TBD
Test and Evaluation Organizations											
Not Applicable.											
(U) B. Budget Acquisition History and Planning Information Continued ($ in Thousands)											
Government Furnished Property:											
Not Applicable.											
Subtotal Product Development						7,550	18,296	5,154	4,214		
Subtotal Support and Management						1,641	1,972	617	1,094		
Subtotal Test and Evaluation											
Total Project						9,191	20,268	5,771	5,308	Cont	TBD

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0305114F Traffic Cntrl/Approach/Landing Sys

COST (*In Thousands*)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	8,427	7,103	3,968	4,007	1,835	1,164	7,935	6,391	Continuing	TBD
2026 System Support	280	274	283	456	287	298	306	315	Continuing	TBD
3587 Precision Landing Development	8,147	6,829	3,685	3,551	1,548	866	7,629	6,076	Continuing	TBD

(U) A. Mission Description and Budget Item Justification

This effort was originally established for development of Military Microwave Landing System Avionics (MMLSA) and acquisition of the commercially developed Commercial Microwave Landing System Avionics (CMLSA). Originally part of a twenty year program to transition Air Force operations from the use of Precision Approach radar (PAR) and Instrument Landing Systems (ILS) to the Microwave Landing System (MLS) for precision approach and landing. Due to the emergence of the Global Positioning System (GPS) as more cost effective solution (available after 2000), the effort is now being redirected to develop replacement box for ILS avionics to sustain precision landing capability until GPS becomes available as the follow-on precision landing technology. Current Air Force receivers do not meet the new specification required by the International Civil Aviation Organization (ICAO) for protection from interference problems forecasted to occur after 1998. The CMLSA continues to be installed on C-130 aircraft to meet a specific short-term precision landing mission requirement for tactical airlift. Project 2026 funds ongoing liaison and interagency cooperative studies, between the USAF ATCALS program office and various organizations to include other Services, the Federal Aviation Administration (FAA) and the ICAO. This program element is in Budget Activity Reasearch Category, Operational Systems Development, because it is upgrading avionics in currently fielded weapon systems

(U) B. Program Change Summary ($ in Thousands)

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
(U) Previous President's Budget	8,600	7,566	5,571	6,610	TBD
(U) Appropriated Value	8,600	7,566			
(U) Adjustments to Appropriated Value					
a. Congressional adjustments	173	463			
(U) Current Budget Submit/President's Budget	8,427	7,103	3,968	4,007	TBD

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305114F Traffic Cntrl/Approach/Landing Sys

(U) Change Summary Explanation:

Funding: Funding decreases in FY96 and FY97 are due to a reduction in the scope of planned RDT&E activities and program restructure.

Schedule: N/A

Technical: N/A

(U) C. Other Program Funding Summary ($ in Thousands)

	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	To Comp	Total Cost
(U) Aircraft Procurement AF Budget Activity 5, Weapon System Code	5,492	3,287	2,481	167	151	158	5136	5141	cont	TBD
Related RDT&E:										
(U) Program Element 0305137F, National Airspace System	14,441	30,980	13,759	17,238	9,943	4,912	1,631	1,333		

(U) D. Schedule Profile

	FY 1994				FY 1995				FY 1996				FY 1997			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
(U) Acquisition Milestones:																
(U) Milestone III															X	
(U) Contract Milestones																
(U) Award Precision Landing ECO						X										
(U) Initial MMLS Delivery								X								
(U) Initial TRV Delivery												X				
(U)																
(U) Test and Evaluation Milestones																
(U) TRV First Article Complete											X					

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0305114F Traffic Cntrl/Approach/Landing Sys

	FY 1994				FY 1995				FY 1996				FY 1997			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
(U) TRV Operational Testing Complete																
(U) Other																
(U) MMLS IOC													X			
(U) CMLSA Depot Activation											X					

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0305114F Traffic Cntrl/Approach/Landing Sys

PROJECT: 2026

COST (*In Thousands*)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
2026 System Support	280	274	283	456	287	298	306	315	Continuing	TBD

(U) A. Mission Description and Budget Item Justification

This continuing effort funds ongoing liaison and interagency cooperative studies, as well as interoperability analyses between the USAF ATCALS program office and joint various organizations which include the other services, the FAA and the ICAO. Continues mission support for the ATCALS programs including several efforts with the FAA. RDT&E funds are used to resolve or minimize technical interface problems associated with interoperabilty between existing or planned DOD/FAA ATCALS equipment and capabilities.

(U) FY 1994
- (U) Continued support for all ATCALS projects. ($50)
- (U) Continued interoperability and interface evaluations. ($160)
- (U) Began support for the portable precision landing system studies for the Joint Special Operations Command (JSOC) ($70)

(U) FY 1995
- (U) Continued support for all ATCALS projects. ($50)
- (U) Continued interoperability and interface evaluations. ($159)
- (U) Continued support for the portable precision landing system studies for the Joint Special Operations Command (JSOC) ($65)

(U) FY 1996
- (U) Continued support for all ATCALS projects. ($50)
- (U) Continued interoperability and interface evaluations. ($112)
- (U) Continued support for the portable precision landing system studies for the Joint Special Operations Command (JSOC) ($121)

(U) FY 1997
- (U) Continued support for all ATCALS projects. ($125)
- (U) Continued interoperability and interface evaluations. ($250)
- (U) Continued support for the portable precision landing system studies for the Joint Special Operations Command (JSOC) ($81)

(U) B. Program Change Summary ($ in Thousands)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0305114F Traffic Cntrl/Approach/Landing Sys

PROJECT: 2026

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
(U) Previous President's Budget	280	274	284	278	TBD
(U) Appropriated Value	280	274			
(U) Adjustments to Appropriated Value	0	0			
(U) Current Budget Submit/President's Budget	280	274	283	456	TBD

(U) Change Summary Explanation:

Funding: None

Schedule: None

Technical: None

(U) C. Other Program Funding Summary ($ in Thousands) N/A

(U) D. Schedule Profile

	FY 1994				FY 1995				FY 1996				FY 1997			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
(U) Acquisition Milestones N/A																
(U) Contract Milestones																
(U) Initial TRV Delivery												X				
(U) Test and Evaluation Milestones																
(U) First Article Testing Complete									X							
(U) Operational Testing Complete											X					

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305114F Traffic Cntrl/Approach/Landing Sys PROJECT 2026

(U) A. Project Cost Breakdown ($ in Thousands)

	FY 1994	FY 1995	FY 1996	FY 1997
(U) System Engineering	70	70	66	72
(U) Contractor Engineering	80	80	70	99
(U) Test and Evaluation Support	100	95	112	250
(U) Program Management Support	20	20	20	20
(U) Travel	10	9	15	15
(U) Total	280	274	283	456

(U) B. Budget Acquisition History and Planning Information ($ in Thousands)

Performing Organizations: ESC/TG - No contract or Government effort in excess of One Million dollars.

Government Furnished Property: N/A

(U) C. Funding Profile ($ in Thousands) N/A

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0305114F Traffic Cntrl/Approach/Landing Sys

PROJECT: 3587

COST (*In Thousands*)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
3587 Precision Landing Development	8,147	6,829	3,685	3,551	1,548	866	7,629	6,076	Continuing	TBD

(U) A. **Mission Description and Budget Item Justification**

DOD and The Department of Transpiration (DOT) have a goal to development and acquire a common civil/military precision approach and landing system that is capable of operating with Category I,II or III signal guidance accuracy. The International Civil Aviation Organization (ICAO) and NATO designated worldwide implementation of PLS to be January 1988 with MLS as the standard. Due to the emergence of the Global Positioning System (GPS), as a more cost effective solution, the Air Force's precision landing development has been redirected to develop a replacement box for ILS to support a precision landing capability until GPS becomes available. GPS is expected to be available in FY 2000. This replacement box capability will allow DOD to meet the ICAO requirements for FM frequency protection. This is especially critical in Europe where there is a high density of FM radio stations. The Air Force has a worldwide deployment commitments and large numbers of its aircraft have a requirement for compliance with the ICAO Standards and recommended practices.

(U) FY 1994
- (U) Continued MMLSA EMD Phase II ($5,184)
- (U) Continued support for MLS testing and integration ($485)
- (U) Aircraft installation kit testing ($858)
- (U) Continue National Precision approach strategy study ($1,620)

(U) FY 1995
- (U) Identification of technical approaches to upgrade the current ILS ($930)
- (U) Begin development of a precision landing capability ($4,517)
- (U) Continue the National Precision Approach study ($552)
- (U) Perform platform integration and system engineering analyses ($830)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY: 7 - Operational System Development	PE NUMBER AND TITLE: 0305114F Traffic Cntrl/Approach/Landing Sys — PROJECT: 3587

(U) FY 1996
- (U) Continue development of a precision landing capability ($2,565)
- (U) Continue the National Precision Approach study ($100)
- (U) Continue Perform platform integration and system engineering analyses ($635)
- (U) Begin PLS flight certification ($385)

(U) FY 1997
- (U) Continue development of a precision landing capability ($2,206)
- (U) Complete the National Precision Approach study ($100)
- (U) Continue Perform platform integration and system engineering analyses ($520)
- (U) Continue PLS flight certification ($725)

(U) B. Program Change Summary ($ in Thousands)

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
(U) Previous President's Budget	8,320	7292	5287	6332	TBD
(U) Appropriated Value	8,320	7292			
(U) Adjustments to Appropriated Value					
a. Congressional reductions	173	463			
(U) Current Budget Submit/President's Budget	8,147	6,829	3,685	3,551	TBD

(U) Change Summary Explanation:

Funding: Funding decreases in FY96 and FY97 are due to a reduction in the scope of planned RDT&E activities and program restructure.

Schedule: N/A

Technical: N/A

(U) C. Other Program Funding Summary ($ in Thousands)

FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	To Comp	Total Cost

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0305114F Traffic Cntrl/Approach/Landing Sys

PROJECT: 3587

	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	To Comp	Total Cost
(U) Aircraft Procurement AF Budget Activity 5, Weapon System Code	5,492	3,287	2,481	167	151	158	5136	5141	cont	TBD
Related RDT&E:										
(U) Program Element 0305137F	14,441	30,980	13,759	17,238	9,943	4,912	1,631	1,333	cont	TDB

(U) D. Schedule Profile

	FY 1994				FY 1995				FY 1996				FY 1997			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
(U) Acquisition Milestones:																
(U) Milestone III															X	
(U) Contract Milestones																
(U) Award Precision Landing ECO						X										
(U) Initial MMLS Delivery								X								
(U)																
(U) Test and Evaluation Milestones N/A																
(U) Other																
(U) MMLS IOC													X			
(U) CMLSA Depot Activation											X					

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305114F Traffic Cntrl/Approach/Landing Sys PROJECT 3587

(U) A. Project Cost Breakdown ($ in Thousands)

	FY 1994	FY 1995	FY 1996	FY 1997
(U) Primary Hardware Development	6,045	4,517	2,565	2,206
(U) Test and Evaluation Support	485	208	385	725
(U) Engineering/Technical Support	890	454	320	240
(U) Avionics Integration Efforts	420	1,435	250	217
(U) Program Management Support	247	175	140	140
(U) Travel	60	40	25	23
(U) Total	8,147	6,829	3,685	3,551

(U) B. Budget Acquisition History and Planning Information ($ in Thousands)

Performing Organizations:

Government Furnished Property: N/A

(U) C. Funding Profile ($ in Thousands) N/A

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0305119F Medium Launch Vehicles

COST (*In Thousands*)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	32,869	20,097	21,898	16,323	13,507	29,113	34,753	35,530	Continuing	Continuing
4326 Austere Launch Imp Inv (ALII)	7,583	2,860	0	0	0	0	0	0	0	0
624A Medium Launch Vehicles	25,286	17,237	21,898	16,323	13,507	29,113	34,753	35,530	Continuing	Continuing

NOTE: In FY94, funding for Reentry Systems Launch Program (RSLP), $16,035,000, and Small Launch Vehicles (SLV), $20,832,000, was in this Program Element but is not reflected in the FY94 Total Program Element Cost above. Instead, FY94 funding and beyond for these projects is in PE #603308F (Strategic Missile Mods) and PE #603402F (Space Test Program), respectively.

(U) **A. Mission Description and Budget Item Justification**

National Security requirements dictate a continuing, highly reliable means of placing critical Department of Defense (DoD) satellites into required orbits. Assured access to space, directed by the President in the National Security Launch Strategy, will be accomplished through the use of a Expendable Launch Vehicles (ELVs). The Medium Launch Vehicle (MLV) program provides sustainment, procurement and launch of DoD ELVs, including Atlas II and Delta II at Cape Canaveral AFS, FL and Delta II, Atlas II, and Atlas E at Vandenberg AFB, CA. This program also provides for engineering support of active launch programs and post-flight assessment of DoD ELVs to maintain their high reliability. In FY94, the MLV RDT&E funds were broken into two parts, MLV (BPAC 624A) and Austere Launch Improvements Investments (ALII), BPAC 4326. The purpose of ALII is to identify those funds implementing OSD direction on space launch improvements. The ALII funds were transferred to the Evolved Expendable Launch Vehicle Program Element (PE #603853F) for FY96 and subsequent years. The preceding tasks require most of the funds to be in research category Operational Systems Support.

(U) **B. Program Change Summary ($ in Thousands)**

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
(U) Previous President's Budget	71,168	21,042	73,479	87,028	Continuing
(U) Appropriated Value	72,458	21,042			
(U) Adjustments to Appropriated Value					
a. Cong Gen Reductions	- 1,290	- 507			
b. SBIR	- 1,110	- 433			
c. Omnibus or Other Above Threshold Reprogram					
d. Below Theshold Reprogramming	-513	- 5			
(U) Adjustments to Budget Years Since FY95 PB			- 51,581	- 70,705	
(U) Current Budget Submit/President's Budget	69,545	20,097	21,898	16,323	Continuing

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305119F Medium Launch Vehicles

(U) Change Summary Explanation:

Funding: FY96 and FY97 funds for ALII project were transferred to PE #603853F, EELV Program.

Schedule: Not Applicable.

Technical: Not Applicable.

(U) C. Other Program Funding Summary ($ in Thousands)

	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	To Compl	Total Cost
(U) Weapons Procurement	109,541	135,088	189,785	215,653	269,118	284,443	355,899	296,276	Continue	Continue
(U) Military Construction	0	0	0	0	33,953	35,006	36,056	37,138	Continue	Continue

Related RDT&E:

(U) Space & Missile Rocket Propulsion (PE #603302F)

(U) Evolved Expendable Launch Vehicle (EELV, PE #603853F)

(U) D. Schedule Profile

	FY 1994				FY 1995				FY 1996				FY 1997			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
(U) Delta GPS Launch	X	X					X*		X*	X*	X*	X*	X*	X*	X*	X*
(U) Delta STP Launch										X						
(U) Delta Mods for GPS Block IIR Satellites	X	X	X	X	X	X	X	X								
(U) Atlas Launches	X						X									
(U) Atlas West Coast Pad Activation	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
(U) MLV Improvements (ALII)	X	X	X	X	X	X	X	X								

*NOTE: Asterisk launches indicate a Launch-On-Need (LON) estimate

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0305119F Medium Launch Vehicles

PROJECT: 4326

COST (*In Thousands*)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
4326 Austere Launch Imp Inv (ALII)	7,583	2,860	0	0	0	0	0	0	0	0

(U) A. Mission Description and Budget Item Justification

This project was created as a result of the Bottom Up Review on Space Launch. The funding in FY94 and FY95 was transferred from previously programmed funds in the MLV project (BPAC 624A), and these funds are used for austere improvements to sustain the MLV programs. The preceding tasks require most of the funds to be in research category 6.7, Operational Systems Support, this PE also contains efforts in research category 6.6, Management and Support.

(U) FY 1994
- (U) Austere improvements to MLV, including development and integration of low cost flight tracking system for range safety ($7,583)

(U) FY 1995
- (U) Continue austere improvements to MLV and complete prototype and of low cost flight tracking system ($2,860)
- (U) Release RFP for EELV, competitive award of development contracts.

(U) FY 1996
- (U) Funding transferred to PE #603853F.

(U) FY 1997
- (U) Funding transferred to PE #603853F.

(U) B. Program Change Summary ($ in Thousands)

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
(U) Previous President's Budget	7,852	3,067	51,003	59,860	Continuing
(U) Appropriated Value		3,067			
(U) Adjustments to Appropriated Value					
a. Cong Gen Reductions					
b. SBIR		- 203			
c. Omnibus or Other Above Threshold Reprogram					
d. Below Theshold Reprogramming	-269	-4			
(U) Adjustments to Budget Years Since FY95 PB			- 51,003	- 59,860	
(U) Current Budget Submit/President's Budget	7,583	2,860	0	0	

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY: 7 - Operational System Development	PE NUMBER AND TITLE: 0305119F Medium Launch Vehicles — PROJECT: 4326

(U) Change Summary Explanation:

Funding: FY96 and FY97 funds were transferred to PE #603853F, EELV.

Schedule: Not Applicable

Technical: Not Applicable

(U) C. Other Program Funding Summary ($ in Thousands)

(U) Not Applicable.

Related RDT&E:

(U) Space & Missile Rocket Propulsion (PE #603302F)

(U) Evolved Expendable Launch Vehicle (EELV, PE #603853F)

(U) D. Schedule Profile

	FY 1994				FY 1995				FY 1996				FY 1997			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
(U) Modification to Delta Safety Systems and ground support equipment	X	X	X	X	X	X	X	X								

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February, 1995

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
7 - Operational System Development	0305119F Medium Launch Vehicles	4326

(U) A. **Project Cost Breakdown ($ in Thousands)**

	FY 1994	FY 1995	FY 1996	FY 1997
(U) Primary Hardware Development	7,583	2,860	0	0
(U) Total	7,583	2,860	0	0

(U) B. **Budget Acquisition History and Planning Information ($ in Thousands)**
Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0305119F Medium Launch Vehicles

PROJECT: 624A

COST (*In Thousands*)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
624A Medium Launch Vehicles	25,286	17,237	21,898	16,323	13,507	29,113	34,753	35,530	Continuing	Continuing

(U) A. **Mission Description and Budget Item Justification**

National Security requirements dictate a continuing, highly reliable means of placing critical Department of Defense (DoD) satellites into required orbits. Assured access to space, directed by the President in the National Security Launch Strategy, will be accomplished through the use of a robust mix of Expendable Launch Vehicles (ELVs). The Medium Launch Vehicle (MLV) program provides sustainment, procurement and launch of DoD ELVs, including Atlas II and Delta II at Cape Canaveral AFS, FL and Delta II, Atlas II, and Atlas E at Vandenberg AFB, CA. This program also provides for engineering support of active launch programs and post-flight assessment of DoD ELVs to maintain their high reliability. The preceding tasks require the funds to be in Operational Systems Support research category.

(U) FY 1994
- (U) Delta II range safety compliance vehicle and required facilities upgrades continued ($9,090)
- (U) Continue MLV III/GPS IIR new mission integration ($3,500)
- (U) West Coast Atlas II launch complex activation continues ($1,211)
- (U) Base support and environmental programs ($3,322)
- (U) Sustaining engineering and mission support for MLV launch facilities, infrastructure, and launch operations includes space launch complexes 3, 17, and 36 and supporting facilities ($8,163)

(U) FY 1995
- (U) Complete Delta II range safety compliance vehicle upgrades, first flight with new upgrades this year ($7,000)
- (U) Continue GPS IIR mission integration and complete site activation ($900)
- (U) West Coast Atlas II activation continues ($1,383)
- (U) Engineering support for STP (ARGOS) at Vandenberg ($535)
- (U) Base support and environmental programs ($1,293)
- (U) Sustaining engineering and mission support for MLV launch facilities, infrastructure, and launch operations includes space launch complexes 3, 17, and 36 and supporting facilities ($6,126)

(U) FY 1996
- (U) Complete Delta II range safety required facility upgrades this year ($832)
- (U) Complete STP (ARGOS) mission integration ($1,394)
- (U) West Coast Atlas II activation continues ($1,502)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY: 7 - Operational System Development	PE NUMBER AND TITLE: 0305119F Medium Launch Vehicles / PROJECT: 624A

- (U) Complete GPS IIR mission integration ($6,541)
- (U) Base support and environmental programs ($2,700)
- (U) Sustaining engineering and mission support for MLV launch facilities, infrastructure, and launch operations includes space launch complexes 3, 17, and 36 and supporting facilities ($8,929)

(U) FY 1997
- (U) Base support and environmental programs ($5,390)
- (U) West Coast Atlas II activation continues ($1,115)
- (U) Sustaining engineering and mission support for MLV launch facilities, infrastructure, and launch operations includes space launch complexes 3, 17, and 36 and supporting facilities ($9,818)

(U) B. Program Change Summary ($ in Thousands)

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
(U) Previous President's Budget	26,458	17,975	22,476	17,168	Cont
(U) Appropriated Value	27,748	17,975			
(U) Adjustments to Appropriated Value					
a. Cong Gen Reductions	- 1,290	- 507			
b. SBIR		- 230			
c. Omnibus or Other Above Threshold Reprogram	- 1,110				
d. Below Theshold Reprogramming	-62	- 1			
(U) Adjustments to Budget Years Since FY95 PB			- 578	- 845	
(U) Current Budget Submit/President's Budget	25,286	17,237	21,898	16,323	Cont

(U) Change Summary Explanation:

Funding: No significant changes.

Schedule:

Technical:

(U) C. Other Program Funding Summary ($ in Thousands)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305119F Medium Launch Vehicles PROJECT 624A

	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	To Compl	Total Cost
(U) Weapons Procurement	109,541	135,088	189,785	215,653	269,118	284,443	355,899	296,276	Continue	Continue
(U) Military Construction	0	0	0	0	33,953	35,006	36,056	37,138	Continue	Continue

Related RDT&E:
(U) Space & Missile Rocket Propulsion (PE #603302F)
(U) Evolved Expendable Launch Vehicle (EELV, PE #603853F)

(U) D. Schedule Profile

	FY 1994				FY 1995				FY 1996				FY 1997			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
(U) Delta GPS Launch	X	X					X*		X*	X*	X*	X*	X*	X*	X*	X*
(U) Delta STP Launch										X						
(U) Delta Mods for GPS Block IIR Satellites	X	X	X	X	X	X	X	X								
(U) Atlas Launches	X						X									
(U) Atlas West Coast Pad Activation	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
(U) MLV Improvements (ALII)	X	X	X	X	X	X	X	X								

*NOTE: Asterisk launches indicate a Launch-On-Need (LON) estimate

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0305119F Medium Launch Vehicles

PROJECT: 624A

(U) A. **Project Cost Breakdown ($ in Thousands)**

	FY 1994	FY 1995	FY 1996	FY 1997
(U) Primary Hardware Development	25,286	17,237	21,898	16,323
(U) Total	25,286	17,237	21,898	16,323

(U) B. **Budget Acquisition History and Planning Information ($ in Thousands)**

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1994	Budget FY 1994	Budget FY 1995	Budget FY 1996	Budget FY 1997	Budget to Complete	Total Program
Product Development Organizations											
Martin Marietta	FFP	Jun 88	N/A	N/A	69,417	456	1,112	1,022	1,088	cont	cont
McDonnell Douglas Aerospace	FFP	Sep 87	N/A	N/A	201,038	14,026	1,040	8,977	1,113	cont	cont
GSAC	Various	Various	N/A	N/A		2,549	7,261	2,647	2,479	cont	cont
Support /Management											
Mission Support	FPI	FY94	N/A	N/A	N/A	1,079	1,100	1,200	1,300	cont	cont
Various SMC	Various	FY94	N/A	N/A		2,669	2,465	3,332	3,491	cont	cont
Other Ktr Sup (EER & MCR)	FFP	FY94	N/A	N/A		140	1,755	696	531	cont	cont
Vandenberg Sup	Various	Various	N/A	N/A		1,045	1,211	1,324	931	cont	cont
Environ/Safety	Various	Various	N/A	N/A		3,322	1,293	2,700	5,390	cont	cont

Test and Evaluation Organizations

Not Applicable

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)		DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305119F Medium Launch Vehicles	PROJECT 624A

(U) B. **Budget Acquisition History and Planning Information Continued ($ in Thousands)**

Government Furnished Property: Not Applicable

Contractor or Government Performing Activity	Total Prior to FY 1994	Budget FY 1994	Budget FY 1995	Budget FY 1996	Budget FY 1997	Budget to Complete	Total Program
Subtotal Product Development	270,455	17,031	9,413	12,646	4,680	cont	cont
Subtotal Support and Management		8,255	7,824	9,252	11,643	cont	cont
Subtotal Test and Evaluation							
Total Project	270,455	25,286	17,237	21,898	16,323	cont	cont

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0305128F Security/Investigative Actys

PROJECT: 0

COST (*In Thousands*)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
0 Total Program Element (PE) Cost	0	0	299	299	348	284	308	318	Continuing	TBD

(U) A. Mission Description and Budget Item Justification

This program element funds 70% of AFOSI's manpower and operations and maintenance costs, as well as, 100% of its procurement and research and development costs. The mission of the Air Force Office of Special Investigations (AFOSI) is to protect Air Force resources through specialized investigative support. This includes investigating criminal matters affecting AF personnel, contract fraud, and economic crimes involving AF weapons systems and spare parts, and the investigation of environmental and counterdrug crimes. This element supports Technical Surveillance Countermeasures (TSCM) and technical support to criminal and counterintelligence investigations and operations conducted by AFOSI. AFOSI's TSCM mission provides security assessments to both AF and DoD facilities and programs. While most research to meet operational requirements is Operational System Development, there is also research in the category of Engineering and Manufacturing Development due to a need for modifications to present technology.

The equipment required to conduct TSCMs and technical support to investigations is unique and complex. TSCM equipment must be continually updated to remain effective in countering the increasingly complex devices used to thwart our security. In an era of advancing technology, reduced manning, and increasingly high level fraud and environmental crime investigations, technical support equipment must be continually updated to enable the most cost effective and lawful telephone, data, and voice interceptions as well as, capture actual criminal activity on video or still images. Additionally, the capability to track suspects engaged in espionage, terrorist, narcotics or other criminal activity must be continually updated to ensure special agents have the best possible chance of thwarting criminal acts. AFOSI currently lacks the capability to support the interception of digital audio or telephone transmissions. In addition, AFOSI does not have the capability to effectively integrate automated software and hardware suites in support of TSCM surveys, and an effective technological means for the tracking of audio and tagging type signals.

(U) FY 1994
- (U) None

(U) FY 1995
- (U) None

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305128F Security/Investigative Actys
	PROJECT 0

(U) FY 1996

- (U) TSCM Receiver/Software Suite.
  - -- (U) RDT&E of the incorporation of monolithic microwave integrated circuit (MMIC) technology into a receiver for AFOSI applications. ($25,000)
  - -- (U) RDT&E of software analysis tools, currently in AFOSI inventory, for RF spectrum analysis and integration with receiver systems. ($75,000)
  - -- (U) RDT&E of the integration of first generation data analysis tools with receiver hardware and suitable microprocessing systems. ($75,000)

- (U) FBIRD Digital Audio Recorder. Advanced development of support units for storage, retrieval, and analysis of digitally recorded audio. ($25,000)
- (U) Audio/Telephone Intercept. Demonstration and validation of audio/telephone intercept units for field applications. ($25,000)
- (U) GPS Tracking System. Research, study, and analyze techniques for development of a Global Positioning System (GPS) based tracking systems. ($25,000)
- (U) Digital Image/Audio Analysis & Enhancement. RDT&E of digital image/audio analysis and processing systems to for AFOSI investigative needs. ($24,000)
- (U) Maintenance/Integrated Logistics Support Systems (ILS) integration Advanced development of the AFOSI equipment/maintenance test set and its integration into an ILS system, both of which are under development. ($25,000)

(U) FY 1997

- (U) TSCM Receiver/Software Suite.
  - -- (U) RDT&E of EMD systems for Operational Systems Development. ($100,000)
  - -- (U) Initial Operational Test and Evaluation (IOT&E) in support of fielding for an Initial Operational Capability (IOC) of 15 Jan 97. ($75,000)

- (U) Speech Analysis Techniques. Advanced development of speech analysis systems. ($50,000)
- (U) Maintenance/ILS Systems Integration. IOT&E of the integrated equipment test system and ILS system. ($25,000)
- (U) Link Analysis for Investigative Tracking and Accounting. Research into the application of Link Analysis tools to assist with and tracking criminal investigations. ($49,000)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0305128F Security/Investigative Actys

PROJECT: 0

(U) B. Program Change Summary ($ in Thousands)

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
(U) Previous President's Budget			300	300	600
(U) Appropriated Value					
(U) Adjustments to Appropriated Value					
a.					
b. Inflation			-1	-1	-2
(U) Current Budget Submit/President's Budget			299	299	598

(U) Change Summary Explanation:

Funding: These documents reflect funding changes resulting from re-calculation of inflation.

Schedule:

Technical:

(U) C. Other Program Funding Summary ($ in Thousands)

	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	To Compl	Total Cost
(U) 3080	1730	2264	1049	1090	1034	1147	2238	2304	cont	TBD

Related RDT&E:

(U) No Related Program Elements

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY: 7 - Operational System Development	PE NUMBER AND TITLE: 0305128F Security/Investigative Actys — PROJECT: 0

(U) D. Schedule Profile

	FY 1994				FY 1995				FY 1996				FY 1997			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
(U) TSCM Receiver/Software Suite									X		X		X		X	
(U) FBIRD Digital Audio Recorders									X							
(U) Audio/Telephone Intercept										X						
(U) GPS Tracking System										X						
(U) Digital Image/Audio Analysis & Enhancement									X							
(U) Maintenance/ILS Systems Integration									X				X			
(U) Speech Analysis Techniques														X		
(U) Link Analysis for Investigative Tracking and Accounting														X		

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305128F Security/Investigative Actys
	PROJECT 0

(U) A. Project Cost Breakdown ($ in Thousands)

	FY 1994	FY 1995	FY 1996	FY 1997
(U) Primary Hardware Development	0	0	70	25
(U) Ancillary Hardware Development	0	0	25	0
(U) Software Development	0	0	75	24
(U) Systems Engineering	0	0	80	0
(U) Developmental Test and Evaluation	0	0	35	90
(U) Government Engineering Support	0	0	14	45
(U) Operational Test and Evaluation	0	0	14	90
(U) Travel	0	0	14	25
(U) Total	0	0	299	299

(U) B. Budget Acquisition History and Planning Information ($ in Thousands)

Performing Organizations:

None

Government Furnished Property:

None

(U) C. Funding Profile ($ in Thousands)

No programs in excess of $10 million.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #7 - Operational Systems Development

PE NUMBER AND TITLE: #0305137F, National Airspace System (NAS) 4090

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	14,441	30,126	13,759	17,238	9,943	4,912	1,631	1,333	continuing	continuing

A. (U) Mission Description and Budget Item Justification

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. 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 (SUA), provides transparent services to military and civil aircraft, replaces aging DoD ATC systems, and increases flight safety. The Military Airspace Management System (MAMS) will effectively schedule and manage SUA. DoD military ATC and fighting/flying readiness will be maintained. Since this program is designed to modernize the DoD ATC system, which is an operational system, this PE is categorized as an operational systems development effort and funding has been included in budget activity seven.

(U) FY 1994($ in Thousands)
- (U) Military Airspace Management System (MAMS) development ($2,500).
- (U) Continue site surveys, facility/transition planning ($5,792).
- (U) Continue the development of the NAS Integration Plan ($1,449).
- (U) Continue NAS DoD Subsystem Analysis for each DoD site ($4,700).

(U) FY 1995($ in Thousands)
- (U) Military Airspace Management System (MAMS) Development ($3,000).
- (U) Continue site surveys, facility/transition planning ($3,605).
- (U) Continue development of the NAS Integration Plan ($0,950).
- (U) Continue NAS DoD Subsystem Analysis for each DoD site ($1,121).
- (U) Radar Acquisition and Test ($13,500).
- (U) Automation Acquisition and Test ($6,590).
- (U) Voice Switch Acquisition and Test ($1,000).

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #7 - Operational Systems Development

PE NUMBER AND TITLE: #0305137F, National Airspace System (NAS) 4090

A. (U) Mission Description and Budget Item Justification (cont)

(U) FY 1996 ($ in Thousands)

- (U) Military Airspace Management System (MAMS) Development ($2,500).
- (U) Continue site surveys, facility/transition planning ($0,650).
- (U) Continue NAS DoD Subsystem Analysis for each DoD site ($2,009).
- (U) Continue Radar Acquisition and Test ($3,800)
- (U) Continue Automation Acquisition and Test ($4,000).
- (U) Continue Voice Switch Acquisition and Test ($0,800).

(U) FY 1997 ($ in Thousands)

- (U) Military Airspace Management System (MAMS) Development ($2,000).
- (U) Continue site surveys, facility/transition planning ($0,400).
- (U) Complete NAS DoD Subsystem Analysis for each DoD site ($1,938).
- (U) Continue Radar Acquisition and Test ($3,500).
- (U) Continue Automation Acquisition and Test ($8,800).
- (U) Continue Voice Switch Acquisition and Test ($0,600).

B.(U) Program Change Summary ($ in Thousands)

	1994	1995	1996	1997	Total Cost
(U) Previous President's Budget	18,773	30,980	18,627	13,636	TBD
(U) Appropriated Value	15,773	30,980			
(U) Adjustments to Appropriated Value	1,332	854			
(U) a. Below Threshold Reprogramming	1,332	854			
(U) b. Program Restructure			4,868	+3,602	
(U) Current Budget Submit/President's Budget	14,441	30,126	13,759	17,238	TBD

(U) Change Summary Explanation:

(U) Funding: FAA delay on automation program necessitated program restructure which shifted some FY 96 funds/requirements to FY 97.

(U) Schedule: None.

(U) Technical: None

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #7 - Operational Systems Development

PE NUMBER AND TITLE: #0305137F, National Airspace System (NAS) 4090

C.(U) Other Program Funding Summary ($ in Thousands)

	1994	1995	1996	1997	1998	1999	2000	2001	To Compl	Total Cost
(U) Other Procurement, BA 16 Weapon System Code 837100, PE0305137F	0	0	0	3,045	24,147	64,525	60,630	69,632	Continuing	Continuing
(U) Military Construction, BA 24 AF PE 0305137F	0	0	0	0	3,700	0	0	2,592	Continuing	Continuing

D.(U) Schedule Profile

	1994				1995				1996				1997			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
(U) Acquisition Milestone																
(U) Milestone II/III							X									
(U) Contract Milestones																
(U) MAMS Contract Awarded			*													
(U) Radar																
RFP Release							X									
Contract Award								X								
(U) Automation																
RFP Release								X								
Contract Award												X				
(U) Voice Switch																
RFP Released			*													
Contract Award								X								
NAS IOC Apr 2000																
NAS FOC Apr 2006																

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February 1995

BUDGET ACTIVITY: #7 - Operational Systems Development

PE NUMBER AND TITLE: #0305137F, National Airspace System (NAS)

PROJECT NO.: 4090

A. Project Cost Breakdown ($ in Thousands)

	1994	1995	1996	1997
(U) a. Software Development	2,500	3,000	2,500	2,000
(U) b. Site Surveys	1,110	1,100	400	300
(U) c. Facility/Transition Planning	1,665	1,005	250	100
(U) d. Integration/Interface Planning	1,449	950	100	100
(U) e. System Engineering	3,017	1,500	1,500	1,400
(U) f. Contractor Engineering Support	989	600		
(U) g. Primary Hardware and Test Eval	2,342	21,450	8,600	12,900
(U) h. Program Management Support	1,309	481	369	398
(U) i. Travel	60	40	40	40
Total	14,441	30,126	13,759	17,238

B.(U) Budget Acquisition History and Planning Information ($ in Thousands)

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to 1994	Budget 1994	Budget 1995	Budget 1996	Budget 1997	Budget to Complete	Total Program
(U) Product Development Organizations:											
a. Computer Based Systems	CPAF	Jun 94	N/A	10,000	0	2,500	3,000	2,500	2,000	0	10,000
b. ESC					38,501	11,941	27,126	11,259	15,238	6,645	110,710
(U) Support and Management Organizations	SM-ALC				0	0	0	0	0	2.2B	2.2B
(U) Test and Evaluation Organizations	AFOTEC (PE 0207426F)				0,032	0,067	0,131	0,390	1,201	Continuing	TBD

Government Furnished Property: N/A

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0305138F Upper Stage Space Vehicles

COST (*In Thousands*)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
4053 Upper Stage Dev (Inertial Upper Stg)	3,854	3,547	3,554	3,303	3,475	3,562	3,668	3,780	Continuing	Continuing

(U) **A. Mission Description and Budget Item Justification**

(U) The Upper Stages Program provides consolidated acquisition of the Inertial Upper Stage (IUS) to support the DoD Mission Model. This effort includes flight operations at the Eastern Launch Site (ELS), FL; 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/MOU's between USAF and NASA. IUS supports the launch of Defense Support Program (DSP) satellites. IUS is the upper stage on a Titan IV (or it can be modified for Shuttle) and takes the DSP satellite to the required orbit. The program continuously evaluates and improves upper stage reliability, cost effectiveness, and responsiveness. It supports redesign of aging equipment and spares which are no longer manufactured or available; investigation of flight anomalies; and small studies to assist in defining future upper stages. The preceeding tasks require funding in Budget Activity Research Category Operational Systems Support.

(U) FY 1994
- (U) Conducted study of new integral modular engine design ($703)
- (U) Designed and developed Flight Controller to replace obsolete, flight hardware ($1,000)
- (U) Provided studies/analyses in support of one DoD mission ($501)
- (U) Performed anomaly resolution from last IUS flight and requalification of batteries ($650)
- (U) Program Management Support Activities ($1,000)

(U) FY 1995
- (U) Study and design corrective actions for anomalies and obsolete items ($3,547)

(U) FY 1996
- (U) Study and design corrective actions for anomalies and obsolete items ($3,554)

(U) FY 1997
- (U) Study and design corrective actions for anomalies and obsolete items ($3,303)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0305138F Upper Stage Space Vehicles

(U) **B. Program Change Summary ($ in Thousands)**

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
(U) Previous President's Budget	4,118	3,663	3,597	3,349	Continuing
(U) Appropriated Value	4,141	3,663			
(U) Adjustments to Appropriated Value					
a. Cong Gen Reductions	-23	-39			
b. SBIR	-64	-76			
c. Omnibus or Other Above Threshold Reprogram					
d. Below Threshold Reprogramming	-200	-1			
Adjustments to Budget Years Since FY 95 PB			-43	-46	
(U) Current Budget Submit/President's Budget	3,854	3,547	3,554	3,303	Continuing

(U) Change Summary Explanation:

Funding: Minor adjustments for inflation.

Schedule: Not Applicable.

Technical: Not Applicable.

(U) **C. Other Program Funding Summary ($ in Thousands)**

	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	To Compl	Total Cost
(U) Missile Procurement	70,917	102,791	56,963	54,668	56,486	58,350	60,108	61,924	Continue	Continue

Related RDT&E:

(U) PE 0305144F, Titan Vehicles

(U) PE 0102431F, DSP

(U) IUS program supports the NASA Space Transportation System as the upper stage for use with the Space Shuttle

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305138F Upper Stage Space Vehicles

(U) **D. Schedule Profile**

	FY 1994				FY 1995				FY 1996				FY 1997			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
(U) USAF Launch					X							X				
(U) Avionics Replacement					X	X	X	X								
(U) Integration, Launch Support, and Life Extension Modification	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0305138F Upper Stage Space Vehicles

(U) **A. Project Cost Breakdown ($ in Thousands)**

	FY 1994	FY 1995	FY 1996	FY 1997
(U) Avionics Obsolescence Mitigation	1,000	1,000	1,000	1,000
(U) Program Management Support	1,000	924	954	1,000
(U) Software Development	501	700	700	700
(U) Systems Engineering	1,353	923	900	603
(U) Total	3,854	3,547	3,554	3,303

(U) **B. Budget Acquisition History and Planning Information ($ in Thousands)**

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1994	Budget FY 1994	Budget FY 1995	Budget FY 1996	Budget FY 1997	Budget to Complete	Total Program
Product Development Organizations											
Boeing	FPI/AF	Jul 85	907,000	910,000	5,800	1,036	1,300	N/A	N/A		8,136
	FPI/AF	Mar 91	89,000	88,000	0	0	621	2,054	1,803	cont	cont
	CPAF/LOE	Sep 90	N/A	N/A	300	821	300	300	300	cont	cont
Aerojet	CPFF	Mar 95	703	703	0	703	0	0	0		703
Support and Management Organizations											
Space and Missile Systems Center, LAAFB	N/A	N/A	N/A	N/A	1,261	1,294	1,326	1,200	1,200	cont	cont

Test and Evaluation Organizations Not Applicable

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305138F Upper Stage Space Vehicles

(U) B. **Budget Acquisition History and Planning Information Continued ($ in Thousands)**

Government Furnished Property: Not Applicable

Contractor or Government Performing Activity	Total Prior to FY 1994	Budget FY 1994	Budget FY 1995	Budget FY 1996	Budget FY 1997	Budget to Complete	Total Program
Subtotal Product Development	6,100	2,560	2,221	2,354	2,103	cont	cont
Subtotal Support and Management	1,261	1,294	1,326	1,200	1,200	cont	cont
Subtotal Test and Evaluation							
Total Project	7,361	3,854	3,547	3,554	3,303	cont	cont

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0305144F Titan Space Launch Vehicles

PROJECT: 4135

COST (*In Thousands*)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
4135 Titan II/IV	263,540	147,660	140,514	148,656	205,744	94,935	56,550	53,835	Continuing	Continuing

(U) A. **Mission Description and Budget Item Justification**

(U) National security requirements dictate a continuing, highly reliable means of placing critical DoD 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 provides several different configurations for the Titan IV [No Upper Stage (NUS), Inertial Upper Stage (IUS), and Centaur]. In addition, the Titan IV program is developing a solid rocket motor upgrade (SRMU) 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 to maintain system characterization and reliability.

(U) Beginning in FY94, this program element also includes funding for engineering costs, payload integration, and Government costs for the Titan II space launch vehicle. This activity is included as operational systems development since both Titan II and Titan IV are operational launch vehicles.

(U) FY 1994
- (U) Continued development of product/process upgrades and range safety compliant systems ($53,200)
- (U) Continued integration for the Defense Support Program (DSP) and Milstar ($27,300)
- (U) Facility modifications ($8,400)
- (U) Titan block change implementations ($119,400)
- (U) Sustaining engineering ($49,600)
- (U) Environmental management ($1,100)
- (U) Continued Titan II ($4,540)

(U) FY 1995
- (U) Continue development of product/process upgrades and range safety-compliant systems ($44,171)
- (U) Continue integration for the Defense Support Program (DSP) and Milstar ($13,400)
- (U) Continue facility modifications and upgrades ($4,000)
- (U) Implement design requalification for follow-on procurement ($51,600)
- (U) Continue sustaining engineering ($27,100)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY: 7 - Operational System Development	PE NUMBER AND TITLE: 0305144F Titan Space Launch Vehicles / PROJECT: 4135

- (U) Continue environmental management ($3,800)
- (U) Continue Titan II ($3,600)

(U) FY 1996
- (U) Continue development of product/process upgrades and range safety compliant systems ($65,200)
- (U) Continue integration for the Defense Support Program (DSP) and Milstar ($9,200)
- (U) Continue facility modifications and upgrades ($23,400)
- (U) Continue design requalification for follow-on procurement ($12,700)
- (U) Continue sustaining engineering ($18,300)
- (U) Continue environmental management ($2,300)
- (U) Continue Titan II, including guidance replacement ($9,414)

(U) FY 1997
- (U) Continue development of product/process upgrades and range safety compliant systems ($42,000)
- (U) Continue integration for the Defense Support Program (DSP) and Milstar ($19,000)
- (U) Continue facility modifications and upgrades ($32,500)
- (U) Continue design requalification for follow-on procurement ($21,600)
- (U) Continue sustaining engineering ($27,700)
- (U) Continue environmental management activity ($2,400)
- (U) Continue Titan II ($3,456)

(U) Acquisition Strategy:

(U) This program is in the process of finalizing an acquisition strategy for OSD approval in FY95 detailing contracts to extend launch services beginning in FY96, production of up to six vehicles beginning with advance procurement in FY97, and extension of payload integration beginning in FY98. The strategy will also address a new contract containing the entire program's systems engineering activity currently performed on the existing production/development contract.

(U) B. Program Change Summary ($ in Thousands)

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
(U) Previous President's Budget	270,125	161,096	155,686	110,004	Continuing
(U) Appropriated Value	272,740	153,396			

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0305144F Titan Space Launch Vehicles

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
(U) Adjustments to Appropriated Value					
a. Cong Gen Reductions	- 2,615	- 2,507			
b. SBIR	- 4,214	- 3,184			
c. Omnibus or Other Above Threshold Reprogram					
d. Below Threshold Reprogramming	- 2,371	- 45			
(U) Adjustments to Budget Years Since FY95 PB			- 15,172	+ 38,652	
(U) Current Budget Submit/President's Budget	263,540	147,660	140,514	148,656	Continuing

(U) Change Summary Explanation:

Funding: FY95 reduction associated with decrease in overhead rates resulting from Martin Marietta acquisition of General Dynamics along with other Congressional reductions.

Schedule: FY96 reduction and corresponding increase in FY98 is for payload integration activity delayed due to two year slip in follow-on buy.

Technical: FY97 funding increased to correct shortfalls validated by the AF and OSD Cost Analysis Improvement Group (CAIG) for risks associated with upgraded solid rocket motors.

(U) C. Other Program Funding Summary ($ in Thousands)

	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	To Compl	Total Cost
(U) Missile Procurement, Budget Activity 5, Program Title: Space Boosters	463,174	379,136	464,953	600,706	573,241	614,580	468,605	408,398	Continue	Continue

Related RDT&E:

(U) Not Applicable.

(U) D. Schedule Profile

	FY 1994				FY 1995				FY 1996				FY 1997			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
(U) Acquisition Strategy Report (ASR) to USD(A&T)*						X										

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0305144F Titan Space Launch Vehicles

PROJECT: 4135

	FY 1994				FY 1995				FY 1996				FY 1997			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
(U) Launch Services Contract Award									X							
(U) Sustaining Engineering Contract Awd									X							
(U) Complete development activity for first Titan IV-B Launch (First SRMU)												X				
(U) Follow-on Buy Award- Adv Proc													X			
(U) Centaur Processing Facility IOC (storage only)														X		

*Note: ASR may combine contracts for launch services and program sustaining engineering

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0305144F Titan Space Launch Vehicles

PROJECT: 4135

(U) A. **Project Cost Breakdown ($ in Thousands)**

	FY 1994	FY 1995	FY 1996	FY 1997
(U) Titan IV				
(U) Contract Costs	217,829	118,490	94,382	90,551
(U) Facilties	8,400	4,000	23,400	32,500
(U) Other Government Costs	32,800	21,600	13,300	22,100
(U) Titan II				
(U) Contract Costs	1,711	2,270	8,032	2,105
(U) Other Government Costs	2,800	1,300	1,400	1,400
(U) Total	263,540	147,660	140,514	148,656

(U) B. **Budget Acquisition History and Planning Information ($ in Thousands)**

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC*	Project Office EAC*	Total Prior to FY 1994	Budget FY 1994	Budget FY 1995	Budget FY 1996	Budget FY 1997	Budget to Complete	Total Program
Product Development Organizations											
MMTI 85-C-0019	C/FPIF	1QFY85	11,114,099	11,301,399	1,957,330	190,529	108,319			Continues	Continues
MMTI 85-C-0085	C/FPIF	1QFY85	638,600	638,600	81,300	1,711	2,270			Continues	Continues
MMTI 92-C-0028	C/CPAF	3QFY92	639,800	641,400	41,470	27,300	13,400	9,200	19,000	Continues	Continues
MMTI NEW CONTRACT (TIV)								85,182	71,551	Continues	Continues
MMTI NEW CONTRACT (TII)								8,032	2,105	Continues	Continues
Facility Contracts (various)					64,500	8,400	4,000	23,400	32,500	Continues	Continues

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0305144F Titan Space Launch Vehicles

PROJECT: 4135

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC*	Project Office EAC*	Total Prior to FY 1994	Budget FY 1994	Budget FY 1995	Budget FY 1996	Budget FY 1997	Budget to Complete	Total Program
Support and Management Organizations											
Space and Missile System Contractor					64,500	25,400	19,142	11,713	20,460	Continues	Continues
FFRDC Support					54,500	10,200	3,758	2,987	3,040	Continues	Continues
Test and Evaluation Organizations											
Not Applicable											
Subtotal Product Development					189,227	227,940	127,989	125,814	125,156	Continues	Continues
Subtotal Support and Management					119,000	35,600	22,900	14,700	23,500	Continues	Continues
Subtotal Test and Evaluation											
Total Project					308,227	263,540	150,889	140,514	148,656	Continues	Continues

* NOTE: EAC Includes all sources of funding

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0305145F Arms Control Implementation

COST (*In Thousands*)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	8,457	3,346	998	1,728	1,791	1,864	1,920	1,977	Continuing	TBD
4189 Minuteman III De-Mirving Preparation	3,500	0	0	0	0	0	0	0	0	16,384
4190 Treaty Prep/Verification Support	40	0	498	1,728	1,791	1,864	1,920	1,977	Continuing	TBD
4283 Open Skies Treaty Systems Develop	4,917	3,346	500	0	0	0	0	0	0	8,763

(U) A. **Mission Description and Budget Item Justification**

(U)This element directly supports implementation and planning for current and pending arms control agreements.

- (U) MM III de-MIRVing actions are required to meet overall warhead limitations under Strategic Arms Reduction Treaty (START) and re-entry vehicle (RV) limitations under START II by providing single RV (SRV) capability to the MM III ICBM fleet. The project includes research and development costs associated with: (FY94 program $3,500)
  - (U) new bulkhead design, design testing, and limited production
  - (U) software modifications and testing necessary for successful launch in the SRV configuration
  - (U) program complete, RDT&E funding no longer required after FY94

- (U) Treaty preparation/verification support activities encompass a wide range of projects necessary to prepare the United States for compliance with impending and future arms control treaties and negotiations. (FY94 program $40, FY95 program $0, FY96 program $498)

- (U) Open Skies support includes development of Synthetic Aperture Radar (SAR), SAR media processing equipment, the Data Annotation and Recording Mapping System (DARMS), as well as systems integration, engineering, test, and evaluation. This includes:
  - (U) Aircraft systems integration, engineering, test, and evaluation (FY94 program $1,917, FY95 program $2,846, FY96 program $500)
  - (U) Synthetic Aperture Radar (SAR) prototype development (FY94 program $2,000)
  - (U) Data Annotation and Recording Mapping System (DARMS) prototype development (FY94 program $1,000)
  - (U) Ground processing software development (FY95 program $500)

(U) PE belongs in BA # 7 since projects involve efforts that include modifications to operational systems, and production approval for all R&D activities have been approved.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0305145F Arms Control Implementation

(U) B. Program Change Summary ($ in Thousands)

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
(U) Previous President's Budget	7,067	6,456	2,445	1,738	TBD
(U) Appropriated Value	7,107	3,456			
(U) Adjustments to Appropriated Value					
a. Congressional Reductions	-40	-38			
b. SBIR	-110	-72			
c. BTR	+1,500				
(U) Adjustments to Budget Years Since FY95 PB			-1447	-10	
(U) Current Budget Submit/President's Budget	8,457	3,346	998	1,728	TBD

(U) Change Summary Explanation:

Funding: Not Applicable

Schedule: Not Applicable

Technical: Not Applicable

(U) C. Other Program Funding Summary ($ in Thousands)

	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	To Compl	Total Cost
(U) Missile Procurement: MM II/III Mods	0	4,695	0	0	0	0	0	0	0	21,897
Quantity		210								620
(U) Aircraft Procurement: C-135B	0	0	429	548	0	0	0	0	0	61,577
(U) Other Procurement: Items less than $2.0	39	38	38	40	41	43	44	46	Con't	TBD
(U) Other Procurement: Items Less that $2.0	0	2,441	0	0	0	0	0	0	0	2,441

(U) D. Schedule Profile

(U) See individual project schedules

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0305145F Arms Control Implementation

PROJECT: 4189

COST (*In Thousands*)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
4189 Minuteman III De-Mirving Preparation	3,500	0	0	0	0	0	0	0	0	16,384

(U) A. **Mission Description and Budget Item Justification**

- (U) MM III de-MIRVing actions are required to meet overall warhead limitations under Strategic Arms Reduction Treaty (START) and re-entry vehicle (RV) limitations under START II by providing single RV (SRV) capability to the MM III ICBM fleet. The project includes research and development costs associated with:
  - (U) new bulkhead design to accommodate the SRV configuration
  - (U) design testing
  - (U) limited production of the initial prototype design
  - (U) software modifications
  - (U) testing

(U) FY 1994
- (U) Complete and test the hardware and software modifications. ($2,000)
- (U) Extend existing contract to support software modifications and flight test. ($1,500)
- (U) Program complete in FY94. RDT&E funds are no longer required

(U) FY 1995
- (U) Program Complete

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305145F Arms Control Implementation
	PROJECT 4189

(U) **B. Program Change Summary ($ in Thousands)**

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
(U) Previous President's Budget	2,000	0	0	0	14,884
(U) Appropriated Value	2,000	0			
(U) Adjustments to Appropriated Value					
a. BTR	+1,500				
(U) Current Budget Submit/President's Budget	3,500	0	0	0	16,384

(U) Change Summary Explanation:

Funding: Increased funding provided to extend existing contracts for software support and flight test necessary due to REACT restructure.

Schedule: Flight test schedule adjusted to coincide with the REACT program.

Technical: Not Applicable

(U) **C. Other Program Funding Summary ($ in Thousands)**

	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	To Compl	Total Cost
(U) Missile Procurement: MM II/III Mods	0	4,695	0	0	0	0	0	0	0	21,897
Quantity		210								620

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305145F Arms Control Implementation PROJECT 4189

(U) D. Schedule Profile

	FY 1994				FY 1995				FY 1996				FY 1997			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
(U) Program Milestones																
(U) Milestone III	X*															
(U) First Assets Delivered						X*										
(U) Begin Downloading (1)						X										
(U) Engineering Milestones																
(U) FCA				X*												
(U) PCA				X*												
(U) T&E Milestones																
(U) Dedicated QOT&E				X*												
(U) Flight Test					X*											

(1) Physical downloading of weapons from missiles is contingent upon START II EIF approval and appropriate direction
* Indicates completed activities

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305145F Arms Control Implementation PROJECT 4189

(U) A. **Project Cost Breakdown ($ in Thousands)**

	FY 1994	FY 1995	FY 1996	FY 1997
(U) Software Development	1,290			
(U) SETA Support	1,898			
(U) SPO Support	194			
(U) EOC	118			
(U) Total	3,500			

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305145F Arms Control Implementation PROJECT 4189

(U) B. Budget Acquisition History and Planning Information ($ in Thousands)

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1994	Budget FY 1994	Budget FY 1995	Budget FY 1996	Budget FY 1997	Budget to Complete	Total Program
Product Development Organizations											
Rockwell (0064)		Aug 92			153						153
Rockwell (0080)		Aug 92			2,656	683					3,339
Logicon (0008)		Aug 92			3,886	607					4,493
Support and Management Organizations											
TRW (0005)		Aug 92			4,401	379					4,780
TRW (0100)		Apr 93			509	1,519					2,028
GTE (0012)		Sep 92			832						832
SPO Support					112	194					306
TO Support						24					24
Edwards AFB	PO	Dec 93				94					94
Boeing	T&M	Feb 93			335						335
Subtotal Product Development					6,695	1,290					7,985
Subtotal Support and Management					6,189	2,210					8,399
Subtotal Test and Evaluation											
Total Project					12,884	3,500					16,384

Government Furnished Property: Not Applicable

(U) C. Funding Profile ($ in Thousands) Not Applicable

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0305145F Arms Control Implementation

PROJECT: 4190

COST (*In Thousands*)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
4190 Treaty Prep/Verification Support	40	0	498	1,728	1,791	1,864	1,920	1,977	Continuing	TBD

(U) A. **Mission Description and Budget Item Justification**

- (U) Treaty preparation/verification support activities encompass a wide range of projects necessary to prepare the United States for compliance with impending arms control treaties and negotiations. They include modifications and enhancements to the Arms Control Treaty Information Operating Network, research and analysis activities associated with preparing the Air Force to meet the myriad of required taskings, preparing the USAF to support immediate compliance with existing agreements and analyzing implications of future agreements and negotiations.

(U) FY 1994
- (U) Provided low level research in support of the Non-Proliferation Treaty, a Comprehensive Test Ban Treaty, and other emerging national security policies and programs. ($40)

(U) FY 1995
- (U) Not Applicable

(U) FY 1996
- (U) Resumes research in support of the Non-Proliferation Treaty, a Comprehensive Test Ban Treaty, and other emerging national security policies and programs. ($498)

(U) FY 1997
- (U) Continues research in support of the Non-Proliferation Treaty, a Comprehensive Test Ban Treaty, and other emerging national security policies and programs. ($728)
- (U) Research and development efforts associated with the improving and expanding the Arms Control Treaty Information Operating Network. ($1,000)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305145F Arms Control Implementation
	PROJECT 4190

(U) **B. Program Change Summary ($ in Thousands)**

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
(U) Previous President's Budget	567	2,760	1,945	1,738	TBD
(U) Appropriated Value	607	0			
(U) Adjustments to Appropriated Value					
a. Congressional Reduction	-150				
b. BTR	-417				
(U) Adjustments to Budget Years Since FY95 PB			-1447	-10	
(U) Current Budget Submit/President's Budget	40	0	498	1,728	TBD

(U) Change Summary Explanation:

Funding: General Congressional reduction. Decreased funding due to reduction in treaty preparation activities associated with the Comprehensive Test Ban Treaty and the Non-Proliferation Treaty.

Schedule: Not Applicable

Technical: Not Applicable

(U) **C. Other Program Funding Summary ($ in Thousands)**: Not Applicable

(U) **D. Schedule Profile**:

	FY 1994				FY 1995				FY 1996				FY 1997			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
(U) Analysis and Support		X							X							Cont
(U) Concept Definition													X			
(U) Software development													X			X
(U) Systems Engineering																Start

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0305145F Arms Control Implementation

PROJECT: 4190

(U) A. Project Cost Breakdown ($ in Thousands)

	FY 1994	FY 1995	FY 1996	FY 1997
(U) Program Management Support	40		498	728
(U) Software Development				625
(U) Systems Engineering				375
(U) Total	40		498	1,728

(U) B. Budget Acquisition History and Planning Information ($ in Thousands): Not Applicable

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1994	Budget FY 1994	Budget FY 1995	Budget FY 1996	Budget FY 1997	Budget to Complete	Total Program
Product Development Organizations											
SAIC									1,000	4,125	5,125
Support and Management Organizations											
SAIC	PO	Apr 94				40		498	728	Cont.	Cont.
Subtotal Product Development									1,000	4,125	5,125
Subtotal Support and Management						40		498	728	Cont.	Cont.
Subtotal Test and Evaluation											
Total Project						40		498	1,728	Cont.	TBD

Government Furnished Property: Not Applicable

(U) C. Funding Profile ($ in Thousands): Not Applicable

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0305145F Arms Control Implementation

PROJECT: 4283

COST (*In Thousands*)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
4283 Open Skies Treaty Systems Develop	4,917	3,346	500	0	0	0	0	0	0	8,763

(U) A. **Mission Description and Budget Item Justification**

- (U) Open Skies support includes development of Synthetic Aperture Radar (SAR), SAR media processing equipment, the Data Annotation and Recording Mapping System (DARMS), as well as systems integration, engineering, test, and evaluation. This includes:
  - (U) Aircraft systems integration, engineering, test, and evaluation
  - (U) Synthetic Aperture Radar (SAR) prototype development
  - (U) Data Annotation and Recording Mapping System (DARMS) prototype development
  - (U) Ground processing software development

(U) FY 1994
- (U) Provides for aircraft systems integration, engineering, test and evaluation for the Open Skies OC-135B aircraft. ($1,917)
- (U) Funds the prototype development of the Synthetic Aperture Radar (SAR). ($2,000)
- (U) Provides for the prototype development of the Data Annotation and Recording Mapping System (DARMS). ($1,000)

(U) FY 1995
- (U) Continues the aircraft systems integration, engineering, test, and evaluation for the Open Skies OC-135B aircraft. ($2,846)
- (U) Provides for the software development associated with processing SAR and video magnetic media ($500)

(U) FY 1996
- (U) Test and evaluation of the FOC trainer OC-135B aircraft. ($500)

(U) FY 1997
- (U) Program complete in FY96

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305145F Arms Control Implementation PROJECT 4283

(U) B. **Program Change Summary ($ in Thousands)**

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
(U) Previous President's Budget	4,500	3,696	500	0	8,696
(U) Appropriated Value	4,500	3,456			
(U) Adjustments to Appropriated Value					
a. Congressional Reductions		-38			
b. SBIR		-72			
c. BTR	+417				
(U) Current Budget Submit/President's Budget	4,917	3,346	500	0	8,763

(U) Change Summary Explanation:

Funding: Increased funding due to added costs associated with overall aircraft systems integration. General Congressional reduction in FY95

Schedule: Not Applicable

Technical: Not Applicable

(U) C. **Other Program Funding Summary ($ in Thousands)**

	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	To Compl	Total Cost
(U) Aircraft Procurement: C-135B	0	0	429	548	0	0	0	0	0	61,577
(U) Other Procurement: Items less than $2.0	39	38	38	40	41	43	44	46	Con't	TBD
(U) Other Procurement: Items Less that $2.0	0	2,441	0	0	0	0	0	0	0	2,441

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305145F Arms Control Implementation PROJECT 4283

(U) D. Schedule Profile

Includes all Program activities not just RDT&E	FY 1994				FY 1995				FY 1996				FY 1997			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
(U) Milestone II/III (Complete Mar 93)																
(U) Critical Design Complete (3010)				X*												
(U) FOC Aircraft #1																
(U) Modifications (3010)			X	———	———	———	———	———	X							
(U) T&E (3600)									X	———	X					
(U) Delivery											X					
(U) FOC Aircraft #2																
(U) Modifications (3010)					X	———	———	———	———	———	X					
(U) T&E (3600)											X	———	X			
(U) Delivery													X			
(U) FOC Retrofit of IOC Aircraft																
(U) Modifications (3010)								X	———	———	———	———	X			
(U) T&E (3600)													X	———	X	
(U) Delivery															X	
(U) Ground Proc'ng Facility Enhancements (3600)							X	———	———	———	———	———	X			
(U) Engine Stage III Noise Abatement																
(U) Hush Kit Devel. & Procurement (3010)				X	———	———	———	———	———	———	———	———	———	———	X	
(U) Install Kits (1/98 - 4/99) (3010)																

* Indicates completed activities

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0305145F Arms Control Implementation

PROJECT: 4283

(U) A. Project Cost Breakdown ($ in Thousands)

	FY 1994	FY 1995	FY 1996	FY 1997
(U) Primary Hardware Development	3,417			
(U) Software Development		500		
(U) Systems Engineering	500	2,096		
(U) Test and Evaluation	1,000	750	500	
(U) Total	4,917	3,346	500	

(U) B. Budget Acquisition History and Planning Information ($ in Thousands)

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1994	Budget FY 1994	Budget FY 1995	Budget FY 1996	Budget FY 1997	Budget to Complete	Total Program
Product Development Organizations											
ASC/AM, WPAFB	PO	Aug 94	5,334	5,334		1,917	2,846	500			5,263
DNA (SAR)	MIPR	Mar 94	2,000	2,000		2,000					2,000
DNA (DARMS)	MIPR	Jun 94	1,000	1,000		1,000					1,000
AIA/NAIC, WPAFB	MIPR	est Mar 95	500	500			500				500
Subtotal Product Development						4,917	3,346	500			8,763
Subtotal Support and Management											
Subtotal Test and Evaluation											
Total Project						4,917	3,346	500			8,763

Government Furnished Property: Not Applicable

(U) C. Funding Profile ($ in Thousands): Not Applicable

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0305158F Constant Source

COST (*In Thousands*)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	3,076	3,123	3,089	3,054	898	853	879	905	TBD	TBD
4071 Constant Source	3,076	3,123	0	0	0	0	0	0	0	10,554
4394 Combat Intel System	0	0	2,163	2,138	628	597	615	633	TBD	TBD
4395 Radio	0	0	926	916	270	256	264	272	TBD	TBD

Note: Beginning in FY96, funding for the Constant Source project is broken out into two new projects: Combat Intel System and Radio.

(U) A. **Mission Description and Budget Item Justification**

(U) This program was established as part of the AF TENCAP normalization effort. Recently, the Constant Source Operator Terminal (CSOT) functionality was transformed into the Combat Intelligence System (CIS). This functionality processes the near-real-time threat information utilized by combat units/aircrews for mission planning and execution. The radio portion of this program enables the warfighter to access critical data provided by national and tactical intelligence sources. Currently about 130 ground systems are deployed. Air Force is jointly developing and procuring an airborne qualified radio called Multi-mission Advanced Tactical Terminal (MATT) with US Special Operations Command (SOCOM), Defense Support Program Office (DSPO), and the Navy. This Program Element is assigned budget activity Operational System Development because it involves post-Milestone Three efforts and supports development of operational systems.

(U) **Acquisition Strategy:**

(U) Project 4071 - Integrate COTS software and hardware to reduce development, sustainment, and procurement costs. Sole source contract. Cost Plus Award Fee. Firm Fixed Price.

(U) Project 4394 - Full and open competition leading to a cost plus award fee contract.

(U) Project 4395 - Technology transfer from the Naval Research Laboratory to the contractor. Evolutionary acquisition strategy was implemented with a core capability procured during the first production option. Firm Fixed Price.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305158F Constant Source

(U) **B. Program Change Summary ($ in Thousands)**

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
(U) Previous President's Budget	3,125	3,259	3,108	3,073	Continuing
(U) Appropriated Value	3,245	3,259			
(U) Adjustments to Appropriated Value					
a. Cong Gen Reductions	- 120	- 68			
b. SBIR	- 49	- 67			
c. Omnibus or Other Above Threshold Reprogram					
d. Below Threshold Reprogramming		- 1			
(U) Adjustments to Budget Years Since FY95 PB			- 19	- 19	
(U) Current Budget Submit/President's Budget	3,076	3,123	3,089	3,054	Continuing

(U) Change Summary Explanation:

Funding: Reduction of $19,000 in FY96 - FY97 funding due to inflation changes.

Schedule: Not Applicable.

Technical: Not Applicable.

(U) **C. Other Program Funding Summary ($ in Thousands)**

	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	To Compl	Total Cost
(U) Weapons System Procurement (3080)	10,408	9,312	5,160	6,475	8,731	9,347	10,108	10,844	Cont	Cont

Related RDT&E:

(U) PE#0207247F, Air Force TENCAP
(U) PE#0208019F, Tactical Cryptologic Activities
(U) PE#0305159I, Defense Reconn Support Prog
(U) PE#0305885G, Tactical Cryptologic Program
(U) PE#0304111F, Special Activities

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305158F Constant Source

(U) **D. Schedule Profile**

	FY 1994				FY 1995				FY 1996				FY 1997			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
(U) Combat Intelligence System (CIS)																
(U) Acquisition Strategy Panel			X													
(U) CIS 1.0 Release				X												
(U) Draft Request for Proposal				X												
(U) Formal Request for Proposal					X											
(U) CIS 1.1 Release						X										
(U) Contract Award								X								
(U) Development Test & Eval (DT&E) Start											X					
(U) DT&E Complete for Software Increment (S/W) #1												X				
(U) Initial Operational Test & Eval (IOT&E) Start												X				
(U) IOT&E Complete for S/W #1													X			
(U) Version Release S/W #1													X			
(U) Initial Operational Capability															X	
(U) Multi-mission Advanced Tactical Terminal (MATT)																
(U) Baseline Established	X															
(U) Software Development & Verification Start			X													
(U) Validation Unit Complete				X												
(U) FY94 Production Run/Deliveries Start						X										
(U) Delivery for Platform Start						X										
(U) Exercise FY95 Production Option						X										
(U) FY95 Production Run/Deliveries Start										X						
(U) Exercise FY96 Production Option									X							
(U) FY96 Production Run/Deliveries Start												X				
(U) Exercise FY97 Production Option													X			
(U) FY97 Production Run Start																X
(U) Delivery to Platform Start																X

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0305158F Constant Source

PROJECT: 4071

COST (*In Thousands*)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
4071 Constant Source	3,076	3,123	0	0	0	0	0	0	0	10,554

Note: Beginning in FY96, funding for the Constant Source project is broken out into two new projects: Combat Intel System and Radio.

(U) **A. Mission Description and Budget Item Justification**

(U) FY 1994
- (U) Planned for integration on DoD aircraft ($100)
- (U) Updated software for air/ground systems as required ($2,406)
- (U) Executed ECPs for air/ground systems as required ($350)
- (U) Integrated ground systems into Air Force Combat Intelligence System (CIS) ($220)

(U) FY 1995
- (U) Updated software and executed ECPs for air/ground systems as required ($2,833)
- (U) Planned and supported integrations on DoD aircraft and weapon systems ($95)
- (U) Planned to retrofit existing systems with state-of-the-art components ($100)
- (U) Integrated ground system into CIS ($95)

(U) FY 1996
- (U) None

(U) FY 1997
- (U) None

(U) **B. Program Change Summary ($ in Thousands)**

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
(U) Previous President's Budget	3,125	3,259	3,108	3,073	Continuing
(U) Appropriated Value	3,245	3,259			Continuing
(U) Adjustments to Appropriated Value					

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0305158F Constant Source

PROJECT: 4071

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
a. Cong Gen Reductions	- 120	- 68			
b. SBIR		- 67			
c. Omnibus or Other Above Threshold Reprogram					
d. Below Threshold Reprogramming		- 1			
(U) Adjustments to Budget Years Since FY95 PB			- 3,108	- 3,073	
(U) Current Budget Submit/President's Budget	3,076	3,123	0	0	0

(U) Change Summary Explanation:

Funding: Adjustments to Budget Years Since FY95 PB reflect a transfer of funds from this project (Constant Source Operator Terminal (CSOT)) to two new projects in this Program Element: Combat Intelligence System (CIS) and Radio.

Schedule: Not Applicable.

Technical: Not Applicable.

(U) C. Other Program Funding Summary ($ in Thousands)

	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	To Compl	Total Cost
(U) Weapons System Procurement	10,408	9,312	5,160	6,475	8,731	9,347	10,108	10,844	Cont	Cont

(U) D. Schedule Profile

	FY 1994				FY 1995				FY 1996				FY 1997			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
(U) Combat Intelligence System (CIS)																
(U) Acquisition Strategy Panel			X													
(U) CIS 1.0 Release				X												
(U) Draft Request for Proposal				X												
(U) Formal Request for Proposal					X											
(U) CIS 1.1 Release						X										
(U) Contract Award								X								

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0305158F Constant Source

	FY 1994				FY 1995				FY 1996				FY 1997			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
(U) Multi-mission Advanced Tactical Terminal (MATT)																
(U) Baseline Established	X															
(U) Software Development & Verification Start			X													
(U) Validation Unit Complete				X												
(U) FY94 Production Run/Deliveries Start						X										
(U) Delivery for Platform Start						X										
(U) Exercise FY95 Production Option						X										

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0305158F Constant Source

PROJECT: 4071

(U) A. **Project Cost Breakdown ($ in Thousands)**

	FY 1994	FY 1995	FY 1996	FY 1997
(U) Software Development	1,547	1,921	0	0
(U) Program Management Support	522	343	0	0
(U) Government Engineering Support	254	286	0	0
(U) System Engineering Support	509	514	0	0
(U) Travel	130	101	0	0
(U) Miscellaneous	114	94	0	0
(U) Reductions	0	- 136	0	0
(U) Total	3,076	3,123	0	0

(U) B. **Budget Acquisition History and Planning Information ($ in Thousands)**

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1994	Budget FY 1994	Budget FY 1995	Budget FY 1996	Budget FY 1997	Budget to Complete	Total Program
Product Development Organizations											
BTG, Inc	SS/CPAF	Sep 92			4,287	2,116	1,491				7,894
PRC		TBD	840	840			840				840
Support and Management Organizations											
MITRE		Ongoing				509	551				
TEMS		Ongoing				451	241				

Test and Evaluation Organizations

Not Applicable.

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305158F Constant Source
	PROJECT 4071

(U) B. Budget Acquisition History and Planning Information Continued ($ in Thousands)

Government Furnished Property:
Not Applicable.

	Budget FY 1994	Budget FY 1995	Budget FY 1996	Budget FY 1997	Budget to Complete	Total Program
Subtotal Product Development	2,116	2,331				8,734
Subtotal Support and Management	960	792				Cont
Subtotal Test and Evaluation						
Total Project	3,076	3,123				Cont

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0305158F Constant Source

PROJECT: 4394

COST (*In Thousands*)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
4394 Combat Intel System	0	0	2,163	2,138	628	597	615	633	TBD	TBD

Note: Beginning in FY96, funding for the Constant Source project is broken out into two new projects: Combat Intel System and Radio.

(U) A. Mission Description and Budget Item Justification

(U) FY 1994
- (U) None

(U) FY 1995
- (U) None

(U) FY 1996
- (U) Complete SCI level correlation enhancements ($514)
- (U) Auto Associator Enhancements under Theater Ballistic Mgmt (TBM)Core Systems ($1,310)
- (U) Conduct studies for future CIS intelligence interoperabilities ($339)

(U) FY 1997
- (U) Continue studies for CIS intelligence interoperabilities ($255)
- (U) Continue CIS software development under TBM Core Systems ($1,283)
- (U) Implement results of studies into CIS software under TBM Core Systems ($600)

(U) B. Program Change Summary ($ in Thousands)

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
(U) Previous President's Budget	0	0	0	0	Continuing
(U) Appropriated Value	0	0	0	0	
(U) Adjustments to Appropriated Value					
a. Cong Gen Reductions					
b. SBIR					

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305158F Constant Source

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
c. Omnibus or Other Above Threshold Reprogram					
d. Below Threshold Reprogramming					
(U) Adjustments to Budget Years Since FY95 PB			+ 2,163	+ 2,138	
(U) Current Budget Submit/President's Budget	0	0	2,163	2,138	Continuing

(U) Change Summary Explanation:

Funding: Adjustments to Budget Years Since FY95 PB reflects a transfer of funds from the Constant Source Operator Terminal (CSOT) project to this project ($2,176,000 in FY96, $2,151,000 in FY97), and a reduction of $13,000 in FY96 - FY97 funding due to inflation changes.

Schedule: Not Applicable.

Technical: Not Applicable.

(U) C. Other Program Funding Summary ($ in Thousands)

	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	To Compl	Total Cost
(U) Weapons System Procurement	10,408	9,312	5,160	6,475	8,731	9,347	10,108	10,844	Cont	Cont

(U) D. Schedule Profile

	FY 1994				FY 1995				FY 1996				FY 1997			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
(U) Combat Intelligence System (CIS)																
(U) Development Test & Eval (DT&E) Start											X					
(U) DT&E Complete for Software Increment (S/W) #1												X				
(U) Initial Operational Test & Eval (IOT&E) Start												X				
(U) IOT&E Complete for S/W #1													X			
(U) Version Release S/W #1													X			
(U) Initial Operational Capability															X	

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0305158F Constant Source

PROJECT: 4394

(U) A. **Project Cost Breakdown ($ in Thousands)**

	FY 1994	FY 1995	FY 1996	FY 1997
(U) Software Development	0	0	2,163	2,138
(U) Total	0	0	2,163	2,138

(U) B. **Budget Acquisition History and Planning Information ($ in Thousands)**

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1994	Budget FY 1994	Budget FY 1995	Budget FY 1996	Budget FY 1997	Budget to Complete	Total Program
Product Development Organizations											
CIS Software Dev*	TBD	TBD	TBD					2,163	2,138	Cont	Cont
* Subject to change pending final cost estimate and contract award.											
Support and Management Organizations											
None											
Test and Evaluation Organizations											
None											

(U) B. **Budget Acquisition History and Planning Information Continued ($ in Thousands)**

Government Furnished Property:

Not Applicable.

Subtotal Product Development								2,163	2,138	Continued	Continued
Subtotal Support and Management											
Subtotal Test and Evaluation											
Total Project								2,163	2,138	Continued	Continued

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0305158F Constant Source

PROJECT: 4395

COST (*In Thousands*)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
4395 Radio	0	0	926	916	270	256	264	272	TBD	TBD

Note: Beginning in FY96, funding for the Constant Source project is broken out into two new projects: Combat Intel System and Radio.

(U) A. Mission Description and Budget Item Justification

(U) FY 1994
- (U) None

(U) FY 1995
- (U) None

(U) FY 1996
- (U) Plan and support integration on DoD aircraft and weapon systems ($150)
- (U) Support MATT radio P3I development effort ($676)
- (U) Support migration of MATT into next generation tactical terminal ($100)

(U) FY 1997
- (U) Plan and support integration on DoD aircraft and weapon systems ($150)
- (U) Support MATT radio P3I development effort ($666)
- (U) Support migration of MATT into next generation tactical terminal ($100)

(U) B. Program Change Summary ($ in Thousands)

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
(U) Previous President's Budget	0	0	0	0	Continuing
(U) Appropriated Value	0	0	0	0	
(U) Adjustments to Appropriated Value					
a. Cong Gen Reductions					
b. SBIR					

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0305158F Constant Source

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
d. Below Threshold Reprogramming					
(U) Adjustments to Budget Years Since FY95 PB			+ 926	+ 916	
(U) Current Budget Submit/President's Budget		0	926	916	Continuing

(U) Change Summary Explanation:

Funding: Adjustments to Budget Years Since FY95 PB reflects a transfer of funds from the Constant Source Operator Terminal (CSOT) project to this project ($932,000 in FY96, $922,000 in FY97), and a reduction of $6,000 in FY96 - FY97 funding due to inflation changes.

Schedule: Not Applicable

Technical: Not Applicable

(U) C. Other Program Funding Summary ($ in Thousands)

	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	To Compl	Total Cost
(U) Weapons System Procurement (3080)	10,408	9,312	5,160	6,475	8,731	9,347	10,108	10,844	Cont	Cont

(U) D. Schedule Profile

	FY 1994				FY 1995				FY 1996				FY 1997			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
(U) Multi-mission Advanced Tactical Terminal (MATT)																
(U) FY95 Production Run/Deliveries Start										X						
(U) Exercise FY96 Production Option									X							
(U) FY96 Production Run/Deliveries Start												X				
(U) Exercise FY97 Production Option													X			
(U) FY97 Production Run Start																X
(U) Delivery to Platform Start																X

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0305158F Constant Source

PROJECT: 4395

(U) A. Project Cost Breakdown ($ in Thousands)

	FY 1994	FY 1995	FY 1996	FY 1997
(U) Software Development	0	0	142	229
(U) Program Management Support	0	0	240	230
(U) Travel	0	0	100	100
(U) Government Engineering Support	0	0	230	230
(U) System Engineering Support	0	0	214	127
(U) Total	0	0	926	916

(U) B. Budget Acquisition History and Planning Information ($ in Thousands)

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1994	Budget FY 1994	Budget FY 1995	Budget FY 1996	Budget FY 1997	Budget to Complete	Total Program
Product Development Organizations											
Allied Signal, Inc. MDA911-93-C008	FFP	Apr 93	TBD	TBD				555	550	Cont	Cont
Support and Management Organizations											
MITRE F19628-94-C0001		Ongoing						186	183	Cont	Cont
TEMS Various Contractors		Ongoing						185	183	Cont	Cont
Test and Evaluation Organizations											
None											

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305158F Constant Source PROJECT 4395

(U) B. **Budget Acquisition History and Planning Information Continued ($ in Thousands)**

Government Furnished Property
Not Applicable.

	Budget FY 1994	Budget FY 1995	Budget FY 1996	Budget FY 1997	Budget to Complete	Total Program
Subtotal Product Development			926	916	Continued	Continued
Subtotal Support and Management						
Subtotal Test and Evaluation						
Total Project			926	916	Continued	Continued

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0305160F Def Meteorological Satellite Prog

PROJECT: 0001

COST (*In Thousands*)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
0001 DMSP	24,265	20,099	21,464	19,407	20,121	21,084	21,748	20,936	Continuing	TBD

(U) **A. Mission Description and Budget Item Justification**

The Defense Meteorological Satellite Program (DMSP) is a fully operational Joint-Service program which supports all military services. Operational commanders require timely, quality weather information to effectively employ weapon systems and protect DoD resources. DMSP is the DoD's most important source of global weather data. It provides visible and infrared cloud cover imagery (1/3 nm constant resolution) and other meteorological, oceanographic, 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 450nm polar orbit at all times (sun synchronous means the satellites cross the equator at the same local sun time on each of their 14 orbits/day). DMSP operational systems development supports the current operational DMSP program.

(U) FY 1994
- (U) Continued system integration and test, calibration and validation, and related support activities. ($13,865)
- (U) Continued MARK IVB pre-planned product improvement. ($1,700)
- (U) Continued using Block 6 contracts to assess system capabilities, and operational impacts, and to develop cost models for a DoD/DoC merged national weather satellite system. ($5,300)
- (U) Ensured readiness to transition to Titan II launch vehicle. ($100)
- (U) Conducted Small Tactical Terminal (STT) Operational Design Demonstrations and awarded production contract. ($3,300)

(U) FY 1995
- (U) Continue system integration and test, calibration and validation, and related support activities. ($15,399)
- (U) Support STT IOT&E and begin enhanced algorithm development. ($3,300)
- (U) Begin MARK IVB enhanced algorithm integration effort. ($1,400)

(U) FY 1996
- (U) Continue system integration and test, calibration and validation, and related support activities. ($14,864)
- (U) Continue enhanced STT algorithm development. ($2,600)
- (U) Continue MARK IVB enhanced algorithm integration. ($1,400)
- (U) Begin S18-S20 launch interface design (Delta II). ($1,400)
- (U) Support civilian/military command and control consolidation efforts. ($1,200)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY: 7 - Operational System Development	PE NUMBER AND TITLE: 0305160F Def Meteorological Satellite Prog / PROJECT: 0001

(U) FY 1997
- (U) Continue system integration and test, calibration and validation, and related support activities. ($13,807)
- (U) Complete MARK IVB and STT enhanced algorithm development and implementation. ($2,200)
- (U) Continue S18-S20 launch interface design (Delta II). ($1,000)
- (U) Continue support of civilian/military command and control consolidation efforts. ($2,400)

(U) B. Program Change Summary ($ in Thousands)

	FY 1994	FY 1995	FY 1996	FY 1997
(U) Previous President's Budget	25,709	21,135	21,722	19,678
(U) Appropriated Value	26,553	21,135		
(U) Adjustments to Appropriated Value				
a. Cong Gen Reductions	- 844	- 598		
b. SBIR	- 401	- 433		
c. Onmibus or Above Threshold Reprogramming				
d. Below Threshold Reprogramming	-1,043	- 5		
(U) Adjustments to Budget Years Since FY95 PB			- 258	- 271
(U) Current Budget Submit/President's Budget	24,265	20,099	21,464	19,407

(U) Change Summary Explanation:
Funding: No significant changes.

Schedule: No changes.

Technical: No changes.

(U) C. Other Program Funding Summary ($ in Thousands)

	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	To Compl	Total Cost
(U) Missile Procurement	31,005	28,954	29,265	28,268	30,192	31,544	32,465	34,908	Cont	Cont

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305160F Def Meteorological Satellite Prog PROJECT 0001

	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	To Compl	Total Cost
(U) Other Procurement	20,954	18,678	15,985	16,069	16,509	15,250	15,520	15,852	Cont	Cont

Related RDT&E:

(U) PE #603434F, National Polar Operational Environmental Satellite System (NPOESS)

(U) PE #305160N, DMSP (provides funds for Navy unique studies)

(U) D. Schedule Profile

	FY 1994				FY 1995				FY 1996				FY 1997			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
(U) MARK IVB Deliveries	X	X	X	X	X	X	X									
(U) Small Tactical Terminal First Delivery						X										
(U) Small Tactical terminal IOT&E							X									
(U) 5D-3 Spacecraft Delivery Schedule (S16-19)								X		X				X		X
(U) Planned 5D-2 Launches (F12-F13)				X		X						X				

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0305160F Def Meteorological Satellite Prog

PROJECT: 0001

(U) A. **Project Cost Breakdown ($ in Thousands)**

	FY 1994	FY 1995	FY 1996	FY 1997
(U) Launch Vehicle Transition	113	0	1,327	969
(U) Spacecraft Integration	3,454	4,329	4,006	3,588
(U) Calibratioin/Validation	1,305	577	443	330
(U) Algorithm Development	2,059	2,154	1,412	1,353
(U) On-Orbit Performance Incentives (primary sensor)	500	0	0	0
(U) MARK IVB/STT Enhancements	5,043	4,713	4,412	2,229
(U) Systems Engineering Support	4,171	4,280	4,435	4,361
(U) Block 6/Convergence Studies	5,322	0	0	0
(U) Program Management Support	2,298	4,046	4,260	4,228
(U) Command and Control Consolidation	0	0	1,169	2,349
(U) Total	24,265	20,099	21,464	19,407

(U) B. **Budget Acquisition History and Planning Information ($ in Thousands)**

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1994	Budget FY 1994	Budget FY 1995	Budget FY 1996	Budget FY 1997	Budget to Complete	Total Program
Product Development Organizations											
Martin-Marietta	SS/CPAF/PR	Apr 92	8,572	8,572	1,646	1,099	1,399	2,393	2,035	0	8,572
Westinghouse	SS/CPAF/PR	Apr 90	4,355	4,355	2,394	1,367	594	0	0	0	4,355
Westinghouse	SS/CPAF/PR	May 95	4,402	4,402	0	0	594	1,096	968	1,744	4,402
Lockheed	C/CPAF/PR	Oct 88	44,717	44,717	37,548	1,718	1,220	1,440	1,044	1,747	44,717
Harris	C/CPAF/PR	Jun 94	8,839	8,839	0	2,566	3,343	2,626	294	0	8,829
Other	Various					2,223	1,749	1,810	1,554	Cont	TBD

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0305160F Def Meteorological Satellite Prog

PROJECT: 0001

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1994	Budget FY 1994	Budget FY 1995	Budget FY 1996	Budget FY 1997	Budget to Complete	Total Program
Support and Management Organizations											
	MORD	Oct 95				4,171	4,280	4,435	4,361	Cont	TBD
Phillips Lab	MIPR/PD/PO	Oct 95				956	1,098	806	1,393	Cont	TBD
Martin Marietta	C/CPAF/PR	Jul 91	(Convergence	Support)	4,761	2,292	0	0	0	0	7,053
Lockheed	C/CPAF/PR	Jul 91	(Convergence	Support)	4,666	2,316	0	0	0	0	6,982
Program Mgmt						2,888	4,046	4,260	4,228	Cont	TBD
Other (other labs, C2 consolidation)						2,669	1,776	2,598	3,530	Cont	TBD
Test and Evaluation Organizations											
Not Applicable.											
Subtotal Product Development						8,973	8,899	9,365	5,895		
Subtotal Support and Management						15,292	11,200	12,099	13,512		
Subtotal Test and Evaluation											
Total Project						24,265	20,099	21,464	19,407		

(U) **B. Budget Acquisition History and Planning Information Continued ($ in Thousands)**

Government Furnished Property: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0305164F Navstar Global Pos Sys (User Eq)

PROJECT: 3028

COST (*In Thousands*)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
3028 Navstar GPS	15,976	9,716	17,371	14,891	25,407	34,850	27,195	18,896	Continuing	Continuing

(U) A. Mission Description and Budget Item Justification

The Global Positioning System (GPS) is a space-based radio positioning, navigation, and time distribution system. GPS User Equipment (UE) consists of standardized receivers, antennas, antenna electronics, etc., grouped together to form sets which derive navigation and time information utilizing data transmitted by the satellites. These receivers are used by all the Services and DoD. RDT&E funds UE development and testing, studies and engineering to assist integration into aircraft, software upgrades, product improvement studies, testing and evaluation of commercial GPS UE, and mission support. UE passed DAB Milestone IIIB in January 92 and is therefore in budget activity/research category of Operational Systems Development.

(U) FY 1994
- (U) Continued Integration studies ($2,652).
- (U) Continued to support development testing for aircraft integrations ($1,621).
- (U) Continued developing software block upgrade for 5-channel GPS airborne receiver ($1,326).
- (U) Continued IV&V on platform integrations and on UE software ($532).
- (U) Conducted product improvement studies for the Embedded GPS Receiver (EGR), Space-Based Receiver (SBR), Advanced GPS Receiver (AGR), anti-jam technologies, GPS enhancements for Combat Search and Rescue (CSAR) equipment, differential GPS, precision approach, and integrity. ($3,825)
- (U) Continued development and product improvement testing for user equipment ($1,174).
- (U) Completed development of signal data converter ($27).
- (U) Continued support contracts ($3,065).
- (U) Continued In-House support ($1,154).
- (U) Begin development of Combat Survivor Evador Locator (CSEL) ($600).

(U) FY 1995
- (U) Continue Integration studies ($585).
- (U) Continue to support development testing for aircraft integrations ($818).
- (U) Continue developing software block upgrade for 5-channel GPS airborne receiver ($751).
- (U) Continue IV&V on platform integrations and on UE software ($35).

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY: 7 - Operational System Development	PE NUMBER AND TITLE: 0305164F Navstar Global Pos Sys (User Eq) / PROJECT: 3028

- (U) Conducted product improvement studies for the EGR, SBR, AGR, anti-jam technologies, CSAR equipment, differential GPS, precision approach, and integrity ($1,283).
- (U) Continue development and product improvement testing for user equipment ($500).
- (U) Develop interim GPS Receiver Augmentation Module (GRAM) ($1,491).
- (U) Continue support contracts ($2,134).
- (U) Continue In-House support ($1,821).
- (U) Continue CSEL ($298)

(U) FY 1996
- (U) Continue Integration studies ($652).
- (U) Continue to support development testing for aircraft integrations ($876).
- (U) Continue developing software block upgrade for 5-channel GPS airborne receiver ($1,211).
- (U) Conduct product improvement studies for the EGR, SBR, AGR, anti-jam technologies, inertial navigation technologies, CSAR equipment, differential GPS, precision approach, and integrity; develop hardware for beamsteering and adaptive tracking loops; and integrate multi chip module (MCM) ($3,416)
- (U) Continue development and product improvement testing for user equipment ($1,000).
- (U) Develop next generation antenna electronics and antennas ($2,652).
- (U) Continue commercial GPS receiver evaluation and certification program ($1,800).
- (U) Continue support contracts ($3,382).
- (U) Continue In-House support ($2,382).

(U) FY 1997
- (U) Continue Integration studies ($200).
- (U) Continue to support development testing for aircraft integrations ($895).
- (U) Continue developing software block upgrade for 5-channel GPS airborne receiver ($1,177).
- (U) Conduct product improvement studies for the EGR, SBR, AGR, anti-jam technologies, inertial navigation technologies, CSAR equipment, differential GPS, precision approach, and integrity; and develop hardware for beamsteering and adaptive tracking loops ($3,360).
- (U) Continue development and product improvement testing for user equipment ($1,100).
- (U) Continue commercial GPS receiver evaluation and certification program ($1,820).
- (U) Continue support contracts ($3,278).
- (U) Continue In-House support ($3,061).

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305164F Navstar Global Pos Sys (User Eq)
	PROJECT 3028

(U) **B. Program Change Summary ($ in Thousands)**

	FY 1994	FY 1995	FY 1996	FY 1997
(U) Previous President's Budget	16,073	9,781	10,669	10,519
(U) Appropriated Value	16,164	9,781		
(U) Adjustments to Appropriated Value				
a. Cong Gen Reductions	- 91	- 160		
b. SBIR	- 251	- 203		
c. Omnibus or Other Above Threshold Reprogram	- 406			
d. Below Threshold Reprogramming	+ 560	+ 298		
(U) Adjustments to Budget Years Since FY95 PB			+ 6,702	+ 4,372
(U) Current Budget Submit/President's Budget	15,976	9,716	17,371	14,891

(U) Change Summary Explanation:

Funding: FY94 Omnibus reduction reflects a classified reprogramming. FY94 Below Threshold Reprogramming (BTR) reflects a transfer of funds from PE #305909F. FY95 BTR reflects a transfer of funds from PE #305910F. Adjustments to Budget Years Since FY95 PB in FY96 and FY97 reflects increased funding for additional program activities (see Technical Explanation below).

Schedule: No change.

Technical: Program was expanded to include: Commercial Receiver Evaluation and Certification, Antenna Development, and Software Studies. IV&V requirement has been reduced.

(U) **C. Other Program Funding Summary ($ in Thousands)**

	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	To Compl	Total Cost
(U) Aircraft Procurement (BP16)	2,013	1,782	813	768	1,118	1,163	1,198	1,233	Cont	Cont
(U) Aircraft Procurement (BP19)	67,753	70,178	43,439	50,644	47,258	47,475	59,532	71,165	Cont	Cont
(U) Other Procurement (BA 83/86)	4,577	3,749	1,170	1,473	1,286	1,371	1,314	1,383	Cont	Cont

Related RDT&E:

(U) PE #305165F, Navstar GPS (Space/Grd Segments)

(U) PE #604480F, GPS Block IIF

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305164F Navstar Global Pos Sys (User Eq)
	PROJECT 3028

(U) D. Schedule Profile

	FY 1994				FY 1995				FY 1996				FY 1997			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
(U) Advanced Receiver Technology																
(U) Program Start				x*												
(U) CDR								x								
(U) Brassboard Delivery									x		x					
(U) Anti-Jam Development																
(U) CDR				x*												
(U) Prototypes						x										
(U) Qual Test							x									
(U) Integration Complete											x					
(U) Testing Complete												x				
(U) Broadband Anti-Jam Contract													x			
(U) Antenna R&D Contract									x							
(U) MAGR ECP Development																
(U) Contract ECP 6				x*												
(U) Contract ECP 7							x									
(U) Contract ECP 8												x				
(U) Contract ECP 9																x
(U) CLS Integration Studies Complete					x*											
(U) F-16 Study Complete													x			
(U) SAASM																
(U) Brassboard Test					x*											
(U) Multichip Module (MCM) Prototype				x*												
(U) MCM Testing								x								
(U) DTE Test											x					

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305164F Navstar Global Pos Sys (User Eq)
	PROJECT 3028

(U) A. **Project Cost Breakdown ($ in Thousands)**

	FY 1994	FY 1995	FY 1996	FY 1997
(U) Integration Studies	2,652	585	652	200
(U) Technical Support for Aircraft Integrations	1,621	818	876	895
(U) Independent Verification and Validation	532	35		
(U) Develop Signal Data Converter	27			
(U) Develop AE-F/CRPA-F *			2,652	
(U) Develop Interim GRAM **		1,491		
(U) Software Upgrade	1,326	751	1,211	1,177
(U) Product Improvement Studies	3,825	1,283	3,416	3,360
(U) Development & Product Improvement Testing	1,174	500	1,000	1,100
(U) CREP/ACREP/CRCP ***			1,800	1,820
(U) Support Contracts	3,065	2,134	3,382	3,278
(U) In-House Support	1,154	1,821	2,382	3,061
(U) CSEL Program	600	298		
(U) Total	15,976	9,716	17,371	14,891

* Antenna Electronics - Future/Controlled Reception Pattern Antenna - Future
** GPS Receiver Augmentation Module
*** Civilian Receiver Evaluation Program/Advanced Civilian Receiver Evaluation Program/Civilian Receiver Certification Program

(U) B. **Budget Acquisition History and Planning Information ($ in Thousands)**

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1994	Budget FY 1994	Budget FY 1995	Budget FY 1996	Budget FY 1997	Budget to Complete	Total Program

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0305164F Navstar Global Pos Sys (User Eq)

PROJECT: 3028

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1994	Budget FY 1994	Budget FY 1995	Budget FY 1996	Budget FY 1997	Budget to Complete	Total Program
Product Development Organizations											
Rockwell (MAGR)		Various			17,656	1,215	635	1,111	1,177	Cont	Cont
TBD (Interim GRAM)	C/CPAF	Mar 95	1,491	1,491	0	0	1,491	0	0	0	1,491
Honeywell Inc (F-15 Study)	Unknown	n/a	2,000	2,000	1,000	1,000	0	0	0	0	2,000
General Dynamics	Unknown	Jan 96	1,810	1,810	0	873	485	452	0	0	1,810
OO-ALC (F-16 Study)	Project Order	n/a	327	327	0	327	0	0	0	0	327
TBD (AE-F/CRPA-F)	C/CPAF	Dec 95	7,291	7,291	0	0	0	2,652	0	4,639	7,291
Miscellaneous	Various	Various				7,168	2,730	4,592	4,455	Cont	Cont
Support and Management Organizations											
Overlook Sys (OASD/C3I)	C/CPFF	Dec 95	Cont	Cont	6,848	1,143	1,200	1,300	1,300	Cont	Cont
Aerospace Corp (Technical Supt)		Various	Cont	Cont	0	0	0	1,150	1,185	Cont	Cont
SMC/FMB (Shared Prg Cost)		Various	Cont	Cont	650	0	1,034	1,228	2,591	Cont	Cont
Miscellaneous						3,076	1,641	2,086	1,263		8,066
Test and Evaluation Organizations											
46th TG (SAASM/Test)	Project Order	Nov 95	Cont	Cont	30,271	1,174	500	1,000	1,100	Cont	Cont
46th TG (CREP/ ACREP/CRCP)	Project Order	Dec 95	Cont	Cont	0	0	0	1,800	1,820	Cont	Cont

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)			DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305164F Navstar Global Pos Sys (User Eq)		PROJECT 3028

(U) B. **Budget Acquisition History and Planning Information Continued ($ in Thousands)**

Government Furnished Property:
(U) Not Applicable.

Subtotal Product Development	18,656	10,583	5,341	8,807	5,632	Cont	Cont
Subtotal Support and Management	7,498	4,219	3,875	5,764	6,339	Cont	Cont
Subtotal Test and Evaluation	30,271	1,174	500	2,800	2,920	Cont	Cont
Total Project	56,425	15,976	9,716	17,371	14,891	Cont	Cont

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0305165F Navstar GPS (Space/Grd Segments)

PROJECT: 3030

COST (*In Thousands*)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
3030 Navstar GPS	36,825	35,258	26,921	31,434	48,604	50,972	13,044	11,045	Continuing	Continuing

(U) **A. Mission Description and Budget Item Justification**

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, training simulators, Mission Operation Support Center (MOSC), and operation of the ground control segment; including sustaining engineering; upgrades to the space and ground segments; and R&D efforts to support deployment of the entire GPS system. As a post-Milestone 3 program, we are classified as Budget Activity Research Category of Operational Systems Development.

(U) FY 1994
- (U) Delivered second major ground control segment software upgrade (OR5.4) to AFSPC ($3,800)
  - (U) Continued Block IIR software development ($25,724)
- (U) Continued Upgrade of ES9000 ($3,970)
- (U) Continued GPS Joint Program Office Support ($1,725)
- (U) Completed R&D Contract Phase; final award fee ($646)
- (U) Continued launch and early orbit data base development ($960)

(U) FY 1995
- (U) Completed major ground control segment software upgrade (OR5.30) ($6)
- (U) Continue Block IIR software development and delivery to AFSPACECOM ($22,354)
- (U) Continue Upgrade of ES9000 ($500)
- (U) Continue sustaining engineering for Consolidated Operator Support Environment (COSE) and OCS Architectural Implementation ($4,857)
- (U) Continue Joint Program Office Support ($6,940)
- (U) Complete launch and early orbit data base development ($390)
- (U) Compress launch and early orbit software development ($211)

(U) FY 1996
- (U) Develop Training Simulator ($3,000)
- (U) Develop data storage and retrieval system software required for launch and on-orbit operations ($2,200)
- (U) Begin development of Block IIR mission capable ground control software upgrade ($6,000)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY: 7 - Operational System Development	PE NUMBER AND TITLE: 0305165F Navstar GPS (Space/Grd Segments) / PROJECT: 3030

- (U) Continue GPS Joint Program Office Support ($7,252)
- (U) Continue sustaining engineering for COSE and OCS Architectural Implementation ($5,351)
- (U) Continue Block IIR software development ($3,094)
- (U) Continue upgrade of ES9000 ($24)

(U) FY 1997
- (U) Continue development of Block IIR fully mission capable ground control software upgrade ($18,000)
  - (U) Continue development of training simulator ($1,000)
  - (U) Continue GPS Joint Program Office Support ($5,883)
- (U) Complete Upgrade of ES9000 ($37)
- (U) Continue sustaining engineering for COSE and OCS Architectural Implementation ($5,127)
- (U) Continue Block IIR software development ($1,387)

(U) Acquisition Strategy:
The Acquisition Strategy is to procure additional gap filler satellites and sustain the GPS Constellation.

(U) B. Program Change Summary ($ in Thousands)

	FY 1994	FY 1995	FY 1996	FY 1997
(U) Previous President's Budget	38,808	51,125	37,910	21,085
(U) Appropriated Value	38,990	36,425		
(U) Adjustments to Appropriated Value				
a. Cong Gen Reductions	- 218	- 398		
b. SBIR	- 605	- 760		
c. Omnibus or Other Above Threshold Reprogram	- 142			
d. Below Threshold Reprogramming,	-1,200	- 9		
(U) Adjustments to Budget Years Since FY95 PB			-10,989	10,349
(U) Current Budget Submit/President's Budget	36,825	35,258	26,921	31,434

(U) Change Summary Explanation:
Funding: FY94 Omnibus reduction reflects a classified reprogramming. FY94 Below Threshold Reprogramming reflects a transfer of funds to PE 0305913F. Adjustments to Budget Years Since FY95 PB in FY96 and FY97 reflects a transfer of funding for Block IIF Satellite Development and Control Segment Software Development including associated systems integration to a new PE, 0604480F.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305165F Navstar GPS (Space/Grd Segments)
	PROJECT 3030

Schedule: No change.

Technical: No change.

(U) **C. Other Program Funding Summary ($ in Thousands)**

	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	To Compl	Total Cost
(U) Weapons Procurement	159,987	188,848	174,472	214,636	197,600	214,470	330,694	314,181	Cont	Cont
(U) Other Procurement	2,326	4,962	6,857	6,024	2,524	2,255	456	742	Cont	Cont

Related RDT&E:

(U) PE #0305164F, Navstar GPS (User Equipment)
(U) PE #0101221N, Fleet Ballistic Missile System
(U) PE #0301357F and 0305913F (formerly 0102433F), Nuclear Detonation Detection System (NDS)
(U) PE #0305119F Space Boosters, funds launch services (Delta II)
(U) PE #0604480F, GPS Block IIF

(U) **D. Schedule Profile**

	FY 1994				FY 1995				FY 1996				FY 1997			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
(U) Deliver second major ground control software upgrade (OR5.4)				x												
(U) Continue Block IIR software development	x----	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	----x
(U) Delivery of Block IIR software to AFSPC								x								
(U) Continue upgrade of ES9000	x---	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	----x
(U) Continue Joint Program Office Support	x---	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	----x
(U) Completion of R&D contract				x												
(U) Launch and early data base	x---	--------	--------	----x												
(U) Development of Training Simulator					x---	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	----x
(U) Continue Sustaining Engineering Support					x---	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	----x
(U) Develop Block IIR fully mission capable ground software									x---	--------	--------	--------	--------	--------	--------	----x

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0305165F Navstar GPS (Space/Grd Segments)

PROJECT: 3030

(U) A. **Project Cost Breakdown ($ in Thousands)**

	FY 1994	FY 1995	FY 1996	FY 1997
(U) Block IIR Development	1,606	601	2,200	
(U) Operational Control Segment (OCS) Development/Sustainment	33,396	27,717	14,469	24,551
(U) Training Simulator Development			3,000	1,000
(U) Program Office Support	1,823	6,940	7,252	5,883
(U) Total	36,825	35,258	26,921	31,434

(U) B. **Budget Acquisition History and Planning Information ($ in Thousands)**

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1994	Budget FY 1994	Budget FY 1995	Budget FY 1996	Budget FY 1997	Budget to Complete	Total Program
Product Development Organizations											
Martin Marietta *	FPIF/AF	Jun 89	139,900	140,900	110,092	601		2,200			112,893
Loral Fed Sys **	CPAF	Jun 90	124,400	141,500	61,750	32,885	22,860	3,118	1,424		122,037
IIR Fully Mission Capable Ground Control Software	TBD	FY96	n/a	n/a	n/a	n/a	n/a	6,000	18,000	Cont	Cont
Support and Management Organizations											
Various In House Support	unknown	unknown	n/a	n/a	982	286	8,862	9,296	8,445	Cont	Cont
Agency	multiple	unknown	n/a	n/a	3,054	1,648	730	240		Cont	Cont
Simulator	unknown	unknown	n/a	n/a	n/a	n/a	n/a	3,000	1,000	Cont	Cont
Mission Support	unknown	n/a	n/a	n/a	1,193	1,405	2,806	3,067	2,565	Cont	Cont

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)											DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0305165F Navstar GPS (Space/Grd Segments)						PROJECT 3030
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1994	Budget FY 1994	Budget FY 1995	Budget FY 1996	Budget FY 1997	Budget to Complete	Total Program
Test and Evaluation Organizations Not Applicable.											
* Contractor also funded by other program elements, government liability is $ 135,906,000. ** EAC includes partial estimate for IIR Fully Mission Capable Ground Control Software.											
Subtotal Product Development					171,842	33,486	22,860	11,318	19,424		Cont
Subtotal Support and Management					5,229	3,339	12,398	15,603	12,010		Cont
Subtotal Test and Evaluation											
Total Project					177,071	36,825	35,258	26,921	31,434		Cont

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0305182F Eastern Space Launch Facility

PROJECT: 4137

COST (*In Thousands*)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
4137 Range Standard & Automation (RSA) Prg	49,852	41,342	52,272	37,893	38,601	40,671	41,893	43,147	Continuing	Continuing

(U) A. **Mission Description and Budget Item Justification**

The Eastern and Western Ranges provide tracking, telemetry, communications, command/control and other support capabilities necessary to safely and successfully conduct civil, commercial, and national security spacelift operations, ballistic missile test and evaluation (T&E), and a variety of aeronautical and guided weapons T&E. Range assets are based on 1950s/1960s designs and technology, and are arrayed in a highly inefficient, manpower intensive architecture. Range instrumentation reliability is deteriorating and over 40% of the components are obsolete with no sources of support. The ranges do not provide the responsiveness and flexibility critical to affordably support the nation's spacelift needs. Replacement of the aging systems is a necessity. Range Standardization and Automation (RSA) will completely overhaul and modernize both the Eastern Range (ER) and the Western Range (WR), treating the two as a single integrated range system with an Eastern and Western segment. RSA will develop the integrated range system, using remote control and automation techniques to reduce the number of required operators, sites and facilities, and to produce improved responsiveness. The result will be a range system reconfigurable from one major operation to another in less than 4 hours versus 2-3 days, capable of being operated for 20% less than current ranges, and supportable through existing Air Force logistics infrastructure and standard practices. RSA is critical to the future of the spacelift ranges; performance and cost goals cannot be achieved without RSA. Categorized as Budget Activity Research Category, Operations Systems Development because it upgrades existing operational capabilities with new systems.

(U) FY 1994

- (U) Continue RSA Phase 1 Contract. Complete design/begin development of consolidated instrumentation system including Consolidated Instrumentation Facility (CIF) and Unified Tracking Antenna (UTA) for Antigua and Ascension tracking sites. Design, develop, and acquire communications upgrades at Cape Canaveral Air Station (CCAS). Design, develop, and acquire a satellite communications network to link downrange stations at Antigua and Ascension with Range Operations Control Center (ROCC) at CCAS. ($21,500)
- (U) Continue Eastern ROCC Operational Test & Evaluation for activation in February 1995. ($13,100)
- (U) Program Support includes System Program Office and Air Logistics Center support, and Small Business Innovative Research. ($5,252)
- (U) Dual Use Launch Facility Program grants awarded (Congressionally directed, non-RSA program). ($10,000)

(U) FY 1995

- (U) Continue RSA Phase 1 Contract. Complete CIF/UTA design for Antigua site. Initiate development of range safety instrumentation for Ascension site. Continue CCAS communications/satellite communications networks. ($24,000)
- (U) Complete OT&E of ROCC; operational turnover Feb 95. Continue Engineering Services Contract to facilitate turnover of the facility to operational users. ($11,900)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY: 7 - Operational System Development	PE NUMBER AND TITLE: 0305182F Eastern Space Launch Facility — PROJECT: 4137

- (U) Initiate Eastern Range Command Central, required to respond to faster than anticipated failure of existing command destruct systems, and Western Range communications upgrade projects. ($2,100)
- (U) Program support includes System Program Office and Air Logistics Center support. ($3,342)

(U) FY 1996
- (U) Continue RSA Phase 1 Contract. Continue installation of Consolidated Instrumentation Facility for Antigua. Complete CCAS communications network. ($19,800)
- (U) Award RSA Phase 2A Primary Contract. Initiate architecture study and design of instrumentation, weather, surveillance, Western Range Operations Control Center (WROCC) systems, centralized data processing, and optical systems for both ranges. Contract will continue through 2006. ($15,300)
- (U) Continue ROCC Engineering Services Contract. ($5,300)
- (U) Program support includes System Program Office and Air Logistics Center support. ($3,272)
- (U) Installation of Air Route Surveillance Radar (ARSR-4). ($4,600)
- (U) Lease downrange satellite communications links. ($4,000)

(U) FY 1997
- (U) Continue RSA Phase 1 Contract. Complete installation of Consolidated Instrumentation Facility (CIF) at Antigua. Initiate development test and evaluation of Antigua CIF. Complete installation of Western Range CTPS. ($15,500)
- (U) Continue RSA Phase 2A Primary Contract. Continue architecture study, develop weather, surveillance, telemetry processing and optical systems. ($14,800)
- (U) Program support includes System Program Office and Air Logistics Center support. ($3,393)
- (U) Lease downrange satellite communications links. ($4,200)

(U) **Acquisition Strategy:**
The RSA Phase 1 Contract now underway will provide Consolidated Instrumentation Facilities at Antigua and Ascension, satellite communications from these sites to the Eastern Range Operations Control Center, and Eastern Range communications network upgrades. An FY96 Phase 2A primary contract will provide design of the complete range architecture, and also a Western Range Operations Control Center, imaging systems, communications systems, mobile metric, telemetry and command assets, surveillance systems, weather data collection and prediction systems, debris tracking systems, planning and scheduling systems and data processing/ display systems. An FY99 follow-on equipment contract will provide the primary telemetry receiving, radar, and command systems. A parallel sustaining improvement and modernization activity is separately funded with procurement funds.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0305182F Eastern Space Launch Facility

PROJECT: 4137

(U) **B. Program Change Summary ($ in Thousands)**

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
(U) Previous President's Budget	41,242	42,710	52,573	38,109	Continuing
(U) Appropriated Value	51,242	42,710			
(U) Adjustments to Appropriated Value					
a. Congressional General Reductions	-287	- 466			
b. SBIR	-795	- 891			
c. Omnibus or Other Above Threshold Reprogram					
d. Below Threshold Reprogramming	-308	- 11			
(U) Adjustments to Budget Years Since FY95 PB			-301	-216	
(U) Current Budget Submit/President's Budget	49,852	41,342	52,272	37,893	Continuing

(U) Change Summary Explanation:

Funding: FY 96 and FY 97 changes reflect minor adjustments for inflation.

Schedule: RSA Phase 2A contract award now 2QFY96 vice 4QFY95. Change results from revised acquisition strategy and delays in ROCC operational turnover.

Technical: None.

(U) **C. Other Program Funding Summary ($ in Thousands)**

	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	To Complete	Total Cost
(U) Other Procurement *	87,807	91,688	82,662	92,344	92,750	58,289	60,042	61,835	Continuing	Continuing
(U) MILCON **	7,600	1,750								

Related RDT&E:

(U) Not Applicable.

* Includes funds required for ongoing range sustaining improvement and modernization (I&M) program

** PE #305182F MILCON funds are associated with non-RSA facilities

(U) **D. Schedule Profile**

FY 1994				FY 1995				FY 1996				FY 1997			
1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0305182F Eastern Space Launch Facility

PROJECT: 4137

	FY 1994				FY 1995				FY 1996				FY 1997			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
(U) Complete RSA System Architecture				X												
(U) RSA Phase 1 System Req'mts Review				X												
(U) ROCC Operational Test & Eval Compl					X											
(U) RSA Phase 1 System Design Review					X											
(U) ROCC Turnover						X										
(U) RSA Phase 1 Prelim Design Review							X									
(U) RSA Phase 1 Critical Design Review								X								
(U) Software Maintenance Facility Compl									X							
(U) RSA Phase 2 Primary Contract Award										X						
(U) RSA Phase 2 SLRS Trade Studies											X					
(U) RSA Phase 2 System Req'mts Review														X		
(U) RSA Phase 2 System Design Review																X
(U) RSA Phase 1 Developmental T&E																X

(U) Other Events Beyond BY+1	
(U) RSA Phase 1 Antigua Installation	1st Qtr FY98
(U) RSA Phase 1 WR CTPS Installation	1st Qtr FY98
(U) RSA Phase 2 Prelim Design Review	2nd Qtr FY98
(U) RSA Phase 1 Cape FO Network Inst'l	2nd Qtr FY98
(U) RSA Phase 1 SATCOM Installation	2nd Qtr FY98
(U) RSA Phase 1 Ascension Installation	2nd Qtr FY98
(U) RSA Phase 2 Critical Design Review	3rd Qtr FY98
(U) RSA Phase 1 Operational T&E	1st Qtr FY99
(U) RSA Phase 1 System Turnover	1st Qtr FY99
(U) RSA Follow-on Equipment Contract	2nd Qtr FY99

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0305906F NCMC-TW/AA Systems

COST (*In Thousands*)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	132,576	127,446	60,897	27,895	6,233	4,444	4,747	4,890	Continuing	TBD
3880 CMU	123,217	81,234	51,446	22,135	633	128	0	0	0	1,317,670
3881 Integrated TW/AA	9,359	13,712	9,451	5,760	5,600	4,316	4,747	4,890	Continuing	TBD
4409 Legacy Interfaces	0	32,500	0	0	0	0	0	0	0	32,500

(U) A. Mission Description and Budget Item Justification

This program element funds the replacement systems for the Cheyenne Mountain Complex (CMC) which provides the Command, Control, Communications and Computers (C4) in support of the Integrated Tactical Warning/Attack Assessment (Integrated TW/AA) system. This program incrementally upgrades and replaces the current operational systems without loss of attack warning capability during the phased transition. The CMC supports the Commander-in-Chief (CINC) North American Aerospace Defense Command (NORAD)/CINC US Space Command in providing the National Command Authorities, USSTRATCOM and other forward users with early warning (missile, air, and space) and assessment of attack on North America or its allies.

This program element has three related projects: The first project, Cheyenne Mountain Upgrade (CMU), is six acquisitions that are supported by both the second and third project. The second project, Integrated TW/AA System Engineering, provides interface analysis and disconnect resolution between CMU and over twenty other Integrated TW/AA systems and program upgrades and supports the development of the Cheyenne Mountain Training System (CMTS). The third project, Legacy Interfaces, provides software development upgrades to post-IOC CMU subsystems and direct mission software support to meet operational needs.

This program element is research category/budget activity code 7 (Operational System Development) because it involves post-Milestone Three efforts, and the projects in this program element support development acquisition programs or upgrades.

(U) Acquisition Strategy:

The CMU program was recently restructured to implement an acquisition strategy that tests and delivers four phases of user capability. Phase 1 will implement the complete missile warning capability by Nov 1995. Phases 2/3/4 will test and implement CMU capabilities in annual blocks (with O&M version releases) and incorporate upgrades and changes to meet evolving user requirements.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305906F NCMC-TW/AA Systems

(U) **B. Program Change Summary ($ in Thousands)**

	FY 1994	FY 1995	FY 1996	FY 1997
(U) Previous President's Budget	132,987	100,520	44,434	6,451
(U) Appropriated Value	138,341	133,020		
(U) Adjustments to Appropriated Value				
a. Cong Gen Reductions	- 5,354	- 2,793		
b. SBIR	- 2,075	- 2,748		
c. Omnibus or Other Above Threshold Reprogram	- 436			
d. Below Threshold Reprogramming	+ 2,100	- 33		
(U) Adjustments to Budget Years Since FY95 PB			+16,463	+21,444
(U) Current Budget Submit/President's Budget	132,576	127,446	60,897	27,895

(U) Change Summary Explanation:

Funding: FY95 appropriated value is $32,500,000 greater than PB request due to a Congressional transfer of $41,500,000 in O&M funds to RDT&E, and a Congressional reduction of $9,000,000 in RDT&E. Adjustments to Budget Years Since FY95 PB (in FY96 - FY97) include a decrease ($2,188,000 in FY96, $1,396,000 in FY97) due to reduction to Cheyenne Mountain Training System (CMTS) program, an increase ($19,000,000 in FY96, $23,000,000 in FY97) required to implement restructure of CMU program, and a decrease ($349,000 in FY96, $160,000 in FY97) due to inflation changes.

Schedule: Acquisition approach tests and implements Phase 1 (complete missile warning) by Nov 1995. Phases 2, 3 and 4 (development of subsystem capability and software upgrades) are tied to annual O&M version releases.

Technical: No change.

(U) **C. Other Program Funding Summary ($ in Thousands)**

	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	To Compl	Total Cost
(U) Other Procurement *	17,551	5,710	9,187	6,363	3,370	1,291	1,921	1,979	Cont	TBD
(U) Operations & Maintenance	85,600	42,600	103,000	97,400	94,600	85,700	84,800	87,100	Cont	TBD

* Includes spares for CMU and CINC Mobile Alternate Headquarters (CMAH).

Related RDT&E:

(U) #604441F, Space-Based Infrared System
(U) #305910F, Spacetrack
(U) #305911F, Defense Support Program

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0305906F NCMC-TW/AA Systems

(U) **D. Schedule Profile**

	FY 1994				FY 1995				FY 1996				FY 1997			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
(U) SPADOC 4C ver 1 (Space Defense)		x														
(U) CSSR (Comm Distribution/Tech Control)		x														
(U) CCPDS-R (Missile Warning) Single String				x												
(U) CMU Phase 1 Operational Acceptance									x							
(U) Missile Warning IOT&E											x					
(U) CMU Phase 2 Operational Acceptance												x				
(U) Air Warning Mission Operational Acceptance															x	
(U) CMU Phase 3 Operational Acceptance																x
(U) Space Control Mission Operational Acceptance (Jun 98)																
(U) CMU Phase 4 Operational Acceptance (Aug 98)																
(U) CMU Integrated Mission IOT&E (Mar 99)																

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY: 7 - Operational System Development	PE NUMBER AND TITLE: 0305906F NCMC-TW/AA Systems — PROJECT: 3880

COST (*In Thousands*)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
3880 CMU	123,217	81,234	51,446	22,135	633	128	0	0	0	1,317,670

(U) A. **Mission Description and Budget Item Justification**

The CMU program must meet Joint Chiefs of Staff (JCS) requirements to provide the National Command Authorities with timely, reliable, and unambiguous Integrated TW/AA data for force survival or retaliatory decisions in the face of air, space, or ballistic missile threats. The program will provide: 1) survivable communications access for missile attack warning; 2) integrated warning of ballistic missile, atmospheric, and space threats; 3) standard user displays and warning processing systems at selected command centers; 4) an austere alternate facility capable of early/trans-attack warning and peacetime backup to the Missile Warning Center at Cheyenne Mountain. The CMU program was recently restructured to implement an acquisition strategy that tests and delivers four phases of user capability. Phase 1 will implement the missile warning capability by Nov 1995. Phases 2/3/4 will test and implement CMU capabilities in annual blocks completing all planned capabilities by Dec 1998.

(U) FY 1994

- (U) Continued Phase 1 efforts:
  - (U) SPADOC 4C version 1 achieved IOC on 28 Jan 94 ($28,895)
  - (U) Delivered CSSR subset to APCC and achieve Additional Operational Capability (AOC) #2 at APCC/Cheyenne Mountain on 9 Feb 94 ($15,054)
  - (U) CCPDS-R - Common subsystem achieved IOC at Cheyenne Mountain on 8 Sep 94 ($22,859)
  - (U) Conducted Granite Sentry/SPADOC 4C interface testing with CSSR ($33,130)
  - (U) SCIS - began installation and checkout at 22 locations worldwide ($23,279)

(U) FY 1995

- (U) Continue Phase 1, to include:
  - (U) SCIS Mini-Net (Mar 95) ($625)
  - (U) SPADOC 4C version 2 achieve Operational Acceptance (OA) at Cheyenne Mountain using CSS (Jul 95) ($10,396)
  - (U) Dual node missile warning at APCC (Oct 95) ($22,783)
- (U) Initiate Phase 2, to include:
  - (U) SPADOC 4C version 2 with CSSR ($10,396)
  - (U) SCIS I4 (Sensor Summary Processing) ($20,471)
- (U) Initiate Phase 3, to include:
  - (U) Granite Sentry (Air Warning) at Cheyenne Mountain ($16,563)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY: 7 - Operational System Development	PE NUMBER AND TITLE: 0305906F NCMC-TW/AA Systems — PROJECT: 3880

(U) FY 1996
- (U) Complete Phase 1 with delivery of dual node missile warning at APCC (Nov 95) ($7,727)
- (U) Complete Phase 2 (Aug 96) after Missile Warning IOT&E; deliver Survivable Secure Communications Network and SCIS (I4)/Processing and Display System (Dec 95) ($10,112)
- (U) Continue Phase 3, to include:
  - (U) Missile Warning remote from APCC ($5,687)
  - (U) Granite Sentry (Air Warning) at Cheyenne Mountain ($11,008)
- (U) Initiate Phase 4, to include:
  - (U) SPADOC 4C version 2 with CSSR ($16,912)

(U) FY 1997
- (U) Complete Phase 3 (Aug 97) with delivery of:
  - (U) Missile warning remote from APCC ($8,411)
  - (U) Granite Sentry (Air Warning) at Cheyenne Mountain ($8,535)
- (U) Continue Phase 4, to include:
  - (U) SPADOC 4C version 2 with CSSR ($5,189)

(U) B. Program Change Summary ($ in Thousands)

	FY 1994	FY 1995	FY 1996	FY 1997
(U) Previous President's Budget	122,707	86,808	33,172	661
(U) Appropriated Value	128,546	77,808		
(U) Adjustments to Appropriated Value				
a. Cong Gen Reductions	- 7,429	- 2,793		
b. SBIR		- 2,748		
c. Project Realignment		+ 9,000		
d. Below Threshold Reprogramming	+ 2,100	- 33		
(U) Adjustments to Budget Years Since FY95 PB			+ 18,274	+21,474
(U) Current Budget Submit/President's Budget	123,217	81,234	51,446	22,135

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305906F NCMC-TW/AA Systems	PROJECT 3880

(U) Change Summary Explanation:

Funding: FY95 appropriated value is $9,000,000 less than President's Budget request due to a Congressional reduction for Air Warning processor at APCC. Adjustments to Budget Years Since FY95 PB include an increase required to implement restructure of CMU program and a decrease due to inflation changes. Project Realignment reflects a transfer of $9,000,000 from project 4409 to project 3880.

Schedule: Acquisition approach tests and implements Phase 1 (complete missile warning) by Nov 1995. Phases 2, 3 and 4 (development of subsystem capability and software upgrades) are tied to annual O&M version releases.

Technical: Includes Missile Warning remote from APCC.

(U) C. Other Program Funding Summary ($ in Thousands)

	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	To Compl	Total Cost
(U) Other Procurement *	17,551	5,710	9,187	6,363	3,370	1,291	1,921	1,979	Cont	TBD
(U) Operations & Maintenance	85,600	42,600	103,000	97,400	94,600	85,700	84,800	87,100	Cont	TBD

* Includes spares for CMU and CINC Mobile Alternate Headquarters (CMAH).

(U) D. Schedule Profile

	FY 1994				FY 1995				FY 1996				FY 1997			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
(U) SPADOC 4C ver 1 (Space Defense)		x														
(U) CSSR (Comm Distribution/Tech Control)		x														
(U) CCPDS-R (Missile Warning) Single String				x												
(U) CMU Phase 1 Operational Acceptance									x							
(U) Missile Warning IOT&E											x					
(U) CMU Phase 2 Operational Acceptance												x				
(U) Air Warning Mission Operational Acceptance															x	
(U) CMU Phase 3 Operational Acceptance																x
(U) Space Control Mission Operational Acceptance (Jun 98)																
(U) CMU Phase 4 Operational Acceptance (Aug 98)																
(U) CMU Integrated Mission IOT&E (Mar 99)																

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0305906F NCMC-TW/AA Systems

PROJECT: 3880

(U) A. Project Cost Breakdown ($ in Thousands)

	FY 1994	FY 1995	FY 1996	FY 1997
(U) Major Contract Incremental Funding	62,114	29,096	12,691	3,105
(U) Award/Performance Fee	3,638	5,175	1,079	1,028
(U) Target To Cost/Overrun	4,490	5,799	2,999	552
(U) ECPs/Correction of Deficiencies/Incomp	4,258	5,382	716	469
(U) Interoperability/Test Support	9,260	7,800	8,134	2,677
(U) Pre-Operational Support/SWSC Maintenance	839	3,119	1,977	0
(U) Type I Training/TDY	804	325	125	00
(U) SSCN/SCIS Fallback/Secure Voice Tell Network	1,905	580		
(U) Tech Manuals	23	8		
(U) Missile Warning Remote Display		2,032	3,767	3,873
(U) Test Bed Movement/Maintenance		0	1,300	1,300
(U) SPO Support				
(U) MITRE	13,991	11,342	9,027	3,082
(U) TEMS/SDAS/WSI/SAIC/NSR	6,952	4,275	2,977	878
(U) Program Support	11,669	5,870	6,454	5,171
(U) Other Support	3,274	431	200	0
(U) Total CMU Project	123,217	81,234	51,446	22,135

(U) B. Budget Acquisition History and Planning Information ($ in Thousands)

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1994	Budget FY 1994	Budget FY 1995	Budget FY 1996	Budget FY 1997	Budget to Complete	Total Program
Product Development Organizations											
Loral Aerospace CO Springs CO	C/CPIF/AF	Oct 91	56,092	51,741	236,868	21,213	6,959	3,695	0	0	268,735

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)											DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0305906F NCMC-TW/AA Systems							PROJECT 3880
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1994	Budget FY 1994	Budget FY 1995	Budget FY 1996	Budget FY 1997	Budget to Complete	Total Program
E-Systems St Petersburg FL		Aug 86	103,100	103,100	72,830	15,832	15,287	6,629	0	0	110,578
TRW, Inc Carson CA	C/FPI/AF	Jun 87	168,300	168,500	183,762	17,441	15,437	6,114	3,873	0	226,627
GTE Needham Hgts MA	C/CPIF/AF	Jan 92	17,047	16,693	210,766	13,988	8,441	8,352	3,977	0	245,524
Martin-Marietta CO Springs CA	SS/CPIF/AF	Mar 93	28,586	31,072	85,103	16,145	12,287	7,873	5,154	0	126,562
DISA (Govt) Reston VA	PO	Oct 93	N/A	N/A	5,514	1,905	580	0	0	0	7,999
Support and Management Organizations											
MITRE	SS/PR	Oct 95	N/A	N/A	128,553	13,991	11,342	9,027	3,082	0	165,995
TEMS	C/PR	Oct 95	N/A	N/A	45,336	6,952	4,100	2,977	878	0	60,243
Program Support	N/A	Nov 95	N/A	N/A	70,145	15,750	6,626	6,779	5,171	761	105,232
Test and Evaluation Organizations N/A											
Subtotal Product Development					794,843	86,524	58,983	32,663	13,004	0	986,017
Subtotal Support and Management					244,034	36,693	22,251	18,783	9,131	761	331,653
Subtotal Test and Evaluation											
Total Project					1,038,877	123,217	81,234	51,446	22,135	761	1,317,670

(U) B. Budget Acquisition History and Planning Information Continued ($ in Thousands)

Government Furnished Property: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0305906F NCMC-TW/AA Systems

PROJECT: 3881

COST (*In Thousands*)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
3881 Integrated TW/AA	9,359	13,712	9,451	5,760	5,600	4,316	4,747	4,890	Continuing	TBD

(U) A. Mission Description and Budget Item Justification

This project was set up in 1989 when Air Force recognized the phased transition of CMU program into the Integrated TW/AA network could only be achieved through rigorous system-of-systems design and engineering analysis of all interfaces and relationships among the twenty-six systems of the network. This project provides for the efficient integration of CMU through interface analysis, schedule management and disconnect resolution between CMU and over twenty other Integrated TW/AA systems and program upgrades as required to support the Integrated TW/AA network's continually evolving system-of-systems (e.g., Space-Based Infrared System) and changes driven by new missions/threats.

(U) FY 1994
- (U) Resolved test deficiencies identified during CCPDS-R interface testing with the CSSR ($7,487)
- (U) Resolved test deficiencies from SPADOC software release 4C version 1 (IOC met Feb 94) ($1,872)

(U) FY 1995
- (U) Systems Engineering Integration and Test (SEIT): Provide operation integration of CMU Phase 1 installation, check-out, test and assessment; maintain program schedule; identify, track and resolve CMU disconnects ($5,354)
- (U) Technical Performance Evaluation (TPE): Maintain CMU technical baseline; evaluate CMU performance and track to prescribed requirements; provide system engineering for CMU Phase 1 ($2,205)
- (U) Cheyenne Mountain Training System (CMTS): Continue to support CMTS program currently funded by multiple PEs ($5,457)
- (U) Interface Control Document development ($0.696M)

(U) FY 1996
- (U) SEIT: Provide operation integration of CMU Phase 2 installation, check-out, test and assessment; maintain program schedule; identify, track and resolve CMU disconnects ($5,894)
- (U) TPE: Maintain CMU technical baseline; evaluate CMU performance and track to prescribed requirements; provide system engineering for CMU Phase 2 ($1,370)
- (U) CMTS: Continue to support CMTS program ($2,187)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY: 7 - Operational System Development	PE NUMBER AND TITLE: 0305906F NCMC-TW/AA Systems — PROJECT: 3881

(U) FY 1997

- (U) SEIT: Provide operation integration of CMU Phase 3 installation, check-out, test and assessment; maintain program schedule; identify, track and resolve CMU disconnects ($4,701)
- (U) TPE: Maintain CMU technical baseline; evaluate CMU performance and track to prescribed requirements; provide system engineering for CMU Phase 3 ($1,059)

(U) B. Program Change Summary ($ in Thousands)

	FY 1994	FY 1995	FY 1996	FY 1997
(U) Previous President's Budget	10,280	13,712	11,262	5,790
(U) Appropriated Value	9,795			
(U) Adjustments to Appropriated Value				
a. Cong Gen Reductions				
b. SBIR				
c. Omnibus or Other Above Threshold Reprogram	- 436			
d. Below Threshold Reprogramming				
(U) Adjustments to Budget Years Since FY95 PB			- 1,811	- 30
(U) Current Budget Submit/President's Budget	9,359	13,712	9,451	5,760

(U) Change Summary Explanation:

Funding: Adjustments to Budget Years Since FY95 PB (in FY96 - FY97) include a decrease ($2,188,000 in FY96, $1,396,000 in FY97) due to reduction to Cheyenne Mountain Training System (CMTS) program, an increase ($431,000 in FY96, $1,399,000 in FY97) required to implement restructure of CMU program, and a reduction of ($54,000 in FY96, $33,000 in FY97) due to changes in inflation.

Schedule: No change.

Technical: No change.

(U) C. Other Program Funding Summary ($ in Thousands)

(U) Not Applicable.

(U) D. Schedule Profile

(U) Not Applicable. This is a sustaining engineering effort that supports project 3880 with no distinct milestones.

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0305906F NCMC-TW/AA Systems

PROJECT: 3881

(U) A. Project Cost Breakdown ($ in Thousands)

	FY 1994	FY 1995	FY 1996	FY 1997
(U) Major Contract Incremental Funding		100	2,096	2,201
(U) Award/Performance Fee		167	0	0
(U) ECPs/Correction of Deficiencies/Incomp	90	0	0	0
(U) System of Systems Test Resolution	208			
(U) Interoperability/Test Support		462	316	325
(U) CMTS Systems Integration		4,388	1,435	0
(U) SPO Support				
(U) MITRE	4,877	4,485	3,329	2,254
(U) TEMS/SDAS/WSI/SAIC/NSR	3,240	3,056	2,111	968
(U) Program Support	944	1,054	164	12
(U) Total ITW/AA Project	9,359	13,712	9,451	5,760

(U) B. Budget Acquisition History and Planning Information ($ in Thousands)

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1994	Budget FY 1994	Budget FY 1995	Budget FY 1996	Budget FY 1997	Budget to Complete	Total Program
Product Development Organizations											
Support and Management Organizations											
MITRE	SS/PR	Oct 95	N/A	N/A	29,777	4,877	4,485	3,329	2,254	Cont	TBD
TEMS	C/PR	Oct 95	N/A	N/A	17,134	3,240	3,056	2,111	968	Cont	TBD
Program Support	N/A	Nov 95	N/A	N/A	5,593	944	1,054	164	12	Cont	TBD
Prime Contractors	(TBD)				247	298	5,117	3,847	2,526	Cont	TBD
Test and Evaluation Organizations											
N/A											

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE: February, 1995
BUDGET ACTIVITY: 7 - Operational System Development	PE NUMBER AND TITLE: 0305906F NCMC-TW/AA Systems						PROJECT: 3881

(U) B. Budget Acquisition History and Planning Information Continued ($ in Thousands)

Government Furnished Property:
Not Applicable.

Subtotal Product Development							
Subtotal Support and Management	52,751	9,359	13,712	9,451	5,760	Cont	TBD
Subtotal Test and Evaluation							
Total Project	52,751	9,359	13,712	9,451	5,600	Cont	TBD

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0305906F NCMC-TW/AA Systems

PROJECT: 4409

COST (*In Thousands*)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
4409 Legacy Interfaces	0	32,500	0	0	0	0	0	0	0	32,500

(U) **A. Mission Description and Budget Item Justification**

The FY95 Appropriations Conference Committee transferred $41.5M from the O&M Critical Space Contract Operations Line to the RDT&E R-1 line in this program element. Congress realigned these funds from O&M to RDT&E to identify the costs associated with CMU software development upgrades to the CMU program. To clearly account for this funding, this project, Legacy Interfaces, was established. This project provides funding for software development upgrades to the CMU program and for direct mission software support to meet operational needs.

(U) FY 1995
- (U) Provide SPADOC software maintenance support ($7,277)
- (U) Provide SCIS software maintenance support ($1,885)
- (U) Provide Cheyenne Mountain Air Station (CMAS) software support ($15,200)
- (U) Provide warning systems software support ($8,138)

(U) **B. Program Change Summary ($ in Thousands)**

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
(U) Previous President's Budget	0	0	0	0	0
(U) Appropriated Value	0	41,500			
(U) Adjustments to Appropriated Value	0				
a. Cong Gen Reductions					
b. SBIR					
c. Project Realignment		- 9,000			
d. Below Threshold Reprogramming					
(U) Current Budget Submit/President's Budget	0	32,500	0	0	32,500

(U) Change Summary Explanation:
Funding: FY95 funding was provided by Congressional transfer. Project Realignment reflects a transfer of $9,000,000 to project 3880.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305906F NCMC-TW/AA Systems PROJECT 4409

Schedule: No change.

Technical: No change.

(U) **C. Other Program Funding Summary ($ in Thousands)**

(U) Not Applicable..

(U) **D. Schedule Profile**

	FY 1994				FY 1995				FY 1996				FY 1997			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
(U) SPADOC software maintenance					x	-------	-------	-------								
(U) SCIS software maintenance					x	-------	-------	-------								
(U) CMAS software maintenance					x	-------	-------	-------								
(U) Warning systems software maint					x	-------	-------	-------								

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305906F NCMC-TW/AA Systems PROJECT 4409

(U) A. **Project Cost Breakdown ($ in Thousands)**

	FY 1994	FY 1995	FY 1996	FY 1997
(U) Major Contract Incremental Funding		29,548		
(U) Award/Performance Fee		2,952		
(U) Total Legacy Interfaces Project		32,500		

(U) B. **Budget Acquisition History and Planning Information ($ in Thousands)**

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1994	Budget FY 1994	Budget FY 1995	Budget FY 1996	Budget FY 1997	Budget to Complete	Total Program
Product Development Organizations											
Loral Aerospace CO Springs CO	C/AF	Oct 94	7,277	7,277			7,277				7,277
E-Systems St Petersburg FL	C/AF	Oct 94	1,885	1,885			1,885				1,885
Kaman Sciences CO Springs CA	C/AF	Oct 94	15,200	15,200			15,200				15,200
Kaman Sciences CO Springs CO	C/AF	Oct 94	8,138	8,138			8,138				8,138
Support and Management Organizations											
N/A											
Test and Evaluation Organizations											
N/A											

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)		DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305906F NCMC-TW/AA Systems	PROJECT 4409

(U) B. **Budget Acquisition History and Planning Information Continued ($ in Thousands)**

Government Furnished Property:
Not Applicable.

Subtotal Product Development		
Subtotal Support and Management	32,500	32,500
Subtotal Test and Evaluation		
Total Project	32,500	32,500

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0305910F Spacetrack

COST (*In Thousands*)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	55,086	49,874	35,583	12,139	7,562	10,579	10,989	11,411	Continuing	Continuing
2295 Space Surveil Net Improvement Pgm (SSNIP)	16,372	9,343	9,822	3,642	3,523	6,786	6,990	7,199	Continuing	Continuing
2296 Space Surveil C3 Interface	0	2,117	0	0	0	0	0	0	0	2,117
3903 Space Control Support*	3,596	950	0	0	0	0	0	0	0	29,328
4239 Air Force Maui Optical Station	5,024	5,775	1,061	2,997	4,039	3,793	3,999	4,212	Continuing	Continuing
4241 Advanced Electro Optical System	16,575	16,364	0	0	0	0	0	0	TBD	TBD
4279 Have Stare Radar	13,519	15,325	24,700	5,500	0	0	0	0	0	59,700

* Note: Space Control Support project number changed from 3887 to 3903. This is a number change only.

(U) A. **Mission Description and Budget Item Justification**

The SPACETRACK program element represents a worldwide space surveillance network (SSN) of dedicated, collateral, and contributing electro-optical, passive radio frequency (RF) and radar sensors. The SSN is tasked to provide space object cataloging and identification, satellite attack warning, timely notification to U.S. forces of satellite fly-over, space treaty monitoring, and scientific and technical intelligence gathering. The continued increase in satellite and orbital debris populations, as well as the increasing diversity in launch trajectories, non-standard orbits, and geosynchronous altitudes, necessitates continued modernization of the SSN to meet existing and future requirements and ensure their cost-effective supportability. SPACETRACK also provides the systems interface efforts necessary for the command and control, targeting, and damage assessment of a U.S. Antisatellite (ASAT) system. The Image Information Processing Center and Supercomputing facility for the Air Force Maui Optical Station (AMOS), were transferred to PE 62601F in FY92. The resources and responsibility for completing the HAVE STARE Radar System development were transferred to SPACETRACK from an intelligence program per Congressional direction in FY93. All of these projects are Budget Activity/Research Category Operational Systems Development because they involve development of or modifications to operational sensor network sites.

(U) **Acquisition Strategy:**
Projects in this Program Element are sustaining engineering efforts.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305910F Spacetrack

(U) B. Program Change Summary ($ in Thousands)

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
(U) Previous President's Budget	56,975	34,396	42,485	19,353	Continuing
(U) Appropriated Value	60,521	54,896			
(U) Adjustments to Appropriated Value					
a. Cong Gen Reductions	- 3,546	- 1,072			
b. SBIR	- 889	- 1,136			
c. Omnibus or Other Above Threshold Reprogram					
d. Below Threshold Reprogramming	- 1,000	- 2,814			
(U) Adjustments to Budget Years Since FY95 PB			- 6,902	- 7,214	
(U) Current Budget Submit/President's Budget	55,086	49,874	35,583	12,139	Continuing

(U) Change Summary Explanation:

Funding: FY94 Below Threshold Reprogramming (BTR) reflects a classified reprogramming. FY95 Appropriated Value reflects a Congressional addition of $17,500,000 for AEOS project and $3,000,000 for HAVE STARE project. FY95 BTR reflects a reprogramming of funds to PE 0207247F and PE 0305164F. Adjustments to Budget Years Since FY95 PB reflects funding transfer to Operations & Maintenance account, reduction to Command, Control and Communications (C3) programs and reductions for inflation.

Schedule: HAVE STARE IOC is delayed to FY98/99 due to delay in overseas site selection.

Technical: None.

(U) C. Other Program Funding Summary ($ in Thousands)

	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	To Compl	Total Cost
(U) Other Procurement										
Space Mods with Initial Spares	11,104	16,141	16,443	13,080	8,406	9,058	7,000	5,537	Cont	Cont

Related RDT&E:

(U) Program Element #0305906F, NORAD Cheyenne Mountain Complex Tactical Warning/Attack Assessment System of Systems.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305910F Spacetrack

(U) **D. Schedule Profile**

	FY 1994				FY 1995				FY 1996				FY 1997			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
(U) GEODSS Telescope Mods																
(U) Dem/Val	x															
(U) EMD																x
(U) ASAT BMC3																
(U) Reviews (SRR/SDR)				x												
(U) Administrative Contract Close-Out						x										
(U) AEOS																
(U) Telescope (Fab/IOC)						x										
(U) HAVE STARE																
(U) Radar (Select Site)								x								

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY: 7 - Operational System Development	PE NUMBER AND TITLE: 0305910F Spacetrack — PROJECT: 2295

COST (*In Thousands*)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
2295 Space Surveil Net Improvement Pgm (SSNIP)	16,372	9,343	9,822	3,642	3,523	6,786	6,990	7,199	Continuing	Continuing

(U) A. **Mission Description and Budget Item Justification**

Space surveillance includes space object cataloging and identification and supports 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) provides the sustaining engineering to correct identified deficiencies in support of those mission requirements. SSNIP also implements modifications required to reduce supportability/maintainability O&M costs. SSNIP efforts currently include reducing uncorrelated target (UCT) errors, orbital debris measurement and research, communications/data link optimization, system architecture analyses and changes to the Ground-based Electro-Optical Deep space Surveillance System (GEODSS). This project is an Operational Systems Development Budget Activity because it involves a level-of-effort for sustained engineering support for development of, or modifications to, an operational spacetrack network site.

(U) FY 1994

- (U) Continued FY93 initiated GEODSS software algorithm developments to better enable detection of anomalies (changes) in geostationary spacecraft and the hardware and software design development modifications that will enable performance to be refined sufficiently to allow 3 sites to provide worldwide coverage; allow O&M cost reductions through reduction in the number of sites and consolidation of operations. We will replace the obsolescing computer system with current generation commercial off-the-shelf (COTS) automatic data processing equipment (ADPE); will replace the obsolescing vacuum tubes with solid state charge-coupled device cameras; will develop remote operations capability and will enable the systems to be relocatable to sites with minimum support infrastructure ($9,000).
- (U) Continued effort to improve accuracy of star catalog data base to support electro-optical sensors ($200).
- (U) Completed Haystack Auxiliary (HAX) Radar Program ($372).
- (U) Continued development of astrodynamic standards to improve the accuracy of orbital element data, to improve consistency between sensors and to correct basic inadequacies of existing models for non-standard orbits ($300).
- (U) Continued systems engineering level-of-effort to define and support required sensor investment programs for FY95 implementation. Efforts include alternatives to improve and optimize existing near earth surveillance ($6,500).

(U) FY 1995

- (U) Continue GEODSS modifications ($4,000).
- (U) Continue modifications to the Eglin radar's deep space search capability ($700).
- (U) Complete FY93-initiated GEODSS anomaly detection algorithm developments ($900).

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY: 7 - Operational System Development	PE NUMBER AND TITLE: 0305910F Spacetrack / PROJECT: 2295

- (U) Continue astrodynamic standards development and star catalog maintenance efforts ($1,300).
- (U) Continued development of astrodynamic standards to improve the accuracy of orbital element data, to improve consistency between sensors and to correct basic inadequacies of existing models for non-standard orbits ($300).
- (U) Optimize communications/data links to provide dedicated, secure voice and data links between SSN elements and the Space Surveillance Center in Cheyenne Mt. (and its alternate), as well as improve overall data flow capacity ($600).
- (U) Continue systems engineering level-of-effort to define and support required sensor investment programs for FY96 implementation. Efforts include alternatives to improve and optimize existing near earth surveillance and begin Eglin Radar deep space range transmitter modifications ($1,543).

(U) FY 1996
- (U) Continues GEODSS modifications ($6,000).
- (U) Continue modifications to the Eglin radar's deep space search capability ($882).
- (U) Continue systems engineering level-of-effort to define and support required sensor investment programs for FY97 implementation. Efforts include alternatives to improve and optimize existing near earth surveillance ($3,000).

(U) FY 1997
- (U) Continue GEODSS modifications ($1,742).
- (U) Continue modifications to the Eglin radar's deep space search capability ($900).
- (U) Continue systems engineering level-of-effort to define and support required sensor investment programs for FY98 implementation. Efforts include alternatives to improve and optimize existing near earth surveillance ($1,000).

(U) B. Program Change Summary ($ in Thousands)

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
(U) Previous President's Budget	16,372	9,343	9,878	4,688	Continuing
(U) Appropriated Value	16,372	9,343			
(U) Adjustments to Appropriated Value					
a. Cong Gen Reductions					
b. SBIR					
c. Omnibus or Other Above Threshold Reprogram					
d. Below Threshold Reprogramming					
(U) Adjustments to Budget Years Since FY95 PB			- 56	- 21	
(U) Current Budget Submit/President's Budget	16,372	9,343	9,822	3,642	Continuing

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305910F Spacetrack PROJECT 2295

(U) Change Summary Explanation:
Funding: Insignificant changes.

Schedule: None.

Technical: None.

(U) **C. Other Program Funding Summary ($ in Thousands)**

	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	To Compl	Total Cost
(U) Other Procurement										
(U) Space Mods with Initial Spares	11,104	16,141	16,443	13,080	8,406	9,055	7,000	5,337	Cont	Cont

(U) **D. Schedule Profile**

	FY 1994				FY 1995				FY 1996				FY 1997			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
(U) GEODSS Telescope Mods																
(U) Dem/Val	x															
(U) EMD																x

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305910F Spacetrack
	PROJECT 2295

(U) **A. Project Cost Breakdown ($ in Thousands)**

	FY 1994	FY 1995	FY 1996	FY 1997
(U) Sustaining Engineering Level-of-Effort	16,372	9,343	9,822	3,642
(U) Total	16,372	9,343	9,822	3,642

(U) **B. Budget Acquisition History and Planning Information ($ in Thousands)**

Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0305910F Spacetrack

PROJECT: 2296

COST (*In Thousands*)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
2296 Space Surveil C3 Interface	0	2,117	0	0	0	0	0	0	0	2,117

(U) **A. Mission Description and Budget Item Justification**

Intended to evaluate the potential space-based sensor contributions to the missions of the Space Surveillance Network (SSN) including the command, control and communications (C3) interfaces and potential operations concepts for the tasking of space-based sensors in concert with the ground-based SSN. Effort programmed and budgeted as part of the Space-Based Infrared System (SBIRS) program. Funds to be used for higher priority requirements.

(U) FY 1994: Not Applicable.
(U) FY 1995: Not Applicable.
(U) FY 1996: Not Applicable.
(U) FY 1997: Not Applicable.

(U) **B. Program Change Summary ($ in Thousands)**

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
(U) Previous President's Budget	0	2,152	198	1,620	Continuing
(U) Appropriated Value		2,152			
(U) Adjustments to Appropriated Value					
a. Cong Gen Reductions		- 35			
b. SBIR					
c. Omnibus or Other Above Threshold Reprogram					
d. Below Threshold Reprogramming					
(U) Adjustments to Budget Years Since FY95 PB			-198	-1,620	
(U) Current Budget Submit/President's Budget		2,117	0	0	2,117

(U) Change Summary Explanation:

Funding: Adjustments to Budget Years Since FY95 PB reflects transition of the project to SBIRS after FY95.

Schedule: None.

Technical: None.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305910F Spacetrack

(U) C. **Other Program Funding Summary ($ in Thousands)**
Not Applicable.

(U) D. **Schedule Profile**
Not Applicable.

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305910F Spacetrack

(U) **A. Project Cost Breakdown ($ in Thousands)**

	FY 1994	FY 1995	FY 1996	FY 1997
(U) Sustaining Engineering Level of Effort	0	2,117	0	0
(U) Total	0	2,117	0	0

(U) **B. Budget Acquisition History and Planning Information ($ in Thousands)**
Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0305910F Spacetrack

PROJECT: 3903

COST (*In Thousands*)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
3903 Space Control Support*	3,596	950	0	0	0	0	0	0	0	29,328

(U) **A. Mission Description and Budget Item Justification**

The U.S. space control objectives are to guarantee free U.S. access to space in peace and deny an adversary's use or control of space in war or crisis. The DoD's ASAT program protects the option to pursue deployment of an ASAT capability if directed. The Air Force is lead for the overall ASAT system architecture, end-to-end operational testing, and the development of the Battle Management/C3 (BM/C3) infrastructure that would be required for any future capability. The Kinetic Energy ASAT weapon system program being developed by the Army was canceled in August 1993. This project does not include fielding an ASAT system. Instead, the emphasis has been on developing the BM/C3 specification and interfaces for integration with the Cheyenne Mountain Complex (CMC) System of Systems. The BM/C3 contractor is designing and documenting the ASAT architecture, interfaces, and top level specifications. The contractor has also performed modeling activities to identify critical or high risk functions and interfaces for prototyping and testing. This project is an Operational Systems Development Budget Activity because it involves a level-of-effort for sustained engineering support for development of, or modifications to, an operational spacetrack network site. With completion of this project, residual funds will be reprogrammed to related efforts in the CMU PE 35906F.

(U) FY 1994
- (U) Conducted system engineering studies on the BM/C3 system ($1,500).
- (U) Developed a BM/C3 model to define and authenticate requirements for the Space Engagement Node (SEN) ($596).
- (U) Developed a SEN specification and associated Interface Control Documents (ICDs) ($1,500).

(U) FY 1995
- (U) Design Review and ICD open item follow-up and administrative close-out of ASAT BM/C3 contract ($950).

(U) FY 1996: Not Applicable.

(U) FY 1997: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0305910F Spacetrack

PROJECT: 3903

(U) **B. Program Change Summary ($ in Thousands)**

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
(U) Previous President's Budget	3,596	966			29,328
(U) Appropriated Value	3,596	966			
(U) Adjustments to Appropriated Value					
a. Cong Gen Reductions		- 16			
b. SBIR					
c. Omnibus or Other Above Threshold Reprogram					
d. Below Threshold Reprogramming					
(U) Adjustments to Budget Years Since FY95 PB					
(U) Current Budget Submit/President's Budget	3,596	950			29,312

(U) Change Summary Explanation:

Funding: None.

Schedule: None.

Technical: None.

(U) **C. Other Program Funding Summary ($ in Thousands)**

Not Applicable.

(U) **D. Schedule Profile**

	FY 1994				FY 1995				FY 1996				FY 1997			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
(U) Reviews (SRR/SDR)	x			x												
(U) Administrative Contract Close-out						x										

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305910F Spacetrack

(U) **A. Project Cost Breakdown ($ in Thousands)**

	FY 1994	FY 1995	FY 1996	FY 1997
(U) Sustaining Engineering Level of Effort	3,596	950	0	0
(U) Total	3,596	950	0	0

(U) **B. Budget Acquisition History and Planning Information ($ in Thousands)**
Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0305910F Spacetrack

PROJECT: 4239

COST (*In Thousands*)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
4239 Air Force Maui Optical Station	5,024	5,775	1,061	2,997	4,039	3,793	3,999	4,212	Continuing	Continuing

(U) A. **Mission Description and Budget Item Justification**

AMOS serves as a national R&D testbed for electro-optics and imaging technology supporting government and scientific communities. It also provides operational data to AFSPC: infrared signature data and compensated imaging data used for space object identification and mission/payload assessment. This project is an Operational Systems Development Budget Activity Research Category because it involves a level-of-effort for sustained engineering support for development of, or modifications to, an operational spacetrack network site.

(U) FY 1994
- (U) Continued basic AMOS facility operations and support upgrade integration efforts ($4,224).
- (U) Developed sensors for daylight imaging and geosynchronous space object identification (SOI) ($200).
- (U) Continued development of electro-optical data analysis tools for USSPACECOM ($200).
- (U) Began development of an observatory control system ($200).
- (U) Completed optical site networking experiment ($200).

(U) FY 1995
- (U) Continue basic AMOS facility operations and support upgrade integration efforts ($5,000).
- (U) Continue development of an observatory control system ($775).
- (U) Continue development of sensors for daylight imaging and geosynchronous SOI ($200).

(U) FY 1996
- (U) Continue basic AMOS facility operations and support upgrade integration efforts ($1,061).

(U) FY 1997
- (U) Continue basic AMOS facility operations and support upgrade integration efforts ($2,997).

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305910F Spacetrack	PROJECT 4239

(U) **B. Program Change Summary ($ in Thousands)**

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
(U) Previous President's Budget	5,024	5,872	6,067	6,014	Cont
(U) Appropriated Value	5,024	5,872			
(U) Adjustments to Appropriated Value					
a. Cong Gen Reductions		- 97			
b. SBIR					
c. Omnibus or Other Above Threshold Reprogram					
d. Below Threshold Reprogramming					
(U) Adjustments to Budget Years Since FY95 PB			- 5,006	-3,017	
(U) Current Budget Submit/President's Budget	5,024	5,775	1,061	2,997	Cont

(U) Change Summary Explanation:

Funding: Adjustments to Budget Years Since FY95 PB reflects funding realignments to O&M appropriation budget account ($5,300,000 in FY96, $3,500,000 in FY97), and reductions for inflation ($6,000 in FY96, and $17,000 in FY97).

Schedule: None.

Technical: None.

(U) **C. Other Program Funding Summary ($ in Thousands)**

Not Applicable.

(U) **D. Schedule Profile**

Not Applicable.

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305910F Spacetrack PROJECT 4239

(U) A. **Project Cost Breakdown ($ in Thousands)**

	FY 1994	FY 1995	FY 1996	FY 1997
(U) Sustaining Engineering Level of Effort	5,024	5,775	1,061	2,997
(U) Total	5,024	5,775	1,061	2,997

(U) B. **Budget Acquisition History and Planning Information ($ in Thousands)**
Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0305910F Spacetrack

PROJECT: 4241

COST (*In Thousands*)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
4241 Advanced Electro Optical System	16,575	16,364	0	0	0	0	0	0	TBD	TBD

(U) A. **Mission Description and Budget Item Justification**

The Advanced Electro-Optical System (AEOS) is a 3.67 meter telescope addition to the Air Force Maui Optical Station (AMOS). The AEOS program was initiated in FY91 per Congressional direction. Congress has continued to appropriate funding to continue this project in FY93, FY94 and FY95. Additional funding in FY96 and beyond, required to complete AEOS, is not programmed. However if Congress continues funding, the AEOS telescope could become operational by FY98. This project is an Operational Systems Development Budget Activity Research Category because it involves a level-of-effort for sustained engineering support for development of, or modifications to, an operational spacetrack network site.

(U) FY 1994
- (U) Completed facility design and began development ($23,000 FY93 funds).
- (U) Initiated adaptive optics acquisition ($4,675).
- (U) Developed telescope control systems ($4,000).
- (U) Continued telescope development incremental funding ($4,000).
- (U) Initiated sensor instrumentation acquisitions ($3,900).

(U) FY 1995
- (U) Continue telescope development incremental funding ($10,964).
- (U) Continue sensor instrumentation acquisitions ($5,200).
- (U) NASA independent design review ($200).

(U) FY 1996: Not Applicable

(U) FY 1997: Not Applicable

(U) B. **Program Change Summary ($ in Thousands)**

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0305910F Spacetrack

PROJECT: 4241

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
(U) Previous President's Budget	16,575	0			TBD
(U) Appropriated Value	16,575	17,500			
(U) Adjustments to Appropriated Value					
a. Cong Gen Reductions					
b. SBIR		- 1,136			
c. Omnibus or Other Above Threshold Reprogram					
d. Below Threshold Reprogramming					
(U) Adjustments to Budget Years Since FY95 PB					
(U) Current Budget Submit/President's Budget	16,575	16,364			TBD

(U) Change Summary Explanation:

Funding: Congress added $17,500,000 in FY95 for continuation of this project.

Schedule: None.

Technical: None.

(U) **C. Other Program Funding Summary ($ in Thousands)**

Not Applicable.

(U) **D. Schedule Profile**

	FY 1994				FY 1995				FY 1996				FY 1997			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
(U) Telescope (Fab/IOC)						x										x

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305910F Spacetrack

(U) A. **Project Cost Breakdown ($ in Thousands)**

	FY 1994	FY 1995	FY 1996	FY 1997
(U) Sustaining Engineering Level of Effort	16,575	16,364	0	0
(U) Total	16,575	16,364	0	0

(U) B. **Budget Acquisition History and Planning Information ($ in Thousands)**
Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0305910F Spacetrack

PROJECT: 4279

COST (*In Thousands*)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
4279 Have Stare Radar	13,519	15,325	24,700	5,500	0	0	0	0	0	59,700

(U) A. **Mission Description and Budget Item Justification**

The HAVE STARE (HS) radar was transferred from the intelligence budget in FY93 at the direction of Congress. The Air Force has identified a requirement for the HS system and has programmed funding in this program element to complete development and to deploy the system. HS is a high resolution X-band tracking and imaging radar with a 27 meter mechanical dish antenna. HS will be deployed as a dedicated space surveillance sensor to support the mission of space object catalog maintenance of deep space objects and mission payload assessment. The potential to support other missions is also being evaluated. Operational site location deployment has not been determined. HS will provide both an improvement in capability and a reduction in overall SPACETRACK O&M costs. This system is currently in the EMD phase leading to an IOC in FY98. This project is an Operational Systems Development Budget Activity because it involves a level-of-effort for sustained engineering support for development of, or modifications to, an operational spacetrack network site.

(U) FY 1994
- (U) Completed software Formal Qualification Testing ($1,500).
- (U) Completed in-plant hardware /software integration and testing ($1,000).
- (U) Began in-CONUS developmental test and evaluation at Vandenberg AFB, CA ($2,000).
- (U) Incorporated near real time imagery capability modifications ($3,600 FY93 funds).
- (U) Began incorporation of functionality and connectivity modifications required for integration with the Space Surveillance Network ($9,019).

(U) FY 1995
- (U) Complete in-CONUS developmental test and evaluation at Vandenberg AFB, CA ($6,125).
- (U) Continue incorporation of functionality and connectivity modifications required for integration with the Space Surveillance Network ($4,000).
- (U) Begin pre-deployment effort ($2,000).
- (U) Develop in-CONUS training workstation ($3,000).

(U) FY 1996
- (U) Begin site preparation at operational deployment location ($8,000).
- (U) Begin packing and shipping radar facility equipment to operational deployment location ($2,000).
- (U) Continue incorporation of functionality and connectivity modifications required for integration with the Space Surveillance Network ($2,000).
- (U) Begin operating location site interface connections and radar integrations ($12,700).

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305910F Spacetrack
	PROJECT 4279

(U) FY 1997
- (U) Deploy system to operating location ($5,000).
- (U) Continue on-site DT&E ($500).

(U) B. Program Change Summary ($ in Thousands)

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
(U) Previous President's Budget	13,519	16,063	26,324	7,031	TBD
(U) Appropriated Value	13,519	19,063			
(U) Adjustments to Appropriated Value					
a. Cong Gen Reductions		- 924			
b. SBIR					
c. Omnibus or Other Above Threshold Reprogram					
d. Below Threshold Reprogramming		- 2,814			
(U) Adjustments to Budget Years Since FY95 PB			- 1,642	- 1,531	
(U) Current Budget Submit/President's Budget	13,519	15,325	24,700	5,500	TBD

(U) Change Summary Explanation:

Funding: Congress added $3,000,000 in FY95 for an in-CONUS training workstation. FY95 Below Threshold Reprogramming reflects transfer of funds to PE 0207247F and PE 0305164F. Adjustments to Budget Years Since FY95 PB reflect reduction to C3 programs and reductions due to inflation.

Schedule: Project delayed due to delay in overseas site selection.

Technical:

(U) C. Other Program Funding Summary ($ in Thousands)

	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	To Compl	Total Cost
(U) Prior year GDIP and OSD funding levels are classified.										

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305910F Spacetrack PROJECT 4279

(U) **D. Schedule Profile**

	FY 1994				FY 1995				FY 1996				FY 1997			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
(U) HAVE STARE Radar Select Site								x								

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305910F Spacetrack PROJECT 4279

(U) A. **Project Cost Breakdown ($ in Thousands)**

	FY 1994	FY 1995	FY 1996	FY 1997
(U) Prime Contract	10,000	12,000	20,000	3,000
(U) SPO Support	3,519	3,325	4,700	2,500
(U) Total	13,519	15,325	24,700	5,500

(U) B. **Budget Acquisition History and Planning Information ($ in Thousands)**
Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0305911F Defense Support Program

COST (*In Thousands*)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	46,898	64,712	43,672	38,819	37,922	37,726	37,156	38,159	Continuing	Continuing
3615 Talon Shield/Alert	0	12,500	5,399	3,649	4,208	4,326	4,456	4,566	Continuing	Continuing
3624 Defense Support Program	46,898	52,212	38,273	35,170	33,714	33,400	32,700	33,593	Continuing	Continuing

(U) **A. Mission Description and Budget Item Justification**

The Defense Support Program (DSP) is a system of satellites 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. The Talon Shield/ALERT (Attack and Launch Early Reporting to Theater) is an upgrade to ground station mission processing which exploits inherent satellite capability to provide theater missile warning and cueing. DSP is an operational system and is therefore included in the Budget Activity Research Category Operational Systems Support.

(U) **Acquisition Strategy:**

The Defense Support Program (DSP) is currently sustaining production of the the remaining satellites, 18 through 23. This sustainment includes post production storage, testing, preparation for launch and on orbit testing. Current contract efforts are required to stretch the support of launch centers to 12 months from the originally contracted 6 month launch centers. Satellite 23 will be the last of the DSP satellites to be procured. The follow-on to DSP, Space Based Infrared Systems satellites, will replace DSP starting in FY02. The ALERT squadron was activated on 1 Oct 94 with an anticipated ALERT IOC of 28 Feb 95. Further Talon Shield RDT&E efforts will be required to meet the AFSPC FOC requirements.

(U) **B. Program Change Summary ($ in Thousands)**

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
(U) Previous President's Budget	50,311	76,351	119,531	61,633	Continuing
(U) Appropriated Value	51,577	67,359			
(U) Adjustments to Appropriated Value					
a. Congressional General Reductions	- 1,266	- 1,235			
b. SBIR	- 785	- 1,395			
c. Omnibus or Other Above Threshold Reprogram	- 2,100				
d. Below Threshold Reprogramming	- 528	- 17			
(U) Adjustments to Budget Years Since FY95 PB			-75,859	-22,814	
(U) Current Budget Submit/President's Budget	46,898	64,712	43,672	38,819	Continuing

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305911F Defense Support Program

(U) Change Summary Explanation:

Funding: FY96 and FY97 funding was deleted from PE 305911F because the requirement for consolidated ground is included as part of the architecture for the Space Based Infrared Systems (SBIRS) program (PE #604441F).

Schedule: The schedule for upgrades to the existing software at the fixed ground stations has been rebaselined due to the termination of the contract for development of replacement software (System I). Schedules were also revised for the ground computer changeout as a result of the System I termination. The SRSU schedule has slipped to the right because of the failure of IOT&E. ALERT IOC has slipped 2 months due to problems identified during their operational assessment.

Technical: DSP Program Office has assumed life cycle support for the system under Integrated Weapon Systems Management philosophy. Sustainment and support activity is now an integral portion of the technical effort. DSP Program Office recently accepted lead role for a joint program with ESC/MS to provide an integrated DSP/Milstar capability for the DSP mobile ground system. DSP Program Office is now required to respond to an Army upgrade of the DSCS communication vehicle to a fiber optic interface in order to maintain compatibility. The DSP Mission Control Station (MCS) will be modified to continue to process mission data from both DSP and the next generation early warning satellite during the transition from one system to the other.

(U) C. **Other Program Funding Summary ($ in Thousands)**

	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	To Compl	Total Cost
(U) Missile Procurement	350,309	361,404	102,911	86,914	196,107	119,237	151,838	172,245	Continue	Continue
(U) Other Procurement	28,373	23,925	36,909	4,358	3,160	0	3,301	2,902	Continue	Continue
Related RDT&E:										
(U) PE #603441F - SBIRS Dem/Val	0	114,032	130,744	126,369	127,367	144,283	119,390	119,363	Continue	Continue
(U) PE #604441F - SBIRS EMD	0	99,981	152,219	198,982	350,213	566,098	661,490	698,109	Continue	Continue

(U) D. **Schedule Profile**

	FY 1994				FY 1995				FY 1996				FY 1997			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
(U) Satellite Deliveries	X			X		XX	X	X								
(U) MPF Transition to AFMC			X													
(U) LCS Termination		X														
(U) SRSU IOT&E First String			X													

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0305911F Defense Support Program

	FY 1994				FY 1995				FY 1996				FY 1997			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
(U) SRSU IOT&E Second String					X											
(U) Fixed Site Computer Award				X												
(U) Transition MCS Award						X										
(U) ALERT LOC Contract Award (Jul 93)																
(U) Hardware Install Complete		X														
(U) System Test Complete			X													
(U) ALERT IOC Contract Award		X														
(U) IOC						X										
(U) Complete Training						X										
(U) Start Blue Suit Maintenance									X							
(U) Final Hardware Installation											X					
(U) ALERT FOC Certification (Oct 96)													X			

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305911F Defense Support Program	PROJECT 3615

COST (*In Thousands*)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
3615 Talon Shield/Alert	0	12,500	5,399	3,649	4,208	4,326	4,456	4,566	Continuing	Continuing

(U) A. **Mission Description and Budget Item Justification**

The Talon Shield project identified changes to existing DSP processing to enhance theater missile defense warning capabilities. These enhancements will facilitate more timely and accurate detection, identification, location and tracking of theater missile threats. This data supports attack operations/counterforce operations by providing accurate, timely launch prediction. In addition, this data will support active and passive defense forces by providing target cueing data and precise impact point prediction. The Air Force will transition these enhancements to an operational system, ALERT, to provide continuous real-time warning to operational forces.

(U) FY 1994 (Accomplished under BMDO PE #603216C)
- (U) Project BMDO funded in FY94.
- (U) Continue Talon Shield hardware and software development (BMDO funding).
- (U) Continue other interface development for mapping, earth imaging, weather, and navigational data.
- (U) Initiate training planning.
- (U) Begin Type I operator training and technical orders.

(U) FY 1995
- (U) Combined Air Force and BMDO funded project
- (U) Continue Talon Shield hardware and software development
- (U) Initiate Pre-Operational software development support ($3,000)
- (U) Continue Operations and Maintenance Training Plan development and begin implementation ($1,600)
- (U) Begin hardware and software data package ($4,900)
- (U) FFRDC and office support ($2,900)
- (U) Initiate Initial Operational Test & Evaluation ($100)

(U) FY 1996
- (U) Continue Talon Shield development (BMDO funded)
- (U) Continue development to achieve ALERT full operational capability ($1,530)
- (U) Continue Operations and Maintenance Training Plan development and implementation ($300)
- (U) FFRDC and office support ($3,569)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305911F Defense Support Program
	PROJECT 3615

(U) FY 1997
- (U) Continue Talon Shield development (BMDO funded)
- (U) Continue software development to achieve ALERT full operational capability ($.08M)
- (U) FFRDC and office support ($3,569)

(U) **B. Program Change Summary ($ in Thousands)**

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
(U) Previous President's Budget	0	10,135	10,201	10,274	Continuing
(U) Appropriated Value	0	12,500			
(U) Adjustments to Appropriated Value	0	0			
a. Congressional General Reductions					
b. SBIR					
c. Omnibus or Other Above Threshold Reprogramming					
d. Below Threshold Reprogramming					
(U) Adjustments to Budget Years Since FY95 PB			- 4,802	- 6,625	
(U) Current Budget Submit/President's Budget	0	12,500	5,399	3,649	Continuing

(U) Change Summary Explanation:

Funding: Adjustments to Budget Years Since FY95 PB in FY96 and FY97 reflects a transfer of funding to Operations & Support because the program reached IOC (Initial Operational Capability).

Schedule: IOC for program slipped from Dec 94 to Feb 95.

Technical: Talon Shield Operational Assessment (OA) is experiencing problems with meeting some user requirements and therefore has cause additional work to resolve and complete OA testing.

(U) **C. Other Program Funding Summary ($ in Thousands)**

	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	To Compl	Total Cost
(U) Missile Procurement	350,309	361,404	102,911	86,914	196,107	119,237	151,838	172,245	Cont	Cont
(U) Other Procurement	28,373	23,925	36,909	4,358	3,160	0	3,301	2,902	Cont	Cont

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0305911F Defense Support Program

PROJECT: 3615

	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	To Compl	Total Cost
Related RDT&E:										
(U) DSP (Project 3624)	46,898	52,212	38,273	35,170	33,714	33,400	32,700	33,593	Cont	Cont
(U) PE #603441F - SBIRS Dem/Val	0	111,838	130,744	126,369	127,367	144,283	119,390	119,363	Cont	Cont
(U) PE #604441F - SBIRS EMD	0	99,981	152,219	198,982	350,213	566,098	661,490	698,109	Cont	Cont

(U) D. **Schedule Profile**

	FY 1994				FY 1995				FY 1996				FY 1997			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
(U) ALERT LOC Contract Award (Jul 93)																
(U) Hardware Install Complete		X														
(U) System Test Complete			X													
(U) ALERT IOC Contract Award		X														
(U) IOC						X										
(U) Complete Training						X										
(U) Start Blue Suit Maintenance									X							
(U) Final Hardware Installation											X					
(U) ALERT FOC Certification (Oct 96)												X				

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0305911F Defense Support Program

PROJECT: 3615

(U) A. **Project Cost Breakdown ($ in Thousands)**

	FY 1994 *	FY 1995	FY 1996	FY 1997
(U) Developmental Support Equipment Acquisition	0	0	0	0
(U) Software Development	0	2,100	100	80
(U) Program Management Support	0	1,295	1,599	939
(U) Training Development	0	1,590	0	0
(U) Engineering Analysis	0	0	0	0
(U) Technical Data	0	4,870	1,270	50
(U) Travel	0	80	80	80
(U) Research Personnel	0	2,565	2,350	2,500
(U) Total	0	12,500	5,399	3,649

* FY94 funding under BMDO PE #603216C

(U) B. **Budget Acquisition History and Planning Information ($ in Thousands)**

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1994	Budget FY 1994*	Budget FY 1995	Budget FY 1996	Budget FY 1997	Budget to Complete	Total Program
Product Development Organizations											
Aerojet	CPAF	Aug 92	TBD	TBD	0	0	8,970	1,370	0	Continue	10,340
Support and Management Organizations											
SMC					0	0	3,530	4,029	3,649	Continue	11,208
Test and Evaluation Organizations											
Not Applicable.											

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0305911F Defense Support Program

PROJECT: 3615

(U) B. Budget Acquisition History and Planning Information Continued ($ in Thousands)

Government Furnished Property:

Item Description	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Delivery Date	Total Prior to FY 1994	Budget FY 1994	Budget FY 1995	Budget FY 1996	Budget FY 1997	Budget to Complete	Total Program
Product Development Property										
GF Hardware			Aug 94		427					427
Support and Management Property										
Test and Evaluation Property										
Subtotal Product Development					0	8,970	1,370	0	Cont	TBD
Subtotal Support and Management					0	3,530	4,029	3,649	Cont	TBD
Subtotal Test and Evaluation					0	0	0	0	Cont	TBD
Total Project					0	12,500	5,399	3,649	Cont	TBD

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY: 7 - Operational System Development	PE NUMBER AND TITLE: 0305911F Defense Support Program / PROJECT: 3624

COST (*In Thousands*)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
3624 Defense Support Program	46,898	52,212	38,273	35,170	33,714	33,400	32,700	33,593	Continuing	Continuing

(U) A. **Mission Description and Budget Item Justification**

The DSP system provides a space-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 a constellation of satellites 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 detonation events and provides information for theater warning and exploitation. This program element provides funding for development to modernize ground stations to ensure continued operability, integration of satellites to launch vehicles, procurement of satellites and ground station hardware, and operation of the DSP ground stations.

(U) FY 1994

- (U) Assume responsibility for consolidated support of DSP software from AFSPC
- (U) Provided yearly software development facility support to program activities ($4,900)
- (U) Provide yearly funding for shelter storage fees ($100)
- (U) Continue orbital constellation software development and anomaly resolution ($5,200)
- (U) Continue sustainability replacement of ground station mission processing computers ($5,400)
- (U) Initiate development planning for establishment of capability to operate all DSP satellites and perform entire DSP mission from within the CONUS ground station to allow closure of the DSP overseas operational facilities ($5,800)
- (U) Continue development to replace unsupportable satellite readout equipment at the fixed ground stations. Complete installation and checkout for both Satellite Readout Station Upgrade (SRSU) sites ($4,698)
- (U) Initiate development to support integration of Milstar Mobile Communication Vehicle into Mobile Ground System ($4,000)
- (U) Initiate Flight 17 Early On-Orbit Test (EOT) software support for the Mobile Ground System ($100)
- (U) Begin special study to support Space-Based Infrared (SBIR) phenomenology impact ($800)
- (U) FFRDC ($3,900)
- (U) Program office support (TDYs, supplies, computers, etc.) ($8,700)
- (U) Continue development to replace unsupportable RADEC Data Units at the fixed ground stations ($2,000)
- (U) Continue residual tasking to support delivery of the Mobile Ground System ($600)
- (U) Continue development and sustaining capabilities for acquisition logistics engineering ($700)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY: 7 - Operational System Development	PE NUMBER AND TITLE: 0305911F Defense Support Program / PROJECT: 3624

(U) FY 1995
- (U) Continue software upgrade to program analysis tool ($600)
- (U) Continue yearly funding for shelter storage fees ($100)
- (U) Initiate acquisition for consolidated DSP ground station ($13,200)
- (U) Begin special studies to support DSP satellite manufacturing, production, test and launch activities as required ($1,812)
- (U) Initiate independent verification and validation ($900)
- (U) Complete integration of DSP mobile ground terminal and Milstar Mobile communication vehicle ($1,500)
- (U) Continue development to replace unsupportable satellite readout equipment at the fixed ground stations. Complete installation and checkout for the overseas ground station ($3,300)
- (U) Continue orbital constellation support software development and anomaly resolution ($7,800)
- (U) FFRDC ($5,000)
- (U) Program office support (TDYs, supplies, computer support, ECO risk, etc) ($9,000)
- (U) Continue yearly software development facility support to program activities for ground station operations ($6,700)
- (U) Continue development to replace unsupportable RADEC Data Units at the fixed ground stations ($1,100)
- (U) Continue development and sustaining capabilities for acquisition logistics engineering support ($1,200)

(U) FY 1996
- (U) Continue special studies to support DSP satellite manufacturing, production, test, and launch activities as required ($2,200)
- (U) Continue orbital constellation support software development and anomaly resolution ($7,900)
- (U) Continue independent verification and validation ($1,000)
- (U) FFRDC ($5,200)
- (U) Program office support (TDYs, supplies, ECO risk, etc.) ($13,473)
- (U) Continue yearly software development facility support to ground station operations activities ($6,900)
- (U) Continue development to replace unsupportable RADEC Data Units at the fixed ground stations ($300)
- (U) Continue development and sustaining capabilities for acquisition logistics engineering ($1,300)

(U) FY 1997
- (U) Continue special studies to support DSP satellite manufacturing, production, test, and launch activities as required ($2,200)
- (U) Continue orbital constellation support software development and anomaly resolution ($8,000)
- (U) Continue independent verification and validation ($1,400)
- (U) FFRDC ($5,300)
- (U) Continue yearly software development facility support for ground station operations program activities ($5,400)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305911F Defense Support Program
	PROJECT 3624

- (U) Continue development and sustaining capabilities for acquisition logistics engineering ($1,300)
- (U) Program office support (TDYs, supplies, ECO risk, etc.) ($11,570)

(U) **B. Program Change Summary ($ in Thousands)**

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
(U) Previous President's Budget	50,311	64,185	38,309	35,617	Continuing
(U) Appropriated Value	51,577	54,859			
(U) Adjustments to Appropriated Value					
a. Congressional General Reductions	- 1,266	- 1,235			
b. SBIR	- 785	- 1,395			
c. Omnibus or Other Above Threshold Reprogramming	- 2,100				
d. Below Threshold Reprogramming	- 528	- 17			
(U) Adjustments to Budget Years Since FY95 PB			- 36	- 447	
(U) Current Budget Submit/President's Budget	46,898	52,212	38,273	35,170	Continuing

(U) Change Summary Explanation:

Funding: FY96 and FY97 funding was deleted from PE 305911F because the requirement for consolidated ground is included as part of the architecture for the Space Based Infrared Systems (SBIRS) program (PE #604441F).

Schedule:. The schedule for upgrades to the existing software at the fixed ground stations has been rebaselined due to the termination of the contract for development of replacement software (System I). Schedules were also revised for the ground computer changeout as a result of the System I termination. The SRSU schedule has slipped to the right because of the failure of IOT&E.

Technical: DSP Program Office has assumed life cycle support for the system under Integrated Weapon Systems Management philosophy. Sustainment and support activity is now an integral portion of the technical effort. DSP Program Office recently accepted lead role for a joint program with ESC/MS to provide an integrated DSP/Milstar capability for the DSP mobile ground system. DSP Program Office is now required to respond to an Army upgrade of the DSCS communication vehicle to a fiber optic interface in order to maintain compatibility. The DSP Mission Control Station (MCS) will be modified to continue to process mission data from both DSP and the next generation early warning satellite during the transition from one system to the other.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0305911F Defense Support Program

PROJECT: 3624

(U) C. **Other Program Funding Summary ($ in Thousands)**

	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	To Complete	Total Cost
(U) Missile Procurement	350,309	361,404	102,911	86,914	196,107	119,237	151,838	172,245	Continuing	Continuing
(U) Other Procurement	28,373	23,925	36,909	4,358	3,160	0	3,301	2,902	Continuing	Continuing
Related RDT&E:										
(U) Talon Shield/ALERT (Project 3615)	0	12,500	5,399	3,649	4,208	4,326	4,456	4,566	Continuing	Continuing
(U) PE #603441F - SBIRS Dem/Val	0	111,383	130,744	126,369	127,367	144,283	119,390	119,363	Continuing	Continuing
(U) PE #604441F - SBIRS EMD	0	99,981	152,219	198,982	350,213	566,098	661,490	698,109	Continuing	Continuing

(U) D. **Schedule Profile**

	FY 1994				FY 1995				FY 1996				FY 1997			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
(U) Satellite Deliveries	X			X		XX	X	X								
(U) MPF Transition to AFMC			X													
(U) LCS Termination		X														
(U) SRSU IOT&E First String			X													
(U) SRSU IOT&E Second String					X											
(U) Fixed Site Computer Award				X												
(U) Transition MCS Award						X										

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0305911F Defense Support Program

PROJECT: 3624

(U) A. **Project Cost Breakdown ($ in Thousands)**

	FY 1994	FY 1995	FY 1996	FY 1997
(U) Systems Engineering	800	1,200	1,000	1,400
(U) Software Development	10,600	15,100	14,800	13,400
(U) Program Management Support	14,000	9,300	11,000	10,400
(U) Development Support Equipment Acquisition	19,798	15,700	8,400	6,700
(U) Travel	1,000	1,000	1,000	1,000
(U) Miscellaneous	700	9,912	2,073	2,270
(U) Total	46,898	52,212	38,273	35,170

(U) B. **Budget Acquisition History and Planning Information ($ in Thousands)**

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1994	Budget FY 1994	Budget FY 1995	Budget FY 1996	Budget FY 1997	Budget to Complete	Total Program
Product Development Organizations											
Aerojet	CPAF	Oct 93	54,835	54,835	6,460	5,185	7,137	7,208	7,369	Cont	TBD
Aerojet	CPAF	Sep 93	TBD	TBD	4,450	5,156	9,210				
IBM	FPIF/AF	Apr 94	106,884	110,918	30,744	3,635	3,250	0	0		
IBM	CPAF	Oct 93	71,189	62,577	11,572	4,926	7,246	6,909	5,430	Cont	TBD
DOE	P.O.					2,000	1,100	250			
Dept of Air Force	AF616					10,836	4,805	2,847	1,698	Cont	TBD
Phillips Lab	P.O.	Mar 94				300	0	0	0		
NRC	FPIF	Apr 94	700	700		700	1,248	1,246	1,303	Cont	TBD
SPARTA	CPAF	Aug 94			500	150	0	0	0		
Program Off Supt						7,055	6,256	7,377	6,849	Cont	TBD
ECO Risk							4,000	4,350	4,249		

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0305911F Defense Support Program

PROJECT: 3624

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1994	Budget FY 1994	Budget FY 1995	Budget FY 1996	Budget FY 1997	Budget to Complete	Total Program
Support and Management Organizations											
	MIPR					824					
IBM	FPIF/AF/CP					400					
Dept of Defense	MIPR					500					
Aerospace Corp	MORD					4,170	5,000	5,150	5,305	Cont	TBD
Dept of Navy	MIPR					85	0	0	0		
Dept of Air Force	MIPR					665	0	0	0		
Aerojet	FPI/AF/FF		430,502	430,502	0	0	500	500	500	Cont	TBD
Aerojet	CPFF/LOE		12,116	12,116	8,741	0	301	252	256	Cont	TBD
TRW	FPI/CPFF		640,039	640,239	7,417	0	500	500	500	Cont	TBD
Aerojet	CPFF		510,363	502,743	1,294	0	650	672	695	Cont	TBD
TRW	CPFF				12,608	52	249	252	256	Cont	TBD
TRW	FPI		558,216	505,797	0	0	500	500	500	Cont	TBD
ASEC					250	259	260	260	260	Cont	TBD

Test and Evaluation Organizations

Not Applicable.

(U) B. Budget Acquisition History and Planning Information Continued ($ in Thousands)

Government Furnished Property:

Item Description	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Delivery Date	Total Prior to FY 1994	Budget FY 1994	Budget FY 1995	Budget FY 1996	Budget FY 1997	Budget to Complete	Total Program
Product Development Property										
SRSU	FFIF/CPAF	1989		9,629						

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0305911F Defense Support Program

PROJECT: 3624

Item Description	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Delivery Date	Total Prior to FY 1994	Budget FY 1994	Budget FY 1995	Budget FY 1996	Budget FY 1997	Budget to Complete	Total Program
Support and Management Property										
Test and Evaluation Property										
Subtotal Product Development					40,393	44,252	30,187	26,898	Cont	TBD
Subtotal Support and Management					6,955	7,960	8,086	8,272	Cont	TBD
Subtotal Test and Evaluation					0	0	0	0	Cont	TBD
Total Project					46,898	52,212	38,273	35,170	Cont	TBD

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0305913F Nudet Detection System

PROJECT: 2808

COST (*In Thousands*)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
2808 Nuc Detonation Det Sys (Sensors)	10,331	9,815	16,277	21,283	15,882	7,912	2,110	1,982	Continuing	Continuing

(U) A. **Mission Description and Budget Item Justification**

The Nuclear Detonation (NUDET) Detection System (NDS) consists of space, control, and user equipment segments, along with a calibration facility. The space segment consists of NUDET detection sensors on the GPS/NDS satellites. The control segment consists of ground control software is known as the Integrated Correlation and Display System (ICADS). The user equipment segment consists of the Ground NDS Terminals (GNT). The calibration facility is the AFSPC/AFTAC Laser Facility (AALF) which provides an end-to-end test capability. The NDS provides a worldwide highly survivable capability to detect, locate, and report any nuclear detonations in the Earth's atmosphere or in near space in near real time. The NDS supports NUDET detection requirements for AFSPC (Integrated Tactical Warning and Attack (ITWAA) Assessment), USSTRATCOM (Nuclear Force Management), and AFTAC (Treaty Monitoring). NDS is classified Budget Activity Research Category Operational Systems Development because it is a post Milestone 3 program.

(U) FY 1994
- (U) Continued ICADS development, integration and test ($3,716)
- (U) Continued AFTAC AFSPC Laser Facility (AALF) system engineering and program management ($200)
- (U) Continued initial NDS EMP Sensor on orbit qualification ($897)
- (U) Continued GNT development, integration and test. Completed GNT Technical Requirements Document (TRD) ($2,537)
- (U) Continued development of GNT software common to ICADS ($2,897)
  - (U) Continued Mission Support Requirements ($84)

(U) FY 1995
- (U) Continue GNT development, integration and test of GNTs ($1,803)
- (U) Continue ICADS development and software upgrades ($5,354)
- (U) Continue NDS EMP Sensor on-orbit qualification ($920)
- (U) Continue engineering studies for AALF acquisition ($275)
- (U) Continue development of GNT software common to ICADS ($235)
  - (U) Continue system engineering and program management for ICADS and GNT ($725)
  - (U) Continue Mission Support Requirements ($503)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY: 7 - Operational System Development	PE NUMBER AND TITLE: 0305913F Nudet Detection System — PROJECT: 2808

(U) FY 1996
- (U) Continue ICADS and GNT development ($6,447)
- (U) Continue NDS EMP Sensor on-orbit qualification ($1,012)
- (U) Contract start for AALF software and laser development ($7,485)
  - (U) Continued System Engineering and Program Management for ICADS and GNT ($804)
  - (U) Continue Mission Support Requirements ($529)

(U) FY 1997
- (U) Continue ICADS and GNT development ($11,900)
- (U) Continue EMP Sensor on-orbit qualification ($1,046)
- (U) Continue AALF software and laser development ($6,975)
  - (U) Continued System Engineering and Program Management for ICADS and GNT ($828)
  - (U) Continue Mission Support Requirements ($534)

(U) **Acquisition Strategy:**

The NDS Acquisition Strategy is to sustain the NDS capability for IIR and IIF satellites.

(U) **B. Program Change Summary ($ in Thousands)**

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
(U) Previous President's Budget	9,307	10,140	6,209	5,054	Cont
(U) Appropriated Value	9,359	10,140			
(U) Adjustments to Appropriated Value					
a. Cong Gen Reductions	- 52	- 110			
b. SBIR	- 145	- 212			
c. Omnibus or Other Above Threshold Reprogram	- 31	- 3			
d. Below Threshold Reprogramming	+1,200				
(U) Adjustments to Budget Years Since FY95 PB			+ 10,068	+ 16,238	
(U) Current Budget Submit/President's Budget	10,331	9,815	16,277	21,283	Cont

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305913F Nudet Detection System
	PROJECT 2808

(U) Change Summary Explanation:

Funding: FY94 Below Threshold Reprogramming reflects a realignment of funds between GPS (Space/Ground Segment) and NDS. Adjustments to Budget Years Since FY95 PB in FY96 and FY97 reflects increase in funding for accelerated schedule and increased program content (See explanations below).

Schedule: ICADS and GNT software development schedules were accelerated to meet USSTRATCOM's minimum required NDS coverage.

Technical: Funding includes Block IIR software upgrades for ICADS and GNT, and AALF software and laser mounts development for end-to-end testing of the NDS suite aboard the GPS satellites.

(U) C. **Other Program Funding Summary ($ in Thousands)**

	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	To Compl	Total Cost
(U) Operations & Maintenance	0	1,963	5,962	6,523	7,165	7,356	7,626	7,997	Cont	Cont
(U) Missile Procurement	39,336	45,282	19,091	4,282	4,376	3,829	3,782	2,569	Cont	Cont
(U) Other Procurement	0	0	5,770	2,189	4,475	1,392	1,393	1,293	Cont	Cont

Related RDT&E:

(U) PE #305165F, Navstar GPS (Space/Ground Segment)
(U) PE #604480F, GPS Block IIF
(U) PE #305911F, Defense Support Program

(U) D. **Schedule Profile**

	FY 1994				FY 1995				FY 1996				FY 1997			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
(U) **ICADS Milestones & Program Events**																
(U) Program Status Review (PSR14)				x												
(U) Build 4B Systems Design Review (SDR)					x											
(U) Build 5 Start						x										
(U) PSR15							x									

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0305913F Nudet Detection System

PROJECT: 2808

	FY 1994				FY 1995				FY 1996				FY 1997			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
(U) Build 4 Critical Design Review (CDR)								x								
(U) PSR15									x							
(U) Build 5 Systems Req Review (SRR)										x						
(U) Subrelease6 (SR6), Initial IIR SOH Capability										x						
(U) Build 5 SDR												x				
(U) Build 5 Preliminary Design Review (PDR)													x			
(U) Build 4B System Verification Test (SVT)														x		
(U) Build 6 (Block IIF Upgrade) Start																x
(U) Build 5 CDR																x
(U) Build 4B Acceptance test (AT)																x
(U) **GNT Milestones & Program Events**																
(U) Program Status Review (PSR6)				x												
(U) Phase II SDR					x											
(U) Phase I SVT						x										
(U) Phase I AT							x									
(U) Phase I Deliveries to AFSPC/USSTRATCOM								x								
(U) Phase II CDR									x							
(U) PSR7									x							
(U) Subrelease6 (SR6)										x						
(U) Phase I Initial Operational Capability (IOC)											x					
(U) Phase II SVT													x			
(U) Phase III PDR													x			
(U) Phase II AT														x		
(U) Phase III CDR															x	

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0305913F Nudet Detection System

PROJECT: 2808

	FY 1994				FY 1995				FY 1996				FY 1997			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
(U) **AALF Milestones & Program Events**																
(U) Acquisition Strategy Panel					x											
(U) Request For Proposal Issued							x									
(U) Best and Final Offers Received								x								
(U) Contract Award								x								
(U) System Requirements Review (SRR)									x							
(U) Preliminary Design Review (PDR)										x						
(U) Critical Design Review (CDR)											x					
(U) IOC System Test & Evaluation														x		
(U) IOC															x	

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February, 1995
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305913F Nudet Detection System
	PROJECT 2808

(U) A. **Project Cost Breakdown ($ in Thousands)**

	FY 1994	FY 1995	FY 1996	FY 1997
(U) Systems Engineering	560	1,054	312	322
(U) Software Development	6,587	4,262	11,064	14,776
(U) Software Upgrade	1,000	2,423	1,500	2,000
(U) Miscellaneous	1,197	1,155	2,289	3,039
(U) Technical Data	79	72	98	92
(U) Development Test & Evaluation	687	623	767	791
(U) Program Management Support	231	226	247	263
(U) Total	10,331	9,815	16,277	21,283

(U) B. **Budget Acquisition History and Planning Information ($ in Thousands)**

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1994	Budget FY 1994	Budget FY 1995	Budget FY 1996	Budget FY 1997	Budget to Complete	Total Program
Product Development Organizations											
ICADS:											
Sandia Labs	SS/Cost/MIPR	Oct 95	Cont	Cont	2,550	6,503	5,354	4,789	10,164	Cont	29,575
SAIC	C/CPAF/PR	Oct 95	Cont	Cont	4,364	94	362	402	414	Cont	5,636
GNT:											
Sandia Labs	SS/Cost/MIPR	Oct 95	Cont	Cont	16,089	2,281	2,038	1,658	1,736	Cont	23,802
Intermetrics/SAIC	C/CPAF/PR	Oct 95	1,262	1,262	1,006	256	363	402	414	1,262	3,703
AALF:											
SAIC	C/CPAF/PR	Oct 95	Cont	Cont	0	200	275	0	0	Cont	475
TBD	TBD	Oct 95	TBD	23,000	0	0	0	7,485	6,975	Cont	14,460

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February, 1995

BUDGET ACTIVITY: 7 - Operational System Development

PE NUMBER AND TITLE: 0305913F Nudet Detection System

PROJECT: 2808

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1994	Budget FY 1994	Budget FY 1995	Budget FY 1996	Budget FY 1997	Budget to Complete	Total Program
W-Sensor Support:											
SRI		Aug 94	253	253	202	51	0	0	0	253	506
Los Alamos	SS/FFP/MIPR	Oct 94	Cont	Cont	1,040	822	920	1,012	1,046	Cont	4,840
Mission	Multiple	n/a	Cont	Cont	2,145	84	503	529	534	Cont	4,095
Sandia Labs	SS/FFP/MIPR	Oct 95	4,780	4,780	4,474	40	0	0	0	4,780	9,294
Support and Management Organizations											
Not Applicable.											
Test and Evaluation Organizations											
Not Applicable.											
Subtotal Product Development						10,331	9,815	16,277	21,283		
Subtotal Support and Management											
Subtotal Test and Evaluation											
Total Project						10,331	9,815	16,277	21,283		

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

#7, Operational Systems Development | **#0401119F/C-5 Squadrons**

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Actual	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	0	0	0	793	0	0	0	0	0	793

A. Mission Description and Budget Item Justification ($ in Thousands)

4377: Real-Time Information in the Cockpit (RTIC): The AMC Airlift and Air Refueling Mission Area Plans identify a deficiency in capability to protect airlift aircraft from flying in harm's way during combat operations. RTIC resolves this deficiency and increases aircrew survivability by providing current threat information to in-flight aircrews via portable, on-aircraft, mission equipment that receives and displays critical, real-time, intelligence information. RTIC provides increased threat situational awareness and enables aircrews to modify their mission to avoid enemy threats under rapidly changing combat conditions. To limit system implementation costs, it is envisioned that RTIC will be "snapped-on" to any AMC mobility fleet aircraft when this capability is required. These systems are intended to be transferred between KC-135, KC-10, C-141, C-5, and C-17 operational wings, as required. This project is a FY97 new start that requires RDT&E funding to modify previously developed intelligence communication and display equipment to meet AMC requirements. The project is a low technical risk effort supporting fielded weapons systems and, therefore, is Budget Activity/Research Category, Operational Systems Development.

FY 1994:
- None

FY 1995:
- None

FY 1996:
- None

FY 1997: New Start
- Engineering Studies (150)
- Cost and Operational Effectiveness Analysis (150)
- Modification and Integration for Use on AMC Aircraft (493)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #7, Operational Systems Development

PE NUMBER AND TITLE: #0401119F/C-5 Squadrons

B. Program Change Summary ($ in Thousands)

	1994	1995	1996	1997	Total Cost
Previous President's Budget	0	0	0	0	0
Appropriated Value	0	0	0	0	0
Adjustments to Appropriated Value	0	0	0	0	0
Adjustments to Budget Years Since FY95 PB	0	0	0	793	793
Current Budget Submit/President's Budget	0	0	0	793	793

Change Summary Explanation: New Start

C. Other Program Funding Summary ($ in Thousands)

	1994	1995	1996	1997	1998	1999	2000	2001	To Compl	Total Cost
PE#0401119F/C-5 Squadrons										
Aircraft Procurement, AF, BA-7	0	0	0	0	1,551	1,582	1,618	1,654	TBD	TBD
PE#0401218F/KC-135 Squadrons										
RDT&E, AF, BA-7	0	0	0	793	0	0	0	0	0	793
Aircraft Procurement, AF, BA-7	0	0	0	0	1,551	1,582	1,618	1,653	TBD	TBD
Operations & Maintenance, AF, BA-2	0	0	0	0	1,000	1,019	1,050	1,071	TBD	TBD

D. Schedule Profile

	1994				1995				1996				1997			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Program Start														X		

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February 1995

BUDGET ACTIVITY: #7, Operational Systems Development

PE NUMBER AND TITLE: #0401119F/C-5 Squadrons

PROJECT NO.: 4377

A. Project Cost Breakdown ($ in Thousands)

	1994	1995	1996	1997
Engineering Studies				150
Cost and Operational Effectiveness Analysis				150
Modification and Integration for Use on AMC Aircraft				493
Total				793

B. Budget Acquisition History and Planning Information ($ in Thousands): Contracting office and contractor not yet selected.

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to 1994	Budget 1994	Budget 1995	Budget 1996	Budget 1997	Budget to Complete	Total Program
TBD											

Product Development Organizations:
TBD

Support and Management Organizations:
TBD

Test and Evaluation Organizations:
TBD

Government Furnished Property: N/A

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #7, Operational Systems Development

PE NUMBER AND TITLE: #0401218F/KC-135 Squadrons

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Actual	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	11,540	22,515	12,727	793	0	0	0	0	0	47,575
2214 Improved Air Refueling System (IARS)	3,060	5,154	0	0	0	0	0	0	0	8,214
4285 Receptacle Modification	2,902	2,746	0	0	0	0	0	0	0	5,648
4286 Multipoint Modification	5,578	14,615	12,727	0	0	0	0	0	0	32,920
4403 Real-Time Information in the Cockpit	0	0	0	793	0	0	0	0	0	793

A. (U) Mission Description and Budget Item Justification

1. (U) 2214: Improved Air Refueling System (IARS): The IARS program, which ends in FY95, funds research and development to improve the aerial refueling system of the KC-135 fleet. The IARS requirement, established by the SAC Statement of Need (SON) 001-87, identifies deficiencies in KC-135 refueling capability. The IARS program investigates correction of systems deficiencies improving overall refueling capability and associated refueling procedures. Operational users prioritize each year's activities so the most serious deficiencies are addressed. This project is comprised of low technical risk efforts supporting a fielded weapon system and, therefore, is assigned to Budget Activity Operational Systems Development.

2. (U) 4285: Receptacle Modification: Receptacle-equipped KC-135 aircraft will provide increased offloads at extended ranges, increased tanker utilization, reduced reliance on forward basing, and enhanced mission flexibility. The Air Force tanker mission is to extend the range and mission effectiveness of combat, reconnaissance, and airlift forces of all commands and services. KC-135s are used in worldwide deployment and theater employment roles and are capable of delivering fuel to various Air Force, Navy, Marine, NATO, and other allied aircraft with minimum reliance on forward basing. The uncertain availability of forward basing and offload demands at extended ranges results in additional tanker requirements for mission success. Refueling can be conducted more efficiently and the air campaign tempo increased if KC-135 tanker aircraft could provide increased offloads at extended ranges and could accommodate closer waves of fighters. To minimize operational expense and increase mission effectiveness, the KC-135 fleet requires the capability to operate in a more efficient manner.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #7, Operational Systems Development	PE NUMBER AND TITLE: #0401218F/KC-135 Squadrons

These requirements were established by AMC Mission Need Statement (MNS) 003-92 and AMC Operational Requirements Document (ORD) 003-92-I/II. This project is a low technical risk effort supporting a fielded weapon system and, therefore, is assigned to Budget Activity Operational Systems Development.

3. (U) 4286: Multipoint Modification: Multipoint enhances interoperability with Navy, NATO, and other allied receivers. It permits simultaneous and independent refueling of two probe-equipped receivers. The system provides enhanced reliability and efficiency for probe/drogue refueling and allows refueling of probe-equipped and receptacle-equipped receivers during a single mission (not simultaneously). This requirement was established by AMC MNS 003-92 and AMC ORD 003-92-I/II. This project is a low technical risk effort supporting a fielded weapon system and, therefore, is assigned to Budget Activity Operational Systems Development.

4. (U) 4403: Real-Time Information in the Cockpit (RTIC): The AMC Airlift and Air Refueling Mission Area Plans identify a deficiency in systems to protect aircraft from flying in harm's way during combat operations. RTIC provides aircrews with portable, on-aircraft, mission equipment to receive and display critical, real-time, intelligence information. Strategic mobility aircrews often fly extended missions or transit enroute stations without full intelligence briefing capability. Information provided prior to mission departure is often outdated or incomplete upon arrival in theater. RTIC provides increased threat situational awareness and enables aircrews to make mission modifications to avoid enemy threats under rapidly changing combat conditions. To limit system implementation costs, it is envisioned that RTIC will be "snapped-on" to any AMC mobility fleet aircraft when this capability is required. These systems are intended to be transferred between KC-135, KC-10, C-141, C-5, and C-17 operational wings, as required. This project is comprised of low technical risk efforts supporting fielded weapons systems and, therefore, is assigned to Budget Activity Operational Systems Development.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #7, Operational Systems Development

PE NUMBER AND TITLE: #0401218F/KC-135 Squadrons

B. (U) Program Change Summary ($ in Thousands)

	1994	1995	1996	1997	Total Cost
Previous President's Budget	11,745	5,160	3,494	3,415	23,814
Appropriated Value	11,826	23,260			
Adjustments to Appropriated Value					
a. Undistibuted Reductions	66	254			
b. SBIR	183	485			
c. Omnibus or Other Above Threshold Reprogramming	0	0			
b. Below Threshold Reprogramming	37	6			
Adjustments to Budget Years Since FY95 PB			9,233	(2,622)	
Current Budget Submit/President's Budget (FY96 PB)	11,540	22,515	12,727	793	47,575

Change Summary Explanation:

Funding: FY96 funding for multipoint critical to program execution. FY95 PB inadvertently omitted multipoint and receptacle RDT&E funds due to conflicting programming actions. FY96 PB eliminates funding for IARS in FY96/97. FY97 funds are for RTIC, a new program start.

Schedule: FY94 receptacle/multipoint execution delayed until the fourth quarter of FY95 due to a Congressional restriction of obligating funds and evolving Air Force priorities during FY94. This restriction was deleted in FY95. Request for Proposal release FY95/2. Contract award planned for FY95/4. RDT&E phase scheduled to complete FY96/3.

Technical: N/A

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #7, Operational Systems Development

PE NUMBER AND TITLE: #0401218F/KC-135 Squadrons

C. (U) Other Program Funding Summary ($ in Thousands)

	1994	1995	1996	1997	1998	1999	2000	2001	To Compl	Total Cost
PE# 0401218F/KC-135 Squadrons										
Aircraft Procurement, AF, BA-5 KC-135 Mods, Receptacles/Multipoint	0	7,500	11,200	21,600	20,400	20,400	42,500	40,400	21,200	185,200
Aircraft Procurement, AF, BA-7 Other Production Charges, RTIC	0	0	0	0	1,551	1,582	1,618	1,653	TBD	TBD
Operations & Maintenance, AF, BA-2 Mobilization, RTIC	0	0	0	0	1,000	1,019	1,050	1,071	TBD	TBD
PE# 040119F/C-5 Squadrons										
Aircraft Procurement, AF, BA-7 Other Production Charges, RTIC	0	0	0	0	1,551	1,582	1,618	1,654	TBD	TBD

Related RDT&E: C-5 Squadrons, PE# 0401119F.

D. (U) Schedule Profile

	1994				1995				1996				1997			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Improved Air Refueling System (IARS) Receptacle Modification Multipoint Modification Real Time Information in the Cockpit	See Individual Project R-2 Exhibits for Schedule Profiles															

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #7, Operational Systems Development

PE NUMBER AND TITLE: #0401218F/KC-135 Squadrons

PROJECT TITLE / PROJECT NO.: IARS / 2214

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Actual	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Improved Air Refueling System (IARS)	3,060	5,154	0	0	0	0	0	0	0	8,214

A. (U) Mission Description and Budget Item Justification ($ in Thousands)

(U) 2214: Improved Air Refueling System (IARS): The IARS program investigates correction of aging weapon system and deficiencies to improve overall refueling capability and associated refueling procedures. Operational users prioritize each year's activities so the most serious deficiencies are addressed.

(U) FY 1994:
- (U) - Corrosion studies and testing (1,169)
  - -- Investigation and development of corrosion control processes
  - -- Corrosion effects on structures and systems testing and analysis
  - -- Prototype development and testing of corrosion inhibitors and sealants
- (U) - Simulator evaluation of crew station for cockpit and mission changes (892)
- (U) - Improved boom nozzle flight test (150)
- (U) - Mission support (780)
- (U) - Miscellaneous (69)

(U) FY 1995:
- (U) - PROJECT CORAL REACH - Aging aircraft corrosion, fatigue, and supportability investigations (2,374)
  - -- Full scale C/KC-135 fuselage panel corrosion and fatigue testing
  - -- Testing and development of predictive techniques for corrosion effects on fatigue crack growth rates
  - -- Development of nondestructive inspection (NDI) instrumentation and techniques for the C/KC-135
  - -- Methodology to quantify effects of corrosion for C/KC-135
  - -- Integrity testing of aging C/KC-135 aircraft functional systems
  - -- Initiate service life determination program

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT TITLE / PROJECT NO.
#7, Operational Systems Development	#0401218F/KC-135 Squadrons	IARS / 2214

(U) FY 1995 (continued):

(U) - C/KC-135 engineering studies (400)
- -- Materials testing and inspection techniques development
- -- Avionics/crew systems supportability and replacement requirements development and evaluations

(U) - PACER CRAG (Compass, Radar, And GPS) support activities (1,572)
- -- Crew station evaluation of 2-man crew flying SIOP missions
- -- Dedicated PACER CRAG support
- -- Dedicated radar upgrade support

(U) - Improved boom nozzle prototype units for operational test on KC-135 (125)

(U) - Mission support (623)
- -- Dedicated Development System Manager support

(U) - Miscellaneous (60)

(U) FY 1996: N/A

(U) FY 1997: N/A

B. (U) Program Change Summary ($ in Thousands)

	1994	1995	1996	1997	Total Cost
Previous President's Budget	3,060	5,160	3,494	3,415	15,129
Appropriated Value	3,141	5,160			
Adjustments to Appropriated Value:					
a. Undistributed Reductions	66	0			
b. SBIR	15	0			
c. Omnibus or Other Above Threshold Reprogramming	0	0			
d. Below Threshold Reprogramming	0	6			
Adjustments to Budget Years Since FY95 PB			(3,494)	(3,415)	
Current Budget Submit/President's Budget	3,060	5,154	0	0	8,214

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT TITLE / PROJECT NO.
#7, Operational Systems Development	#0401218F/KC-135 Squadrons	IARS / 2214

Change Summary Explanation:

Funding: IARS not funded beyond FY95. IARS will be replaced by specific user projects and AFMC initiatives identified during development of the FY97 APB/FY98 PB.

Schedule: Numerous projects in parallel, based on user priority determination.

Technical: N/A

C. (U) Other Program Funding Summary ($ in Thousands): N/A

Related RDT&E: N/A

D. (U) Schedule Profile

	1994				1995				1996				1997			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Improved Air Refueling System (IARS)	---------- Ongoing Studies ----------								Program ends FY96/4							

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February 1995

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT TITLE / PROJECT NO.
#7, Operational Systems Development	#0401218F/KC-135 Squadrons	IARS / 2214

A. (U) Project Cost Breakdown ($ in Thousands)

	1994	1995	1996	1997
Corrosion Studies and Testing	1,169			
Project CORAL REACH		2,374		
C/KC-135 Engineering Studies		400		
Simulator Evaluation of Crew Station	892			
PACER CRAG Support Activities		1,572		
Improved Boom Nozzle Support	150	125		
Mission Support	780	623		
Miscellaneous	69	60		
TOTALS	3,060	5,154		

B. (U) Budget Acquisition History and Planning Information ($ in Thousands)

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to 1994	Budget 1994	Budget 1995	Budget 1996	Budget 1997	Budget to Complete	Total Program
Boeing					0		1,760	Project ends FY96/4		0	1,760
Miscellaneous					0	2,061	2,182	Project ends FY96/4		0	4,243

Product Development Organizations:
N/A

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February 1995

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT TITLE / PROJECT NO.
#7, Operational Systems Development	#0401218F/KC-135 Squadrons	IARS / 2214

B. (U) Budget Acquisition History and Planning Information ($ in Thousands): Continued

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to 1994	Budget 1994	Budget 1995	Budget 1996	Budget 1997	Budget to Complete	Total Program
Support and Management Organizations:											
Miscellaneous					0	849	1,087	Project ends FY96/4		0	1,936
Test and Evaluation Organizations:											
Miscellaneous					0	150	125	Project ends FY96/4		0	275

Government Furnished Property: N/A

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #7, Operational Systems Development

PE NUMBER AND TITLE: #0401218F/KC-135 Squadrons

PROJECT TITLE / PROJECT NO.: Receptacle Mod / 4285

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Actual	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Receptacle Modification	2,902	2,746	0	0	0	0	0	0	0	5,648

A. (U) Mission Description and Budget Item Justification ($ in Thousands)

(U) 4285: Receptacle Modification: Receptacle-equipped KC-135 aircraft will provide increased offloads at extended ranges, increased tanker utilization, reduced reliance on forward basing, and enhanced mission flexibility. The Air Force tanker mission is to extend the range and mission effectiveness of combat, reconnaissance, and airlift forces of all commands and services. KC-135s are used in worldwide deployment and theater employment roles and are capable of delivering fuel to various Air Force, Navy, Marine, NATO, and other allied aircraft with minimum reliance on forward basing. The questionable availability of forward basing and off-load demands at extended ranges results in additional tanker requirements for mission success. Refueling can be conducted more efficiently and the air campaign tempo increased if KC-135 tanker aircraft can provide increased offloads at extended ranges and could accommodate closer waves of fighters. To minimize operational expense and increase mission effectiveness, the KC-135 fleet requires the capability to operate in a more efficient manner. These requirements were established by AMC MNS 003-92 and AMC ORD 003-92-I/II. Project is planned as part of an integrated program with Project No. 4286, Multipoint Modification.

(U) FY 1994:
- (U) - Fund source selection activities, combined receptacle-multipoint contract award scheduled for FY95/4 (148)
- (U) - Engineering design of receptacle program (1,500)
- (U) - Group A materials, fabrication, and assembly (1,200)
- (U) - Mission support (54)

(U) FY 1995:
- (U) - Complete assembly, installation, checkout, and testing of Group A (1,900)
- (U) - Contractor flight test support (120)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT TITLE / PROJECT NO.
#7, Operational Systems Development	#0401218F/KC-135 Squadrons	Receptacle Mod / 4285

(U) FY 1995 (continued):
- (U) - Government test facility and support (100)
- (U) - Training and support equipment (200)
- (U) - Data (200)
- (U) - Mission support (226)

(U) FY 1996/1997: N/A

B. (U) Program Change Summary ($ in Thousands)

	1994	1995	1996	1997	Total Cost
Previous President's Budget	3,107	0	0	0	3,107
Appropriated Value	3,107	3,000	0	0	
Adjustments to Appropriated Value:					
a. Undistributed Reductions	0	254			
b. SBIR	168	0			
c. Omnibus or Other Above Threshold Reprogramming	0	0			
b. Below Threshold Reprogramming	37	0			
Adjustments to Budget Years Since FY95 PB			0	0	
Current Budget Submit/President's Budget	2,902	2,746	0	0	5,648

Change Summary Explanation:

Funding: N/A

Schedule: FY94 receptacle/multipoint execution delayed until the fourth quarter of FY95 due to a Congressional restriction of obligating funds and evolving Air Force priorities during FY94. This restriction was deleted in FY95. Request for Proposal release FY95/2. Contract award planned for FY95/4. RDT&E phase scheduled to complete FY96/3.

Technical: N/A

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT TITLE / PROJECT NO.
#7, Operational Systems Development	#0401218F/KC-135 Squadrons	Receptacle Mod / 4285

C. (U) Other Program Funding Summary ($ in Thousands)

	1994	1995	1996	1997	1998	1999	2000	2001	To Compl	Total Cost
Aircraft Procurement, AF, BA-5 KC-135 Mods, MN-KC4233	0	7,500	0	0	0	0	0	0	0	7,500

Related RDT&E: Project No. 4286, Multipoint Modification.

D. (U) Schedule Profile

	1994				1995				1996				1997			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Tactical Round Table/Acquisition Panel					X											
Draft RFP						X										
Final RFP						X										
Source Selection							X									
Contract Award								X								
Design/Build/Install											X					
Ground Test Complete											X					
Flight Test Complete												X				
Production Option Award												X				
IOC (FY02/4)																

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February 1995

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT TITLE / PROJECT NO.
#7, Operational Systems Development	#0401218F/KC-135 Squadrons	Receptacle Mod / 4285

A. (U) Project Cost Breakdown ($ in Thousands) N/A

	1994	1995	1996	1997
Procurement Prep & Source Selection	148		0	0
Engineering Design	1,500		0	0
Group A Materials, Fab & Assembly	1,200		0	0
Group A Assembly, Installation & Test		1,900	0	0
Test Support		220	0	0
Training & Support Equipment		200	0	0
Data		200	0	0
Mission Support	54	226	0	0

B. (U) Budget Acquisition History and Planning Information ($ in Thousands)

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to 1994	Budget 1994	Budget 1995	Budget 1996	Budget 1997	Budget to Complete	Total Program
TBD					0	2,848	2,420	0	0	0	5,253

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February 1995

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT TITLE / PROJECT NO.
#7, Operational Systems Development	#0401218F/KC-135 Squadrons	Receptacle Mod / 4285

B. (U) Budget Acquisition History and Planning Information ($ in Thousands): Continued

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to 1994	Budget 1994	Budget 1995	Budget 1996	Budget 1997	Budget to Complete	Total Program
Product Development Organizations:											
ASC/LCA					0	54	226	0	0	0	280
Support and Management Orgnaizations:											
N/A					0	0	0	0	0	0	0
Test and Evaluation Organizations:											
TBD					0	0	100	0	0	0	100

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #7, Operational Systems Development

PE NUMBER AND TITLE: #0401218F/KC-135 Squadrons

PROJECT TITLE / PROJECT NO.: Multipoint Mod / 4286

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Actual	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
4286: Multipoint Modification	5,578	14,615	12,727	0	0	0	0	0	0	32,920

A. (U) Mission Description and Budget Item Justification

(U) 4286: Multipoint Modification: The Multipoint Refueling System (MPRS) enhances interoperability with Navy, NATO and other allied receivers by allowing for simultaneous and independent refueling of two probe-equipped receivers. The system provides enhanced reliability and efficiency for probe/drogue refueling and permits refueling of probe-equipped and receptacle-equipped receivers during a single mission (not simultaneously). This requirement was established by AMC MNS 003-92 and AMC ORD 003-92-I/II. Project is planned as an integrated program with Project No. 4285, Receptacle Modification.

(U) FY 1994:
- (U) - Fund source selection activities; combined multipoint-receptacle contract award scheduled for FY95/4 (100)
- (U) - Engineering design of MPRS (2,478)
- (U) - Procure pods and pylons for engineering and manufacturing development program (3,000)

(U) FY 1995:
- (U) - Engineering design of MPRS (10,000)
- (U) - Procure Group A (1,000)
- (U) - Assembly and installation process for Group A (2,000)
- (U) - Test planning (300)
- (U) - System engineering and technical assistance support (300)
- (U) - Mission support (1,015)

(U) FY 1996:
- (U) - Engineering design of MPRS (1,300)
- (U) - Complete assembly, installation, checkout, and test of Group A (5,500)
- (U) - Contractor flight test support (1,000)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT TITLE / PROJECT NO.
#7, Operational Systems Development	#0401218F/KC-135 Squadrons	Multipoint Mod / 4286

(U) FY 1996 (continued):
- (U) - Government test facility and support (1,800)
- (U) - Training and support equipment (800)
- (U) - Data (900)
- (U) - System engineering and technical assistance support (350)
- (U) - Mission support (1,077)

(U) FY 1997: N/A

B. (U) Program Change Summary ($ in Thousands)

	1994	1995	1996	1997	Total Cost
Previous President's Budget	5,578	0	0	0	5,578
Appropriated Value	5,578	15,100			
Adjustments to Appropriated Value:					
a. Undistributed Reductions	0	0			
b. SBIR	0	485			
c. Omnibus or Other Above Threshold Reprogramming	0	0			
d. Below Threshold Reprogramming	0	0			
Adjustments to Budget Years Since FY95 PB			12,727	0	
Current Budget Submit/President's Budget	5,578	14,615	12,727	0	32,920

Change Summary Explanation:

Funding: FY96 funds added to support mod kit development and test.

Schedule: FY94 receptacle/multipoint execution delayed until the fourth quarter of FY95 due to a Congressional restriction of obligating funds and evolving Air Force priorities during FY94. This restriction was deleted in FY95. Request for Proposal release FY95/2. Contract award planned for FY95/4. RDT&E phase scheduled to complete FY96/3.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #7, Operational Systems Development

PE NUMBER AND TITLE: #0401218F/KC-135 Squadrons

PROJECT TITLE / PROJECT NO.: Multipoint Mod / 4286

Technical: Full and open competition for system design to meet Air Force requirements. Previous development by numerous prime contractors permits a modified NDI solution and eliminates the need for a competitive flyoff. (Program cost estimate reduced from $55.2M to $33.4M.)

C. (U) Other Program Funding Summary ($ in Thousands)

	1994	1995	1996	1997	1998	1999	2000	2001	To Compl	Total Cost
Aircraft Procurement, AF, BA-5 KC-135 Mods, MN-KC4231	0	0	11,200	21,600	20,400	20,400	42,500	40,400	21,200	177,700

Related RDT&E: Project No. 4285, Receptacle Modification.

D. (U) Schedule Profile

	1994				1995				1996				1997			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Round Table/Acquisition Panel					X											
Draft RFP						X										
Final RFP						X										
Source Selection							X									
Contract Award								X								
Design/Build/Install											X					
Ground Test Complete											X					
Flight Test Complete												X				
Production Option Award												X				
IOC (FY02/4)																

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February 1995

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT TITLE / PROJECT NO.
#7, Operational Systems Development	#0401218F/KC-135 Squadrons	Multipoint Mod / 4286

A. (U) Project Cost Breakdown ($ in Thousands):

	1994	1995	1996	1997
Procurement Prep & Source Selection	100			0
Engineering Design	2,478	10,000	1,300	0
Pods and Pylons for EMD Program	3,000			0
Group A Procurement		1,000		0
Group A Assembly and Installation		2,000	5,500	0
Test Planning/Support		300	2,800	0
Data			900	0
Training and Support Equipment			800	0
SETA Support		300	350	0
Mission Support		1,015	1,077	0

B. (U) Budget Acquisition History and Planning Information ($ in Thousands)

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to 1994	Budget 1994	Budget 1995	Budget 1996	Budget 1997	Budget to Complete	Total Program
TBD					0	5,578	13,300	9,500	0	0	28,378

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February 1995

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT TITLE / PROJECT NO.
#7, Operational Systems Development	#0401218F/KC-135 Squadrons	Multipoint Mod / 4286

B. (U) Budget Acquisition History and Planning Information ($ in Thousands): Continued

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to 1994	Budget 1994	Budget 1995	Budget 1996	Budget 1997	Budget to Complete	Total Program
Product Development Organizations:											
ASC/LCA					0	0	1,015	1,077	0	0	2,092
Support and Management Organizations:											
TBD					0	0	300	350	0	0	650
Test and Evaluation Organizations:											
TBD					0	0	0	1,800	0	0	1,800

Government Furnished Property: N/A

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #7, Operational Systems Development

PE NUMBER AND TITLE: #0401218F/KC-135 Squadrons

PROJECT TITLE / PROJECT NO.: RTIC / 4403

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Actual	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
4403 Real-Time Information in the Cockpit (RTIC)	0	0	0	793	0	0	0	0	0	793

(U) NOTE: This project is a FY97 new start to modify previously developed intelligence communication and display equipment to meet AMC requirements.

A.(U) Mission Description and Budget Item Justification

(U) 4403: The AMC Airlift and Air Refueling Mission Area Plans identify a deficiency in systems to protect aircraft from flying in harm's way during combat operations. RTIC provides aircrews with portable, on-aircraft, mission equipment to receive and display critical, real-time, intelligence information. Strategic mobility aircrews often fly extended missions or transit enroute stations without full intelligence briefing capability. Information provided prior to mission departure is often outdated or incomplete upon arrival in theater. RTIC provides increased threat situational awareness and enables aircrews to make mission modifications to avoid enemy threats under rapidly changing combat conditions. To limit system implementation costs, it is envisioned that RTIC will be "snapped-on" to any AMC mobility fleet aircraft when this capability is required. These systems are intended to be transferred between KC-135, KC-10, C-141, C-5, and C-17 operational wings, as required.

(U) FY 1997

(U) - Modification and integration required for use on AMC aircraft ($793)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT TITLE / PROJECT NO.
#7, Operational Systems Development	#0401218F/KC-135 Squadrons	RTIC / 4403

B. (U) Program Change Summary: ($ in Thousands)

	1994	1995	1996	1997	Total Cost
Previous President's Budget	0	0	0	0	0
Appropriated Value	0	0	0	0	0
Adjustments to Appropriated Value	0	0	0	0	0
Adjustments to Budget Years Since FY95 PB	0	0	0	793	793
Current Budget Submit/President's Budget	0	0	0	793	793

Change Summary Explanation:

Funding: New program start
Schedule: New program start
Technical: N/A

C. (U) Other Program Funding Summary ($ in Thousands)

	1994	1995	1996	1997	1998	1999	2000	2001	To Compl	Total Cost
PE# 0401218F/KC-135 Squadrons										
Aircraft Procurement, AF, BA-7 Other Production Charges	0	0	0	0	1,551	1,582	1,618	1,653	TBD	TBD
Operations & Maintenance, AF, BA-2 Mobilization	0	0	0	0	1,000	1,019	1,050	1,071	TBD	TBD
PE# 0401119F/C-5 Squadrons										
RDT&E, AF, BA-7 Operational Systems Development	0	0	0	793	0	0	0	0	0	793
Aircraft Procurement, AF, BA-7 Other Production Charges	0	0	0	0	1,551	1,582	1,618	1,654	TBD	TBD

D. (U) Schedule Profile: Not available at this time; new program start in FY97.

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February 1995

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT TITLE / PROJECT NO.
#7, Operational Systems Development	#0401218F/KC-135 Squadron	RTIC / 4403

A. (U) Project Cost Breakdown ($ in Thousands): N/A

	1994	1995	1996	1997
Modification and Integration for Use on AMC Aircraft	0	0	0	793

B. (U) Budget Acquisition History and Planning Information ($ in Thousands): Contracting office (SPO) and contractor not yet selected.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #7, Operational System Development

PE NUMBER AND TITLE: #0404102F, AEROSPACE RESCUE AND RECOVERY

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Actual	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	0.0	0.0	5,369	3,481	0.0	0.0	0.0	0.0	0.0	8,850

A. (U) Mission Description and Budget Item Justification ($ in Thousands)

The mission of the HH-60G is search and rescue in hostile environments. To operate on the future battlefield, rescue forces must be capable of communicating with command, control, and supporting forces. Also, defensive systems are required in an increased threat environment. These funds will be used to engineer (1) the installation of long range communications, missile jamming receiver, and flare and chaff dispensers; and (2) control all communication radios, transponders, and navigation radios on to the current 1553 data bus and aircraft control display software. This program also integrates the AAR-47 missile warning receiver, ALE-47 flare/chaff dispensers, and APR-39a(v)1 controls on to the 1553 data bus and into aircraft control display unit software to provide both manual and automatic threat identification and countermeasure dispensing. This program is a new start in FY96 and is Research Category/Budget Activity Operational Systems Development because the project supports a currently operational system. The acquisition strategy is to use proven, off-the-shelf equipment and technology.

(U) FY 1994 Accomplishments:
- (U) - Not Applicable

(U) FY 1995 Plans:
- (U) - Not Applicable

(U) FY 1996 Plans: New Start
- (U) - Engineering integration and control of all avionics. ($2,380)
- (U) - Engineering and integration of Infrared Countermeasures (IRCM) and Missile Warning Receiver (MWR). ($2,989)

(U) FY 1997 Plans:
- (U) - Engineering integration and control of all avionics. ($1,500)
- (U) - Engineering and integration of Infrared Countermeasures (IRCM) and Missile Warning Receiver (MWR). ($1,981)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #7, Operational System Development

PE NUMBER AND TITLE: #0404102F, AEROSPACE RESCUE AND RECOVERY

B. (U) Program Change Summary ($ in Thousands)

	1994	1995	1996	1997	Total Cost
Previous President's Budget	0.0	0.0	0.0	0.0	0.0
Appropriated Value					
Adjustments to Appropriated Value					
Current Budget Submit/President's Budget	0.0	0.0	5,369	3,481	8,850

(U) Change Summary Explanation:

(U) Funding: New start to integrate HH-60G aircraft modifications to optimize the aircraft for rescue operations.

(U) Schedule: Contract award in FY 1996

(U) Technical: The upgrades to the HH-60G include the following:
Installation and integration of long range communications - Secure HF and SATCOM.
Installation and integration of defensive countermeasure - missile jamming receiver (AAR-47) and flare and chaff dispensers (ALE-47).
Integration of currently installed Radar Warning Receiver (RWR) (APR-39a(v)1).

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #7, Operational System Development

PE NUMBER AND TITLE: #0404102F, AEROSPACE RESCUE AND RECOVERY

C. (U) Other Program Funding Summary ($ in Thousands)

Information below is based on the upgrade of battlefield rescue communications and defense systems capability on HH-60G.

	1994	1995	1996	1997	1998	1999	2000	2001	To Compl	Total Cost
BP1100 HH-60										
Aircraft Procurement - AF	0.0	0.0	0.0	7,349	5,171	6,067	10,400	11,668	0.0	40,655

Related RDT&E: N/A

D. (U) Schedule Profile

Fiscal Year actual and planned events by quarter

	1994				1995				1996				1997			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Acquisition Milestones																
Acquisition Program Baseline		X*														
Milestone II/III																X
IOC (2Q/98)																
Contract Milestones																
Contract Award											X					
T&E Milestones																
IOT&E														X		
FOT&E															X	

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February 1995

BUDGET ACTIVITY: #7, Operational System Development

PE NUMBER AND TITLE: #0404102F, AEROSPACE RESCUE AND RECOVERY

PROJECT NO.

A. (U) Project Cost Breakdown ($ in Thousands)

	1994	1995	1996	1997
Avionics Integration				
System Engineering	0.0	0.0	1,000	0.0
Program Management Support	0.0	0.0	500	0.0
Configuration Management	0.0	0.0	250	0.0
Technical Data	0.0	0.0	250	0.0
Integrated Logistics Support	0.0	0.0	350	0.0
Operational Test & Evaluation	0.0	0.0	0.0	1,500
Travel	0.0	0.0	30	0.0
Integration of Infrared Countermeasures (IRCM) and Missle Warning Receiver (MWR)				
System Engineering	0.0	0.0	1,000	0.0
Program Management Support	0.0	0.0	750	0.0
Configuration Management	0.0	0.0	250	0.0
Technical Data	0.0	0.0	250	0.0
Integrated Logistics Support	0.0	0.0	700	0.0
Operational Test & Evaluation	0.0	0.0	0.0	1,981
Travel	0.0	0.0	39	0.0
Total	0.0	0.0	5,369	3,481

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February 1995

BUDGET ACTIVITY: #7, Operational System Development

PE NUMBER AND TITLE: #0404102F, AEROSPACE RESCUE AND RECOVERY

PROJECT NO.

B. (U) Budget Acquisition History and Planning Information ($ in Thousands)

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to 1994	Budget 1994	Budget 1995	Budget 1996	Budget 1997	Budget to Complete	Total Program
Product Development Organizations											
Contract Winner	SS/C	3/96	N/A	N/A	0.0	0.0	0.0	5,309	0.0	0.0	5,309
Support and Management Organizations											
WR-ALC/LU	Allot	1/96	N/A	N/A	0.0	0.0	0.0	60	40	0.0	100
Test and Evaluation Organizations											
ACC and AFOTEC	PO	3/97	N/A	N/A	0.0	0.0	0.0	0.0	3,441	0.0	3,441
Government Furnished Property:	**N/A**										
Subtotal Product Development					0.0	0.0	0.0	5,309	0.0	0.0	5,309
Subtotal Support and Management					0.0	0.0	0.0	60	40	0.0	100
Subtotal Test and Evaluation					0.0	0.0	0.0	0.0	3,441	0.0	3,441
Total Project					0.0	0.0	0.0	5,369	3,481	0.0	8,850

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #1, Basic Research

PE NUMBER AND TITLE: PE 0601102F, Defense Research Sciences

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Total PE 0601102F Cost	224,762	239,666	239,893	247,194	254,306	261,577	267,279	274,289	Cont	Cont
Project 2301, Physics	17,655	19,514	20,562	21,188	21,797	22,421	22,909	23,510	Cont	Cont
Project 2302, Solid Mechanics and Structures	10,955	15,165	15,979	16,466	16,939	17,424	17,803	18,270	Cont	Cont
Project 2303, Chemistry	27,853	32,367	34,106	35,144	36,155	37,188	37,999	38,996	Cont	Cont
Project 2304, Math and Computer Science	27,275	32,525	34,272	35,315	36,331	37,370	38,185	39,186	Cont	Cont
Project 2305, Electronics	24,314	29,375	30,953	31,895	32,812	33,750	34,486	35,391	Cont	Cont
Project 2306, Structual Materials	11,295	15,897	16,751	17,261	17,758	18,265	18,663	19,153	Cont	Cont
Project 2307, Fluid Mechanics	12,098	11,708	12,337	12,712	13,078	13,452	13,745	14,106	Cont	Cont
Project 2308, Propulsion	10,386	11,266	11,871	12,232	12,584	12,944	13,226	13,573	Cont	Cont
Project 2309, Terrestrial Sciences	25,516	17,320	5,606	5,776	5,942	6,112	6,246	6,409	Cont	Cont
Project 2310, Atmospheric Sciences	5,711	7,641	8,051	8,296	8,535	8,779	8,970	9,206	Cont	Cont
Project 2311, Space Sciences	5,569	5,513	5,809	5,986	6,158	6,334	6,472	6,642	Cont	Cont
Project 2312, Biological Sciences	15,324	16,226	17,097	17,618	18,125	18,643	19,049	19,549	Cont	Cont
Project 2313, Human Performance	8,625	9,212	9,706	10,002	10,290	10,584	10,814	11,098	Cont	Cont

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #1, Basic Research

PE NUMBER AND TITLE: PE 0601102F, Defense Research Sciences

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 4113, Science and Engineering Education	10,210	15,937	16,793	17,303	17,802	18,311	18,712	19,200	Cont	Cont
Project 4161, Defense Technical Information Fund	11,976	0	0	0	0	0	0	0	0	34,942

A. (U) Mission Description and Budget Item Justification: This Basic Research program, 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. These technologies include aerospace structures, aerodynamics, materials, propulsion, power, electronics, computer science, directed energy, conventional weapons, life sciences, and terrestrial, atmospheric, and space sciences. All projects are coordinated through the Project Reliance process to harmonize efforts, eliminate duplication, and ensure the most effective use of funds. All technology areas are subject to long-range research planning and technical review by Tri-Service Scientific Planning Groups that interface with and support the DoD Science and Technology Technology Area Planning Teams.

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	234,830	235,805	247,177	254,916	Cont
Appropriated Value	236,321	247,805			
Adjustments to Appropriated Value:					
a. Congressional General Reductions	-2,156	-8,139			
b. SBIR	-2,491				
c. Omnibus Reprogramming	-6,912				
Current President's Budget	224,762	239,666	239,893	247,194	Cont

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #1, Basic Research	PE NUMBER AND TITLE: PE 0601102F, Defense Research Sciences

Change Summary Explanation:

Funding: Not Applicable.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary: Not Applicable.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #1, Basic Research

PE NUMBER AND TITLE: PE 0601102F, Defense Research Sciences

PROJECT NO.: 2301

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 2301, Physics	17,655	19,514	20,562	21,188	21,797	22,421	22,909	23,510	Cont	Cont

A. (U) Mission Description and Budget Item Justification: This project provides the fundamental knowledge required to conceptualize and develop new Air Force weapons and also establishes the basis for many technologies critical to the Air Force. Research in physics has an impact on electromagnetic countermeasures, nuclear weapons effects, communications, and non-destructive and non-intrusive testing and analysis, as well as new materials development. Other technologies affected include avionics, laser technology, and propulsion research. The primary areas of research supported by this project are Photonic Physics, Optics, Plasma Physics, Atomic and Molecular Physics.

(U) FY 1994:

- (U) Perfected an understanding of laser light materials interaction giving rise to direct write materials processing of micro-electro mechanical sensors and actuators. Elucidated physical principles that drive phase-controlled materials, a candidate for highly efficient x-ray laser systems. Laid foundation for high-power plasma filled millimeter wave amplifier used by Hughes in an important ARPA program. ($17,655K)

(U) FY 1995:

- (U) Study adaptive feedback techniques for boosting reliability and lowering manufacturing cost of vacuum microwave devices and study new concept infrared lasers for use in infrared countermeasures. Demonstrate laser instrumentation for monitoring applications in flexible manufacturing and non-destructive evaluation. Establish limits of active atmospheric compensation for optical rays used in ground-based space imaging or in airborne laser technology. ($19,514K)

(U) FY 1996:

- (U) Establish novel concepts for boosting performance of high-power microwave systems. Find new approaches to small, laser-based ultra stable clocks for navigation and position finding. Address physics limitations when imaging through the atmosphere for surveillance or airborne laser applications. Extend enhanced imaging techniques to low light levels and high resolution. Explore principles of stretched atoms and their application in energy storage. ($20,562K)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #1, Basic Research

PE NUMBER AND TITLE: PE 0601102F, Defense Research Sciences

PROJECT NO.: 2301

(U) FY 1997:
- (U) Extend existing imaging techniques to the limits of physical principles for monitoring space debris and space assets. Extend power efficiency and harmonic linearity in micro-wave and millimeter-wave vacuum tubes. Discover novel laser media for the window from ultraviolet to the visible. Continue to support scientific approaches to providing design and performance options in optical countermeasures, high power microwaves, and space surveillance and targeting precision, recognized as being the foremost issues for physics research. ($21,188K)

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	17,492	20,720	21,711	22,385	Cont
Current President's Budget	17,655	19,514	20,562	21,188	Cont

Change Summary Explanation:

Funding: Not Applicable.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(U) Related Activities:
- (U) PE 0602203F, Aerospace Propulsion.
- (U) PE 0602601F, Phillips Laboratory.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #1, Basic Research

PE NUMBER AND TITLE: PE 0601102F, Defense Research Sciences

PROJECT NO.: 2302

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 2302, Solid Mechanics and Strucures	10,955	15,165	15,979	16,466	16,939	17,424	17,803	18,270	Cont	Cont

A. (U) Mission Description and Budget Item Justification: Research is conducted in mechanics of materials, particulate mechanics, and structural mechanics. The anisotropy, inhomogeneity, and damage characteristics of advanced aerospace materials dictate the development of new solid mechanics and structural principles which are critical for performance prediction and material synthesis. Research in structures includes nonlinear dynamics, aeroelasticity, intelligent materials and structures, fluid/structure interaction, and failure mechanisms. Extreme service environment (space, blast, thermal, and electromagnetic field) that current and future structural systems must experience has made the development of fundamentals of solid mechanics theory a necessity. Material systems of interest for severe environment applications include high-temperature polymer systems, metallic materials and metal-matrix composites, ceramics and ceramic-matrix composites, and carbon/carbon composites.

(U) FY 1994:

- (U) Modeled the stresses and strains around fibers in ceramic-matrix composite materials, including partial matrix cracks. Modeled the effect of oxidation inhibitors on structural response of carbon/carbon composites. Developed an understanding of the mechanical properties of bone tissue used to develop improved aerospace materials and structures. Developed models for soil transport and resulting fate of chemicals in the environment. Also developed generic theories for solid materials with various types of internal damage, including cracks and voids. ($10,955K)

(U) FY 1995:

- (U) Continue research on the effect of service environment on polymer-matrix composites, including high-temperature composites such as graphite/polyimides. Research adaptive structures which integrate sensors and actuators for detection and mitigation of damage in aerospace structures. Examine the mechanics of functionally graded materials that can be tailored for a particular aerospace application. Research the behavior of aging aircraft structures, including those having multiple-site cracking and corrosion damage. Model chemical fluid flow and transport through soils and explore methods to improve characterization of hazardous waste sites. Study the localization of damage in structural materials and determine the process by which failure occurs through formation of instabilities. Develop new models of fluid structure interaction that more accurately account for the effect of deformable structures. ($15,165K)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #1, Basic Research

PE NUMBER AND TITLE: PE 0601102F, Defense Research Sciences

PROJECT NO.: 2302

(U) FY 1996:
- (U) Research the mechanics of metal and composite processing and manufacturing, such as chemical vapor infiltration and deformation forming, including the highly nonlinear and dissipative behavior of material systems undergoing change. Develop models for ceramic-matrix composites subjected to cyclic loading at various frequencies. Develop improved non-destructive evaluation techniques for the detection of corrosion and internal damage in aging aircraft structures. ($15,979K)

(U) FY 1997:
- (U) Develop models for three-dimensionally reinforced composite materials. Continue research of the scaling issues in structural mechanics and develop necessary computational techniques for handling homogenization. Examine the behavior of materials at very small scales, as necessary for the development of micro-electromechanical systems. ($16,466K)

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	12,548	13,180	13,825	14,265	Cont
Current President's Budget	10,955	15,165	15,979	16,466	Cont

Change Summary Explanation:

Funding: Not Applicable.

Schedule: Not Applicable.

Technical: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #1, Basic Research	PE NUMBER AND TITLE: PE 0601102F, Defense Research Sciences — PROJECT NO.: 2302

C. (U) Other Program Funding Summary:

(U) Related Activities:
- (U) PE 0602102F, Materials.
- (U) PE 0602201F, Aerospace Flight Dynamics.
- (U) PE 0602202F, Human Systems Technology.
- (U) PE 0603211F, Aerospace Structures.
- (U) PE 0602203F, Aerospace Propulsion.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #1, Basic Research

PE NUMBER AND TITLE: PE 0601102F, Defense Research Sciences

PROJECT NO.: 2303

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 2303, Chemistry	27,853	32,367	34,106	35,144	36,155	37,188	37,999	38,996	Cont	Cont

A. (U) Mission Description and Budget Item Justification: In the chemistry research program, knowledge and understanding is sought in chemical synthesis and reactivity, polymer chemistry, inorganic materials chemistry, and molecular dynamics. The focus is on building the knowledge base required to develop new materials and to improve the synthesis of existing materials. Research on structural, electronic and photonic materials, electromagnetic and conventional weaponry, propellants, and environmentally safer materials are focus areas. Synthesis and characterization of higher performance and lower cost nonmetallic materials for application as structural composites, lubricants, and sealants is conducted. Unique chemical approaches are utilized to characterize polymeric and organic materials, ceramics, glass, semiconductors, and composite structures. Atomic and molecular level surface interactions that can limit performance of electronic devices and lubricant materials are explored. Molecular energy release mechanisms and energy storage in metastable molecular systems are investigated to foster advances in laser weapons development and new chemical propellants.

(U) FY 1994:

- (U) Conceptualized and demonstrated novel ceramic-polymer chemistry which provides method for obtaining resistive materials for electronic packaging applications with both low thermal expansion coefficient and low dielectric constant. Developed organic photo refractive thin films that showed 80% diffraction efficiency. Developed polymer-inorganic hybrids for improved embossing of wave guides with high peak to trough ratio and low surface roughness. Demonstrated ultrafast electron diffraction method for determining the structure of molecules. ($27,853K)

(U) FY 1995:

- (U) Investigate fuel combustion under supercritical conditions as an enhancement of turbine engine performance. Research explosive materials with focus on molecular designs that retain high energy content, but have reduced shock sensitivity. Continue research on improved environmentally acceptable fire suppressant to replace currently used halons and develop high performance lubricating coating for solids at high temperatures. Continue research to apply the mathematical theory of optimization to the "up front" design of polymers for optimum properties. ($32,367K)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #1, Basic Research	PE NUMBER AND TITLE: PE 0601102F, Defense Research Sciences — PROJECT NO.: 2303

(U) FY 1996:
- (U) Initiate research on ceramic precursors covering synthesis, processing fundamentals, and precursor/ceramic structure property relationships. Continue research to develop materials for photonic applications. Explore novel approaches for environmentally benign anti-icing chemistry. Investigate the heterogeneous chemistry occurring on aerosols and particulates in rocket exhausts. ($34,106K)

(U) FY 1997:
- (U) Investigate physical aging effects on properties and performance of polymers. Continue research on low-cost biomimetic approaches to improved materials for electronic and electro-optical applications. Explore novel approaches to inorganic-based polymeric materials. Investigate chemical processing methods for producing nanophase ceramics and laminated metals. ($35,144K)

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	25,191	30,567	32,007	32,986	Cont
Current President's Budget	27,853	32,367	34,106	35,144	Cont

Change Summary Explanation:

Funding: Not Applicable.

Schedule: Not Applicable.

Technical: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #1, Basic Research	PE NUMBER AND TITLE: PE 0601102F, Defense Research Sciences — PROJECT NO.: 2303

C. (U) Other Program Funding Summary:

(U) Related Activities:
- (U) PE 0602102F, Materials.
- (U) PE 0602601F, Phillips Laboratory.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #1, Basic Research

PE NUMBER AND TITLE: PE 0601102F, Defense Research Sciences

PROJECT NO.: 2304

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 2304, Math and Computer Science	27,275	32,525	34,272	35,315	36,331	37,370	38,185	39,186	Cont	Cont

A. (U) Mission Description and Budget Item Justification: This research focuses on mathematical modeling, simulation, and control of complex systems and provides analytical and computational methods. 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.

(U) FY 1994:
- (U) Developed a mathematical model predicting the performance of phase-sensitive amplifiers distributed along optical fibers. Developed new feedback theory for nonlinear control that does not require gain scheduling, for application to control of aircraft and missiles. Developed a new methodology for determination of the optimal configuration of parallel code on given computer architectures. This will increase portability of parallel programs. Developed new shape optimization techniques of importance to aircraft design. ($27,275K)

(U) FY 1995:
- (U) Investigate models of discrete event dynamical systems to facilitate the development of more dynamic and responsive planning systems. Research parallel multiresolution algorithms capable of predicting the long time dynamics of physical dissipative systems over a broad range of physical scales. Initiate research to develop massively parallel algorithms for efficient and reliable solutions to computational electromagnetics problems by using improved artificial boundary conditions that permit the truncation of the computational domain. ($32,525K)

(U) FY 1996:
- (U) Investigate the capacity for image enhancement and data compression schemes to facilitate the transmission of information over limited bandwidths. Transition the theory of invariants in vision to efficient automatic object recognition technology. Develop optimal control methods that allow for effective pulse-shaping for high-power microwave. Research combinations of Artificial Intelligence and Operations Research methods to provide real-time reactive planning strategies. ($34,272K)

(U) FY 1997:
- (U) Transition theories of student models to efficient computer mediated training. Study methods for managing large amounts of dissimilar information for use on distributed heterogeneous processors to enable real-time battlefield collaboration. Develop modeling and evaluation methods that permit the simulation of combustion processes for conventional warhead design problems. ($35,315K)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #1, Basic Research

PE NUMBER AND TITLE: PE 0601102F, Defense Research Sciences

PROJECT NO.: 2304

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	29,437	32,080	33,588	34,615	Cont
Current President's Budget	27,275	32,525	34,272	35,315	Cont

Change Summary Explanation:

Funding: Not Applicable.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0602201F, Aerospace Flight Dynamics.
- (U) PE 0602702F, Command, Control, and Communications.
- (U) PE 0603728F, Advanced Computer Technology.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #1, Basic Research

PE NUMBER AND TITLE: PE 0601102F, Defense Research Sciences

PROJECT NO.: 2305

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 2305, Electronics	24,314	29,375	30,953	31,895	32,812	33,750	34,486	35,391	Cont	Cont

A. (U) Mission Description and Budget Item Justification: Research emphasizes electronic devices and systems that enable new Air Force capabilities such as battle information management systems, countermeasures, sensors, and the more electric aircraft concept. 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 is conducted in electronic processes which will enable the engineer to model and predict performance of electronic materials, devices, and systems for high-speed digital and analog signal processing, microwave and millimeter wave signal and power generation, microwave tubes, superconducting optical signal processing, and radiation hardening.

(U) FY 1994:

- (U) Invented single flux superconducting digital quantum electronic device for extremely high frequency application and extremely low-power consumption. Discovered new temperature ohmic contact for high temperature electronic applications. Established novel heat sinking configuration which allows heterojunction bipolar transistors to reach predicted performance limits. Obtained first ever light emission from an erbium doped silicon light emitting injection diode. ($24,314K)

(U) FY 1995:

- (U) Investigate wide bandgap semiconductor materials for high-power microwave sources. Study the use of optical diagnostic techniques for discerning characteristics of aerodynamic turbulence. Research wide bandgap semiconductors for high temperature electronics, blue emitters for recording, and optical pumping sources and evaluate fundamental material and reliability issues related to ideal metallization, ohmic contacts, and Schottky barriers. ($29,375K)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #1, Basic Research

PE NUMBER AND TITLE: PE 0601102F, Defense Research Sciences

PROJECT NO.: 2305

(U) FY 1996:
- (U) Find materials and device configurations which tolerate electronic operation beyond current military specifications, up to 300C. Determine quantum effects limiting further down scaling of silicon devices. Take a critical look at the feasibility of active silicon-based opto-electronic devices. Search for high density optical information storage memories. Explore novel concepts for digital superconductive circuits. Search for reliable sensors for hidden corrosion detection. ($30,953K)

(U) FY 1997:
- (U) Continue science support for strategically important technologies which promise substantial down stream performance and cost improvements. Special attention is given to innovative approaches to ultrafast, real-time avionics concepts, to advancing the state-of-the-art in optical computing storage, and to improving the precision of space surveillance and targeting. ($31,895K)

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	23,524	29,075	30,446	31,379	Cont
Current President's Budget	24,314	29,375	30,953	31,895	Cont

Change Summary Explanation:

Funding: Not Applicable.

Schedule: Not Applicable.

Technical: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #1, Basic Research	PE NUMBER AND TITLE: PE 0601102F, Defense Research Sciences — PROJECT NO.: 2305

C. (U) Other Program Funding Summary:

(U) Related Activities:
- (U) PE 0602204F, Aerospace Avionics.
- (U) PE 0602702F, Command, Control, and Communications.
- (U) PE 0603728F, Advanced Computer Technology.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #1, Basic Research

PE NUMBER AND TITLE: PE 0601102F, Defense Research Sciences

PROJECT NO.: 2306

COST ($ In Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 2306, Structural Materials	11,295	15,897	16,751	17,261	17,758	18,265	18,663	19,153	Cont	Cont

A. (U) Mission Description and Budget Item Justification: Research focuses on metallic polymers, and ceramic and nonmetallic structural materials. Materials research provides the knowledge for improving the performance, cost, and reliability of structural materials. Structural materials research 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 refractory alloys, intermetallics, polymer composites metal and ceramic matrix composites, and advanced ceramics, such as alumina, silicon carbide, silicon nitride, and carbon/carbon. Research in new processing methods complements research on materials properties. Direct goals of this program are to increase the operating temperature of engine materials which will further increase thrust-to-weight ratio 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.

(U) FY 1994:

- (U) Developed a model of dislocation structure generation of nickel aluminide intermetallic materials. This model will aid in the improvements of these materials for future use in advanced engine applications. Developed a new theory for shear ligament toughening in metals. Performed experiments in interface doping that resulted in a dramatic improvement in the high temperature strength of alumina-based ceramics and achieved a basic understanding of frequency dependence in the fatigue resistance of ceramic matrix composites. Developed new thin films for oxidation protection of silicon nitride -- an important structural ceramic material. Achieved basic understanding of mechanisms of surface damage in ceramics used in bearings and methods of damage minimization. A number of polymer precursors for ceramics were transitioned to 6.2-6.3 efforts. ($11,295K)

(U) FY 1995:

- (U) Initiate studies on polymer composites degradation from service environment. Explore new concepts to provide increased damage tolerance to a third generation of intermetallic materials which show potential for operations at elevated temperatures. Initiate fundamental studies of interfaces between metals and ceramics. Research processing of ceramic material through oxidation of metallic precursors. Continue studies of nanocrystalline metallic and ceramic structural materials focusing on processing, property mechanisms, characterization, and material stability. Research the relationship between the compositional and microstructural features of metals and ceramics and their physical, chemical, and mechanical properties. ($15,897K)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT NO.
#1, Basic Research	PE 0601102F, Defense Research Sciences	2306

(U) FY 1996:

- (U) Research polymer composites bonding integrity and strenght enhancement. Investigate processing approaches to the synthesis of functionally graded materials with emphasis on achieving balanced mechanical properties. Research microstructural mechanisms controlling mechanical performance of nanocrystalline materials. Investigate high temperature fracture mechanics, static and dynamic fatigue, and mechanisms of surface strengthening of monolithic and composite ceramic materials. Continue fundamental studies, both theoretical and experimental, on structure and properties of ceramic/metal and ceramic/ceramic interfaces at high temperatures. Research oxidation-resistant interfaces for composites and coatings for carbon/carbon materials and investigate the environmental effects of processing/property relationships of carbon/carbon composites. ($16,751K)

(U) FY 1997:

- (U) Investigate processing approaches to the synthesis of nanolaminated thin oxide films with emphasis on achieving balanced mechanical and thermal properties. Continue to research microstructural mechanisms controlling mechanical performance of nanocrystalline materials. Elucidate microstructural aspects of high temperature fracture mechanics, static and dynamic fatigue, and mechanisms of surface strengthening of monolithic and composite ceramic materials. Continue studies on polymer composites chemical and physical behavior for improving aerospace structural strenght. Continue fundamental studies, both theoretical and experimental, on structure and properties of ceramic/metal and ceramic/ceramic interfaces at high temperatures. Continue studies of new oxidation-resistant interfaces for composites and coatings for carbon/carbon materials. Study doping of carbon to improve oxidation resistance. ($17,261K)

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	11,911	12,464	13,075	13,492	Cont
Current President's Budget	11,295	15,897	16,751	17,261	Cont

Change Summary Explanation:

Funding: Not Applicable.

Schedule: Not Applicable.

Technical: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #1, Basic Research

PE NUMBER AND TITLE: PE 0601102F, Defense Research Sciences

PROJECT NO.: 2306

C. (U) Other Program Funding Summary:

(U) Related Activities:
- (U) PE 0602102F, Materials.
- (U) PE 0603211F, Aerospace Structures.
- (U) PE 0708011F, Manufacturing Technology.
- (U) PE 0602203F, Aerospace Propulsion.
- (U) PE 0602201F, Aerospace Flight Dynamics.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #1, Basic Research

PE NUMBER AND TITLE: PE 0601102F, Defense Research Sciences

PROJECT NO.: 2307

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 2307, Fluid Mechanics	12,098	11,708	12,337	12,712	13,078	13,452	13,745	14,106	Cont	Cont

A. (U) Mission Description and Budget Item Justification: Research involves turbulence prediction and control, unsteady and separated flows, hypersonics, and internal fluid dynamics. This research provides fundamental knowledge, tools, data, concepts and methods for improving the efficiency, effectiveness, and reliability of aerospace vehicles. Research provides an understanding of key fluid flow phenomena, improves theoretical models for aerodynamic prediction and design, and originates flow control concepts and predictive methods to expand current flight performance boundaries. Research includes the development of computational methods for complex flows, prediction of real gas effects in high-speed flight, control and prediction of turbulence in flight vehicles, propulsion systems, aero-optic applications, the dynamics of unsteady and separated flows, thrust vectoring and high lift concepts associated with enhanced performance and maneuverability, heat transfer and compressor instabilities in gas turbine engines, flow-structure interactions in both external and internal flows, and transport phenomena in structural materials processing.

(U) FY 1994:

- (U) Achieved noise abatement and enhanced mixing in supersonic jets by implementing a new control strategy using piezo-electric actuators. Evaluated innovative aerodynamic drag reducing surfaces by using a novel direct numerical simulation algorithm for turbulent flows. Attenuated buffet-induced vibrations by actively and passively controlling vortex breakdown over swept wings. Developed new wind-driven manipulator arm design to achieve arbitrary coupled aircraft maneuvers in wind tunnel environment. ($12,098K)

(U) FY 1995:

- (U) Research boundary layer transition on supersonic and hypersonic flight vehicles. Study nonlinear buffet and limit cycle oscillations in the transonic nonlinear regime. Explore methods for controlling vortex breakdown with leading and trailing edge boundary manipulation concepts. Develop turbulence models which include the effects of compressibility for application to complex high-speed aerodynamics and heat transfer. Explore micro-electromechanical systems approaches for advanced flow sensors and actuators and develop predictive methods for three-dimensional flows about multiple flight vehicles/stores undergoing dynamic maneuver. Investigate pressure-temperature sensitive paint systems for full coverage unsteady measurements in high-speed turbomachinery flows. ($11,708K)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #1, Basic Research

PE NUMBER AND TITLE: PE 0601102F, Defense Research Sciences

PROJECT NO.: 2307

(U) FY 1996:
- (U) Investigate active heat transfer reduction concepts in wall jet flows. Develop theory of trailing edge receptivity and explore active control concepts for supersonic jet screech suppression. Investigate dynamic aerothermoelastic effects associated with supersonic and hypersonic maneuvering flight vehicle configurations. Study materials processing fluid dynamics research within thermofluids area. Research unsteady aeroelasticity in gas turbine compressors emphasizing inlet-compressor interactions. ($12,337K)

(U) FY 1997:
- (U) Develop a full computational modeling technique for airbreathing propulsion systems, including new turbulence models to predict unsteady, compressible, internal flow phenomena. Integrate micro-actuators, sensors, and nonlinear control algorithms and models to optimize materials processing systems and also to enable high-lift airfoil design concepts. Investigate actively bladed high-speed compressors to simultaneously suppress noise, flutter, and surge in gas turbine engines. Incorporate new Large Eddy Simulation computational techniques to predict unsteady three-dimensional flows around high-speed flight vehicle configurations. ($12,712K)

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	12,451	15,227	15,966	16,469	Cont
Current President's Budget	12,098	11,708	12,337	12,712	Cont

Change Summary Explanation:

Funding: Not Applicable.

Schedule: Not Applicable.

Technical: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT NO.
#1, Basic Research	PE 0601102F, Defense Research Sciences	2307

C. (U) Other Program Funding Summary:

(U) Related Activities:
- (U) PE 0602102F, Materials.
- (U) PE 0602201F, Aerospace Flight Dynamics.
- (U) PE 0602203F, Aerospace Propulsion.
- (U) PE 0603211F, Aerospace Structures.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #1, Basic Research

PE NUMBER AND TITLE: PE 0601102F, Defense Research Sciences

PROJECT NO.: 2308

COST ($ In Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 2308, Propulsion	10,386	11,266	11,871	12,232	12,584	12,944	13,226	13,573	Cont	Cont

A. (U) Mission Description and Budget Item Justification: Efforts include space power and propulsion, airbreathing propulsion, and propulsion diagnostics. Research is focused on the efficient utilization of energy in 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 energy. 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 space-based power and propulsion systems will be addressed. Research in diagnostics supports the first two areas by providing critically needed measurement capabilities for processes such as spray and solid propellant combustion, and plasma propulsion.

(U) FY 1994:

- (U) Formulated a new model for turbulent combustion with multistep chemistry based on the Euclidian Minimum Spanning Tree approximation of the chemical kinetics. Developed two measurement approaches to characterize propellant droplet deformation to within 0.1 percent of the droplet diameter in order to determine the onset of combustion instability and secondary atomization. Discovered a bimodal probability density function through coupled acoustic instability and turbulence analysis that can explain erratic pressure bursts in liquid rockets. Developed a metal reactions transition-state theory that predicts reaction rate coefficients from a single measurement. Formulated a direct simulation Monte Carlo and Particle-In-Cell meshed code to predict plasma thruster plume and contamination behavior. Developed two-wavelength holographic interferometry to measure temperature and concentration fields in dense sprays. ($10,386K)

(U) FY 1995:

- (U) Study degenerate four-wave mixing and laser-induced fluorescence for plasma measurements. Research droplet and spray behavior to include the coupling between sprays and the appearance of instabilities in liquid-fueled rockets, and the dispersion of non-dilute sprays in gaseous turbulent shear layers. Investigate fuel droplet behavior at resolutions smaller than the droplet size to explore the phenomenon of turbulence modulation by droplets and extend quantitative multi-dimensional imaging techniques to time-resolved measurements in three dimensions and the characterization of plasmas. Develop direct simulation Monte Carlo and Navier Stokes hybrid computational model to predict plume fields in the continuum and transition regimes. ($11,266K)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT NO.
#1, Basic Research	PE 0601102F, Defense Research Sciences	2308

(U) FY 1996:
- (U) Study combustion product formation in combustors and plumes. Investigate supercritical fuel behavior, and conduct computational and experimental studies of droplet dispersion, vaporization, and combustion in turbulent jets. Research gas mixing in preburner chambers to study combustion instability in liquid-fueled rockets and platelet injector dynamics, and continue experimental and numerical investigation of plasma thrusters for orbit maneuvering and station keeping. ($11,871K)

(U) FY 1997:
- (U) Continue combustion product formation studies and the investigation of supercritical fuel behavior. Conduct additional computational and experimental studies of turbulent combustion and droplet dispersion, vaporization, and combustion. Study combustion instability in liquid-fueled rockets and continue experimental and numerical investigation of plasma thrusters for orbit maneuvering and station keeping. ($12,232K)

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	11,878	12,965	13,601	14,033	Cont
Current President's Budget	10,386	11,266	11,871	12,232	Cont

Change Summary Explanation:

Funding: Not Applicable.

Schedule: Not Applicable.

Technical: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #1, Basic Research	PE NUMBER AND TITLE: PE 0601102F, Defense Research Sciences — PROJECT NO.: 2308

C. (U) Other Program Funding Summary:

(U) Related Activities:
- (U) PE 0602102F, Materials.
- (U) PE 0602203F, Aerospace Propulsion.
- (U) PE 0602601F, Phillips Laboratory.
- (U) PE 0603211F, Aerospace Structures.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #1, Basic Research

PE NUMBER AND TITLE: PE 0601102F, Defense Research Sciences

PROJECT NO.: 2309

COST ($ In Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 2309, Terrestrial Sciences	25,516	17,320	5,606	5,776	5,942	6,112	6,246	6,409	Cont	Cont

A. (U) Mission Description and Budget Item Justification: Provide fundamental research in seismology. Basic research in seismology is required to understand the propagation through the earth of seismic waves caused by underground explosions and to locate the source of such events. Research is required to identify seismic signatures which can be used to discriminate between natural events (for example, earthquakes) and explosions and other man-caused events. This research will provide an improved seismic monitoring capability required to effectively monitor compliance with nuclear test ban treaty agreements and will also help detect nuclear proliferation by improving the detection and identification of small nuclear tests.

(U) FY 1994:

- (U) Investigated the spectral differences between commercial surface explosions (quarrying) and mining explosions at depth in the same active operation in the same time frame; spectra appear to mirror the free surface of quarrying. Investigated the waveform and spectral similarities between underground chemical explosions and nuclear explosions in the same test region. Formulated a system of equations for wide-angle one-way elastic Rayleigh integrals and local elastic Born scattering theory. Developed a new method of discrimination based on energy strength from broadband regional records. ($25,516K)

(U) FY 1995:

- (U) Investigate seismic signatures of all natural and man-made events which require discriminants in order to identify underground nuclear tests with high reliability and investigate near source phenomena coupled with host rock rheology and cavity characteristics to establish non-ideal effects on magnitude estimation. Continue research relating to determination of location and depth of natural and man-caused seismic events. ($17,320K)

(U) FY 1996:

- (U) Continue research relating to discriminating between nuclear underground tests and other types of underground and surface non-nuclear explosions. Continue location and depth of seismic events research. Continue location and seismic event research. ($5,606K)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #1, Basic Research	PE NUMBER AND TITLE: PE 0601102F, Defense Research Sciences — PROJECT NO.: 2309

(U) FY 1997:
- (U) Bring to conclusion research investigations in discrimination, and event location and depth. Expand upon the investigations begun in FY 1996 to provide the scientific basis for global monitoring of the Comprehensive Test Ban Treaty. Redefine collaborations between regional seismologists and rock rheologists and continue near source research. ($5,776K)

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	25,000	4,605	4,855	5,027	Cont
Current President's Budget	25,516	17,320	5,606	5,776	Cont

Change Summary Explanation:

Funding: Changes due to Congressionally mandated add of $12 million for Joint Seismic Program and Global Seismic Network in FY 1995.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(U) Related Activities:
- (U) PE 0602601F, Phillips Laboratory.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #1, Basic Research

PE NUMBER AND TITLE: PE 0601102F, Defense Research Sciences

PROJECT NO.: 2310

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 2310, Atmospheric Sciences	5,711	7,641	8,051	8,296	8,535	8,779	8,970	9,206	Cont	Cont

A. (U) Mission Description and Budget Item Justification: Areas of emphasis include ionospheric research and meteorology. This research 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/infrared (IR) transmission/emissivity all affect the performance of Air Force systems. Research includes new measurement techniques and the development of models for specifying and predicting weather and other atmospheric conditions. Emphasis is placed on understanding fundamental atmospheric processes and their impacts on optical and IR weapon systems, and on understanding the dynamics and structure of the ionosphere that affect communications and surveillance systems. Major research efforts focus on ionospheric dynamics, mesoscale meteorology, triggered and natural lightning, cloud prediction, and models which define the optical structure of the atmosphere.

(U) FY 1994:
- (U) Identified numerous incorrect identifications of water vapor transitions throughout the IR and visible regions of the spectrum via extension of direct numerical diagonalization analysis to water vapor. Validated and improved radiative transfer and photochemical models using optical characteristics from the CIRRUS 1A spectrometer. Identified improved techniques for four-dimensional data simulation and utilization of satellite water vapor retrievals in mesoscale models. Conducted a field experiment which assessed electric fields associated with triggered lightning using prototype sounding rockets. ($5,711K)

(U) FY 1995:
- (U) Research mesoscale meteorology for improving numerical models of battlefield-scale forecasts and conduct research on the coupling of the atmosphere's fluid behavior with its chemistry, especially in the middle/upper atmosphere. Study artificially disturbed ionosphere. This study is vital to the development of improved optical and infrared technology. ($7,641K)

(U) FY 1996:
- (U) Research satellite data retrieval algorithms with emphasis on improved utilization of multispectral data. Study atmospheric electrification with emphasis on tropospheric discharges which may extend into the stratosphere. Improve our understanding of atmospheric structure within the mesosphere and thermosphere with emphasis on relationships to optical transmissivity of atmosphere. ($8,051K)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #1, Basic Research

PE NUMBER AND TITLE: PE 0601102F, Defense Research Sciences

PROJECT NO.: 2310

(U) FY 1997:
- (U) Investigate improved atmospheric simulation capabilities with emphasis on initial development of four-dimensional, spatially correlated fields of wind, clouds, relative humidity, visibility, etc. Conduct studies related to WSR-88D doppler radar to develop methodologies for improved identification of aliased signals, turbulence, and severe weather. ($8,296K)

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	7,165	9,392	9,864	10,186	Cont
Current President's Budget	5,711	7,641	8,051	8,296	Cont

Change Summary Explanation:

Funding: Not Applicable.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(U) Related Activities:
- (U) PE 0305160F, Defense Meteorological Satellite Program.
- (U) PE 0602601F, Phillips Laboratory.
- (U) PE 0603220C, Surveillance, Acquisition, Tracking, and Kill.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #1, Basic Research

PE NUMBER AND TITLE: PE 0601102F, Defense Research Sciences

PROJECT NO.: 2311

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 2311, Space Sciences	5,569	5,513	5,809	5,986	6,158	6,334	6,472	6,642	Cont	Cont

A. (U) Mission Description and Budget Item Justification: The objective of this project is to provide basic knowledge of the space environment and solar activity for the design and calibration of advanced Air Force systems relevant to operations in and through near-earth space. The project also supports the Air Weather Service (AWS) by improving observing and forecasting techniques that support operational military systems. Theoretical and empirical descriptions and models of the physics of the sun and the earth's magnetosphere, which are critical elements of future AWS prediction models and radiation belt codes, are being investigated.

(U) FY 1994:

- (U) Used results from kinematic models of the diffusion of solar magnetic flux to provide correct inputs to calculate the distribution of magnetic flux at the solar surface. These results will be used by the Air Force in solar specifications and long-range forecasting. Conducted multi-spectral studies of solar activity events in support of the Air Force requirement to develop models that specify the types of emission resulting from solar activity . Described the characteristics of plasmas in the region of geomagnetic substorm initiation. These results are needed by the Air Force for models of the intensity and location of the earth's radiation belts. Developed a model for stimulated radiation belt precipitation of protons, which is relevant to the natural variation and active control of the energetic particle populations which cause energy dose degradation of Air Force satellite systems. ($5,569K)

(U) FY 1995:

- (U) Design an instrument for solar magnetic field studies, which will be transitioned to the Air Force Space Forecast Center in FY 1996-1997. Combine kinematic models of solar convection and three-dimensional magnetohydrodynamic simulations for solar activity forecasting. Validate time dependent models of magnetic storm effects with Air Force and NASA satellite data and ground-based sensors. Determine the effects that limit propagation efficiency and the performance of satellite charge control systems and ballistic missile defense systems. ($5,513K)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #1, Basic Research

PE NUMBER AND TITLE: PE 0601102F, Defense Research Sciences

PROJECT NO.: 2311

(U) FY 1996:

- (U) Transition solar activity models to 6.2 for solar forecasting applications. Elucidate processes throughout the solar-terrestrial system using simultaneously measured solar, solar wind, and magnetosphere satellite data. These results will be used for the prediction of geomagnetic storms which affect ground and space assets. Complete models of radiation in plasmas, which are required to assess communications using electron beams or space borne antennas. Obtain data from a space shuttle experiment to validate electron beam propagation models, examine plasma effects on large space structures, and assess tethers in space as power generators. ($5,809K)

(U) FY 1997:

- (U) Integrate solar activity and coronal mass ejection models with interplanetary, magnetosphere, ionosphere,and thermosphere models to generate a unified global space weather mode. scheduled to be transitioned to the Air Force Space Forecast Center in FY 1998. Use space- and ground-based data to test the models and to examine the characteristics of space environment particles and fields during the minimum of solar cycle 22 and the rise of cycle 23. Evaluate secular variations of the geomagnetic field and their effect on radiation dosage over the past three solar cycles. Assess the utility of these variations as a tool for long-term planning of the lifetimes of Air Force and DoD spacecraft. Use high latitude satellite data to establish solar wind signatures for geomagnetic storm alerts. Study satellite degradation by the radiation belts to provide the basis for developing more survivable, robust, Air Force satellite systems. ($5,986K)

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	6,958	6,880	7,237	7,480	Cont
Current President's Budget	5,569	5,513	5,809	5,986	Cont

Change Summary Explanation:

Funding: Not Applicable.

Schedule: Not Applicable.

Technical: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #1, Basic Research	PE NUMBER AND TITLE: PE 0601102F, Defense Research Sciences
	PROJECT NO.: 2311

C. (U) Other Program Funding Summary:

(U) Related Activities:
- (U) PE 0602101F, Geophysics.
- (U) PE 0602702F, Command, Control and Communications.
- (U) PE 0603410F, Space System Environmental Interactions.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #1, Basic Research

PE NUMBER AND TITLE: PE 0601102F, Defense Research Sciences

PROJECT NO.: 2312

COST ($ In Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 2312, Biological Sciences	15,324	16,226	17,097	17,618	18,125	18,643	19,049	19,549	Cont	Cont

A. (U) Mission Description and Budget Item Justification: This project consists of three research areas: 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 mitigate 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 and predict toxicity and provide strategies for the development of new materials that 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 in pilots, impaired performance due to jet-lag and shift-work, night operations, and the loss of life and aircraft due to stress, inattention, or lack of vigilance.

(U) FY 1994:
- (U) Developed a novel statistical software package based on biological kinetics that provides for the first time the ability to assess toxicant effects on multispecies systems. Designed a biochemical that has the potential to improve working memory. Discovered that the brain chemical sertonin greatly enhances that ability of light stimulation at night to reset the biological clock, thus, providing a potentially powerful technique for ameliorating the deleterious effects of jet-lag and shift work. ($15,324K)

(U) FY 1995:
- (U) Expand research on the neurochemistry and molecular biology of the brain during changes in state along a continuum from sleep to arousal to attentiveness. Initiate studies of the mechanisms regulating circadian rhythms in performance in humans. Determine the mechanisms involved in retinal damage induced by ultrashort laser pulses. Continue research on biochemical/molecular markers of toxicity. ($16,226K)

(U) FY 1996:
- (U) Research on biochemical concepts for site remediation and hazardous waste minimization will continue. Toxic mechanisms studies related to health and environmental hazard assessment of new Air Force compounds will receive emphasis. Continue research on the neurochemistry and molecular biology of the brain in order to identify biochemical mechanisms that control circadian clock, attention, arousal, learning, and stress. ($17,097K)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #1, Basic Research	PE NUMBER AND TITLE: PE 0601102F, Defense Research Sciences — PROJECT NO.: 2312

(U) FY 1997:
- (U) Research on adaptive neural control systems will begin to investigate mechanisms involved in regulating goal-oriented behavior and novel defensive strategies employed by organisms for individual and collective protection of resources. Research to determine the mechanisms of toxic effects to man and the environment of new Air Force compounds, such as organic matrix composites and propellants, will continue. Emphasis will be placed on new approaches to predictive toxicology including physiologically-based toxicokinetic modeling. ($17,618K)

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	14,782	19,886	20,840	21,485	Cont
Current President's Budget	15,324	16,226	17,097	17,618	Cont

Change Summary Explanation:

Funding: Not Applicable.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(U) Related Activities:
- (U) PE 0602202F, Human Systems Technology.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #1, Basic Research

PE NUMBER AND TITLE: PE 0601102F, Defense Research Sciences

PROJECT NO.: 2313

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 2313, Human Performance	8,625	9,212	9,706	10,002	10,290	10,584	10,814	11,098	Cont	Cont

A. (U) Mission Description and Budget Item Justification: This project provides fundamental knowledge of information processing in humans and other complex organisms needed to advance technologies of autonomous systems, command and control, human systems integration, and personnel selection and training. Research on sensory and perceptual processing impacts technologies of computer image and speech processing, human interface, and personnel selection. Research on cognitive and team processes impacts technologies of selection, education and training, command and control, and adaptive autonomous systems. Supported areas of research include Vision, Hearing, Cognition, Spatial Orientation, Intelligent Tutors, and Team Situational Awareness.

(U) FY 1994:

- (U) Created model of human auditory processing and expressed it in a single computer chip now under evaluation as front-end for speech recognition. Created model of space variant image processing based on human image processing, potentially useful for low bandwidth high fidelity image generation. Generated model of human cognitive abilities under evaluation for selection and classification. ($8,625K)

(U) FY 1995:

- (U) Investigate team member fatigue and stress to determine optimum performance environments for command, control, and communications. Model human performance using computer algorithms for application to virtual environments/workstation design. Conduct cognition research to address complex decision-making. Research spatial disorientation in the Spatial Disorientation Device at the Armstrong Laboratory. Determine the sensory threshold changes associated with off variable axis rotation-induced spatial disorientation. Continue research in Vision, Hearing, Cognition, Spatial Orientation, Intelligent Tutors, and Team Situational Awareness. ($9,212K)

(U) FY 1996:

- (U) Continue research in Vision, Hearing, Cognition, Spatial Orientation, Intelligent Tutors, and Team Situational Awareness. Determine optimal image compression for human viewing. Determine mechanisms of human auditory localization. Evaluate models of advising in the context of intelligent tutoring. Determine the performance dimensions of human psychomotor abilities. ($9,706K)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #1, Basic Research

PE NUMBER AND TITLE: PE 0601102F, Defense Research Sciences

PROJECT NO.: 2313

(U) FY 1997:
- (U) Continue research in Vision, Hearing, Cognition, Spatial Orientation, Intelligent Tutors, and Team Situational Awareness. Computationally model human sensory processing and pattern recognition. Model human decision-making in selected dynamic tasks of information processing. Experimentally test models of motor performance in virtual environments. Extend models of spatial orientation to performance in naturalistic versions of laboratory tasks. ($10,002K)

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	9,856	12,232	12,835	13,244	Cont
Current President's Budget	8,625	9,212	9,706	10,002	Cont

Change Summary Explanation:

Funding: Not Applicable.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(U) Related Activities:
- (U) PE 0602202F, Human Systems Technology.
- (U) PE 0602702F, Command, Control and Communication.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #1, Basic Research

PE NUMBER AND TITLE: PE 0601102F, Defense Research Sciences

PROJECT NO.: 4113

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 4113, Science and Engineering Education	10,210	15,937	16,793	17,303	17,802	18,311	18,712	19,200	Cont	Cont

A. (U) Mission Description and Budget Item Justification: This project stimulates scientific and engineering education and increases the interaction between the broader research community and the Air Force laboratories. Emphasis is placed on increasing the number of U.S. citizens, especially women and minorities, with advanced degrees in science and engineering. These programs include: the Summer Faculty Research Program under which selected university faculty members conduct research at Air Force labs; the Graduate Student Research Program where graduate students in areas of interest to the Air Force perform research at Air Force labs; the University Resident Research Program where faculty members spend one year at an Air Force lab contributing to Air Force research needs and operations; the U.S. Air Force National Research Council (NRC) Resident Research Associateship Program which provides outstanding post-doctoral and senior scientists and engineers opportunities to research problems of their own choice that are compatible with the research interests of selected Air Force labs; the Laboratory Graduate Fellowship Program which is designed to stimulate doctoral candidate interest in Air Force labs and the research programs of those labs; and the National Defense Science and Engineering Graduate Fellowship Program which is jointly sponsored by the Army, Navy, Air Force, and the Advanced Research Projects Agency for the purpose of increasing the number of U.S. citizens trained in science and engineering.

(U) FY 1994:

- (U)The Summer Faculty Research Program supported 192 university faculty for up to 12 weeks at Air Force labs. The Graduate Student Research Program supported 116 students for up to 12 weeks at Air Force labs. Five percent of these Summer Research Program participants are members of a historically black or minority college. The University Resident Research Program supported 14 university researchers. The National Research Council Resident Research Associateship Program supported 65 fellows, two-thirds are post-doctoral researchers with the remaining one-third seniors. The Laboratory Graduate Fellowship Program supported 51 fellows. The National Defense Science and Engineering Graduate Fellowship Program supported approximately 75 fellowships with ten percent set aside for members of ethnic minority groups underrepresented in science and engineering. ($10,210K)

(U) FY 1995: This program will continue to support scientific and engineering education programs. ($15,937K)

(U) FY 1996: This program will continue to support scientific and engineering education programs. ($16,793K)

(U) FY 1997: This program will continue to support scientific and engineering education programs. ($17,303K)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #1, Basic Research

PE NUMBER AND TITLE: PE 0601102F, Defense Research Sciences

PROJECT NO.: 4113

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	14,461	16,532	17,327	17,870	Cont
Current President's Budget	10,210	15,937	16,793	17,303	Cont

Change Summary Explanation:

Funding: Not Applicable.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0601103D, University Research Initiative.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #1, Basic Research

PE NUMBER AND TITLE: PE 0601102F, Defense Research Sciences

PROJECT NO.: 4161

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 4161. Defense Technical Information Fund	11,976	0	0	0	0	0	0	0	0	34,942

A. (U) Mission Description and Budget Item Justification: This project provides the funding 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.

(U) FY 1994: Funding was provided to DTIC on a monthly cycle of billing and reimbursement at a rate of one-twelfth of the total each month. ($11,976K)

(U) FY 1995: Not Applicable. DTIC is no longer funded through this PE.

(U) FY 1996: Not Applicable.

(U) FY 1997: Not Applicable.

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	12,176	0	0	0	35,142
Current President's Budget	11,976	0	0	0	34,942

Change Summary Explanation:

Funding: Mechanism for funding DTIC has changed.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary: Not Applicable.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: **February 1995**

BUDGET ACTIVITY: **#2, Exploratory Development**

PE NUMBER AND TITLE: **PE 0602102F, Materials**

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Total PE 0602102F Cost	69,366	68,779	74,534	73,321	75,360	77,875	79,270	83,167	Cont	Cont
Project 06ML, Laboratory Operations	29,586	29,844	0	0	0	0	0	0	Cont	Cont
Project 2417, Thermal Protection Materials and Structures	4,801	0	0	0	0	0	0	0	Cont	Cont
Project 2418, Metallic Structural Materials	15,578	0	0	0	0	0	0	0	Cont	Cont
Project 2419, Nonmetallic Structural Materials	4,735	0	0	0	0	0	0	0	Cont	Cont
Project 2420, Aerospace Propulsion Materials	4,313	0	0	0	0	0	0	0	Cont	Cont
Project 2421, Fluids, Lubricants, and Elastomeric Materials	1,741	0	0	0	0	0	0	0	Cont	Cont
Project 2422, Protective Coatings and Materials	4,092	0	0	0	0	0	0	0	Cont	Cont
Project 2423, Electromagnetic Windows and Electronic Materials	4,520	0	0	0	0	0	0	0	Cont	Cont
Project 4347, Materials and Processes for Structures, Propulsion, and Subsystems	0	21,337	45,918	45,171	46,427	47,976	48,836	51,237	Cont	Cont
Project 4348, Materials and Processes for Electronics, Optics, and Survivability	0	6,933	13,852	13,626	14,006	14,473	14,732	15,456	Cont	Cont
Project 4349, Materials and Processes Technology for Sustainment	0	10,665	14,764	14,524	14,927	15,426	15,702	16,474	Cont	Cont

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602102F, Materials

A. (U) Mission Description and Budget Item Justification: This Exploratory Development program develops materials, manufacturing and processing technologies, and non-destructive inspection/evaluation technology. It is the primary source of advanced materials and processes to reduce life cycle costs and improve performance, supportability, reliability, survivability, and affordability of current and future Air Force systems and support equipment. Starting in FY 1996, separate infrastructure projects have been eliminated. All efforts in this program element contain the resources necessary, including civilian salaries, to manage, conduct, and document the technical activities.

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	70,908	70,049	71,113	72,702	Cont
Appropriated Value	71,305	70,049			
Adjustments to Appropriated Value:					
a. Congressional General Reductions	-397	-1,270			
b. SBIR	-442				
c. Omnibus Reprogramming	-1,000				
d. Below Threshold Reprogramming	-100				
Current President's Budget	69,366	68,779	74,534	73,321	Cont

Change Summary Explanation:

Funding: Increase due to additional emphasis on improved manufacturing processes and aging aircraft. Starting in FY 1996, Project 06ML has been eliminated and infrastructure costs, including civilian salaries, have been put in the technical projects.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary: Not Applicable.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602102F, Materials

PROJECT NO.: 06ML

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 06ML, Laboratory Operations	29,586	29,844	0	0	0	0	0	0	Cont	Cont

A. (U) Mission Description and Budget Item Justification: Provides management and operational support for the 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; and salaries. This project will be terminated in FY 1995 and its content distributed to the technical projects.

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	31,928	31,069	31,541	32,246	Cont
Current President's Budget	29,586	29,844	0	0	Cont

Change Summary Explanation:

Funding: Project funding incorporated under technical projects after FY 1995.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary: Not Applicable.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602102F, Materials

PROJECT NO.: 2417

COST ($ In Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 2417, Thermal Protection Materials and Structures	4,801	0	0	0	0	0	0	0	Cont	Cont

A. (U) Mission Description and Budget Item Justification: Develops advanced composite technologies for structural and thermal protection applications in aerospace systems and components which are exposed to extreme operating conditions. Typical aerospace systems and component applications include military gas turbine engines, solid rocket and space engine propulsion systems, strategic reentry and penetration aid systems, space structures, and high Mach number aerodynamic vehicles. The advanced composites improve the accuracy and survivability of missiles, increase the thrust-to-weight ratio and specific fuel consumption of turbine engines, and increase the range, payload, and durability of high-speed aircraft and missiles.

(U) FY 1994:

- (U) Developed thermal resistant materials providing significant weight reduction in applications such as electromagnetic windows, heat shields, nosetips, and leading edges while retaining accurate dimensional stability for advanced strategic, tactical, and space structures. ($3,265K)
  - -- (U) Evaluated, at the coupon level, an advanced composite weave available from three sources that offers improved out of plane composite properties for application to polymeric matrix and carbon-carbon composites.
  - -- (U) Developed high thermal conductivity carbon-carbon thermal planes which reduce operating temperatures by more than 60% and decrease weight by over 50% of conventional aluminum packaging.
- (U) Developed processing techniques for the manufacture of affordable thermal resistant materials to improve their reproducibility, reliability, dimensional stability, and thermal efficiency for advanced strategic, tactical, and space structures. ($964K)
  - -- (U) Demonstrated the feasibility of preceramic precursor coatings for the protection of carbon-carbon in space and oxidizing environments.
- (U) Developed innovative carbon applications for low-cost, lightweight, reliable, and survivable materials for advanced strategic, tactical, and space structures. ($572K)
  - -- (U) Demonstrated a high modulus graphitic foam as a lightweight replacement material for carbon-carbon in lightly loaded spacecraft applications.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602102F, Materials

PROJECT NO.: 2417

(U) FY 1995: Not Applicable.

(U) FY 1996: Not Applicable.

(U) FY 1997: Not Applicable.

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	4,858	0	0	0	Cont
Current President's Budget	4,801	0	0	0	Cont

Change Summary Explanation:

Funding: Project content moved to Project 4347, Materials and Processes for Structures, Propulsion, and Subsystems, in FY 1995.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0603112F, Advanced Materials for Weapon Systems.
- (U) PE 0603211F, Aerospace Structures.
- (U) PE 0708011F, Manufacturing Technology.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602102F, Materials

PROJECT NO.: 2418

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 2418, Metallic Structural Materials	15,578	0	0	0	0	0	0	0	Cont	Cont

A. (U) Mission Description and Budget Item Justification: Develops advanced metallic materials and metal matrix composites with optimum combination of properties from cryogenic temperatures to 1800°F (600°F increase in current capability) for use in tactical and strategic aircraft, turbine engines, and missile primary structures. Develops the processes for the fabrication of these metallic materials. Investigates engineering properties and repair technologies and automated computer systems and databases to reduce weapon production costs. This project also provides quick response solutions and failure analyses to the major commands, product divisions, and accident investigation teams. Metallic materials and metal matrix composites (MMCs) being developed are essential to achieving the doubled thrust-to-weight goal of the Integrated High Performance Turbine Engine Technology (IHPTET) program. The repair technologies and non-destructive inspection/evaluation (NDI/E) capabilities being developed increase supportability and sortie generation.

(U) FY 1994:

- (U) Developed ultra-lightweight and high temperature metallic materials with properties optimized for aerospace applications to provide significant improvements in aircraft and spacecraft affordability, survivability, maintainability, and performance. ($5,570K)
  - -- (U) Determined the optimal processing and microstructural conditions for alpha-two titanium aluminide alloys for use as a lighter weight replacement for superalloys in aircraft turbine engines.
  - -- (U) Demonstrated large parts size processing of gamma titanium aluminides for use in aircraft turbine engine cast and wrought components at temperatures up to 1800°F.
  - -- (U) Rolled sub-scale ingots of an advanced isotropic aluminum lithium alloy to 1.25 inch thick and determined the texture effects for use as a spacecraft and aircraft lightweight structural material.
- (U) Developed processes and techniques for NDI/E of aging metallic systems to improve capabilities for detection of hidden corrosion and multi-site damage in aerospace systems. ($2,296K)
  - -- (U) Demonstrated aluminum clad fiber optic sensor to measure the degree of corrsion on aluminum aircraft structures.
- (U) Developed environmentally compliant and non-toxic materials for aerospace applications. ($957K)
  - -- (U) Performed initial screening of environmentally compliant and non-toxic materials.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #2, Exploratory Development	PE NUMBER AND TITLE: PE 0602102F, Materials — PROJECT NO.: 2418

- (U) Developed and exercised advanced techniques for metallic material joining and fastening, durability testing, and failure mechanism analysis to improve the transition, application, and support of these materials when used in aerospace systems. ($6,755K)
  -- (U) Determined repair procedures and welding and post-welding heat treatments for turbine engine fan blades.
  -- (U) Developed a topographic radioscopy technique standard for use in evaluating promising non-destructive inspection/evaluation (NDI/E) techniques for the evaluation of hidden corrosion in fighter and transport aircraft.

(U) FY 1995: Not Applicable.

(U) FY 1996: Not Applicable.

(U) FY 1997: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602102F, Materials

PROJECT NO.: 2418

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	15,670	0	0	0	Cont
Current President's Budget	15,578	0	0	0	Cont

Change Summary Explanation:

Funding: Aluminum and titanium alloy work moved to Project 4347, Materials and Processes for Structures, Propulsion, and Subsystems, in FY 1995; and non-destructive inspection/evaluation (NDI/E) plus system design engineering and mechanical behavior of metallic/non-metallic structural materials work moved to Project 4349, Materials and Processes Technology for Sustainment, in FY 1995.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0603211F, Aerospace Structures.
- (U) PE 0603112F, Advanced Materials for Weapon Systems.
- (U) PE 0708011F, Manufacturing Technology.
- (U) DOD Metal Matrix Composite Steering Group.
- (U) Office of Science and Technology Committee on Materials Working Group on Non-Destructive Materials.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602102F, Materials

PROJECT NO.: 2419

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 2419, Nonmetallic Structural Materials	4,735	0	0	0	0	0	0	0	Cont	Cont

A. (U) Mission Description and Budget Item Justification: Develops advanced polymeric matrix composite (PMC) materials with properties suitable for use over the temperature range from cryogenic temperatures to 700°F for structural applications in Air Force subsonic and supersonic aircraft, satellites, and missile systems. Emphasis is on constantly increasing strength, stiffness, temperature capability, and durability of PMCs as well as reducing weight and the costs to process them. This emphasis also includes the development of signature reduction materials, ordered polymer films, and molecular composites. New PMCs are expected to translate a 50% weight savings over traditional PMC structures, which will improve overall system range and payload capability.

(U) FY 1994:

- (U) Developed affordable, lightweight, thermal resistant nonmetallic materials and processing techniques for application to aircraft structures, and developed subsystems that will allow significant improvements in aircraft affordability, survivability, maintainability, and performance. ($2,914K)
  - -- (U) Identified a high temperature polymer for scale-up and evaluation for use in supersonic aircraft transparencies.
  - -- (U) Evaluated low outgassing polymeric matrix composites under simulated space environments for use in spacecraft thermal control and structures.
- (U) Developed non-intrusive evaluation processes and materials for improved assessment of nonmetallic structural materials components during fabrication and use. ($1,821K)
  - -- (U) Established an engineering database on AFR700B, a polymeric composite material developed for use in high temperature (700°F) low-observables and structural applications on aircraft.

(U) FY 1995: Not Applicable.

(U) FY 1996: Not Applicable.

(U) FY 1997: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602102F, Materials

PROJECT NO.: 2419

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	4,718	0	0	0	Cont
Current President's Budget	4,735	0	0	0	Cont

Change Summary Explanation:

Funding: Project content moved to Project 4347, Materials and Processes for Structures, Propulsion, and Subsystems, in FY 1995.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0603112F, Advanced Materials for Weapon Systems.
- (U) PE 0603211F, Aerospace Structures.
- (U) PE 0708011F, Manufacturing Technology.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602102F, Materials

PROJECT NO.: 2420

COST ($ In Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 2420, Aerospace Propulsion Materials	4,313	0	0	0	0	0	0	0	Cont	Cont

A. (U) Mission Description and Budget Item Justification: Develops ceramic matrix composites (CMCs), advanced intermetallic alloys, and metal matrix composites (MMCs), as well as the processes for fabricating these materials. These materials will be used to make lighter weight uncooled turbine engine components capable of operating in oxidizing environments at temperatures greater than 2800°F for the required service life. This project supports the DOD/NASA Integrated High Performance Turbine Engine Technology (IHPTET) initiative, which plans to double the thrust-to-weight ratio of turbine engines by the year 2003 and provide technology for improved performance of derivatives of current engines. The materials developed in this project will improve engine producibility, durability, life cycle costs, and fuel consumption.

(U) FY 1994:

- (U) Developed advanced ceramic composites for propulsion applications to double advanced propulsion and high temperature vehicle structure capabilities. ($1,893K)
  - -- (U) Developed materials and processes for an advanced ceramic fiber suitable for use in ceramic matrix composites in oxidizing conditions up to 1500°F for aircraft turbine engine applications.
- (U) Developed advanced intermetallic metals and composites for propulsion applications to double advanced propulsion and high temperature vehicle structure capabilities. ($920K)
  - -- (U) Identified advanced intermetallic compositions with the suitability for use in aircraft engine applications exceeding 2500°F.
- (U) Developed analytical and physical process modeling techniques for advanced propulsion system materials to better understand their characteristics in order to improve their reliability and lower their acquisition and life cycle costs. ($1,500K)
  - -- (U) Completed laboratory demonstration of gamma titanium aluminide processing technology.
  - -- (U) Developed advanced processing methods to reduce the cost and improve the reliability of hot pressed metal matrix composites (MMCs).

(U) FY 1995: Not Applicable.

(U) FY 1996: Not Applicable.

(U) FY 1997: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602102F, Materials

PROJECT NO.: 2420

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	4,348	0	0	0	Cont
Current President's Budget	4,313	0	0	0	Cont

Change Summary Explanation:

Funding: Project content moved to Project 4347, Materials and Processes for Structures, Propulsion, and Subsystems, in FY 1995.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0602203F, Aerospace Propulsion.
- (U) PE 0603202F, Aircraft Propulsion Subsystem Integration.
- (U) PE 0603112F, Advanced Materials for Weapon Systems.
- (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.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602102F, Materials

PROJECT NO.: 2421

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 2421, Fluids, Lubricants, and Elastomeric Materials	1,741	0	0	0	0	0	0	0	Cont	Cont

A. (U) Mission Description and Budget Item Justification: Develops advanced fluids, lubricants, seals, sealants, and fluid technologies, together with an understanding of their behavior and performance. Improves the non-flammability and low temperature fluidity of fluids and lubricants. These materials are used in aircraft propulsion and hydraulic systems, spacecraft and missile propulsion systems, and spacecraft attitude control systems. This project develops the higher temperature lubricants and seals required by the higher operating temperatures of military turbine engines being developed under the Integrated High Performance Turbine Engine Technology (IHPTET) program.

(U) FY 1994:
- (U) Developed advanced fluids and lubricants to enhance aerospace system affordability, survivability, and performance. ($1,162K)
  -- (U) Completed laboratory demonstration of advanced grease for use in cruise missile engines.
- (U) Developed advanced tribomaterials to enhance aerospace system affordability, survivability, and performance. ($579K)
  -- (U) Developed a new method for determining the outgassing contamination characteristics of spacecraft materials which has been accepted by the American Society of Test Methods (ASTM E1559-93).

(U) FY 1995: Not Applicable.

(U) FY 1996: Not Applicable.

(U) FY 1997: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602102F, Materials

PROJECT NO.: 2421

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	1,706	0	0	0	Cont
Current President's Budget	1,741	0	0	0	Cont

Change Summary Explanation:

Funding: Project content moved to Project 4347, Materials and Processes for Structures, Propulsion, and Subsystems, in FY 1995.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0603202F, Aircraft Propulsion Subsystem Integration.
- (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.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602102F, Materials

PROJECT NO.: 2422

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 2422, Protective Coatings and Materials	4,092	0	0	0	0	0	0	0	Cont	Cont

A. (U) Mission Description and Budget Item Justification: Develops materials and protective coatings concepts to improve the survivability of aircrews and vital components of Air Force aircraft, missiles, and satellites in natural and threat environments. Materials developed in this project primarily have a protective function essential to the survival of the crew, avionics, and other critical subsystems. Types of materials developed include survivable thermal management materials for satellites which reduce the problem of contamination of spacecraft surfaces while enhancing survivability, camouflage and signature control coatings, and laser hardening materials and protective concepts. These protective materials ensure Air Force aircrews and weapon systems can carry out their missions.

(U) FY 1994:

- (U) Developed advanced materials technologies that enhance laser hardening for aircrews and laser hardening and low-observability for sensors, avionics, and other electro-optical components. ($3,039K)
  - -- (U) Developed the materials and processing technology for thermochromic materials as infrared (IR) optical power limiters for use in the protection of thermal imaging sensors.
  - -- (U) Transitioned liquid crystal switchable optical polarizer technology to enhance tunable filter devices operation for eye and sensor protection from wavelength agile lasers.
- (U) Developed advanced materials technologies that enhance laser hardening and low-observability for Air Force aircraft, missile, and space system structural components such as canopies, radomes, IR domes, and other structural elements. ($1,053K)
  - -- (U) Developed a process for high velocity thermal spraying aircraft protective coatings with reduced volatile organic content compared to conventional epoxy based coatings.

(U) FY 1995: Not Applicable.

(U) FY 1996: Not Applicable.

(U) FY 1997: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602102F, Materials

PROJECT NO.: 2422

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	3,151	0	0	0	Cont
Current President's Budget	4,092	0	0	0	Cont

Change Summary Explanation:

Funding: Project content moved to Project 4348, Materials and Processes for Electronics, Optics, and Survivability, in FY 1995.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0603112F, Advanced Materials for Weapon Systems.
- (U) PE 0603211F, Aerospace Structures.
- (U) PE 0708011F, Manufacturing Technology.
- (U) Tri-Service Laser Hardened Materials and Structures Group.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602102F, Materials

PROJECT NO.: 2423

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 2423, Electromagnetic Windows and Electronic Materials	4,520	0	0	0	0	0	0	0	Cont	Cont

A. (U) Mission Description and Budget Item Justification: Develops high payoff materials and processes for microelectronic, microwave (MW), and millimeter wave (MMW) applications, IR detectors, electro-optics, and IR transparencies. These materials and processes are essential for the development of reliable, higher performance integrated circuits and related components, active (radar) and passive (IR) sensors, laser-based systems, and avionics, communications, and electronic warfare (EW) systems for Air Force aircraft, munitions, and missile and space systems, and have significant dual-use payoff. Materials being developed for micro-electronic, MW, and related applications are enabling technologies for higher frequency, higher power, higher reliability, and much higher operating temperature systems. Materials being developed for IR detectors will significantly extend target detection and tracking capability. Nonlinear optical (NLO) materials being developed will extend the capability of present lasers and make optical signal processing possible. Investigates high temperature materials to enable the fabrication of radio/radar circuitry with significantly higher performance for EW systems and offers the potential for greatly increased signal processing capability. High durability IR window materials will offer sustained supersonic flight survivability with greatly increased resistance to rain, sand, and dust erosion at all speeds.

(U) FY 1994:

- (U) Developed advanced producible infrared detector and transparency materials and processes for improved strategic and tactical surveillance, integrated photonics, and high density electronic packaging capabilities. ($859K)
  - -- (U) Scaled up diamond coating processing to ten inch diameter as a near-term protective solution to high mach aircraft infrared sensor windows.
- (U) Developed advanced producible MW and microelectronics materials and processes for improved strategic and tactical surveillance, integrated photonics, and high density electronic packaging capabilities. ($1,530K)
  - -- (U) Demonstrated two inch diameter boules of semiconductive silicon carbide for X-band radar applications. This material operates at a higher temperature than conventional semiconductors, offering high-power with reduced cooling (weight).
- (U) Developed advanced producible ultrastructure growth technology and nonlinear optical materials and processes for improved strategic and tactical surveillance, integrated photonics, and high density electronic packaging capabilities. ($1,686K)
  - -- (U) Developed ellipsometry, a non-contact measurement technique for in situ process growth control of electronic materials.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #2, Exploratory Development	PE NUMBER AND TITLE: PE 0602102F, Materials — PROJECT NO.: 2423

- (U) Developed advanced producible High Temperature Superconductor materials and advanced packaging and interconnections technologies for improved strategic and tactical surveillance, integrated photonics, and high density electronic packaging capabilities. ($445K)
  -- (U) Developed a unique characterization technique for the evaluation of microwave transmission and reflection properties in superconductive materials for radar and electronic device applications.

(U) FY 1995: Not Applicable.

(U) FY 1996: Not Applicable.

(U) FY 1997: Not Applicable.

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	4,529	0	0	0	Cont
Current President's Budget	4,520	0	0	0	Cont

Change Summary Explanation:

Funding: Project content moved to Project 4348, Materials and Processes for Electronics, Optics, and Survivability, in FY 1995.

Schedule: Not Applicable.

Technical: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #2, Exploratory Development	PE NUMBER AND TITLE: PE 0602102F, Materials — PROJECT NO.: 2423

C. (U) Other Program Funding Summary:

(U) Related Activities:
- (U) PE 0603112F, Advanced Materials for Weapon Systems.
- (U) PE 0602204F, Aerospace Avionics.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602102F, Materials

PROJECT NO.: 4347

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 4347, Materials and Processes for Structures, Propulsion, and Subsystems	0	21,337	45,918	45,171	46,427	47,976	48,836	51,237	Cont	Cont

A. (U) Mission Description and Budget Item Justification: Develops materials and process technologies, spacecraft, and missiles with improved affordability, maintainability, and enhanced performance of current and future Air Force systems. Advanced thermal protection and carbon-carbon composites (CCC) materials are developed that are affordable, lightweight, and ablation and erosion resistant to meet the thermal and nuclear hardness requirements of future ballistic and maneuvering reentry systems. A family of affordable lightweight materials are developed, including metals, metallic and nonmetallic composites, and ceramics which can provide upgraded capability for existing aircraft, spacecraft, missile, and propulsion systems to meet the requirements for new systems beyond the year 2000. Included are turbine engine materials with operating capabilities from 1700°F to 2800°F that will enable engine designs to double the thrust to weight of 1986 engine performance capabilities. Spacecraft material technologies are developed that are lightweight, dimensionally stable, noncontaminating, and resistant to the space environment. Fluids, lubricants, seals, and other nonstructural material technologies are developed for the subsystems on aircraft, spacecraft, and missile systems as well as their propulsion systems.

(U) FY 1994: Not Applicable.

(U) FY 1995:

- (U) Develop carbon-carbon and thermal protection material technologies to improve operational capability of strategic and tactical systems. These materials offer significant benefits in high temperature shape retention, weight savings, and thermal conductivity properties which will lead to smaller radiators on aerospace systems and lighter and cooler space electronics packages. ($4,673K)
  - -- (U) Demonstrate an advanced shape stable carbon-carbon composite material for advanced reentry applications.
  - -- (U) Demonstrate advanced composite woven cylinders (one foot length) for spacecraft and reentry applications.
  - -- (U) Evaluate polymeric precursor coatings for spacecraft thermal control and structural applications under simulated space environments.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #2, Exploratory Development	PE NUMBER AND TITLE: PE 0602102F, Materials — PROJECT NO.: 4347

- (U) Develop advanced nonmetallic composite structural materials for aircraft applications including lightweight airframes, control surfaces, aircraft canopies, smart skins, and engine compressor frames and ducts, and for spacecraft applications including lightweight trusses, struts, solar arrays, antenna supports, and bus structures. These materials and processing technologies will offer significant benefits in weight savings compared with the use of traditional metallic counterparts. Advances in processing technologies will greatly reduce manufacture times and reduce both manufacturing and life cycle costs. ($4,538K)
  - -- (U) Characterize the electroluminescent behavior in ordered polymers to establish their feasibility as a new class of materials suitable for displays in aircraft crew stations.
  - -- (U) Complete and transition the knowledge base for the intelligent processing of a high temperature polymeric matrix composite material (AFR700B) to industry.
  - -- (U) Develop materials processing specification for high modulus, thin gage organic matrix composite materials for use in satellite thermal control and structural applications.
- (U) Develop nonstructural materials (such as fluids, lubricants, seals, greases, and coatings) for improved system performance, reduced toxicity, and reduced life cycle costs. ($2,369K)
  - -- (U) Indentified advanced turbine engine seal materials to be transitioned to the Integrated High Performance Turbine Engine Technology (IHPTET) Phase II engine demonstrators.
  - -- (U) Identify the causes of non-reproducibility in potassium silicate thermal control coatings for satellite thermal control and structural applications.
- (U) Develop affordable lightweight metallic materials that are considerably lighter than conventional aluminum and can withstand higher temperatures than currently available materials. Applications are in lighter aircraft and spacecraft structural components, and in high temperature, high performance engine components. ($5,575K)
  - -- (U) Characterize the mechanical properties of titanium matrix composites for use as an actuator rod for turbine engine exhaust flaps.
  - -- (U) Determine the effects of microstructure and processing on the fracture behavior of an advanced titanium alloy for use in aircraft structural applications.
- (U) Develop ceramic matrix composites and very high temperature metallics to enable revolutionary performance improvements in advanced propulsion systems and high temperature airframe structures. Will also develop improved processes for producing these materials to greatly reduce component costs. ($4,182K)
  - -- (U) Develop new materials and processes for the repair of ceramic matrix composites for use in aircraft and space launch thermal protection and propulsion applications.
  - -- (U) Develop a new class of thermal barrier coatings for turbine engine applications that are so thin that they do not measureably increase the weight of engine components.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE February 1995
BUDGET ACTIVITY **#2, Exploratory Development**	PE NUMBER AND TITLE **PE 0602102F, Materials** — PROJECT NO. **4347**

(U) FY 1996:

- (U) Develop carbon-carbon and thermal protection material technologies to improve operational capability of strategic and tactical systems. These materials offer significant benefits in high temperature shape retention, weight savings, and thermal conductivity properties which will lead to smaller radiators on aerospace systems and lighter and cooler space electronics packages. ($10,160K)
  - -- (U) Demonstrate new nosetip, leading edge, and antenna window materials in extreme environments for advanced reentry vehicles.
  - -- (U) Validate advanced structural and thermal control composites and polymer-based protective coatings in space environments for carbon-carbon satellite and electronic thermal management.
- (U) Develop advanced nonmetallic composite structural materials for aircraft applications including lightweight airframes, control surfaces, aircraft canopies, smart skins, and engine compressor frames and ducts, and for spacecraft applications including lightweight trusses, struts, solar arrays, antenna supports, and bus structures. These materials and processing technologies will offer significant benefits in weight savings compared with the use of traditional metallic counterparts. Advances in processing technologies will greatly reduce manufacture times and reduce both manufacturing and life cycle costs. ($10,745K)
  - -- (U) Demonstrate a low-cost (30% part cost savings) organic matrix composite process for aircraft and turbine engine applications.
  - -- (U) Complete laboratory demonstration of damage tolerant thermoplastic composite technology to secondary structural applications in advanced fighter aircraft.
  - -- (U) Investigate in-flight material fatigue life modeling and prediction for composite aircraft structures.
- (U) Develop nonstructural materials (such as fluids, lubricants, seals, greases, and coatings) for improved system performance, reduced toxicity, and reduced life cycle costs. ($5,718K)
  - -- (U) Complete laboratory demonstration of fire resistant, low temperature hydraulic fluid for all Air Force aircraft.
  - -- (U) Evaluate and demonstrate low solvent content low-observable coatings for aircraft.
- (U) Develop affordable lightweight metallic materials that are considerably lighter than conventional aluminum and can withstand higher temperatures than currently available materials. Applications are in lighter aircraft and spacecraft structural components, and in high temperature, high performance engine components. ($9,155K)
  - -- (U) Complete laboratory demonstration of gamma titanium aluminides for Integrated High Performance Turbine Engine Technology (IHPTET) demonstrator engines for 30% weight savings over superalloys.
  - -- (U) Complete laboratory demonstration of fatigue and stress corrosion resistant, thick, advanced aluminum technology for life extension in aging transport aircraft.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #2, Exploratory Development	PE NUMBER AND TITLE: PE 0602102F, Materials
	PROJECT NO.: 4347

- (U) Develop ceramic matrix composites and very high temperature metallics to enable revolutionary performance improvements in advanced propulsion systems and high temperature airframe structures. Will also develop improved processes for producing these materials to greatly reduce component costs. ($10,140K)
  - -- (U) Evaluate the performance of a ceramic matrix composite for space launch applications.
  - -- (U) Demonstrate microlaminate thermal barrier coatings for superalloys with added 200°F thermal resistance with minimal (less than two percent) weight for turbine engine blades.
  - -- (U) Demonstrate in situ process control of ceramic fiber matrix interface coatings for improved composite strength, toughness, and durability for turbine engine applications.

(U) FY 1997:

- (U) Develop carbon-carbon and thermal protection material technologies to improve operational capability of strategic and tactical systems. These materials offer significant benefits in high temperature shape retention, weight savings, and thermal conductivity properties which will lead to smaller radiators on aerospace systems and lighter and cooler space electronics packages. ($9,993K)
  - -- (U) Demonstrate advanced reentry material validation via ground and flight tests of new nosetip, heatshield, and antenna window materials.
  - -- (U) Develop one step carbon-carbon process for electronic packaging applications in aircraft and spacecraft.
- (U) Develop advanced nonmetallic composite structural materials for aircraft applications including lightweight airframes, control surfaces, aircraft canopies, smart skins, and engine compressor frames and ducts, and for spacecraft applications including lightweight trusses, struts, solar arrays, antenna supports, and bus structures. These materials and processing technologies will offer significant benefits in weight savings compared with the use of traditional metallic counterparts. Advances in processing technologies will greatly reduce manufacture times and reduce both manufacturing and life cycle costs. ($10,570K)
  - -- (U) Publish a composite patch design guide based on spline variation elastic theory for the repair and life extension of aging aircraft.
  - -- (U) Demonstrate the viability of high modulus polymeric composites for lightweight spacecraft structural applications.
- (U) Develop nonstructural materials (such as fluids, lubricants, seals, greases, and coatings) for improved system performance, reduced toxicity, and reduced life cycle costs. ($5,625K)
  - -- (U) Complete laboratory demonstration of polyalphaolefin (PAO)-based coolant with improved temperature stability and dielectric performance to Air Force airborne radar systems.
  - -- (U) Identify advanced lubricants and coating system technologies for application in spacecraft moving mechanical assemblies.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602102F, Materials

PROJECT NO.: 4347

- (U) Develop affordable light-weight metallic materials that are considerably lighter than conventional aluminum and can withstand higher temperatures than currently available materials. Applications are in lighter aircraft and spacecraft structural components, and in high temperature, high performance engine components. ($9,008K)
  - -- (U) Develop high temperature fibers for titanium metal matrix composites for structural applications greater than 1200°F.
  - -- (U) Develop mechanistic life prediction methodologies for superalloys and coated metallics for advanced turbine engine applications.
- (U) Develop ceramic matrix composites and very high temperature metallics to enable revolutionary performance improvements in advanced propulsion systems and high temperature airframe structures. Will also develop improved processes for producing these materials to greatly reduce component costs. ($9,975K)
  - -- (U) Develop low-cost ceramic matrix processes that can reduce the cost of these composites by 40% of today's cost.
  - -- (U) Develop repair materials and processes for low-observable and other ceramic composite structures.

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	0	22,183	22,520	23,023	Cont
Current President's Budget	0	21,337	45,918	45,171	Cont

Change Summary Explanation:

Funding: This project was formed in FY 1995 from the combination of Project 2417, the aluminum and titanium alloy work of Project 2418, Project 2419, Project 2420, and Project 2421. Increase due to additional emphasis on improved manufacturing processes and aging aircraft. Part of Project 06ML, Laboratory Operations, funding incorporated in this project after FY 1995.

Schedule: Not Applicable.

Technical: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE
	February 1995

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT NO.
#2, Exploratory Development	**PE 0602102F, Materials**	**4347**

C. (U) Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0603112F, Advanced Materials for Weapon Systems.
- (U) PE 0603211F, Aerospace Systems.
- (U) PE 0603202F, Aeropropulsion Subsystem Integration.
- (U) PE 0603216F, Aeropropulsion and Power Technology.
- (U) PE 0708011F, Manufacturing Technology.
- (U) DOD Metal Matrix Composite Steering Group.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602102F, Materials

PROJECT NO.: 4348

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 4348, Materials and Processes for Electronics, Optics, and Survivability	0	6,933	13,852	13,626	14,006	14,473	14,732	15,456	Cont	Cont

A. (U) Mission Description and Budget Item Justification: Develops materials and process technologies for optical and electro-optical devices and subsystems for aircraft, missile, and space systems. This project also develops new materials and accompanying processes for protection of aircrews, sensors, aircraft, and space systems from laser threats. Radar modules, microwave devices, infrared (IR) detectors, photonics, and optical processors are used in target detection, data processing, electronic warfare, and communications. The performance of these systems is constrained by the quality and physical characteristics of these materials and their processes. New materials and processes are developed that improve the production quality and rates to develop advanced electronic and optical materials that offer higher operating speeds, greater bandwidth density, improved thermal management, greater sensitivity, and expanded dynamic range. Protection from lasers is dependent upon the wavelength, whether the wavelength is pulsed or continuous, the ability of the enemy to vary the wavelength, as well as the susceptibility of the system. Materials and processes are developed that can withstand the high laser temperature gradients, reject damaging wavelengths, or lower response thresholds, and/or response times.

(U) FY 1994: Not Applicable.

(U) FY 1995:

- (U) Develop new electronic and electromagnetic materials and processes for improved microwave and microelectronic technology for radar, communications, and optical processing systems. Developments will offer lower cost and higher performance systems capable of operating in more demanding thermal, atmospheric, and electromagnetic environments. ($4,536K)
  - -- (U) Demonstrate epitaxial growth processing of silicon carbide semiconductors, making its processing comparable to conventional semiconductor materials.
  - -- (U) Demonstrate motheye anti-reflective treatments on diamond coated IR windows for high mach aircraft infrared windows.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #2, Exploratory Development	PE NUMBER AND TITLE: PE 0602102F, Materials	PROJECT NO.: 4348

- (U) Develop materials and processes to enhance the survivability of aircrews and sensor systems against laser threats. These materials will prevent costly systems losses or damage from laser irradiation. ($2,397K)
  - -- (U) Develop and characterize nonlinear optical materials for use in space-, air-, and ground-based thermal imaging systems and evaluate for use in optical power limiting laser protective devices.
  - -- (U) Demonstrate near-infrared nonlinear absorption in organic material complexes for agile laser protection of night vision systems.

(U) FY 1996:

- (U) Develop new electronic and electromagnetic materials and processes for improved microwave and microelectronic technology for radar, communications, and optical processing systems. Developments will offer lower cost and higher performance systems capable of operating in more demanding thermal, atmospheric, and electromagnetic environments. ($10,450K)
  - -- (U) Demonstrate a semiorganic frequency conversion crystal source for blue laser applications (double transfer rates or storage capabilities of red laser).
  - -- (U) Complete durable long wave infrared (LWIR) window materials effort.
  - -- (U) Demonstrate high temperature microwave electronic materials for uncooled radar and avionic applications.
- (U) Develop materials and processes to enhance the survivability of aircrews and sensor systems against laser threats. These materials will prevent costly systems losses or damage from laser irradiation. ($3,402K)
  - -- (U) Demonstrate a low-energy threshold midwave infrared semiconductor nonlinear absorber for sensor protection.
  - -- (U) Complete laboratory demonstration of first generation switchable hologram materials for application into switchable filters used in visible and near-infrared sensor protection.

(U) FY 1997:

- (U) Develop new electronic and electromagnetic materials and processes for improved microwave and microelectronic technology for radar, communications, and optical processing systems. Developments will offer lower cost and higher performance systems capable of operating in more demanding thermal, atmospheric, and electromagnetic environments. ($10,280K)
  - -- (U) Demonstrate a high temperature superconducting infrared detector material that would not require cryogenic cooling for specialized space applications.
  - -- (U) Develop electronic materials that couple digital and optical data transfer on a single chip.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT NO.
#2, Exploratory Development	PE 0602102F, Materials	4348

- (U) Develop materials and processes to enhance the survivability of aircrews and sensor systems against laser threats. These materials will prevent costly systems losses or damage from laser irradiation. ($3,346K)
  - -- (U) Develop candidate mid infrared, nonlinear materials and evaluate for use in tunable filter technology for laser protection devices.
  - -- (U) Complete laboratory demonstration of first generation, nonlinear organic materials for application into optical power limiters used in visible and near-infrared personnel and sensor protection.

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	0	6,923	7,028	7,185	Cont
Current President's Budget	0	6,933	13,852	13,626	Cont

Change Summary Explanation:

Funding: This project was formed in FY 1995 from the combination of Project 2422, Protective Coatings and Materials, and Project 2423, Electromagnetic Windows and Electronic Materials. Increase due to additional emphasis on improved manufacturing processes and aging aircraft. Part of Project 06ML, Laboratory Operations, funding incorporated in this project after FY 1995.

Schedule: Not Applicable.

Technical: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #2, Exploratory Development	PE NUMBER AND TITLE: PE 0602102F, Materials — PROJECT NO.: 4348

C. (U) Other Program Funding Summary:

(U) Related Activities:
- (U) PE 0603112F, Advanced Materials for Weapon Systems.
- (U) PE 0602204F, Aerospace Avionics.
- (U) PE 0603211F, Aerospace Systems.
- (U) PE 0708011F, Manufacturing Technology.
- (U) Tri-Service Laser Hardening Materials and Structures Group.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602102F, Materials

PROJECT NO.: 4349

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 4349, Materials and Processes Technology for Sustainment	0	10,665	14,764	14,524	14,927	15,426	15,702	16,474	Cont	Cont

A. (U) Mission Description and Budget Item Justification: Develops materials and processes to provide systems and operational support to Air Force mission areas by providing techniques to assure the quality of delivered systems, transitioning more reliable and maintainable materials, establishing capability to detect and characterize performance threatening defects, eliminating the dependency on hazardous and toxic materials in repair and maintenance processes, and providing quick reaction support to the operational commands and repair centers. Non-destructive inspection/evaluation (NDI/E) methods are essential to ensure optimum quality in the design and production of aircraft, spacecraft, propulsion, and missile systems. NDI/E methods are essential to monitor and detect the onset of any service initiated damage and/or deterioration. This project develops techniques that increase the capability and reliability of currently used methods to detect and characterize performance threatening defects in metallic and nonmetallic composite structures.

(U) FY 1994: Not Applicable.

(U) FY 1995:

- (U) Develop NDI/E techniques to evaluate and characterize damage in complex, low-observable materials and structures. Identify NDI/E techniques to inspect the integrity of metal to metal bondlines in aircraft structures. NDI/E capability improvements are essential to ensuring optimum quality in design, manufacture, and maintenance of Air Force aircraft and missile weapon systems. ($2,610K)
  - -- (U) Develop NDI/E techniques to evaluate the electrical properties of composite, low-observable structures.
  - -- (U) Demonstrate a high energy tomoscope, which gives electron microscope images of solids similar to x-ray images derived from computed tomography.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #2, Exploratory Development	PE NUMBER AND TITLE: PE 0602102F, Materials	PROJECT NO.: 4349

- (U) Develop support capabilities, information, and processes to resolve problems in the use of materials and processes or in conducting failure analysis of components. Develop a materials database for transition of metal matrix composites to aerospace systems. Maintain a handbook on materials and processes guidelines for composite patching of aircraft structures. Design allowables developed for thin gage titanium alloy castings. ($8,055K)
  - -- (U) Develop statistically derived allowables, and some related typical values, of metallic materials and elements for aerospace vehicle structures (MIL-HDBK-5).
  - -- (U) Determine composite repair techniques for large area structures on advanced bombers.

(U) FY 1996:

- (U) Develop non-destructive inspection/evaluation (NDI/E) techniques to evaluate and characterize damage in complex, low-observable materials and structures. Identify NDI/E techniques to inspect the integrity of metal to metal bondlines in aircraft structures. NDI/E capability improvements are essential to ensuring optimum quality in design, manufacture, and maintenance of Air Force aircraft and missile weapon systems. ($5,166K)
  - -- (U) Demonstrate corrosion characterization techniques for the inspection of transport and refueling aircraft.
- (U) Develop support capabilities, information, and processes to resolve problems in the use of materials and processes or in conducting failure analysis of components. Develop a materials database for transition of metal matrix composites to aerospace systems. Maintain a handbook on materials and processes guidelines for composite patching of aircraft structures. Design allowables developed for thin gage titanium alloy castings. ($9,598K)
  - -- (U) Develop advanced surface cleaning and surface preparation for removal of aircraft paints.
  - -- (U) Develop advanced heat blanket repair concept for large area (greater than 10 square feet) composite patches.

(U) FY 1997:

- (U) Develop NDI/E techniques to evaluate and characterize damage in complex, low-observable materials and structures. Identify NDI/E techniques to inspect the integrity of metal to metal bondlines in aircraft structures. NDI/E capability improvements are essential to ensuring optimum quality in design, manufacture, and maintenance of Air Force aircraft and missile weapon systems. ($5,082K)
  - -- (U) Develop non-destructive inspection techniques for the evaluation of advanced fighter and bomber low-observable materials and structures.
- (U) Develop support capabilities, information, and processes to resolve problems in the use of materials and processes or in conducting failure analysis of components. Develop a materials database for transition of metal matrix composites to aerospace systems. Maintain a handbook on materials and processes guidelines for composite patching of aircraft structures. Design allowables developed for thin gage titanium alloy castings. ($9,442K)
  - -- (U) Demonstrate an advanced non-chromated surface treatment for aircraft structural materials.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT NO.
#2, Exploratory Development	PE 0602102F, Materials	4349

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	0	9,874	10,024	10,248	Cont
Current President's Budget	0	10,665	14,764	14,524	Cont

Change Summary Explanation:

Funding: This project was formed in FY 1995 from the non-destructive inspection/evaluation (NDI/E) plus system design engineering and mechanical behavior of metallic/non-metallic structural materials work of Project 2418, Metallic Structural Materials. Increase due to additional emphasis on improved manufacturing processes and aging aircraft. Part of Project 06ML, Laboratory Operations, funding incorporated in this project after FY 1995.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0603112F, Advanced Materials for Weapons Systems.
- (U) PE 0603211F, Aerospace Structures.
- (U) PE 0603211F, Aerospace Systems.
- (U) PE 0708011F, Manufacturing Technology.
- (U) Office of Science and Technology Committee on Materials Working Group on Non-Destructive Materials.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602201F, Aerospace Flight Dynamics

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Total PE 0602201F Cost	59,033	59,715	66,268	64,254	65,991	68,012	70,238	71,956	Cont	Cont
Project 06FF, Directorate Operations	35,138	35,958	0	0	0	0	0	0	Cont	Cont
Project 2401, Structures	5,603	6,129	16,397	15,927	16,369	16,877	17,499	17,872	Cont	Cont
Project 2402, Vehicle Equipment	4,681	4,371	11,694	11,359	11,674	12,036	12,480	12,746	Cont	Cont
Project 2403, Flight Control	7,527	7,603	20,336	19,755	20,303	20,932	21,703	22,167	Cont	Cont
Project 2404, Aeromechanics	6,084	5,654	15,626	15,192	15,100	15,569	16,142	16,487	Cont	Cont
Project 4397, Air Base Technology	0	0	2,215	2,021	2,545	2,598	2,414	2,684	Cont	Cont

A. (U) Mission Description and Budget Item Justification: This Exploratory Development program develops the air vehicle technology base in aeromechanics, structures, flight control, cockpits, vehicle subsystems, and air base operability to reduce life cycle costs and improve performance of existing and future air vehicles and air bases. These air vehicle technology programs offer: increased reliability, maintainability, and supportability for air vehicles, subsystems, and air base operability; in all-weather, day/night operations; and with distributed simulation. FY 1996 program funding increase is due to programs in support of the Air Force Aging Aircraft initiative and the shift of Air Base Technology, now Project 4397 from PE 0602206F, Project 2673. Starting in FY 1996, separate infrastructure projects have been eliminated. All efforts in this program element contain the resources necessary, including civilian salaries, to manage, conduct, and document the technical activities.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602201F, Aerospace Flight Dynamics

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	59,405	64,046	65,387	67,067	Cont
Appropriated Value	59,738	60,946			
Adjustments to Appropriated Value:					
a. Congressional General Reductions	-334	-1,231			
b. SBIR	-371				
Current President's Budget	59,033	59,715	66,268	64,254	Cont

Change Summary Explanation:

Funding: Changes due to assumption of air base technology efforts previously conducted under PE 0602206F, Project 2673, starting in FY 1996 and continuing.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary: Not Applicable.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602201F, Aerospace Flight Dynamics

PROJECT NO.: 06FF

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 06FF, Directorate Operations	35,138	35,958	0	0	0	0	0	0	Cont	Cont

A. (U) Mission Description and Budget Item Justification: 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.

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	37,317	37,891	36,396	34,966	Cont
Current President's Budget	35,138	35,958	0	0	Cont

Change Summary Explanation:

Funding: Changes due to redistribution of this project into the technical projects beginning in FY 1996.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary: Not Applicable.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602201F, Aerospace Flight Dynamics

PROJECT NO.: 2401

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 2401, Structures	5,603	6,129	16,397	15,927	16,369	16,877	17,499	17,872	Cont	Cont

A. (U) Mission Description and Budget Item Justification: This project develops more supportable and survivable aircraft structures technologies, investigates new structural concepts and design techniques which exploit new materials and fabrication processes to strengthen air vehicle structures while reducing weight and cost; and develops "smart" structures that will have embedded sensors to report stress, fatigue, and/or battle damage, leading to improved maintainability.

(U) FY 1994:
- (U) Continued to develop advanced metallic and composite structural concepts and design techniques for air vehicles. ($3,090K)
  - -- (U) Developed high-temperature dynamic strain measurement techniques and evaluated high-temperature strain gauges necessary to measure and evaluate structural integrity of exhaust washed structures and/or high speed air vehicles.
  - -- (U) Successfully embedded fiber optics in organic composite laminates to monitor life and assess battle damage of air vehicles.
- (U) Continued to develop structural life enhancement methods to ensure the integrity of both metallic and composite repairs. ($2,513K)
  - -- (U) Determined risk of failure of C-141 wing components with new risk analysis software to enhance the structural life of aging air vehicles.
  - -- (U) Developed deterministic crack growth prediction method for air vehicles so that our fleet may overfly current structural replacement requirements.

(U) FY 1995:
- (U) Develop advanced metallic and composite structural concepts and design techniques for air vehicles. ($3,840K)
  - -- (U) Develop analytical designs for active vibration control, via piezoelectric damping layers, for increased aircraft longevity.
  - -- (U) Develop aircraft health monitoring sensor capability to reduce maintenance and aid reconfiguration in the event of battle damage.
  - -- (U) Release the Automated Structural Optimization System (v.12) to the Navy and industry for aircraft design optimization.
- (U) Develop structural life enhancement methods to ensure the structural integrity of both metallic and composite repairs. ($2,289K)
  - -- (U) Fatigue test a micro-channel heat exchanger for exhaust washed structures to more efficiently cool high-temperature structures.
  - -- (U) Develop a PC-based risk analysis model for aging aircraft life extension.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #2, Exploratory Development	PE NUMBER AND TITLE: PE 0602201F, Aerospace Flight Dynamics — PROJECT NO.: 2401

(U) FY 1996:
- (U) Develop advanced metallic and composite structural concepts and design techniques for air vehicles. ($6,559K)
  - -- (U) Validate multidisciplinary maneuver-load control design methodology to reduce fighter aircraft gross weight.
  - -- (U) Demonstrate in wind tunnels "smart stiffness" approaches to maneuver flight vehicles by means of wing warping, without conventional separate control surfaces, to reduce aircraft weight, drag, and radar signature.
- (U) Develop structural life enhancement methods to ensure the structural integrity of metallic and composite structures and repairs. ($9,838K)
  - -- (U) Develop corrosion sensors to reduce the number, cost, and time of inspections for corrosion and to improve reliability.
  - -- (U) Develop multiple-site damage analysis techniques for predicting and controlling widespread fatigue damage.
  - -- (U) Develop improved computational aeroelasticity methods to enable active aeroelastic wing for improved maneuverability.

(U) FY 1997:
- (U) Develop advanced metallic and composite structural concepts and design techniques for air vehicles. ($11,308K)
  - -- (U) Develop fatique and fracture analysis techniques to include the effects of special aircraft environments to extend their lifetime, reduce required inspections, and improve repair characteristics.
  - -- (U) Complete an evaluation of an aircraft life enhancement technique by laser shock processing for metallic structures.
- (U) Develop structural life enhancement methods to ensure the structural integrity of both metallic and composite repairs. ($4,619K)
  - -- (U) Apply multidisciplinary maneuver load control designs to demonstrate 10 percent gross weight reduction in fighter aircraft.
  - -- (U) Ground test a "smart stiffness" wing with active warping for maneuver without conventional control surfaces to reduce aircraft weight, drag, and radar signature.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602201F, Aerospace Flight Dynamics

PROJECT NO.: 2401

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	5,699	6,619	7,351	8,282	Cont
Current President's Budget	5,603	6,129	16,397	15,927	Cont

Change Summary Explanation:

Funding: Changes due to consolidation of a portion of Project 06FF into this project beginning in FY 1996.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0602102F, Materials.
- (U) PE 0602269F, Hypersonic Technology Development.
- (U) PE 0603211F, Aerospace Structures.
- (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.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602201F, Aerospace Flight Dynamics

PROJECT NO.: 2402

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 2402, Vehicle Equipment	4,681	4,371	11,694	11,359	11,674	12,036	12,480	12,746	Cont	Cont

A. (U) Mission Description and Budget Item Justification: This project develops technologies to reduce subsystem and component life cycle costs, improve vehicle/crew member survival in operational environments, and improve subsystem performance for current and future flight vehicles.

(U) FY 1994:

- (U) Demonstrated technologies that increase performance, supportability, and affordability of air vehicle subsystems. ($3,324K)
  - -- (U) Designed a microencapsulated phase change materials liquid cooling loop for aircraft application.
  - -- (U) Verified an analytical design package on aircraft frameless transparencies that will increase the survivability of bird strike impacts.
  - -- (U) Developed and demonstrated a ballistic winds dropsonde using global positioning satellite receivers to improve accuracy of air-dropped cargo.
- (U) Developed and demonstrated technologies that increase air vehicle/crew member survivability and safety. ($1,357K)
  - -- (U) Developed a computational fluid dynamics model to predict Advanced Concept Ejection Seat (ACES-II) ejection seat trajectory for use in high-speed and light-weight pilot ejections.

(U) FY 1995:

- (U) Demonstrate technologies that increase performance, supportability, and affordability of air vehicle subsystems. ($3,365K)
  - -- (U) Test a microencapsulated phase change material liquid cooling loop for aircraft applications.
  - -- (U) Complete analysis and design of aircraft transparency coupon durability test methods for increased maintainability and survivability.
  - -- (U) Establish relationship between polycarbonate aging mechanisms and thermal and mechanical load histories.
  - - (U) Identify aircraft release separation improvements for high altitude precision air drop.
- (U) Develop and demonstrate technologies that increase air vehicle/crew member survivability and safety. ($1,006K)
  - -- (U) Evaluate ACES-II ejection seat stability concepts for enhanced stability of high-speed and light-weight pilot ejections.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #2, Exploratory Development	PE NUMBER AND TITLE: PE 0602201F, Aerospace Flight Dynamics — PROJECT NO.: 2402

(U) FY 1996:
- (U) Demonstrate technologies that increase performance, supportability, and affordability of air vehicle subsystems. ($8,595K)
  - -- (U) Demonstrate ability to convert aircraft waste heat into useful power using catalytic chemical reactors for increased aircraft performance.
  - -- (U) Conduct studies on aircraft transparency static discharge measurements to improve resistance to lightning strikes.
  - -- (U) Develop design criteria for the next generation aircraft transparency to demonstrate improved reliability and reduced logistics support.
  - -- (U) Determine conceptual design to compute air release point for high altitude precision air drop.
- (U) Develop and demonstrate technologies that increase air vehicle/crew member survivability and safety. ($3,099K)
  - -- (U) Demonstrate high speed ejection seat computational fluid dynamics (CFD) model to improve crew member/ejection seat stability during high speed ejections.
  - -- (U) Develop initial concepts for active stability ejection seat platform concepts to increase the safe ejection envelope of current ejection seats.

(U) FY 1997:
- (U) Demonstrate technologies that increase performance, supportability, and affordability of air vehicle subsystems. ($8,405K)
  - -- (U) Develop initial concepts to integrate aircraft waste heat conversion capability and distributed electronic cooling for increased aircraft performance.
  - -- (U) Define requirements to implement a systems engineering capability to model, simulate, and assess critical interaction among aircraft subsystems.
  - -- (U) Fabricate next generation aircraft transparency demonstration articles.
- (U) Develop and demonstrate technologies that increase air vehicle/crew member survivability and safety (i.e., increase the safe ejection envelope and/or accomodate pilots whose size and/or weight is outside existing seat parameters). ($2,954K)
  - -- (U) Complete flight CFD for aircraft ejection seats to improve crew member/ejection seat stability during high speed ejections.
  - -- (U) Validate active stability ejection seat platform concepts to increase the safe ejection envelope of current ejection seats.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT NO.
#2, Exploratory Development	PE 0602201F, Aerospace Flight Dynamics	2402

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	4,064	4,720	5,242	5,907	Cont
Current President's Budget	4,681	4,371	11,694	11,359	Cont

Change Summary Explanation:

Funding: Changes due to consolidation of a portion of Project 06FF into this project beginning in FY 1996.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0602202F, Human Systems Technology.
- (U) PE 0603106F, Logistics System Technology.
- (U) PE 0603205F, Flight Vehicle Component and Subsystem Technologies.
- (U) PE 0603231F, Crew Systems and Personnel Protection Technology.
- (U) PE 0603245F, Flight Vehicle Technology Integration.
- (U) PE 0604212F, Aircraft Equipment Development.
- (U) PE 0604609F, Reliability and Maintainability Technology Insertion Program.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602201F, Aerospace Flight Dynamics

PROJECT NO.: 2403

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 2403, Flight Control	7,527	7,603	20,336	19,755	20,303	20,932	21,703	22,167	Cont	Cont

A. (U) Mission Description and Budget Item Justification: This project develops technology to enable the pilot to obtain maximum performance from the aircraft under all conditions, 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, provide robust capability to control aircraft after damage and failures, and network synthetic environments for simulation evaluation of advanced concepts.

(U) FY 1994:

- (U) Continued to develop and demonstrate advanced flight control concepts to provide a combat advantage for 21st century aircraft by increasing performance and survivability while decreasing cost and supportability requirements. ($5,324K)
  - -- (U) Developed and distributed robust multivariable control theory draft design guidelines for Navy, NASA, industry, and universities evaluation.
  - -- (U) Designed, fabricated, and integrated the control electronics of an Electro-Hydrostatic Actuator (EHA) with self-contained miniaturized control and power electronics including an active closed-loop cooling unit integral to the actuator.
  - -- (U) Designed, fabricated, and tested a simple actuator (Pulse Width Modulated Popet Valve Design) with loop closure control electronics.
- (U) Continued to develop and demonstrate technologies for improved situational awareness and supportability of current and future aircraft cockpits. ($2,203K)
  - -- (U) Demonstrated the feasibility and applicability of synthetic terrain imagery for helmet mounted displays for improved situational awareness.

(U) FY 1995:

- (U) Develop and demonstrate advanced flight control concepts to provide a combat advantage for 21st century aircraft by increasing performance and survivability while decreasing cost and supportability requirements. ($6,006K)
  - -- (U) Develop and verify the Standard Evaluation Maneuver Set (STEMS) for flying qualities on military aircraft.
  - -- (U) Demonstrate applicability of alternative aerodynamic control effectors for reduced/no vertical rudder configurations.
  - -- (U) Conduct engineering flight simulations to support flying quality analysis techniques development.
  - -- (U) Conduct loaded test of an advanced rotary actuator for primary control surfaces on aircraft with very thin wings.
- (U) Develop and demonstrate technologies for improved situational awareness and supportability of current and future aircraft cockpits. ($1,597K)
  - -- (U) Develop and test two-dimensional audio cueing and helmet-mounted symbology to reduce the amount of time required to visually detect and identify airborne threats.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #2, Exploratory Development	PE NUMBER AND TITLE: PE 0602201F, Aerospace Flight Dynamics — PROJECT NO.: 2403

(U) FY 1996:

- (U) Develop and demonstrate advanced flight control concepts to provide a combat advantage for 21st century aircraft by increasing performance and survivability while decreasing cost and supportability requirements. ($17,692K)
  - -- (U) Test innovative combinations of control effectors (e.g., pop-up controls, differential wingtip controls, pneumatic controls) that provide safe and effective control for air vehicles to realize signature and affordability benefits.
  - -- (U) Develop comprehensive design criteria for the prevention of pilot induced oscillation phenomena.
  - -- (U) Formulate a fault tolerant architecture for managing all flight-critical control-of-flight functions on a fixed wing vehicle.
- (U) Develop and demonstrate technologies for improved situational awareness and supportability of current and future aircraft cockpits. ($2,644K)
  - -- (U) Conduct pilot-in-the-loop testing of new symbology and cockpit presentation concepts to permit exploitation of sensor fusion techniques.
  - -- (U) Develop initial concepts for information fusion techniques to enable a pilot to exploit off-board intelligence data.
  - -- (U) Complete preliminary design of two-person large cockpit concepts to reduce crew size and life-cycle costs.

(U) FY 1997:

- (U) Develop and demonstrate advanced flight control concepts to provide a combat advantage for 21st century aircraft by increasing performance and survivability while decreasing cost and supportability requirements. ($16,989K)
  - -- (U) Develop multiple objective, optimized control law techniques to maximize aircraft performance while minimizing its electronic signature.
  - -- (U) Develop network simulation technology to assess air combat aiding systems.
  - -- (U) Conduct loaded tests of advanced actuator concepts that are simpler, lighter, and lower cost than conventional flight control actuators.
- (U) Develop and demonstrate technologies for improved situational awareness and supportability of current and future aircraft cockpits. ($2,766K)
  - -- (U) Conduct pilot-in-the-loop testing of new symbology and cockpit presentation concepts to permit exploitation of sensor fusion techniques.
  - -- (U) Conduct pilot-in-the-loop testing of information fusion techniques to enable pilot exploitation of off-board intelligence data.
  - -- (U) Conduct pilot-in-the-loop testing of two-person large aircraft cockpit concept to reduce crew size and life cycle costs.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602201F, Aerospace Flight Dynamics

PROJECT NO.: 2403

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	7,068	8,210	9,117	10,272	Cont
Current President's Budget	7,527	7,603	20,336	19,755	Cont

Change Summary Explanation:

Funding: Changes due to consolidation of a portion of Project 06FF into this project beginning in FY 1996.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0602202F, Human Systems technology.
- (U) PE 0602204F, Aerospace Avionics.
- (U) PE 0603205F, Flight Vehicle Component and Subsystems Technology.
- (U) PE 0603245F, Flight Vehicle Technology Integration.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602201F, Aerospace Flight Dynamics

PROJECT NO.: 2404

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 2404, Aeromechanics	6,084	5,654	15,626	15,192	15,100	15,569	16,142	16,487	Cont	Cont

A. (U) Mission Description and Budget Item Justification: This project develops aerodynamic design integration technologies for current and future flight vehicles, focusing on speed regimes ranging from low to high Mach. These technologies have potential to reduce cost, improve range to yield enhanced global force projection, improve maneuverability, and reduce observability.

(U) FY 1994:
- (U) Continued to develop and demonstrate affordable technologies to increase aerodynamic performance and survivability through reduced drag, improved fuel fraction, enhanced maneuverability and control, and reduced signature. ($3,940K)
  - -- (U) Completed thrust vectoring nozzle model hardware to demonstrate reduced signature and enhanced maneuvering.
- (U) Continued to develop and demonstrate technologies for a more efficient design cycle in the acquisition process through an integrated systems approach. ($2,144K)
  - -- (U) Completed data base of current aircraft to enable quick reaction responses with emerging computational fluid dynamics analysis techniques to user problems.

(U) FY 1995:
- (U) Develop and demonstrate affordable technologies to increase aerodynamic performance and survivability through reduced drag, improved fuel fraction, enhanced maneuverability and control, and reduced signature. ($3,505K)
  - -- (U) Investigate advanced low-cost, compact inlets to increase fuel fraction (increase range).
  - -- (U) Develop high payoff aerodynamic concepts for affordable, survivable transport aircraft.
  - -- (U) Develop concepts for increased aerodynamic efficient air vehicles to increase range.
- (U) Develop and demonstrate technologies for a more efficient design cycle in the acquisition process through an integrated systems approach. ($2,149K)
  - -- (U) Develop concepts for Computational Fluid Dynamics (CFD) design optimization code for aircraft performance and survivability.
  - -- (U) Complete improved preliminary design aerodynamic prediction methods for advanced flight vehicles.
  - -- (U) Develop aerostructural CFD code for aging aircraft and design optimization for advanced flight vehicles.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #2, Exploratory Development	PE NUMBER AND TITLE: PE 0602201F, Aerospace Flight Dynamics — PROJECT NO.: 2404

(U) FY 1996:
- (U) Develop and demonstrate affordable technologies to increase aerodynamic performance and survivability through reduced drag, improved fuel fraction, enhanced maneuverability and control, and reduced signature. ($10,157K)
  - -- (U) Complete advanced low-cost, compact inlet to increase aircraft fuel fraction (i.e., increase range).
  - -- (U) Investigate low-drag/low observable external weapons integration for reduced drag and signature.
  - -- (U) Investigate advanced fluidic nozzle designs for low-cost and reduced signature thrust vectoring nozzle.
  - -- (U) Investigate increased aerodynamic efficiency fighter designs to extend combat range.
- (U) Develop and demonstrate technologies for a more efficient design cycle in the acquisition process through an integrated systems approach. ($5,469K)
  - -- (U) Develop new concepts for computational fluid dynamics (CFD) design optimiztion code for aircraft performance and survivability.
  - -- (U) Investigate aerostructural CFD code for aging aircraft and design optimization of advanced flight vehicles.

(U) FY 1997:
- (U) Develop and demonstrate affordable technologies to increase aerodynamic performance and survivability through reduced drag, improved fuel fraction, enhanced maneuverability and control, and reduced signature. ($9,875K)
  - -- (U) Complete advanced fluidic nozzle development for low cost, reduced signature, thrust vectoring nozzle.
  - -- (U) Complete high payoff aerodynamic concepts for affordable, survivable transport aircraft.
  - -- (U) Investigate increased aerodynamic efficient fighter aircraft to extend combat range.
  - -- (U) Investigate aft body/nozzle reduced aeroacoustics for reduced nozzle life cycle costs.
- (U) Develop and demonstrate technologies for a more efficient design cycle in the acquisition process through an integrated systems approach. ($5,317K)
  - -- (U) Complete CFD design optimization code for aircraft performance and survivability.
  - -- (U) Investigate aerostructural CFD code for aging aircraft and design optimization of advanced flight vehicles.
  - -- (U) Develop a low signature computational electromagnetic code for design of highly survivable advanced aircraft.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602201F, Aerospace Flight Dynamics

PROJECT NO.: 2404

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	5,257	6,606	7,281	7,640	Cont
Current President's Budget	6,084	5,654	15,626	15,192	Cont

Change Summary Explanation:

Funding: Changes due to consolidation of a portion of Project 06FF into this project beginning in FY 1996.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0603205F, Flight Vehicle Component and Subsystem Technologies.
- (U) PE 0602260F, Hypersonic Technology Development.
- (U) PE 0603245F, Flight Vehicle Technology Integration.
- (U) This project has been coordinated through the Project Reliance Process to harmonize efforts and eliminate duplication.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602201F, Aerospace Flight Dynamics

PROJECT NO.: 4397

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 4397, Air Base Technology	0	0	2,215	2,021	2,545	2,598	2,414	2,684	Cont	Cont

A. (U) Mission Description and Budget Item Justification: This project develops technologies for fixed and bare base operations, including airfield pavements, energy systems, automation, air base survivability, air base recovery, protective systems, fire protection, and crash rescue. This project assumes the efforts started under PE 0602206F, Project 2673. This project supports the DOD Energy Program Memorandum (DEPPM) 91-2 to reduce energy usage and will reduce operations and maintenance (O&M) costs.

(U) FY 1994: Not Applicable.

(U) FY 1995: Not Applicable.

(U) FY 1996:

- (U) Develop and demonstrate design criteria for improved bare-base/fixed-site applications (e.g., power and environmental utilities, survivable air base structures, and durable/repairable airfield surfaces). ($1,435K)
  - -- (U) Develop a computerized system to monitor and control utility system performance, detect system degradation, determine its cause, and predict future maintenance.
  - -- (U) Develop a concept for converting Air Force base waste streams into useful energy to reduce landfill needs, decrease sanitation and site cleanup problems, and reduce energy expenses.
  - -- (U) Develop lightweight composite deployable shelters increase readiness and reduce airlift requirements.
- (U) Develop aircraft/air base fire-fighting technologies (e.g., clean, environmentally-safe fire-fighting agents, vehicles, equipment, personnel protective clothing, fire risk assessment techniques, and firefighter training systems). ($780K)
  - -- (U) Complete development of an environmentally acceptable (biodegradable and non-toxic) Aqueous Film Forming Foam (AFFF), a replacement agent for Halon.
  - -- (U) Develop technologies for improved fire fighting agents, equipment, and techniques to fight large frame aircraft fires, including interior and flowing fuel fires.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #2, Exploratory Development	PE NUMBER AND TITLE: PE 0602201F, Aerospace Flight Dynamics — PROJECT NO.: 4397

(U) FY 1997:

- (U) Develop and demonstrate design criteria for improved bare-base/fixed-site applications (e.g., power and environmental utilities, survivable air base structures, and durable/repairable airfield surfaces). ($1,641K)
  - -- (U) Complete preliminary design of a computerized predictive maintenance system for airbase utility systems.
  - -- (U) Conduct bench tests of concepts to convert waste into energy sources for fixed base applications.
  - -- (U) Develop contingency systems for use of in-theater materials to construct protective shelters at 25-30 percent reduction in costs.
- (U) Develop aircraft/air base fire-fighting technologies (e.g., clean, environmentally-safe fire-fighting agents, vehicles, equipment, personnel protective clothing, fire risk assessment techniques, and firefighter training systems). ($380K)
  - -- (U) Complete feasibility demonstration of improved fire fighting agents, equipment, and techniques to fight large frame aircraft fires to include interior and flowing fuel fires.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602201F, Aerospace Flight Dynamics

PROJECT NO.: 4397

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	0	0	0	0	0
Current President's Budget	0	0	2,215	2,021	Cont

Change Summary Explanation:

Funding: This project assumes responsibility for air base technology efforts previously performed in PE 0602206F, Project 2673. This project also includes a portion of Project 06FF funds beginning in FY 1996.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0602206F, Civil Engineering and Environmental Quality.
- (U) PE 0603205F, Flight Vehicle Subsystem and Component Technologies.
- (U) PE 0603231F, Crew Systems and Personnel Protection Technology
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.
- (U) PE 0603307F, Air Base Operability Advanced Development.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: **February 1995**

BUDGET ACTIVITY: **#2, Exploratory Development**

PE NUMBER AND TITLE: **PE 0602202F, Human Systems Technology**

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Total PE 0602202F Cost	78,947	86,665	90,311	87,841	89,289	90,387	93,378	96,517	Cont	Cont
Project 06ED, Laboratory Operations	1,977	1,920	-0-	-0-	-0-	-0-	-0-	-0-	Cont	Cont
Project 06HT, Laboratory Operations	10,243	11,638	-0-	-0-	-0-	-0-	-0-	-0-	Cont	Cont
Project 06MD, Laboratory Operations	28,360	28,162	-0-	-0-	-0-	-0-	-0-	-0-	Cont	Cont
Project 1121, Training Development and Assessment Technology	3,573	3,230	-0-	-0-	-0-	-0-	-0-	-0-	Cont	Cont
Project 1123, Manpower, Personnel, and Training Technology	6,405	11,403	23,105	20,751	20,615	21,456	21,381	22,152	Cont	Cont
Project 1710, Logistics Technology	3,156	4,124	6,570	5,808	5,682	6,011	5,964	6,126	Cont	Cont
Project 1900, Environmental Technology	1,805	2,354	10,691	10,504	11,662	12,876	15,911	16,361	Cont	Cont
Project 2673, Air Base Operability Technology	1,933	2,138	-0-	-0-	-0-	-0-	-0-	-0-	Cont	Cont
Project 6302, Occupational and Environmental Toxic Hazards in Air Force Operations	2,301	2,200	-0-	-0-	-0-	-0-	-0-	-0-	Cont	Cont
Project 6770, Human Technology Studies in Advanced Systems	630	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	TBD
Project 6893, Manned Weapon System Effectiveness	694	629	-0-	-0-	-0-	-0-	-0-	-0-	Cont	Cont
Project 7184, Crew Technology	4,415	5,676	27,397	27,428	28,051	27,104	26,959	28,251	Cont	Cont

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: **February 1995**

BUDGET ACTIVITY: **#2, Exploratory Development**

PE NUMBER AND TITLE: **PE 0602202F, Human Systems Technology**

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 7231, Safety and Aircrew Effectiveness in Mechanical Force Environments	2,097	2,532	-0-	-0-	-0-	-0-	-0-	-0-	Cont	Cont
Project 7719, Force Acquisition and Distribution Technology	2,854	2,702	-0-	-0-	-0-	-0-	-0-	-0-	Cont	Cont
Project 7755, Human Biodynamics and Physiology	1,260	1,129	7,824	7,508	7,736	7,664	7,740	7,881	Cont	Cont
Project 7757, Toxicology/Radiation Hazards	5,215	4,612	14,724	15,842	15,543	15,276	15,423	15,746	Cont	Cont
Project 7930, Advanced Crew Technology	2,029	2,216	-0-	-0-	-0-	-0-	-0-	-0-	Cont	Cont

Note 1: Beginning in FY 1996, the three Exploratory Development PEs at Armstrong Laboratory (PE 0602202F, Human Systems Technology (Projects 06MD, 6302, 6893, 7184, 7231, 7755, 7757, and 7930); PE 0602205F, Personnel, Training, and Simulation (Projects 06HT, 1121, 1123, 1710, and 7719); and PE 0602206F, Civil Engineering and Environmental Quality (Projects 06ED, 1900, and 2673)) have been combined into PE 0602202F. The total PE costs for FY 1994 and FY 1995 reflect this consolidation. In addition, beginning in FY 1996, the three 06 accounts for laboratory operations (Projects 06ED, 06HT, and 06MD) have been redistributed into the technical projects. Also, beginning in FY 1996, Project 2673, Air Base Operability Technology, transfers from PE 0602206F to the Wright Laboratory PE 0602201F, Aerospace Flight Dynamics. All efforts in this program element contain the resources necessary, including civilian salaries, to manage, conduct, and document the technical activities.

Note 2: There are no new starts in this Program Element. Starting in FY 1996, Projects 1123, 7184, and 7757 reflect title changes and incorporation of work previously reported as follows:
Project 1123: Title Change to: Manpower, Personnel, and Training Technology. Starting in FY 1996, this project incorporates work from Projects 1121 and 7719.
Project 7184: Title Change to: Crew Technology. Starting in FY 1996, this project incorporates work from Projects 6893, a portion of 7231, and 7930.
Project 7757: Title Change to: Toxicology/Radiation Hazards. Starting in FY 1996, this project incorporates work from Project 6302 and a portion of 7231.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: **#2, Exploratory Development**

PE NUMBER AND TITLE: **PE 0602202F, Human Systems Technology**

A. (U) Mission Description and Budget Item Justification: This Exploratory Development program establishes technology feasibility and develops the technology base for Air Force human interface needs required for weapon systems, operational readiness, and environmental quality. The program addresses six key areas: crew systems; human resources; aerospace biodynamic investigation; occupational and environmental safety; environmental compliance; and site remediation.

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	81,880	89,411	89,097	90,500	Cont
Appropriated Value	82,339	88,550			
Adjustments to Appropriated Value					
a. Congressional General Reductions	-459	-1,885			
b. SBIR	-510				
c. Omnibus Reprogramming	-1,900				
d. Below Threshold Reprogramming	-523				
Current Budget Submit/President's Budget	78,947	86,665	90,311	87,841	Cont

Change Summary Explanation:

Funding: Changes due to increased emphasis on aircrew training technologies, technologies to support aging aircraft, and crew escape technologies.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary: Not Applicable.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: **February 1995**

BUDGET ACTIVITY: **#2, Exploratory Development**

PE NUMBER AND TITLE: **PE 0602202F, Human Systems Technology**

PROJECT NO.: **06ED**

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 06ED, Laboratory Operations	1,977	1,920	-0-	-0-	-0-	-0-	-0-	-0-	Cont	Cont

A. (U) Mission Description and Budget Item Justification: This project complements all other projects in this program element by providing for the management, support, and operations of the Armstrong and Wright Laboratories located at Tyndall AFB, FL. It provides for: the pay and related costs of civilian scientists, engineers, and support personnel; travel; transportation of equipment; rents; communications; utilities; laboratory supplies; unique equipment; and related costs.

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	2,177	2,420	2,501	2,259	Cont
Current Budget Submit/President's Budget	1,977	1,920	-0-	-0-	Cont

Change Summary Explanation:

Funding: Changes due to redistribution of the three 06 accounts for laboratory operations (Projects 06ED, 06HT, and 06MD) into the technical projects beginning in FY 1996.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary: Not Applicable.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: **February 1995**

BUDGET ACTIVITY: **#2, Exploratory Development**

PE NUMBER AND TITLE: **PE 0602202F, Human Systems Technology**

PROJECT NO.: **06HT**

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 06HT, Laboratory Operations	10,243	11,638	-0-	-0-	-0-	-0-	-0-	-0-	Cont	Cont

A. (U) Mission Description and Budget Item Justification: This project provides for the management, support, and operations of the Human Resources Directorate of the Armstrong Laboratory. This Directorate has elements at: Brooks AFB, TX; Wright-Patterson AFB, OH; and Mesa, AZ. It provides for: the pay and related costs of civilian scientists, engineers, and support personnel; travel; transportation of equipment; rents; communications; utilities; laboratory supplies; unique equipment; and contractor support services.

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	10,964	10,948	10,774	10,744	Cont
Current Budget Submit/President's Budget	10,243	11,638	-0-	-0-	Cont

Change Summary Explanation:

Funding: Changes due to redistribution of the three 06 accounts for laboratory operations (Projects 06ED, 06HT, and 06MD) into the technical projects beginning in FY 1996.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary: Not Applicable.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: **February 1995**

BUDGET ACTIVITY: **#2, Exploratory Development**

PE NUMBER AND TITLE: **PE 0602202F, Human Systems Technology**

PROJECT NO.: **06MD**

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 06MD, Laboratory Operations	28,360	28,162	-0-	-0-	-0-	-0-	-0-	-0-	Cont	Cont

A. (U) Mission Description and Budget Item Justification: This project provides for the management, support, and operations 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 scientists, engineers, and support personnel; travel; transportation of equipment; rents; communications; utilities; laboratory supplies; unique equipment; and related costs.

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	27,621	28,299	28,443	26,805	Cont
Current Budget Submit/President's Budget	28,360	28,162	-0-	-0-	Cont

Change Summary Explanation:

Funding: Changes due to redistribution of the three 06 accounts for laboratory operations (Projects 06ED, 06HT, and 06MD) into the technical projects beginning in FY 1996.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary: Not Applicable.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602202F, Human Systems Technology

PROJECT NO.: 1121

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 1121, Training Development and Assessment Technology	3,573	3,230	-0-	-0-	-0-	-0-	-0-	-0-	Cont	Cont

A. (U) Mission Description and Budget Item Justification: This project develops technology to accelerate learning, increase skill/knowledge retention, and enhance job performance. This effort also develops cost-effective methods for designing, delivering, and evaluating training. Increased Air Force use of advanced technology and changes in the overall qualifications of the recruit pool add challenge to the already demanding task of effectively training Air Force recruits.

(U) FY 1994:
- (U) Developed intelligent/adaptive training technologies. ($1,123K)
  - -- (U) Delivered technologies for building virtual environment-based intelligent tutors.
  - -- (U) Completed and commercialized word problem solving tutor to support teaching of critical math literacy skills in public education.
  - -- (U) Evaluated use of intelligent tutor for teaching critical reading/writing literacy skills.
- (U) Developed intelligent, instructional design technologies. ($1,393K)
  - -- (U) Completed beta test of an on-line, case-based instructional design support technology for novice instructional designers.
  - -- (U) Completed preliminary evaluation of an experimental, instructional design advisor technology to reduce the cost and time to design and develop interactive courseware.
  - -- (U) Initiated development of interactive, multi-media distance learning technologies to increase the quality of distance training.
- (U) Developed intelligent training assessment technologies. ($1,057K)
  - -- (U) Identified methods for validating training time allocation curves to maintain proficiency levels.
  - -- (U) Developed and evaluated criteria and metrics to assess the effectiveness and efficiency of training technologies.

(U) FY 1995:
- (U) Continue to develop intelligent/adaptive training technologies. ($1,020K)
  - -- (U) Demonstrate the effectiveness of instructional strategies for automated, intelligent instruction in operational tasks and settings.
  - -- (U) Complete evaluation of reading/writing tutor for fundamental literacy skills and assess scientific skills tutor.
  - -- (U) Conduct field evaluation of virtual environment application to training technology.

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BUDGET ACTIVITY: #2, Exploratory Development	PE NUMBER AND TITLE: PE 0602202F, Human Systems Technology — PROJECT NO.: 1121

- (U) Continue to develop intelligent, instructional design technologies. ($1,396K)
  - -- (U) Develop guidelines for developing adaptive, interactive courseware for Air Force education needs.
  - -- (U) Demonstrate interactive courseware for selected logistics environments.
  - -- (U) Continue to develop interactive, multi-media distance learning technologies to increase the quality of distance training.
- (U) Continue to develop intelligent training assessment technologies. ($814K)
  - -- (U) Deliver technology to support career field management planning.
  - -- (U) Develop and test components of a comprehensive framework for education and training assessment.

(U) FY 1996: Not Applicable.

(U) FY 1997: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT NO.
#2, Exploratory Development	PE 0602202F, Human Systems Technology	1121

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	3,271	4,020	3,454	3,407	Cont
Current Budget Submit/President's Budget	3,573	3,230	-0-	-0-	Cont

Change Summary Explanation:

Funding: Changes due to consolidation into Project 1123.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0602233N, Mission Support Technology: Personnel, Training, and Simulation Technology Area.
- (U) PE 0602785A, Manpower, Personnel, and Training Technology.
- (U) PE 0603227F, Personnel, Training, and Simulation Technology.
- (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.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602202F, Human Systems Technology

PROJECT NO.: 1123

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 1123, Manpower, Personnel, Training	6,405	11,403	23,105	20,751	20,615	21,456	21,381	22,152	Cont	Cont

A. (U) Mission Description and Budget Item Justification: This project develops and evaluates new methods and techniques for aircrew training. It investigates the spectrum of aircrew training for the best ways to design, deliver, and assess training on the ground and in the air. It develops and evaluates flight training technologies from desk-top trainers to full-mission simulators to determine how to achieve maximum fidelity at minimum cost. This project will reduce the cost of future aircrew training technologies and increase the capability for realistic combat training. Beginning FY 1996 and beyond, the following Mission Description will reflect work previously reported under Projects 1121 and 7719. This Exploratory Development program develops technologies to increase operational readiness by: providing more effective methods to classify, assign, train, and retain personnel. This program focuses on reducing the manpower required to operate and support weapon systems and on improving the effectiveness of the operators and maintainers.

(U) FY 1994:
- (U) Developed concepts, trainers/simulators, and associated technologies for improved Air Force aircrew training. ($4,984K)
  -- (U) Developed and evaluated criteria and metrics for combat situational awareness for use in selecting and training F-15 pilots.
  -- (U) Developed single and multi-ship mission preparation models to improve aircrew mission preparation and rehearsal.
- (U) Developed guidelines for fidelity specifications for visual technologies used to improve aircrew training simulators. ($1,421K)
  -- (U) Determined temporal specifications for image generators.
  -- (U) Determined terrain and object density specifications for low altitude flight.

(U) FY 1995:
- (U) Continue to develop concepts, trainers/simulators, and associated technologies to improve Air Force aircrew training. ($10,079K)
  -- (U) Develop guidelines for situational awareness in fighter operations.
  -- (U) Develop tri-Service training guidelines.
- (U) Develop guidelines for fidelity specifications for visual technologies to increase effectiveness of aircrew training simulators. ($1,324K)
  -- (U) Develop and demonstrate color matching for independent visual displays used in distributed combat training exorcise.
  -- (U) Design user friendly eye position monitor for use in aircrew training.

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BUDGET ACTIVITY: #2, Exploratory Development	PE NUMBER AND TITLE: PE 0602202F, Human Systems Technology — PROJECT NO.: 1123

(U) FY 1996:

- (U) Develop intelligent/adaptive training technologies for improved automated training. ($2,499K)
  - -- (U) Demonstrate the effectiveness of instructional strategies for automated, intelligent instruction in operational tasks and settings.
  - -- (U) Complete large-scale evaluation of an intelligent tutor for fundamental science literacy skills, and of a licensed reading/writing tutor for commercial sale.
- (U) Develop intelligent, instructional design technologies to reduce cost and time of automated training system design. ($2,340K)
  - -- (U) Develop and evaluate desktop training technology for logistics command and control.
  - -- (U) Complete formative evaluation of an experimental instructional design advisor for providing intelligent performance support to novice instructional designers.
  - -- (U) Develop interactive, multi-media distance learning technologies to increase the quality of distance training.
- (U) Develop intelligent training assessment technologies to improve evaluation of training effectiveness. ($853K)
  - -- (U) Complete development and evaluation of an experimental, intelligent training decision support technology for assessing the impacts of changes in personnel, budgets, and training resources.
  - -- (U) Develop preliminary education and training assessment guidelines
- (U) Continue to develop concepts, trainers/simulators, and associated technologies to improve Air Force aircrew training. ($8,788K)
  - -- (U) Develop electronic classroom technology for aircrew training.
  - -- (U) Continue development of training guidelines for situational awareness training.
  - -- (U) Continue development of part-task trainers for combat mission training.
- (U) Develop guidelines for fidelity specifications for visual technologies used to improve aircrew training simulators. ($1,935K)
  - -- (U) Determine terrain and target correlation specifications for dissimilar visual technologies used in distributed combat training exercises.
  - -- (U) Develop and evaluate eye position monitor for use in training aircrews.
  - -- (U) Determine training value of alternative low cost visual displays for unit-level simulators
- (U) Develop technologies to help identify, classify, and retain various categories of Air Force personnel. ($1,439K)
  - -- (U) Develop and verify the relationship between training time, equipment repair time, and individual aptitude and experience.
  - -- (U) Complete initial phase of an automated career counseling and exploration technology for displaced workers, critical to effective use of personnel during force downsizing and reengineering.
  - -- (U) Develop initial version of a job performance-based entry-level and career job classification standard setting technology.
  - -- (U) Deliver neural network-based officer retention estimation technology.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE February 1995
BUDGET ACTIVITY: #2, Exploratory Development	PE NUMBER AND TITLE: PE 0602202F, Human Systems Technology	PROJECT NO.: 1123

- (U) Develop technologies to improve assessment of individual qualities/abilities (e.g., cognitive, physical, spatial, etc.) of Air Force personnel. ($4,812K)
  - -- (U) Develop data base of specific mental capabilities for complex, high-technology jobs for on-the-job performance assessment.
  - -- (U) Collect technical school performance data.
  - -- (U) Develop noncognitive measures of effectiveness.
  - -- (U) Complete development of performance assessment methodologies to determine mission readiness of personnel.
  - -- (U) Collect test data to evaluate minority performance on pilot ability measurements.
  - -- (U) Determine gains in re-testing candidates for pilot ability measures.
- (U) Develop crew resource management test technology for selecting Air National Guard and United States Air Force Reserve pilots. ($439K)
  - -- (U) Verify crew resource management skills test for selection of C-130 pilots.

(U) FY 1997:

- (U) Develop intelligent/adaptive training technologies. ($2,402K)
  - -- (U) Demonstrate the effectiveness of instructional strategies for automated, intelligent instruction in operational tasks and settings.
  - -- (U) Complete transition of intelligent tutor for critical science literacy skills to public education institutions.
- (U) Continue to develop intelligent, instructional design technologies. ($1,934K)
  - -- (U) Complete evaluation of an experimental instructional design advisor for providing intelligent, performance support to novice instructional designers.
  - -- (U) Continue to develop and evaluate interactive, multi-media distance learning technologies to increase the quality of distance training.
- (U) Continue to develop intelligent training assessment technologies. ($905K)
  - -- (U) Develop and verify criteria to assess the effectiveness and efficiency of training technologies in operational settings.
  - -- (U) Conduct preliminary validation of an integrated framework for education and training assessment.
- (U) Continue to develop trainers, simulators, and associated technologies to improve Air Force aircrew training. ($7,924K)
  - -- (U) Continue to develop electronic classroom technology for aircrew training.
  - -- (U) Develop training guidelines for situational awareness training.
  - -- (U) Continue development of part-task trainers for combat mission training.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #2, Exploratory Development	PE NUMBER AND TITLE: PE 0602202F, Human Systems Technology — PROJECT NO.: 1123

- (U) Continue to develop guidelines for fidelity specifications for visual technologies used to improve aircrew training simulators. ($1,360K)
  - -- (U) Determine impact of enhanced visual replay as feedback tool for distributed training debrief.
  - -- (U) Determine visual database specifications for mission planning and rehearsal.
  - -- (U) Define simulator-based rehearsal impacts.
- (U) Continue to develop technologies to help identify, classify, and retain various categories of Air Force personnel. ($2,468K)
  - -- (U) Complete initial design phase of an automated career counseling and exploration system for use by students through out their secondary education to assist them in career choice and in channeling qualified individuals into technically-demanding Air Force jobs.
  - -- (U) Develop technologies to specify job classification standards from a career life-cycle perspective.
  - -- (U) Complete initial design for a Manpower, Personnel and Training (MPT) space and support system manpower model.
- (U) Continue to develop technologies to assess individual qualities/abilities (e.g., cognitive, physical, spatial, etc.) of Air Force personnel. ($3,316K)
  - -- (U) Develop adaptive tests to investigate generation of mental abilities to improve precision while decreasing administration time.
  - -- (U) Continue development of database of specific mental capabilities for complex, high-technology jobs for on-the-job performance assessment.
  - -- (U) Complete development of noncognitive measures of effectiveness.
  - -- (U) Collect test data to evaluate minority performance on pilot ability measurements.
  - -- (U) Develop measurement models for aircrew performance readiness tests.
- (U) Continue to develop crew resource management test technology for selecting Air National Guard and United States Air Force Reserve pilots. ($442K)
  - -- (U) Develop crew resource management skills test and transition to Air National Guard and Air Force Reserves.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT NO.
#2, Exploratory Development	PE 0602202F, Human Systems Technology	1123

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	6,915	7,751	7,544	6,810	Cont
Current Budget Submit/President's Budget	6,405	11,403	23,105	20,751	Cont

Change Summary Explanation:

Funding: Changes in FY 1996 due to incorporation of 06 account laboratory operations funds plus incorporation of Projects 1121 and 7719 into this project.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0602233N, Mission Support Technology: Personnel, Training, and Simulation Technology Area.
- (U) PE 0602716A, Human Factors Engineering Technology Development.
- (U) PE 0602727A, Non-System Training Devices Technology.
- (U) PE 0602785A, Manpower, Personnel, and Training Technology.
- (U) PE 0603106F, Logistics Systems Technology.
- (U) PE 0603227F, Personnel, Training, and Simulation Technology.
- (U) PE 0604227F, Flight Simulator Development.
- (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.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602202F, Human Systems Technology

PROJECT NO.: 1710

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 1710, Logistics Technology	3,156	4,124	6,570	5,808	5,682	6,011	5,964	6,126	Cont	Cont

A. (U) Mission Description and Budget Item Justification: This project develops technologies to: improve logistics support for both combat and peacetime operations; enhance logistics planning and assessment models for realistic wartime and contingency operations; improve logistics support requirements' trade-off and design methods to reduce manpower and equipment needed to support logistics operations in dispersed locations; and develop software tools for use in designing improved reliability, maintainability, supportability, and man-machine interfaces to reduce life-cycle costs and increase system affordability.

(U) FY 1994:
- (U) Developed technology to improve requirements definition and design of reliable, maintainable, and supportable Air Force weapon systems. ($3,156K)
  -- (U) Developed technology to determine how well humans interact with and operate new equipment.
  -- (U) Developed functional specifications for an advanced definition of system requirements and decision support tool.
  -- (U) Developed technology to improve analysis of logistics support reliability, maintenance, and supportability.

(U) FY 1995:
- (U) Develop requirement assessment tools to improve wing-level contingency logistics planning and support equipment operational concepts. ($4,124K)
  -- (U) Develop and assess requirement tracking and design trade-off tools.
  -- (U) Develop needs assessment methods and technologies to improve wing-level logistical planning and support.

(U) FY 1996:
- (U) Develop technology for improved logistics planning, for support equipment upgrades, and for more effective software maintenance.($6,570K)
  -- (U) Continue to develop needs assessment methods and technology to improve wing-level contingency logistical planning and support.
  -- (U) Continue to develop improved software maintenance technology for on-board aircraft systems.

(U) FY 1997:
- (U) Continue development of technology for improved contingency logistics planning, support equipment functional upgrades, and more effective software maintenance of on-board systems. ($5,808K)
  -- (U) Complete preliminary software tools to support wing-level contingency logistics planning, replanning, and support.
  -- (U) Develop computer-based design tools to minimize weapon systems use of hazardous materials.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602202F, Human Systems Technology

PROJECT NO.: 1710

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	3,708	4,125	4,067	3,690	Cont
Current Budget Submit/President's Budget	3,156	4,124	6,570	5,808	Cont

Change Summary Explanation:

Funding: Changes in FY 1996 due to incorporation of 06 account laboratory operations funds into this project and increased emphasis on improved reliability, maintainability, and supportability of aging aircraft.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0602233N, Mission Support Technology: Personnel, Training, and Simulation Technology Area.
- (U) PE 0602716A, Human Factors Engineering Technology Development.
- (U) PE 0603106F, Logistics Systems Technology.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602202F, Human Systems Technology

PROJECT NO.: 1900

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 1900, Environmental Technology	1,805	2,354	10,691	10,504	11,662	12,876	15,911	16,361	Cont	Cont

A. (U) Mission Description and Budget Item Justification: This project develops technologies to characterize the chemistry of Air Force generated pollutants and toxic materials, assesses their interaction with the environment, and develops control and clean-up techniques. Efforts are conducted to reduce the cost and increase the effectiveness of technologies that protect the environment. New Air Force fuels and chemicals are analyzed to 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. Novel site remediation, monitoring, and modeling technologies are also explored.

(U) FY 1994:

- (U) Developed technologies and design criteria for improved monitoring, disposal characterization, and remediation techniques for contaminated Air Force sites. ($854K)
  - -- (U) Developed in-place physical/chemical technologies to contain and treat dense nonaqueous phase liquids (DNAPLs), including determining design parameters for using surfactants to immobilize contaminants for later biodegradation and evaluating novel enzymatic contaminant degradation methods.
  - -- (U) Developed bioremediation technologies to clean up Air Force sites contaminated with a wide variety of contaminants, including development of a bioreactor to treat nitroaromatic compounds such as trinitrotoluene (TNT) as an alternative disposal and treatment method for Air Force energetic materials.
  - -- (U) Determined the fate and transport characteristics of soil and groundwater contaminants, including fuels, solvents and energetic compounds, to enhance and verify contaminant models for development of remediation technologies and remediation plans.
- (U) Developed technologies to predict and reduce contamination by Air Force materials and operations. ($951K)
  - -- (U) Developed innovative technologies to treat/recycle hazardous wastes from Air Force industrial operations to reduce disposal costs and comply with regulatory limits, including environmentally safe disposal methods for small quantities of energetic materials and methods for removing heavy metals from plating and finishing bath sludges.
  - -- (U) Developed affordable technologies to control air pollutant emissions from Air Force industrial processes to comply with Clean Air Act Amendments (CAAA), including characterizing the effect of operating conditions on the rate of formation, distribution, and removal of NOx by new catalytic processes.
  - -- (U) Determined the atmospheric chemistry of candidate and new Air Force fuels and chemicals, including characterizing reactions of solvents to aid in selecting environmentally friendly solvents; continued atmospheric research to enhance risk assessment and model verification for Air Force space launch operations.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE February 1995
BUDGET ACTIVITY: **#2, Exploratory Development**	PE NUMBER AND TITLE: **PE 0602202F, Human Systems Technology** — PROJECT NO.: **1900**

(U) FY 1995:
- (U) Continue to develop technologies and design criteria for improved monitoring, disposal characterization, and remediation techniques for contaminated Air Force sites. ($1,062K)
  - -- (U) Continue to develop in-place physical/chemical technologies to contain and treat dense nonaqueous phase liquids (DNAPLs), including methods to treat DNAPLs in aquifers, as faster, lower-cost alternatives to current pump-and-treat technologies.
  - -- (U) Develop in-place sensors and techniques to locate, identify, and monitor DNAPL sources and to monitor contaminant plumes and remediation activities, including use of geophysical technologies to locate and monitor DNAPLs.
  - -- (U) Continue to identify and characterize the conditions, processes, products and key indicators associated with the natural attenuation of hydrocarbon fuels to provide a scientific foundation for regulatory acceptance as a cleanup alternative.
- (U) Continue to develop technologies to predict and reduce contamination by Air Force materials and operations. ($1,292K)
  - -- (U) Continue to develop innovative technologies to treat/recycle hazardous wastes from Air Force industrial operations to reduce disposal costs and comply with regulatory limits, including technologies to remove metals from waste water and a chemical reactor to treat energetic hazardous materials.
  - -- (U) Continue to develop affordable technologies to control air pollutant emissions from Air Force industrial processes, including cleaning, painting/depainting, and combustion operations to comply with Clean Air Act Amendments (CAAA).
  - -- (U) Determine the atmospheric chemistry of candidate and new Air Force fuels and chemicals as an input into the selection process and compliance determination of new and replacement materials such as refrigerants and firefighting agents.

(U) FY 1996:
- (U) Continue to develop technologies and design criteria for improved monitoring, disposal characterization, and remediation techniques for contaminated Air Force sites. ($4,277K)
  - -- (U) Complete in-place generation of hydrogen peroxide to destroy groundwater contaminants faster and at lower-cost than current pump-and-treat systems and continue in-place physical/chemical technology development to contain and treat dense nonaqueous phase liquids (DNAPLs).
  - -- (U) Finish micromachined sensors to improve sensor capability and horizontal monitoring to improve sensor placement; continue to develop in-place sensors and geophysical technologies to locate, identify, and monitor DNAPL sources, plumes and remediation activities.
  - -- (U) Finalize methods for stimulating the anaerobic destruction of contaminants cheaper and simpler than current aerobic technologies and continue to develop in-place bioremediation technologies to clean up Air Force sites contaminated with fuels and solvents.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE February 1995
BUDGET ACTIVITY: #2, Exploratory Development	PE NUMBER AND TITLE: PE 0602202F, Human Systems Technology — PROJECT NO.: 1900

- (U) Continue to develop technologies to predict and reduce contamination by Air Force materials and operations. ($6,414K)
  - -- (U) Develop process monitoring technologies for reporting, control, and treatment for water contaminated with emulsified oils; continue to develop innovative technologies to treat/recycle hazardous wastes from Air Force industrial operations to reduce disposal costs and comply with regulatory limits.
  - -- (U) Develop pulsed corona reactor technology to remove a variety of contaminants, such as Nitrous Oxide (NOx), and low-cost sorbent technology to recover mercury vapor from incinerator exhausts; continue to develop affordable technologies to control air pollutant emissions from Air Force industrial processes to comply with Clean Air Act Amendments (CAAA).
  - -- (U) Determine the atmospheric chemistry of candidate and new Air Force fuels and chemicals, including determining the atmospheric chemistry of hydrofluorocarbons (HFCs), and conduct atmospheric research to enhance risk assessment and model verification for Air Force space launch operations.

(U) FY 1997:

- (U) Continue to develop technologies and design criteria for improved monitoring, disposal characterization, and remediation techniques for contaminated Air Force sites. ($4,201K)
  - -- (U) Investigate reactors for funnel-and-gate technologies which completely destroy organic groundwater contaminants; continue to develop physical/chemical technologies to contain and treat in-place dense nonaqueous phase liquids (DNAPLs).
  - -- (U) Determine the fate and transport characteristics of contaminants in soils and groundwater to enhance and verify models for development of remediation technologies and plans, including addressing the combined effects of physical/chemical and biological processes on contaminants.
  - -- (U) Identify and develop alternative aerobic and anaerobic bioremediation technologies to optimize treatment of solvents and halogenated compounds; continue to develop in-place bioremediation technologies to clean up Air Force sites contaminated with fuels and solvents.
- (U) Continue to develop technologies to predict and reduce contamination in the environment by the Air Force materials and operations. ($6,303K)
  - -- (U) Complete development of technology to treat/recycle metal/halogen contaminated sludge; continue to develop innovative technologies to treat/recycle hazardous wastes from Air Force industrial operations to reduce disposal costs and comply with regulatory limits.
  - -- (U) Develop chemical tank rejuvenation technologies for aqueous degreaser baths and etching/pickings baths; continue to develop cost effective alternate processes and materials that reduce or eliminate the production of hazardous wastes and the use of hazardous materials.
  - -- (U) Determine the atmospheric chemistry of candidate and new Air Force fuels and chemicals; develop a database of the rates of photochemical and dark reactions of Air Force organic solvent vapors, new fire extinguishants, and new fuels in the presence of specific air pollutants.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602202F, Human Systems Technology

PROJECT NO.: 1900

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	1,833	2,236	2,991	3,597	Cont
Current Budget Submit/President's Budget	1,805	2,354	10,691	10,504	Cont

Change Summary Explanation:

Funding: Changes in FY 1996 due to incorporation of 06 account laboratory operations funds into this project and increased emphasis on environmental technologies.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0601102F, Defense Research Sciences.
- (U) PE 0602102F, Materials.
- (U) PE 0602203F, Aerospace Propulsion.
- (U) PE 0603211F, Aerospace Structures.
- (U) PE 0603723F, Civil and Environmental Engineering Technology.
- (U) PE 0603716D, Strategic Environmental Research and Development Program.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602202F, Human Systems Technology

PROJECT NO.: 2673

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 2673, Air Base Operability Technology	1,933	2,138	-0-	-0-	-0-	-0-	-0-	-0-	Cont	Cont

A. (U) Mission Description and Budget Item Justification: This project provides the technology base for current and future Air Force systems in these areas: survivable air base structures, utilities, and operating surfaces against more accurate and powerful conventional and chemical/biological weapons; battle damage assessment and repair; air mobile structures; and cost-effective fire protection, maintenance, and repair of air base facilities, utilities, and operating surfaces.

(U) FY 1994:
- (U) Developed technologies and design criteria for improved bare-base/fixed-site applications (e.g., power and environmental utilities, survivable air base structures, and durable/repairable airfield surfaces). ($1,632K)
- (U) Developed advanced aircraft/air base fire fighting technologies (e.g., clean, environmentally-safe fire fighting agents, vehicles, equipment, personnel protective clothing, fire risk assessment techniques, and fire fighter training systems). ($301K)

(U) FY 1995:
- (U) Continue to develop technologies and design criteria for improved bare-base/fixed-site applications (e.g., power and environmental utilities, survivable air base structures, and durable/repairable airfield surfaces). ($1,602K)
- (U) Continue to develop advanced aircraft/air base fire fighting technologies (e.g., clean, environmentally-safe fire fighting agents, vehicles, equipment, personnel protective clothing, fire risk assessment techniques, and fire fighter training systems). ($536K)

(U) FY 1996: Not Applicable.

(U) FY 1997: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602202F, Human Systems Technology

PROJECT NO.: 2673

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	2,143	2,389	3,183	3,805	Cont
Current Budget Submit/President's Budget	1,933	2,138	-0-	-0-	Cont

Change Summary Explanation:

Funding: Beginning in FY 1996, Project 2673 transfers to Wright Laboratory's PE 0602201F, Aerospace Flight Dynamics.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0601102F, Defense Research Sciences.
- (U) PE 0602102F, Materials.
- (U) PE 0602203F, Aerospace Propulsion.
- (U) PE 0603211F, Aerospace Structures.
- (U) PE 0603231F, Crew Systems and Personnel Protection Technology.
- (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.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602202F, Human Systems Technology

PROJECT NO.: 6302

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 6302, Occupational and Environmental Toxic Hazards in Air Force Operations	2,301	2,220	-0-	-0-	-0-	-0-	-0-	-0-	Cont	Cont

A. (U) Mission Description and Budget Item Justification: This project provides for toxicological technology development and assessment of Air Force materials and processes. It assesses human tolerance levels for chemicals, fuels, and materials to establish exposure criteria for designing new technologies and performs trade-off analyses between weapon systems performance and occupational health and environmental support specifications.

(U) FY 1994:
- (U) Performed toxicological technology development and assessment of Air Force materials and processes. ($2,301K)
  - -- (U) Completed Halon 1301 replacement toxicity assessment; continued support of trade-off decision making by systems managers concerning solvents and high energy fuels.
  - -- (U) Assessed human health risks from chemicals in soil and groundwater in support of site cleanup activities.
  - -- (U) Developed models for extrapolating risks of toxicological materials measurements from short-term, high exposures to long-term, low exposures to improve accuracy and efficiency of toxic exposure risk assessments and to preclude the need for toxicity tests on animals.

(U) FY 1995:
- (U) Continue toxicological technology development and assessment of Air Force materials and processes. ($2,220K)
  - -- (U) Provide systems managers with critical information for risk versus benefit decisions on alternative solvents, new materials such as Halon replacements, and combustion toxicity for turbine engines.
  - -- (U) Assess and relate human health risks to environmental clean-up standards for groundwater contaminants such as trichlorethylene.
  - -- (U) Develop technology to assess environmental and occupational safety of alternative compounds for use in Air Force weapon systems.

(U) FY 1996: Not Applicable.

(U) FY 1997: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602202F, Human Systems Technology

PROJECT NO.: 6302

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	2,928	3,315	3,275	3,955	Cont
Current Budget Submit/President's Budget	2,301	2,200	-0-	-0-	Cont

Change Summary Explanation:

Funding: Changes due to consolidation into Project 7757.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(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.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602202F, Human Systems Technology

PROJECT NO.: 6770

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 6770, Human Technology Studies in Advanced Systems	630	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	TBD

A. (U) Mission Description and Budget Item Justification: This project provides scientific and technical support to in-house scientists from national scientific and technical organizations, committees, and tri-Service groups. This effort supports: (1) advisory groups for tri-Service coordination and review of programs and semi-annual reporting to headquarters on tri-Service research, development, and applications of human factors; (2) the National Academy of Sciences; and (3) coordinating agencies, and (4) national and international resources for compiling and disseminating information on the use of laboratory resources.

(U) FY 1994:

- (U) Supported laboratory's scholars program in areas such as high power microwave bioeffects, high-G induced loss of consciousness, and biophysical/mathematical models of functional vision. ($540K)
- (U) Supported Air Force portion of tri-Service program for the National Academy of Sciences - National Research Council in the areas of training, bioacoustics, biomechanics, vision, and the Institute of Laboratory Animal Research. ($90K)

(U) FY 1995: Not Applicable.

(U) FY 1996: Not Applicable.

(U) FY 1997: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602202F, Human Systems Technology

PROJECT NO.: 6770

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	900	-0-	-0-	-0-	TBD
Current Budget Submit/President's Budget	630	-0-	-0-	-0-	TBD

Change Summary Explanation:

Funding: Changes due to project completion in FY 1994.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(U) Related Activities:

- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

D. Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602202F, Human Systems Technology

PROJECT NO.: 6893

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 6893, Manned Weapon System Effectiveness	694	629	-0-	-0-	-0-	-0-	-0-	-0-	Cont	Cont

A. (U) Mission Description and Budget Item Justification: This project develops technology related to human vision and motion perception in manned weapon systems. The goal is to determine aircrew weaknesses and strengths in these two critical human characteristics to assess effectiveness for: safety of flight; visual countermeasures; and air-to-ground, air-to-air, and space-based operations.

(U) FY 1994:
- (U) Developed technology for camouflage, concealment, deception, and obstruction techniques to disrupt target acquisition and intelligence gathering. ($86K)
  -- (U) Tested improved blended camouflage net for hiding parked aircraft from air attack.
- (U) Explored human information processing and biocybernetic system control technologies for aircrew technologies. ($344K)
  -- (U) Published guide for determining effects of time delays on man-in-the-loop simulation fidelity.
- (U) Developed technology for assessing and enhancing crew visual performance in micro-G and high-speed environments. ($264K)
  -- (U) Evaluated visual function tester while performing Air Force missions on-orbit.

(U) FY 1995:
- (U) Complete development of camouflage, concealment, deception, and obstruction techniques to disrupt target acquisition and intelligence gathering. ($114K)
  -- (U) Complete development and test of human vision performance model in decision aid used to predict target Infra-Red. signatures.
- (U) Explore human information processing and biocybernetic system control technologies for aircrew technologies. ($306K)
  -- (U) Develop direct vestibular stimulation techniques to improve training fidelity and eliminate motion platforms.
- (U) Continue examining crew visual performance in micro-G and high-speed environments. ($209K)
  -- (U) Collect visual accommodation data during sustained Air Force operations on-orbit using visual function tester.

(U) FY 1996: Not Applicable.

(U) FY 1997: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602202F, Human Systems Technology

PROJECT NO.: 6893

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	852	874	681	-0-	Cont
Current Budget Submit/President's Budget	694	629	-0-	-0-	Cont

Change Summary Explanation:

Funding: Changes in FY 1996 due to consolidation into Project 7184.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0602201F, Aerospace Flight Dynamics.
- (U) PE 0602204F, Aerospace Avionics.
- (U) PE 0602702F, Command, Control, and Communications.
- (U) PE 0603205F, Aerospace Vehicle Technology.
- (U) PE 0603227F, Advanced Simulator Technology.
- (U) PE 0603231F, Crew Systems and Personnel Protection 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.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602202F, Human Systems Technology

PROJECT NO.: 7184

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 7184, Crew Technology	4,415	5,676	27,397	27,428	28,051	27,104	26,959	28,251	Cont	Cont

A. (U) Mission Description and Budget Item Justification: This project develops procedures and technologies to optimize interfaces between Air Force personnel and weapon systems. 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, verify, and transition data, methods, and technologies to improve the human interface with Air Force systems. Beginning FY 1996 and beyond, the following Mission Description will reflect work previously reported under Projects 6893, 7930, and a portion of 7231. This Project develops technology required to improve human performance, protection and survivability in operational environments. This is accomplished by defining the physical parameters, capabilities and limits of systems operators; determining human responses to operational stressors such as noise, impact, vibration, hostile fire, sustained acceleration, spatial disorientation, altitude, workload, and sustained operations; and optimizing the human-machine interface. The Project produces human factors design criteria, guidelines, and automated design tools for the development of effective technologies for information display, control interfaces, emergency escape, acceleration protection, and aircrew life support. In response to immediate human factors problems in Air Force weapon systems, the Project provides rapid solutions to systems program offices and operational warfighters.

(U) FY 1994:

- (U) Developed technology for human performance and workload assessment to permit enhanced matching of pilot capabilities and cockpit tasks required during combat. ($772K)
  - -- (U) Evaluated the most commonly used measures of situation awareness for potential application to pilot situation awareness.
  - -- (U) Completed workload evaluation of Quiet Knight II Special Operations Penetration Mission Avionics System, a cockpit system that plans attack routes based on stored and real time information.
- (U) Developed system design integration technologies to improve the ability of engineers to properly consider human factors early in the design process. ($2,328K)
  - -- (U) Applied human engineering principles to cockpit design and mission support.
  - -- (U) Demonstrated human body model with virtual scene and controls scaled to match variable body sizes to improve computer-aided design tools.
- (U) Explored and improved human-machine interfaces for enhancing aircrew performance using exploratory technology for better equipment fit and more effective control of subsystems from the cockpit. ($1,315K)
  - -- (U) Developed helmet-mounted displays (HMDs) and controls to improve air-to-air situation awareness.
  - -- (U) Evaluated low-profile night vision goggle for specialized ground and flight crew operations.
- -- (U) ompleted a synthetic environment simulator technology for joint US-French development and evaluation of advanced interface concepts.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #2, Exploratory Development	PE NUMBER AND TITLE: PE 0602202F, Human Systems Technology — PROJECT NO.: 7184

(U) FY 1995:
- (U) Develop unobtrusive, reliable predictors of human-system effectiveness. ($728K)
  -- (U) Complete analysis of the role of attention allocation in situation awareness.
  -- (U) Develop a portable version of a monitor for measuring physiological variables to assess mental workload.
- (U) Develop system design technologies for greater integration of human performance data and crew system interfaces. ($3,573K)
  -- (U) Complete development of multi-media visualization technology for human performance data to optimize crew systems design.
  -- (U) Demonstrate capability to perform digital laser whole body scans for accurate definition of equipped aircrew members.
- (U) Explore and develop technology for visual displays and symbology for improvement of human-machine interfaces. ($1,375K)
  -- (U) Develop technology for advanced hybrid optical elements to provide a see-through HMD with resolution, luminance, and contrast performance approaching that of current full-size displays.
  -- (U) Verify standards for cockpit Head-Down Display symbology.

(U) FY 1996:
- (U) Complete preliminary exploration of human information processing and biocybernetic control technologies for aircrew systems. ($1,023K)
  -- (U) Publish book on perception and control of self-motion in low altitude flight.
- (U) Continue development of unobtrusive, reliable predictors of human system effectiveness, to include a neural network-based system of performance measurement for flight test. ($1,417K)
  -- (U) Develop demonstrator technology for inflight multi-channel recording of electroencephalograph (EEG) signals.
  -- (U) Complete demonstration of a neural-based Workload Redline concept which combines physiological, performance, and system measurements to predict mental work overload.
  -- (U) Complete concept evaluation of airborne physiological monitor for night, low-level, high-speed flight environments.
- (U) Continue development of system design technologies for integration of human performance data and crew system interfaces including a task time estimator. ($8,376K)
  -- (U) Enhance a computer-aided design model of an aircraft flight line maintenance technician with the capability to estimate remove/repair task times.
  -- (U) Develop computer aided design technology incorporating actual aircraft controls to provide a totally virtual cockpit accommodation model.
  -- (U) Demonstrate the mating of crewstation computer-aided design technology with behavioral data visualization technology to produce a performance-sensitive design tool.
- (U) Continue development of visual displays and symbology for improvement of human-machine interfaces. ($3,441K)
  -- (U) Demonstrate combined use of head-, eye-, brain-, and voice-actuated control of a man-machine system.
  -- (U) Evaluate improved symbology set for aircraft cockpit displays.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE February 1995
BUDGET ACTIVITY **#2, Exploratory Development**	PE NUMBER AND TITLE **PE 0602202F, Human Systems Technology**
	PROJECT NO. **7184**

- (U) Continue to develop injury threshold determination criteria and related technologies for improved protection equipment for aircrew and support personnel. ($3,916K)
  - -- (U) Determine windblast exposure limits.
  - -- (U) Develop six degree of freedom human body model with acceleration limits for small occupants.
  - -- (U) Develop six degree of freedom head/neck model to be used for "safe to fly" evaluation of concept helmet mounted displays.
- (U) Continue to develop technologies to measure and predict human auditory responses and to provide criteria for voice communication for particular Air Force weapon systems and base operations. ($2,219K)
  - -- (U) Complete development of 3-D audio technology for improved communications capability and improved situational awareness.
  - -- (U) Develop and demonstrate 3-D audio technologies for enhanced survivability and situational awareness.
  - -- (U) Develop and transition light-weight Active Noise Reduction (ANR) headset technology for improved voice communications capability and reduced operator noise-induced hearing loss.
- (U) Continue to develop technologies for evaluating and improving aircrew protection and effectiveness in operational environments. ($3,013K)
  - -- (U) Continue development of technologies to reduce effects of high-G acceleration.
  - -- (U) Continue development of advanced life support equipment.
- (U) Continue to develop technologies for sustained aircrew operations and integration of life support systems into aircraft to improve aircrew safety and performance. ($3,992K)
  - -- (U) Develop and evaluate technology to enhance aircrew sustained operational performance.
  - -- (U) Develop spatial disorientation awareness training methods.
  - -- (U) Develop optimized cockpit display symbology and spatial disorientation countermeasures.
  - -- (U) Develop oxygen generation system technologies.

(U) FY 1997:

- (U) Continue development of unobtrusive, reliable predictors of human systems effectiveness. ($1,793K)
  - -- (U) Develop a computer model of operator performance in Theater Missile Defense.
  - -- (U) Complete the integration of memory probes, attention allocation, and other mental components into an overall situation awareness conceptual model.
- (U) Continue development of system design technologies for greater integration of human performance data and crew system interfaces. ($7,805K)
  - -- (U) Demonstrate whole body scanning technology based on accurate digital laser scanning technology.
  - -- (U) Demonstrate technology to revolutionize collaboration by remote team members in design of technologies.
- (U) Continue development of visual displays and symbology technology for improved human-machine interfaces and demonstrate integrated air-to-air virtual cockpit technology. ($4,138K)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #2, Exploratory Development	PE NUMBER AND TITLE: PE 0602202F, Human Systems Technology	PROJECT NO.: 7184

-- (U) Evaluate improved image intensifier tube for night vision goggle technology.
-- (U) Demonstrate integrated air-to-air virtual cockpit technology.
-- (U) Develop binocular Helmet Mounted Display (HMD) specifications and HMD test standards.

- (U) Continue to develop injury criteria and technology for improved aircrew and support personnel protection equipment. ($4,354K)
  -- (U) Verify whole-body restraint concepts for large and small occupants.
  -- (U) Formulate parachute opening shock criteria that will minimize aircrew limb injury.
  -- (U) Develop multi-media work environment for use by engineers who access the Biodynamic Data Bank to evaluate concepts for aircrew protection.
  -- (U) Develop manikin-based injury prediction methodology.
- (U) Continue to develop technologies to measure and predict the effects of human auditory responses and to provide criteria for voice communication for particular Air Force weapon systems and base operations. ($2,285K)
  -- (U) Develop and demonstrate digital audio technologies for improved situational awareness, increased communications capability, and improved human system interfaces for Air Force weapon systems.
  -- (U) Develop and transition audio performance measurement technologies for assessment of individual auditory localization ability in operational situations.
  -- (U) Develop advanced models, criteria, and technologies for improving human audio communication for Air Force weapon systems and for degrading communications capabilities of opposing forces.
- (U) Continue to develop technologies for evaluating and improving aircrew protection and effectiveness in operational environments. ($3,232K)
  -- (U) Develop and evaluate technologies to reduce the effects of high-G acceleration.
  -- (U) Continue development of advanced life support equipment.
- (U) Continue to develop technologies for sustained aircrew operations and integration of life support systems into aircraft to improve aircrew safety and performance. ($3,821K)
  -- (U) Develop and evaluate technology to enhance aircrew sustained operational performance.
  -- (U) Develop spatial disorientation awareness training methods.
  -- (U) Develop optimized cockpit display symbology and spatial disorientation countermeasures.
  -- (U) Develop oxygen generation system technology.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT NO.
#2, Exploratory Development	PE 0602202F, Human Systems Technology	7184

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	5,944	7,279	7,503	8,763	Cont
Current Budget Submit/President's Budget	4,415	5,676	27,397	27,428	Cont

Change Summary Explanation:

Funding: Changes in FY 1996 due to incorporation of 06 account laboratory operations funds plus incorporation of work from Projects 6893, 7930, and a portion of Project 7231 into this project.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(U) Related Activities:
- (U) PE 0602201F, Aerospace Flight Dynamics.
- (U) PE 0602204F, Aerospace Avionics.
- (U) PE 0602702F, Command, Control, and Communications.
- (U) PE 0603205F, Aerospace Vehicle Technology.
- (U) PE 0603227F, Advanced Simulator Technology.
- (U) PE 0603231F, Crew Systems and Personnel Protection Technology.
- (U) PE 0603245F, Advanced Fighter Technology Integration.
- (U) PE 0604601F, Chemical/Biological Warfare Defense Equipment.
- (U) PE 0604703F, Aeromedical/Casualty Care Systems Development.
- (U) PE 0604706F, Life Support Systems.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602202F, Human Systems Technology

PROJECT NO.: 7231

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 7231, Safety and Aircrew Effectiveness in Mechanical Force Environments	2,097	2,532	-0-	-0-	-0-	-0-	-0-	-0-	Cont	Cont

A. (U) Mission Description and Budget Item Justification: This project determines human response to mechanical forces including noise, impact, vibration, and hostile fire. This information is used for safe and effective escape/ejection systems, acceleration protection equipment, aircrew restraint devices, and for reducing crew station vulnerability. This project also develops technology based on understanding of the human auditory system for activities such as operator-centered communications, jamming, and noise exposure criteria. This project also develops telepresence technology for remote operation of mechanical systems by Air Force personnel.

(U) FY 1994:

- (U) Developed ejection acceleration injury assessment technologies for helmet-mounted equipment. ($1,426K)
  - -- (U) Determined the head/neck responses of males and females wearing various weight helmets to impact accelerations along multiple axes.
  - -- (U) Modeled response of humans under high-G acceleration.
  - -- (U) Investigated chest and acceleration measurement methods to determine the most accurate way to monitor subjects during experiments with helmet mounted technologies.
- (U) Developed active noise control and enhanced voice communication technologies for multi-engine aircraft. ($351K)
  - -- (U) Completed flight test of 3-D audio technology voice communication enhancement.
  - -- (U) Developed and transitioned measurement technology for the assessment of voice communications performance in air and ground occupational noise environments.
- (U) Developed aircraft noise and sonic boom technology to assess and reduce adverse impacts of noise produced by Air Force operations. ($320K)
  - -- (U) Developed technology which will enable military radars to record aircraft flight paths during take off and landing for use in airbase noise assessment.
  - -- (U) Developed military training route noise assessment model.
  - -- (U) Measured overflight noise levels of operational aircraft for use in impact assessments.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE February 1995
BUDGET ACTIVITY: #2, Exploratory Development	PE NUMBER AND TITLE: PE 0602202F, Human Systems Technology — PROJECT NO.: 7231

(U) FY 1995:

- (U) Develop injury threshold determination criteria and related technologies for improved protection equipment for aircrew and support personnel. ($1,671K)
  - -- (U) Determine coupling coefficients for multi-axis acceleration.
  - -- (U) Determine effect of off-axis acceleration on head/neck response.
  - -- (U) Develop specifications for small manikins.
  - -- (U) Determine response of a new manikin to impact acceleration.
- (U) Develop technologies to measure and predict human auditory responses and to provide criteria for voice communication for Air Force weapon systems and base operations. ($489K)
  - -- (U) Develop and integrate 3-D audio/helmet mounted display technology applications into Air Force systems.
  - -- (U) Continue to develop technologies to enhance combined human visual/auditory/vestibular perception in time-critical mission scenarios.
  - -- (U) Develop methodologies and criteria for the design and application of auditory symbology.
- (U) Develop aircraft noise and sonic boom technology to assess and reduce adverse impacts of noise produced by Air Force operations. ($372K)
  - -- (U) Develop noise prediction model for subsonic military operating areas and ranges.
  - -- (U) Develop technology to assess topography effects on aircraft noise propagation.
  - -- (U) Verify single event sonic boom prediction model.

(U) FY 1996: Not Applicable.

(U) FY 1997: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602202F, Human Systems Technology

PROJECT NO.: 7231

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	2,617	3,451-	3,443	4,326	Cont
Current Budget Submit/President's Budget	2,097	2,532	-0-	-0-	Cont

Change Summary Explanation:

Funding: Changes due to consolidation into Projects 7184 and 7757.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0602201F, Aerospace Flight Dynamics.
- (U) PE 0603205F, Aerospace Vehicle Technology.
- (U) PE 0603231F, Crew Systems and Personnel Protection Technology.
- (U) PE 0603245F, Advanced Fighter Technology Integration.
- (U) PE 0604706F, Life Support Systems.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602202F, Human Systems Technology

PROJECT NO.: 7719

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 7719, Force Acquisition and Distribution Technology	2,854	2,702	-0-	-0-	-0-	-0-	-0-	-0-	Cont	Cont

A. (U) Mission Description and Budget Item Justification: 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 1994:

- (U) Developed technologies to help identify, classify, and retain various categories of Air Force personnel. ($900K)
  - -- (U) Developed technologies to assess enlisted recruiting costs by aptitude and job interest to ensure the most effective use of limited recruiting resources.
  - -- (U) Developed an automated job survey technology that will assist commanders in assessing what people do in Air Force jobs, what training is required, and how jobs should be structured.
  - -- (U) Developed a technology to determine the effect of improvements to Air Force selection and classification procedures on user-selectable measures of merit.
  - -- (U) Developed an analysis of the Air Force occupational structuring process--essential to making future improvements to the job structuring system.
- (U) Developed technologies to assess individual qualities/abilities (e.g., cognitive, physical, spatial, etc.) of Air Force personnel. ($1,554K)
  - -- (U) Developed experimental computerized abilities measurement test battery technology to improve selection and classification.
  - -- (U) Completed development of cognitive task analysis methodologies for identifying underlying mental abilities required for complex high-technology jobs.
  - -- (U) Refined cognitive abilities measurement and began developing psychomotor abilities measurement methodologies for incorporation into experimental abilities test battery.
- (U) Developed and evaluated computer-assisted personality test methods for pilot selection. ($400K)
  - -- (U) Developed computer software for an objective approach to personality measurement that minimizes subject faking and misrepresentation.
  - -- (U) Verified self-report format for personality measurement against tactical air combat performance.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #2, Exploratory Development	PE NUMBER AND TITLE: PE 0602202F, Human Systems Technology — PROJECT NO.: 7719

(U) FY 1995:
- (U) Continue to develop technologies to help identify, classify, and retain various categories of Air Force personnel. ($840K)
  -- (U) Develop benchmarked occupational learning difficulty ratings to help determine the most efficient entry-level and career job assignment aptitude criteria.
  -- (U) Develop a job structuring computer-based decision aid to assist career field managers in designing the most efficient force to achieve mission accomplishment.
  -- (U) Develop a modeling approach to determine key manpower, personnel, and training interfaces to ensure that new weapon systems and major modifications are procured at the lowest possible life-cycle costs.
- (U) Continue to develop technologies to assess individual qualities/abilities (e.g., cognitive, physical, spatial, etc.) of Air Force personnel. ($1,462K)
  -- (U) Collect technical school performance data to verify experimental abilities measurement test battery.
  -- (U) Develop noncognitive measures to explore potential for incremental validity over cognitive measures.
  -- (U) Continue development of performance assessment methodologies to determine mission readiness of personnel.
  -- (U) Identify theoretical foundation for conducting research into gender effects on performance.
- (U) Develop crew resources management test technology for selecting Air National Guard and United States Air Force Reserve pilots.
  -- (U) Interview experienced C-130 pilots and collect crew resource management performance events and alternative behavioral responses.
  -- (U) Interview experienced and novice C-130 pilots to evaluate crew resource management performance alternatives for development of test scoring keys.

(U) FY 1996: Not Applicable.

(U) FY 1997: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602202F, Human Systems Technology

PROJECT NO.: 7719

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	2,567	3,004	2,787	2,638	Cont
Current Budget Submit/President's Budget	2,854	2,702	-0-	-0-	Cont

Change Summary Explanation:

Funding: Changes due to consolidation into Project 1123.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0602233N, Mission Support Technology: Personnel, Training, and Simulation Technology Area.
- (U) PE 0602785A, Manpower, Personnel, and Training Technology.
- (U) PE 0603227F, Personnel, Training, and Simulation Technology.
- (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.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602202F, Human Systems Technology

PROJECT NO.: 7755

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 7755, Human Biodynamics and Physiology	1,260	1,129	7,824	7,508	7,736	7,664	7,740	7,881	Cont	Cont

A. (U) Mission Description and Budget Item Justification: The human operator is the enabling factor in all aerospace systems. The goal of this project is to optimize aircrew effectiveness through developing an understanding of: (1) biodynamic conditions affecting aircrew selection and retention; (2) methods of early disease detection; (3) impact of asymptomatic disease on aircrew performance; (4) therapeutic drug effects on flight safety; and (5) physiological factors affecting operational readiness and effectiveness.

(U) FY 1994:
- (U) Conducted biodynamic investigations to develop aircrew standards. ($1,159K)
  - -- (U) Completed studies on the effects of altered high-G acceleration environments on cardiovascular physiology.
  - -- (U) Developed preliminary protocol for therapeutic drug use in aircrew.
  - -- (U) Completed studies on ability to fly safely for aircrew with a history of ventricular tachycardia or gallstones.
- (U) Developed operational performance enhancement devices. ($101K)
  - -- (U) Developed improved standards for vision protection devices against such hazards as ultra-violet light, laser radiation, and glare.
  - -- (U) Designed joint Air Force/civilian program to develop a more cost-effective method to treat decompression sickness.

(U) FY 1995:
- (U) Conduct biodynamic investigations to develop aircrew standards. ($871K)
  - -- (U) Develop standards (i.e., cardiovascular, vision/optical devices, neuropsychiatric and hearing/vestibular standards) to improve aircrew selection, retention and performance.
  - -- (U) Develop aircrew performance-based standards in areas such as high-G acceleration, microgravity, and dehydration.
  - -- (U) Develop better capability to assess defense women's health issues (i.e., obstetrics-gynecology (ob-gyn), orthopedic, hyperbaric oxygen therapy, G-tolerance) affecting female aircrew.
- (U) Develop operational performance enhancement devices. ($258K)
  - -- (U) Develop therapeutic, prophylactic, and performance enhancing medication in the aviation environment.
  - -- (U) Develop alternative therapy to treat decompression sickness.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE February 1995
BUDGET ACTIVITY: #2, Exploratory Development	PE NUMBER AND TITLE: PE 0602202F, Human Systems Technology — PROJECT NO.: 7755

(U) FY 1996:
- (U) Conduct biodynamic investigations to develop aircrew standards. ($6,213K)
  -- (U) Refine standards (i.e., cardiovascular, vision/optical devices, neuropsychiatric and hearing/vestibular standards) to improve aircrew selection, retention and performance.
  -- (U) Evaluate aircrew performance-based standards in areas such as high-G acceleration, microgravity, and dehydration.
  -- (U) Continue to develop better capability to assess defense women's health issues (i.e., obstetrics-gynecology (ob-gyn), orthopedic, hyperbaric oxygen therapy, G-tolerance) affecting female aircrew.
- (U) Develop operational performance enhancement devices. ($1,611K)
  -- (U) Test and evaluate therapeutic, prophylactic, and performance enhancing medication in the aviation environment.

(U) FY 1997:
- (U) Conduct biodynamic investigations to develop aircrew standards. ($5,958K)
  -- (U) Continue to refine standards (i.e., cardiovascular, vision/optical devices, neuropsychiatric and hearing/vestibular standards) to improve aircrew selection, retention and performance.
  -- (U) Continue to evaluate aircrew performance-based standards in areas such as high-G acceleration, microgravity, and dehydration.
  -- (U) Continue to assess defense women's health issues (i.e., obstetrics-gynecology (ob-gyn), orthopedic, hyperbaric oxygen therapy, G-tolerance) affecting female aircrew.
- (U) Develop operational performance enhancement devices. ($1,550K)
  -- (U) Continue to evaluate therapeutic, prophylactic, and performance enhancing medication in the aviation environment.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: **#2, Exploratory Development**

PE NUMBER AND TITLE: **PE 0602202F, Human Systems Technology**

PROJECT NO.: **7755**

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	1,014	1,379	1,192	1,291	Cont
Current Budget Submit/President's Budget	1,260	1,129	7,824	7,508	Cont

Change Summary Explanation:

Funding: Changes due to incorporation of 06 account laboratory operations funds into this project.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0603231F, Crew Systems and Personnel Protection Technology.
- (U) PE 0604601F, Chemical/Biological Warfare Defense Equipment.
- (U) PE 0604703F, Aeromedical/Casualty Care Systems Development.
- (U) PE 0604706F, Life Support Systems.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602202F, Human Systems Technology

PROJECT NO.: 7757

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 7757, Toxicology/Radiation Hazards	5,215	4,612	14,724	15,842	15,543	15,276	15,423	15,746	Cont	Cont

A. (U) Mission Description and Budget Item Justification: This project conducts technology development related to the effects and applications of electromagnetic and particulate radiation in aerospace operations. Includes: safety; impact; mission planning and countermeasures in combat; less than lethal applications for special operations and law enforcement; and biologic effects of exposure to radio frequency/microwave radiation, lasers, broad-band munitions, and ionizing radiation. Provides consultation support to other DOD programs by using unique Air Force resources to extend radiation applications, behavioral research, and operations analysis. Beginning FY 1996 and beyond, the following Mission Description will reflect work previously reported under Projects 6302 and a portion of 7231. This project enables the safe operational use of Air Force weapons systems through technology development on the effects and applications of hazardous materials, noise, and electromagnetic and space radiation used in, or resulting from, Air Force operations

(U) FY 1994:
- (U) Developed technology for assessing bioeffects and applications of directed energy in Air Force operations. ($5,215K)
  -- (U) Developed technology to assess bioeffects of pulsed laser radiation on the eye and skin.
  -- (U) Developed technology to assess potential for adverse and delayed bioeffects from exposure to pulsed radiofrequency radiation (RFR) and microwaves.
  -- (U) Assessed carcinogenic potential of RFR exposure using selected wavelengths, pulse forms, and power levels.

(U) FY 1995:
- (U) Develop technology for assessing bioeffects and applications of directed energy in Air Force operations. ($4,612K)
  -- (U) Produce interim exposure guidelines for ultra-short pulse lasers, and continue developing technology to assess occupational and operational threats of lasers.
  -- (U) Continue to develop technology to assess bioeffects of extra-wide band (EWB) and pulsed microwaves and RFR.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: **#2, Exploratory Development**	PE NUMBER AND TITLE: **PE 0602202F, Human Systems Technology** — PROJECT NO.: **7757**

(U) FY 1996:

- (U) Develop technology to exploit the effects and applications of directed energy in Air Force operations. ($9,485K)
  - -- (U) Develop technology to assess the operational impact of laser air defense weapons on visual delivery of precision guided munitions.
  - -- (U) Develop measures and countermeasures to exploit less-than-lethal biological effects of electromagnetic radiation for Air Force security, peacekeeping, and warfighting operations.
  - -- (U) Develop scientific database and methods for setting risk-based health and safety standards that protect personnel from harmful exposure to electromagnetic radiation with minimal operational impact.
  - -- (U) Assess health and safety impact of newly fielded and emerging high power microwave technologies.
- (U) Toxicological technology development and assessment of Air Force materials and processes. ($4,382K)
  - -- (U) Provide systems managers with critical information for risk versus benefit decisions for new materials such as Halon replacements, alternative solvents, and combustion toxicity for turbine engines.
- -- (U) Continue to assess and relate human health risks to clean-up standards for groundwater contaminants such as trichloroethylene. ($1,690K)
  - -- (U) Continue to develop technology to assess potential hazardous impact and occupational safety of alternative compounds for use in Air Force weapon systems.
- (U) Develop aircraft noise and sonic boom technology to assess and reduce adverse impacts of noise produced by Air Force operations. ($857K)
  - -- (U) Demonstrate airbase noise measurement technology.
  - -- (U) Develop Department of Defense manual for noise assessment.
  - -- (U) Update aircraft noise model to allow assessment for select operational Air Force aircraft.
  - -- (U) Verify model for topography effects on aircraft noise propagation.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE February 1995
BUDGET ACTIVITY: #2, Exploratory Development	PE NUMBER AND TITLE: PE 0602202F, Human Systems Technology — PROJECT NO.: 7757

(U) FY 1997:

- (U) Technology development on the effects and applications of directed energy in Air Force operations. ($9,746K)
  - -- (U) Develop technologies to incorporate a model for effects of laser threats on aircrews into Air Force Mission Planning Software.
  - -- (U) Continue developing electromagnetic radiation bioeffects measurement and analysis methods for use in setting risk-based health and safety standards for personnel exposure.
  - -- (U) Continue developing technologies for assessing bioeffects of less-than-lethal directed energy emissions.
  - -- (U) Develop analytical algorithms for calculating and predicting direct and inverse scattering of laser and radiofrequency radiation (RFR).
- (U) Toxicological technology development and assessment of Air Force materials and processes. ($5,228K)
  - -- (U) Continue toxicological assessment of next generation replacements for Halons and ozone depleting solvents to protect Air Force personnel and provide systems managers with risk versus benefit decision tools.
  - -- (U) Continue to develop and improve methods and models to assess chemical mixture toxicity in humans, relate human health effects to cleanup standards, and explore biomarkers as an indicator of exposure.
  - -- (U) Continue development in metabolic techniques for cell culture exposure, species extrapolation for enzymes diversity, and suitable alternatives to animal use for transition to operational and toxicology research initiatives.
- (U) Develop aircraft noise and sonic boom technology to assess and reduce adverse impacts of noise produced by Air Force operations. ($868K)
  - -- (U) Develop reciprocity model for structure damage from noise.
  - -- (U) Develop technology to assess human annoyance response to impulsive noise.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT NO.
#2, Exploratory Development	PE 0602202F, Human Systems Technology	7757

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	4,399	5,079	4,423	5,168	Cont
Current Budget Submit/President's Budget	5,215	4,612	14,724	15,842	Cont

Change Summary Explanation:

Funding: Changes due to incorporation of 06 account laboratory operations funds plus incorporation of work from Project 6302 and a portion of Project 7231 into this project.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0602720A, Environmental Quality Technology.
- (U) PE 0602777A, Systems Health Hazard Prevention Technology.
- (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.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602202F, Human Systems Technology

PROJECT NO.: 7930

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 7930, Advanced Crew Technology	2,029	2,216	-0-	-0-	-0-	-0-	-0-	-0-	-0-	Cont

A. (U) Mission Description and Budget Item Justification: This project studies human response to physiological stressors such as rapid-onset sustained acceleration, spatial disorientation, altitude, workload, and sustained operations. Design criteria and brass-board protective technologies and procedures are developed to improve crew performance in these challenging environments. Additional tasks involve the evaluation, cockpit integration, and man-rating of life support equipment.

(U) FY 1994:
- (U) Demonstrated acceleration tolerance enhancement and decompression sickness avoidance technologies to improve aircrew performance and effectiveness in operational combat environments. ($1,155K)
  - -- (U) Completed advanced computer model for decompression sickness.
- (U) Developed technologies for prevention of spatial disorientation and for improved aircrew performance during sustained operations in long-duration missions. ($874K)
  - -- (U) Demonstrated effects of fatigue upon aircrew performance during long-duration missions.

(U) FY 1995:
- (U) Develop technologies for evaluating and improving aircrew protection and effectiveness in operational environments. ($1,161K)
  - -- (U) Develop technologies to improve aircrew protection and effectiveness in a high-G acceleration environment.
  - -- (U) Develop advanced life support equipment technology to improve aircrew protection and effectiveness at high altitude.
- (U) Develop technologies for sustained aircrew operations and integration of life support technologies into aircraft to improve aircrew safety and performance. ($1,055K)
  - -- (U) Develop technologies to,enhance aircrew sustained operational performance.
  - -- (U) Develop spatial disorientation awareness training methods.
  - -- (U) Develop technologies to optimize cockpit display symbology and spatial disorientation countermeasures.
  - -- (U) Develop technologies for oxygen generation.

(U) FY 1996: Not Applicable.

(U) FY 1997: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: **February 1995**

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT NO.
#2, Exploratory Development	**PE 0602202F, Human Systems Technology**	**7930**

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	2,027	2,842	2,836	3,242-	Cont
Current Budget Submit/President's Budget	2,029	2,216	-0-	-0-	Cont

Change Summary Explanation:

Funding: Changes due to consolidation into Project 7184.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0602202F, Aerospace Flight Dynamics.
- (U) PE 0603205F, Aerospace Vehicle Technology.
- (U) PE 0603231F, Crew Systems and Personnel Protection Technology.
- (U) PE 0603245F, Advanced Fighter Technology Integration.
- (U) PE 0604601F, Chemical/Biological Warfare Defense Equipment.
- (U) PE 0604703F, Aeromedical/Casualty Care Systems Development.
- (U) PE 0604706F, Life Support Systems.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: **February 1995**

BUDGET ACTIVITY: **#2, Exploratory Development**

PE NUMBER AND TITLE: **PE 0602203F, Aerospace Propulsion**

COST ($ In Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Total PE 0602203F	72,408	73,014	78,592	77,901	80,318	80,653	81,094	84,985	Cont	Cont
Project 06PP, Directorate Operations	21,949	22,789	0	0	0	0	0	0	Cont	Cont
Project 3012, Ramjet Technology	6,166	2,527	8,700	8,423	8,798	8,742	8,710	9,145	Cont	Cont
Project 3048, Fuels and Lubrication	12,649	9,545	14,156	12,745	13,294	13,230	13,201	13,861	Cont	Cont
Project 3066, Aerospace Propulsion	23,299	27,630	38,490	40,006	40,833	41,314	41,803	43,719	Cont	Cont
Project 3145, Aerospace Power Technology	8,345	10,523	17,246	16,727	17,393	17,367	17,380	18,260	Cont	Cont

A. (U) Mission Description and Budget Item Justification: This Exploratory Development program develops airbreathing propulsion and aerospace power technologies. The prime areas of focus are turbine engines, ramjets, dual-mode ramjets, combined cycle engines, fuels, lubricants, and aerospace power technologies. Technology advances in turbine engine propulsion and lubrication systems are part of the Integrated High Performance Turbine Engine Technology (IHPTET) program and will increase engine performance, reduce specific fuel consumption, and lower cost of ownership. Ramjet / dual-mode ramjet and combined cycle engines will increase weapon lethality / effectiveness against time-critical targets via high-speed propulsion systems. Fuels efforts will reduce system cost, maintenance, and the usage of hazardous cleaning materials while increasing aircraft performance and life through development of thermally stable and high heat sink fuels. Power system technologies are focused to eliminate troublesome, centralized hydraulic systems by replacement with highly reliable electric systems. Power conditioning, thermal management, and battery improvements will significantly enhance reliability, reduce weight, and lower life cycle costs. Starting in FY 1996, separate infrastructure projects have been eliminated. All efforts in this program element contain the resources necessary, including civilian salaries, to manage, conduct, and document the technical activities.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602203F, Aerospace Propulsion

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	75,085	77,506	72,070	74,132	Cont
Appropriated Value	75,506	74,406			
Adjustments to Appropriated Value:					
a. Congressional General Reductions	-429	-1,392			
b. SBIR	-469				
c. Omnibus Reprogramming	-2,000				
d. Below Threshold Reprogrammings	-200				
Current President's Budget	72,408	73,014	78,592	77,901	Cont

Change Summary Explanation:

Funding: Turbine engine efforts restored to achieve Phase II Integrated High Performance Turbine Engine Technology goals by FY 1997.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary: Not Applicable.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602203F, Aerospace Propulsion

PROJECT NO.: 06PP

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 06PP, Directorate Operations	21,949	22,789	0	0	0	0	0	0	Cont	Cont

A. (U) Mission Description and Budget Item Justification: 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, utilities, and procurement of supplies and equipment. This project will be terminated in FY 1996 and its contents distributed to the technical projects.

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	21,949	22,789	23,065	23,487	Cont
Current President's Budget	21,949	22,789	0	0	Cont

Change Summary Explanation:

Funding: Project funding incorporated under technical projects after FY 1995.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary: Not Applicable.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602203F, Aerospace Propulsion

PROJECT NO.: 3012

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 3012, Ramjet Technology	6,166	2,527	8,700	8,423	8,798	8,742	8,710	9,145	Cont	Cont

A. (U) Mission Description and Budget Item Justification: Establishes technology base for advanced propulsion concepts including integral rocket ramjets for missile propulsion providing increased average velocity and lethality along with combined cycle engines and hydrocarbon fueled dual-mode combustion (subsonic/supersonic burning) ramjets for high-speed vehicles to support future missions such as rapid strike against time-critical targets.

(U) FY 1994:

- (U) Developed ramjet components (inlets, ramburners, fuel systems, inlet/port covers, boost motors, etc.) for airbreathing propulsion applications. This effort facilitates technology transition to current and future air vehicles with greater range, increased velocity, and increased maneuverability which enhance weapon effectiveness. ($3,266K)
  - -- (U) Completed first round test/selection of high energy density gas generator fuels.
  - -- (U) Verified new insulation material significantly lowers combustor wall temperature (200°F - 500°F).
  - -- (U) Verified that advanced migration barrier material reduces the booster liner barrier thickness and survives -65°F to 145°F temperature cycling requirement.
- (U) Developed components for robust dual-mode combustion ramjets for unmanned applications to enable effective coverage of time-critical targets. Emphasis was on performance and mitigating development risk for future weapon systems. ($900K)
  - -- (U) Completed design and fabrication of high-speed, dual-mode burner for performance testing.
- (U) Investigated unique concepts for combining advanced propulsion cycles for high-speed aerospace vehicles. This effort supports technology transition for next generation reconnaissance/strike vehicles (manned and unmanned) and airbreathing boosters. ($2,000K)
  - -- (U) Completed design and initiated fabrication of air core enhanced turborocket combustor test sector.
  - -- (U) Completed design and initiated fabrication of key component for optimizing fuel distribution in an air turborocket combustor.
  - -- (U) Completed facility preparation and test of unique air/fuel (endothermic) heat exchanger reactor.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #2, Exploratory Development	PE NUMBER AND TITLE: PE 0602203F, Aerospace Propulsion — PROJECT NO.: 3012

(U) FY 1995:

- (U) Develop ramjet components (inlets, ramburners, fuel systems, inlet/port covers, boost motors, etc.) for airbreathing propulsion applications. This effort facilitates technology transition to current and future air vehicles with greater range, increased velocity, and increased maneuverability which enhance weapon effectiveness. ($2,527K)
  - -- (U) Complete testing of high energy gas generator fuels and select candidate which meets 100% of energy density goal.
  - -- (U) Verify the secondary combustion performance of the selected high energy gas generator fuel via ramburner tests over a simulated flight envelope.
  - -- (U) Complete testing of nozzleless boost motor design which will meet 100% of the total impulse goal.
  - -- (U) Assess concepts/materials for eliminating debris (foreign object damage) during the rocket-to-ramjet transition process.

(U) FY 1996:

- (U) Develop ramjet components (inlets, ramburners, fuel systems, inlet/port covers, boost motors, etc.) for airbreathing propulsion applications. This effort facilitates technology transition to current and future air vehicles with greater range, increased velocity, and increased maneuverability which enhance weapon effectiveness. ($3,828K)
  - -- (U) Complete sub-scale testing of consumable ramjet structures for elimination of debris during rocket / ramjet transition.
  - -- (U) Accomplish rocket/ramjet transition test to complete boron fuel technology transfer from Germany to U.S.
  - -- (U) Investigate highest payoff technologies for application to advanced ramjet propulsion such as insensitive munitions, low-observables, high energy fuels, self throttling fuel systems (France) and lightweight structures.
- (U) Develop components for robust dual-mode combustion ramjets for unmanned applications to enable effective coverage of time-critical targets. Emphasis will be on performance and mitigating development risk for future weapon systems. ($2,668K)
  - -- (U) Investigate advanced flameholding/fuel injection/mixing techniques to maximize combustor performance and extend dual-mode ramjet operation to the limit of hydrocarbon fuel capability.
  - -- (U) Investigate alternate endothermic fuel systems to assure maximum fuel cooling capability.
  - -- (U) Evaluate opportunities to exploit enormous Russian investment in dual-mode combustion ramjet technology. Coordinate effort with the Air Force intelligence community.
- (U) Investigate unique concepts for combining advanced propulsion cycles for high-speed aerospace vehicles. This effort supports technology transition for next generation reconnaissance/strike vehicles (manned and unmanned) and airbreathing boosters. ($2,204K)
  - -- (U) Complete in-house testing preparations and hardware integration as part of a joint Air Force/NASA turboramjet test program.
  - -- (U) Investigate techniques for continuous operation of the pulsed detonation wave cycle with potential for very high thrust to weight missile engine.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #2, Exploratory Development	PE NUMBER AND TITLE: PE 0602203F, Aerospace Propulsion — PROJECT NO.: 3012

(U) FY 1997:

- (U) Develop ramjet components (inlets, ramburners, fuel systems, inlet/port covers, boost motors, etc.) for airbreathing propulsion applications. This effort facilitates technology transition to current and future air vehicles with greater range, increased velocity, and increased maneuverability which enhance weapon effectiveness. ($2,183K)
  - -- (U) Complete testing of full-scale flight weight consumable structures for eliminating debris during rocket / ramjet transition.
  - -- (U) Determine tactical utility of applying ramjet engine technologies to High-Speed Antiradiation Missile (HARM), Sparrow, and Hawk class missiles.
- (U) Develop components for robust dual-mode combustion ramjets for unmanned applications to enable effective coverage of time-critical targets. Emphasis will be on performance and mitigating development risk for future weapon systems. ($4,167K)
  - -- (U) Test combustor with advanced flameholder/fuel injector to demonstrate acceleration and cruise operation with endothermic fuel.
  - -- (U) Test and evaluate Russian technology developed for an endothermic fueled dual-mode combustion ramjet which will provide information of significant value to future Air Force dual-mode ramjet developments.
- (U) Investigate unique concepts for combining advanced propulsion cycles for high-speed aerospace vehicles. This effort supports technology transition for next generation reconnaissance/strike vehicles (manned and unmanned) and airbreathing boosters. ($2,073K)
  - -- (U) Complete first in-house test phase (joint Air Force/NASA test program) on a turboramjet afterburner (Hyperburner) over a simulated flight envelope.
  - -- (U) Initiate joint Air Force/Army solid fuel Air Turbo Rocket exploratory development propulsion option for cruise missiles or airbreathing boosters.
  - -- (U) Evaluate detonation engine operation in a combustor which is compatible with missile applications.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT NO.
#2, Exploratory Development	PE 0602203F, Aerospace Propulsion	3012

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	6,382	6,698	5,339	5,846	Cont
Current President's Budget	6,166	2,527	8,700	8,423	Cont

Change Summary Explanation:

Funding: Congressional cut of $4.1million in FY 1995. Hypersonic work was continued in FY 1995 under PE 0602269F per the Senate Apppropriations Committee (SAC) recommendations. Increase in FY 1996 and beyond due to incorporation of Project 06PP, Directorate Operations.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0603216F, Aerospace Propulsion and Power Technology.
- (U) PE 0602269F, Hypersonic Technology Development.
- (U) Program is reported to/ coordinated by the Joint Army / Navy / Air Force (JANNAF) executive committee.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602203F, Aerospace Propulsion

PROJECT NO.: 3048

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 3048, Fuels and Lubrication	12,649	9,545	14,156	12,745	13,294	13,230	13,201	13,861	Cont	Cont

A. (U) Mission Description and Budget Item Justification: Develops advanced fuels, lubricants, and component technologies for use in aircraft and missile engines. Conventional petroleum and alternate fuels are developed and evaluated for Air Force applications. Fuels and lubricants must be thermally stable, cost-effective, and operate at higher temperatures.

(U) FY 1994:

- (U) Developed high thermal stability and endothermic hydrocarbon fuels to provide higher heat capacity and operating temperatures for aircraft and missile systems. This technology is for current and future aircraft to reduce maintenance caused by fuel systems fouling, and provide cooling for increased avionics loads and higher engine temperatures. ($6,196K)
  - -- (U) Evaluated over 200 additive candidates to improve JP-8 thermal stability by 100°F.
  - -- (U) Tested JP-8+100 additive in reduced scale fuel system simulator.
  - -- (U) Evaluated high heat sink fuels produced from coal-derived materials.
- (U) Developed high performance, low emission, robust combustor concepts for advanced turbine engines. This will reduce the risk and cost associated with developing high performance, low maintenance engines that operate efficiently within air pollution guidelines and have high thrust-to-weight ratio and low specific fuel consumption. ($1,159K)
  - -- (U) Developed a new combustor concept utilizing a trapped vortex of intensely burning fuel and air for gas turbine engines.
  - -- (U) Conducted studies to characterize combustor lean blow out and collect data for development probability density function computer model to reduce cost and risk of combustor development.
- (U) Developed high temperature liquid and alternate lubricants to upgrade performance and reliability, decrease operational and maintenance costs of current engines, and meet the high operating temperatures of future high performance engines. ($1,568K)
  - -- (U) Released four centistoke lubricant specification for use in advanced gas turbine engines.
  - -- (U) Established vapor phase lubrication as a viable technology at very high bearing compartment temperatures.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #2, Exploratory Development	PE NUMBER AND TITLE: PE 0602203F, Aerospace Propulsion	PROJECT NO.: 3048

- (U) Developed mainshaft bearings, seals, dampers, and gearbox components for gas turbine engines. This will permit engines with higher operating temperatures, longer life, and reduced weight. ($3,726K)
  - -- (U) Validated self lubricating bearings for expendable engines.
  - -- (U) Completed feasibility study of magnetic levitation of gas turbine rotor.
  - -- (U) Completed development of deflection pad bearing to replace compressor bleed air in rotor thrust balancing.

(U) FY 1995:

- (U) Develop high thermal stability and endothermic hydrocarbon fuels to provide higher heat capacity and operating temperatures for aircraft and missile systems. This technology is for current and future aircraft to reduce maintenance caused by fuel systems fouling and provide cooling for increased avionics loads, and higher engine temperatures. ($2,413K)
  - -- (U) Complete testing of best additives for JP-8+100 in reduced scale fuel system simulator.
  - -- (U) Quantify cost savings and reduced fuel system maintenance achievable with JP-8+100.
- (U) Develop high performance, low emission, robust combustor concepts for advanced turbine engines. This will reduce the risk and cost associated with developing high performance, low maintenance engines that operate efficiently within air pollution guidelines and have high thrust-to-weight ratio and low specific fuel consumption. ($1,037K)
  - -- (U) Evaluate high performance, low emissions, single cup, trapped vortex combustor.
  - -- (U) Evaluate advanced fuel/air mixing concepts through dome and liner geometry variation and validate probability density function computer model to reduce risk in developing Integrated High Performance Turbine Engine Technology (IHPTET) combustors.
- (U) Develop lubricant technology to permit efficient high-speed rotation of turbine engine components. This technology includes conventional and advanced lubricants and mechanical systems extended to their highest temperature limitations; and approaches such as magnetic levitation and solid and vapor lubrication for advanced engines with operating conditions that exceed the capabilities of conventional approaches. ($6,095K)
  - -- (U) Develop advanced bearing materials and surface coatings exhibiting effective corrosion resistance and performance with high temperature liquid lubricants.
  - -- (U) Develop vapor phase lubrication technology to meet requirements of expendable engines over their full mission cycle.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #2, Exploratory Development	PE NUMBER AND TITLE: PE 0602203F, Aerospace Propulsion — PROJECT NO.: 3048

(U) FY 1996:

- (U) Develop high thermal stability and endothermic hydrocarbon fuels to provide higher heat capacity and operating temperatures for aircraft and missile systems. This technology is for current and future aircraft to reduce fuel systems fouling and provide cooling for increased avionics loads, higher engine temperatures, and reduced fuel consumption. ($3,686K)
  - -- (U) Demonstrate performance and cost benefits of JP-8+100 fuel to reduce fuel system maintenance.
  - -- (U) Develop advanced fuel system components that allow the utilization of the heat sink of JP-8+100 fuel.
- (U) Develop high performance, low emission, robust combustor concepts for advanced turbine engines. This will reduce the risk and cost associated with developing high performance, low maintenance engines that operate efficiently within air pollution guidelines and have high thrust-to-weight ratio and low specific fuel consumption. ($2,611K)
  - -- (U) Develop and evaluate a high performance, low emissions trapped vortex combustor concept in rig tests using a sector of an annular combustor to validate this revolutionary concept for gas turbine engines.
  - -- (U) Evaluate advanced fuel injector concepts to select the best candidate for increased combustion performance and low emissions in advanced gas turbine engines.
- (U) Develop lubricant technology to permit efficient high-speed rotation of turbine engine components. This technology includes conventional and advanced lubricants and mechanical systems extended to their highest temperature limitations; and approaches such as magnetic levitation and solid and vapor lubrication for advanced engines with operating conditions that exceed the capabilities of conventional approaches. ($7,859K)
  - -- (U) Develop liquid lubricants to 600°F bulk oil temperature to increase thermal stability and life while decreasing friction, wear, deposit formation, and corrosivity in current and future engines.
  - -- (U) Validate vapor phase lubrication and magnetic levitation as technology alternatives to liquid lubricants at temperatures exceeding 700°F.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #2, Exploratory Development	PE NUMBER AND TITLE: PE 0602203F, Aerospace Propulsion — PROJECT NO.: 3048

(U) FY 1997:

- (U) Develop high thermal stability and endothermic hydrocarbon fuels to provide higher heat capacity and operating temperatures for aircraft and missile systems. This technology is for current and future aircraft to reduce fuel systems fouling and provide cooling for increased avionics loads, higher engine temperatures, and reduced fuel consumption. ($4,034K)
  - -- (U) Validate performance and cost benefits of JP-8+100 fuel to increase sortie generation.
  - -- (U) Validate advanced fuel system components that allow the utilization of the heat sink of JP-8+100 fuel.
- (U) Develop high performance, low emission, robust combustor concepts for advanced turbine engines. This will reduce the risk and cost associated with developing high performance, low maintenance engines that operate efficiently within air pollution guidelines and have high thrust-to-weight ratio and low specific fuel consumption. ($2,966K)
  - -- (U) Design high performance, low emissions, full-annular, trapped vortex combustor for transition to Phase III Integrated High Performance Turbine Engine Technology (IHPTET).
  - -- (U) Evaluate the best fuel injector concept in a high pressure combustion rig to fully characterize combustion performance and emissions levels.
- (U) Develop lubricant technology to permit efficient high-speed rotation of turbine engine components. This technology includes conventional and advanced lubricants and mechanical systems extended to their highest temperature limitations; and approaches such as magnetic levitation and solid and vapor lubrication for advanced engines with operating conditions that exceed the capabilities of conventional approaches. ($5,745K)
  - -- (U) Verify vapor phase lubrication as primary system in expendable and limited life gas turbine engines.
  - -- (U) Verify magnetic levitation and control as full replacement for conventional lubricants and bearings in an advanced gas generator.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT NO.
#2, Exploratory Development	PE 0602203F, Aerospace Propulsion	3048

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	13,276	9,505	8,012	8,542	Cont
Current President's Budget	12,649	9,545	14,156	12,745	Cont

Change Summary Explanation:

Funding: Increase in FY 1996 and beyond due to incorporation of Project 06PP, Directorate Operations.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(U) Related Activities:

- (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.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602203F, Aerospace Propulsion

PROJECT NO.: 3066

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 3066, Aerospace Propulsion	23,299	27,630	38,490	40,006	40,833	41,314	41,803	43,719	Cont	Cont

A. (U) Mission Description and Budget Item Justification: Develops technology to increase propulsion system operational reliability, mission flexibility, and performance while reducing weight, fuel consumption, and cost of ownership. Analytical and experimental efforts are conducted in fans/ compressors, high temperature combustors, turbines, internal flow systems, controls, exhaust systems, and structural design. This project supports the Integrated High Performance Turbine Engine Technology (IHPTET) program.

(U) FY 1994:

- (U) Developed core engine components (compressors, combustors, and turbines) for turbofan/turbojet engines for fighters, attack aircraft, bombers, and transports. These components will provide aircraft engines with lower life cycle cost, increased durability, higher performance, and reduced fuel consumption. ($16,043K)
  - -- (U) Designed and fabricated advanced compressors with higher aerodynamic efficiencies, lower manufacturing costs, increased robustness, higher compressor exit temperature capability, lower weight, and improved seals.
  - -- (U) Designed and fabricated advanced combustors with higher combustion efficiencies, lower manufacturing costs, increased robustness, higher combustion temperature, lower weight, and improved burner pattern factor.
  - -- (U) Designed and fabricated advanced turbines with higher aerothermodynamic efficiencies, lower manufacturing costs, increased robustness, higher turbine inlet temperature capability, lower weight, and improved cooling effectiveness.
- (U) Developed turbine engine components (fans, low pressure turbines, engine controls, exhaust nozzles, and integration technology) for turbofan/turbojet engines for fighters, attack aircraft, bombers, and transports. These components will provide aircraft engines with lower life cycle cost, increased durability, higher performance, and reduced fuel consumption. ($4,461K)
  - -- (U) Designed and fabricated advanced fans with higher aerodynamic efficiencies, lower manufacturing costs, increased robustness, higher flow distortion tolerance capability, lower weight, and reduced tip losses.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #2, Exploratory Development	PE NUMBER AND TITLE: PE 0602203F, Aerospace Propulsion	PROJECT NO.: 3066

- (U) Developed components for expendable engines for missile and unmanned air vehicle applications. These components will provide expendable engines with reduced cost, reduced fuel consumption, and increased specific thrust, greatly expanding the operating envelops of cruise missiles. ($1,747K)
  - -- (U) Designed and fabricated advanced turbine with higher aerothermodynamic efficiencies, lower manufacturing costs, increased robustness, higher inlet temperature capability, lower weight, and improved cooling effectiveness.
- (U) Developed components for turboshaft/turboprop and small turbofan engines for trainers, rotorcraft, special operations aircraft, and theater transports. These components will provide lower cost missile engines which exhibit improved durability, higher performance, and reduced fuel consumption. ($1,048K)
  - -- (U) Designed and fabricated advanced compressors with higher aerodynamic efficiencies, lower manufacturing costs, increased robustness, higher compressor exit temperature capability, lower weight, and improved seals.

(U) FY 1995:

- (U Develop core engine components (compressors, combustors, and turbines) for turbofan/turbojet engines for fighters, attack aircraft, bombers, and transports. These components will provide aircraft engines with lower life cycle cost, increased durability, higher performance, and reduced fuel consumption. ($20,170K)
  - -- (U) Demonstrate advanced compressors with higher aerodynamic efficiencies, lower manufacturing costs, increased robustness, higher compressor exit temperature capability, lower weight, and improved seals.
  - -- (U) Demonstrate advanced combustors with higher combustion efficiencies, lower manufacturing costs, increased robustness, higher combustion temperature, lower weight, and improved burner pattern factor.
  - -- (U) Demonstrate advanced turbines with higher aerothermodynamic efficiencies, lower manufacturing costs, increased robustness, higher turbine inlet temperature capability, lower weight, and improved cooling effectiveness.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #2, Exploratory Development	PE NUMBER AND TITLE: PE 0602203F, Aerospace Propulsion — PROJECT NO.: 3066

- (U) Develop turbine engine components (fans, low pressure turbines, engine controls, exhaust nozzles, and integration technology) for turbofan/turbojet engines for fighters, attack aircraft, bombers, and transports. These components will provide aircraft engines with lower life cycle cost, increased durability, higher performance, and reduced fuel consumption. ($3,443K)
  - -- (U) Demonstrate advanced fans with higher aerodynamic efficiencies, lower manufacturing costs, increased robustness, higher flow distortion tolerance capability, lower weight, and reduced tip losses.
- (U) Develop components for expendable engines for missile and unmanned air vehicle applications. These components will provide expendable engines with reduced cost, reduced fuel consumption, and increased specific thrust, greatly expanding the operating envelopes of cruise missiles. ($2,582K)
  - -- (U) Demonstrate advanced turbine with higher aerothermodynamic efficiencies, lower manufacturing costs, increased robustness, higher inlet temperature capability, lower weight, and improved cooling effectiveness.
- (U) Develop components for turboshaft/turboprop and small turbofan engines for trainers, rotorcraft, special operations aircraft, and theater transports. These components will provide aircraft engines with lower life cycle cost, increased durability, higher performance, and reduced fuel consumption. ($1,435K)
  - -- (U) Demonstrate advanced compressors with higher aerodynamic efficiencies, lower manufacturing costs, increased robustness, higher compressor exit temperature capability, lower weight, and improved seals.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #2, Exploratory Development	PE NUMBER AND TITLE: PE 0602203F, Aerospace Propulsion — PROJECT NO.: 3066

(U) FY 1996:

- (U) Develop core engine components for turbofan/turbojet engines for fighters, attack aircraft, bombers, and transports. These components will provide aircraft engines with higher performance, increased durability, reduced fuel consumption, and lower life cycle cost. ($27,888K)
  - -- (U) Design and fabricate advanced compressors with higher aerodynamic efficiencies, lower manufacturing costs, increased robustness, higher compressor exit temperature capability, lower weight, and improved seals.
  - -- (U) Design and fabricate advanced combustors with higher combustion efficiencies, lower manufacturing costs, increased robustness, higher combustion temperature, lower weight, and improved temperature patterns.
  - -- (U) Design and fabricate advanced turbines with higher aerothermodynamic efficiencies, lower manufacturing costs, increased robustness, higher turbine inlet temperature, lower weight, and improved cooling effectiveness.
- (U) Develop turbine engine components (fans, low pressure turbines, engine controls, exhaust nozzles, and integration technology) for turbofan/turbojet engines for fighters, attack aircraft, bombers, and transports. These components will provide aircraft engines with higher performance, increased durability, reduced fuel consumption, and lower life cycle cost. ($3,228K)
  - -- (U) Design and fabricate advanced fan with higher aerodynamic efficiencies, lower manufacturing costs, increased robustness, and lower weight.
- (U) Develop components for expendable engines for missile and unmanned air vehicle applications. These components will provide expendable engines with reduced cost, reduced fuel consumption, and increased specific thrust, greatly expanding the operating envelopes of cruise missiles. ($4,350K)
  - -- (U) Design and fabricate advanced combustor with higher aerothermodynamic efficiencies, lower manufacturing costs, increased robustness, and lower weight.
- (U) Develop components for turboshaft/turboprop and small turbofan engines for trainers, rotorcraft, special operations aircraft, and theater transports. ($3,024K)
  - -- (U) Demonstrate advanced turbine with higher aerodynamic efficiencies, lower manufacturing costs, increased robustness, higher turbine inlet temperature, lower weight, and improved cooling effectiveness.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #2, Exploratory Development	PE NUMBER AND TITLE: PE 0602203F, Aerospace Propulsion — PROJECT NO.: 3066

(U) FY 1997:

- (U) Develop core engine components for turbofan/turbojet engines for fighters, attack aircraft, bombers, and transports. These components will provide aircraft engines with higher performance, increased durability, reduced fuel consumption, and lower life cycle cost. ($28,199K)
  - -- (U) Demonstrate advanced compressors with higher aerodynamic efficiencies, lower manufacturing costs, increased robustness, higher compressor exit temperature capability, lower weight, and improved seals.
  - -- (U) Demonstrate advanced combustors with higher combustion efficiencies, lower manufacturing costs, increased robustness, higher combustion temperature, lower weight, and improved temperature patterns.
  - -- (U) Demonstrate advanced turbines with higher aerothermodynamic efficiencies, lower manufacturing costs, increased robustness, higher turbine inlet temperature, lower weight, and improved cooling effectiveness.
- (U) Develop turbine engine components (fans, low pressure turbines, engine controls, exhaust nozzles, and integration technology) for turbofan/turbojet engines for fighters, attack aircraft, bombers, and transports. These components will provide aircraft engines with higher performance, increased durability, reduced fuel consumption, and lower life cycle cost. ($4,882K)
  - -- (U) Demonstrate advanced fan with higher aerodynamic efficiencies, lower manufacturing costs, increased robustness, and lower weight.
- (U) Develop components for expendable engines for missile and unmanned air vehicle applications. These components will provide expendable engines with reduced cost, reduced fuel consumption, and increased specific thrust, greatly expanding the operating envelopes of cruise missiles. ($4,755K)
  - -- (U) Demonstrate advanced combustor with higher aerothermodynamic efficiencies, lower manufacturing costs, increased robustness, and lower weight.
- (U) Develop components for turboshaft/turboprop and small turbofan engines for trainers, rotorcraft, special operations aircraft, and theater transports. ($2,170K)
  - -- (U) Demonstrate advanced turbine with higher aerodynamic efficiencies, lower manufacturing costs, increased robustness, higher turbine inlet temperature, lower weight, and improved cooling effectiveness.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT NO.
#2, Exploratory Development	PE 0602203F, Aerospace Propulsion	3066

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	24,553	27,693	24,782	25,316	Cont
Current President's Budget	23,299	27,630	38,490	40,006	Cont

Change Summary Explanation:

Funding: Increase in FY 1996 and beyond due to incorporation of Project 06PP, Directorate Operations; also, turbine engine efforts restored to achieve Phase II Integrated High Performance Turbine Engine Technology goals by FY 1997.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0602102F, Materials.
- (U) PE 0603202F, Aircraft Propulsion Subsystem Integration.
- (U) PE 0603216F, Aerospace Propulsion and Power Technology.
- (U) PE 0602122N, Aircraft Technology.
- (U) PE 0603210N, Aircraft Propulsion.
- (U) PE 0603003A, Aviation Advanced Technology.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602203F, Aerospace Propulsion

PROJECT NO.: 3145

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 3145, Aerospace Power Technology	8,345	10,523	17,246	16,727	17,393	17,367	17,380	18,260	Cont	Cont

A. (U) Mission Description and Budget Item Justification: Develops technologies for aerospace power generation, conversion, and transmission systems including advanced electrical power component and subsystem technologies. Power components are developed for aircraft and flight line equipment to increase reliability, maintainability, commonality, and supportability. This project supports an initiative which uses electrical power to replace hydraulic and pneumatic power and their costly logistics support. Essentially, all power electronics technology being developed has dual-use opportunities. Specific application areas include electric automobiles, electric brakes, electrically actuated power steering, and a wide range of variable speed industrial motor drive applications.

(U) FY 1994:

- (U) Developed aerospace batteries and power generation, conversion, and transmission components for aircraft systems. These components provide aircraft with a high degree of self-sufficiency, improved reliability, maintainability, and supportability, all yielding a quicker aircraft turn-around time. In addition, ground support equipment requirements will be dramatically reduced. ($7,780K)
  - -- (U) Fabricated electrical generator for engine start and on-board electrical power for aircraft. Provides two-fold improvement over existing generators and first step towards eliminating engine mounted gearboxes.
  - -- (U) Verified novel cooling scheme for high-power electrically driven actuators and power conditioning units. Provides enhanced thermal stability, doubles life, and improves performance by 50%.
  - -- (U) Verified 270 V battery system for use in fault tolerant electrical systems to guarantee uninterruptable power.
- (U) Developed battery systems for guidance, navigation, and control functions for missile systems. Batteries with higher power density, longer life, increased reliability, and rechargability will provide missile systems with greater reliability and reduced maintenance costs. ($465K)
  - -- (U) Initiated design of novel lithium battery cell and optimized lithium electrochemistry to minimize weight and volume.
- (U) Developed special purpose power components for advanced surveillance and communications systems, as well as ground power applications. ($100K)
  - -- (U) Fabricated and initiated testing of high temperature superconducting coils for use in ultra high efficiency, high-power electrical generators.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #2, Exploratory Development	PE NUMBER AND TITLE: PE 0602203F, Aerospace Propulsion — PROJECT NO.: 3145

(U) FY 1995:

- (U) Develop aerospace batteries and power generation, conversion, and transmission components for aircraft systems. These components provide aircraft with a high degree of self-sufficiency, improved reliability, maintainability, and supportability, all yielding a quicker aircraft turn-around time. In addition, ground support equipment requirements will be dramatically reduced. ($9,882K)
  - -- (U) Initiate rig test of electrical generator with magnetic bearings to improve reliability by two-fold for engine start and auxiliary power unit systems.
  - -- (U) Design and initiate fabrication of internal starter/generator which will allow elimination of engine mounted gearbox and improve reliability by five-fold over existing electrical generators.
  - -- (U) Design electrical components (semiconductor switches, capacitors, smart circuit breakers) essential for fault tolerant electrical power.
- (U) Develop battery systems for guidance, navigation, and control functions for missile systems. Batteries with higher power density, longer life, increased reliability, and rechargability will provide missiles systems with greater reliability and reduced maintenance costs. ($483K)
  - -- (U) Design and fabricate bipolar lithium battery cell to optimize packaging and increase energy density providing a two-fold improvement over current lithium cell designs.
- (U) Develop special purpose power components for advanced surveillance and communications systems, as well as ground power applications. ($158K)
  - -- (U) Validate a high temperature superconducting coil component for use in high-power electrical generators. Provides improved efficiency over existing electrical generators which support air base electrical power needs.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT NO.
#2, Exploratory Development	PE 0602203F, Aerospace Propulsion	3145

(U) FY 1996:

- (U) Develop aerospace batteries and power generation, conversion, and transmission components for aircraft systems. These components provide aircraft with a high degree of self-sufficiency, improved reliability, maintainability, and supportability, all yielding a quicker aircraft turn-around time. In addition, ground support equipment requirements will be dramatically reduced. ($15,246K)
  - -- (U) Rig test components to engine start/auxiliary power unit systems to improve reliability by two-fold.
  - -- (U) Design and fabricate electrical components essential for a fault tolerant electrical power system.
  - -- (U) Test high temperature semiconductor switches to demonstrate increased operating temperature and improved reliability.
- (U) Develop battery systems for guidance, navigation, control functions for missile systems, and for use in navigational aids, radios and sensors for special operations forces. Batteries with higher power density, longer life, increased reliability, and rechargability will provide missiles systems and special operations forces with greater reliability and reduced maintenance costs. ($1,400K)
  - -- (U) Develop lithium cell components for use in rechargeable batteries--allows three-fold reduction in mass and volume over existing batteries.
- (U) Develop special purpose power components for advanced surveillance and communications systems, as well as ground power applications. ($600K)
  - -- (U) Complete electromagnetic interference (EMI) and thermal modeling activities for aircraft power systems.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #2, Exploratory Development	PE NUMBER AND TITLE: PE 0602203F, Aerospace Propulsion — PROJECT NO.: 3145

(U) FY 1997:

- (U) Develop aerospace batteries and power generation, conversion, and transmission components for aircraft systems. These components provide aircraft with a high degree of self-sufficiency, improved reliability, maintainability, and supportability, all yielding a quicker aircraft turn-around time. In addition, ground support equipment requirements will be dramatically reduced. ($14,727K)
  - -- (U) Demonstrate electrical components essential for a fault tolerant electrical power system.
  - -- (U) Complete test and demonstration of high temperature semiconductor switches to demonstrate increased operating temperature and improved reliability.
  - -- (U) Complete fabrication and begin testing internal engine starter / generator which leads to elimination of engine gear box.
- (U) Develop battery systems for guidance, navigation, control functions for missile systems, and for use in navigational aids, radios and sensors for special operations forces. Batteries with higher power density, longer life, increased reliability, and rechargability will provide missiles systems and special operations forces with greater reliability and reduced maintenance costs. ($1,400K)
  - -- (U) Demonstrate lithium cells for use in rechargeable batteries--allows three-fold reduction in mass and volume over existing batteries.
- (U) Develop special purpose power components for advanced surveillance and communications systems, as well as ground power applications. ($600K)
  - -- (U) Design and begin fabrication of high temperature superconducting energy storage device for uninterruptable base power supply.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602203F, Aerospace Propulsion

PROJECT NO.: 3145

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	8,925	10,281	10,872	10,941	Cont
Current President's Budget	8,345	10,523	17,246	16,727	Cont

Change Summary Explanation:

Funding: Increase in FY 1996 and beyond due to incorporation of Project 06PP, Directorate Operations.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(U) Related Activities:

- (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.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602204F, Aerospace Avionics

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Total PE 0602204F Cost	65,578	66,601	74,256	73,561	77,859	80,899	83,397	84,953	Cont	Cont
Project 06AA, Laboratory Operations	37,232	41,152	0	0	0	0	0	0	Cont	Cont
Project 2000, Active Electronic Countermeasures	2,991	2,058	7,590	7,518	7,963	8,278	8,537	8,750	Cont	Cont
Project 2001, Electro-Optical Technology	2,276	1,889	5,777	5,722	6,061	6,301	6,498	6,660	Cont	Cont
Project 2002, Microwave Technology	4,575	5,078	10,613	10,003	11,184	11,666	12,062	12,388	Cont	Cont
Project 2003, Avionics System Design Technology	2,962	287	8,818	8,734	9,251	9,617	9,918	10,165	Cont	Cont
Project 2004, Reconnaissance/Strike Electro-Optical Sensors	1,451	1,076	3,685	3,650	3,866	4,019	4,144	4,248	Cont	Cont
Project 6095, Inertial Reference and Guidance Technology	1,548	1,719	3,931	3,894	4,125	4,288	4,422	4,532	Cont	Cont
Project 6096, Microelectronics Technology	3,477	3,858	10,825	11,241	11,259	11,625	11,926	11,673	Cont	Cont
Project 7622, Reconnaissance/Strike Radio Frequency Sensors	2,487	2,181	6,313	6,253	6,624	6,886	7,101	7,278	Cont	Cont
Project 7629, Fire Control Avionics	2,969	3,296	7,538	7,467	7,909	8,222	8,479	8,691	Cont	Cont
Project 7633, Passive Electronic Countermeasures	2,741	3,043	6,960	6,894	7,302	7,591	7,828	8,024	Cont	Cont
Project 7662, Avionics Data Transmission and Reception	869	964	2,206	2,185	2,315	2,406	2,482	2,544	Cont	Cont

A. (U) Mission Description and Budget Item Justification: This Exploratory Development program establishes technology feasibility and develops the technology base for Air Force avionics needs to include target detection and classification, fire control, navigation, communication, jamming and deception of hostile defenses, architectures, data processing, and electronic devices. Advances in avionics are needed to multiply weapons effectiveness, enhance reliability, and reduce life cycle costs. Starting in FY 1996, the 06AA infrastructure project has been eliminated. All efforts in this program element contain the resources necessary, including civilian salaries, to manage, conduct, and document the technical activities.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602204F, Aerospace Avionics

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	66,091	74,673	75,485	78,004	Cont
Appropriated Value	66,540	67,957			
Adjustments to Appropriated Value:					Cont
a. Congressional General Reductions	-450	-1,356			
b. SBIR	-412				
c. Below Threshold Reprogramming	-100				
Current President's Budget	65,578	66,601	74,256	73,561	Cont

Change Summary Explanation:

Funding: The Program Element level funding reflects increased emphasis in avionics technology development. The project funding increases reflect distribution of Project 06AA, Laboratory Operations, resources to the technical efforts.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary: Not Applicable.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602204F, Aerospace Avionics

PROJECT NO.: 06AA

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 06AA, Laboratory Operations	37,232	41,152	0	0	0	0	0	0	Cont	Cont

A. (U) Mission Description and Budget Item Justification: Provides for management and support of Wright Laboratory's Avionics and Electronics Technology Directorates, Wright-Patterson AFB, OH. It includes civilian pay, travel, utility costs, and building maintenance.

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	37,232	41,990	43,101	43,836	Cont
Current President's Budget	37,232	41,152	0	0	Cont

Change Summary Explanation:

Funding: Beginning in FY 1996, Project 06AA funding is distributed into the technical projects.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary: Not Applicable.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602204F, Aerospace Avionics

PROJECT NO.: 2000

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 2000, Active Electronic Countermeasures	2,991	2,058	7,590	7,518	7,963	8,278	8,537	8,750	Cont	Cont

A. (U) Mission Description and Budget Item Justification: Determines technical feasibility to jam, deceive, or disable electronic threats throughout the electromagnetic spectrum. The project includes tasks to develop countermeasures concepts against radar, infrared, and electro-optical threat weapon system as well as communications, command and control networks. Various links and sensors of threat air defense systems are analyzed and a data base of countermeasures techniques and technology is generated from which specific self-protection or support countermeasures equipment can be developed. The countermeasures capabilities against advanced threats are vital if our operational aircraft are to survive in future hostile environments.

(U) FY 1994:

- (U) Developed technologies for on-board and expendable countermeasures to counter infrared (IR)-guided missiles including those which use imaging seekers. ($1,141K)
  - -- (U) Developed simulation of imaging seeker for evaluating countermeasures concepts under a joint effort with Naval Research Laboratory.
  - -- (U) Evaluated flare decoy concepts which improve spectral ratios of the flare emission required to produce an effective countermeasure against advanced IR missile seekers.
- (U) Developed off-board radio frequency (RF) countermeasure technology and concepts to support affordable solutions to electronic warfare (EW) threats. ($950K)
  - -- (U) Defined and demonstrated key technologies for a distributed architecture decoy countermeasure concept effective against all types of advanced radar threats.
  - -- (U) Demonstrated in the in-house laboratory, the digital RF memory in a configuration required to achieve affordable (digital-based) decoys.
- (U) Developed on-board RF countermeasure technology and concepts to support affordable solutions to EW threats. ($900K)
  - -- (U) Designed efficient ways of building and using advanced array antennas which will result in more powerful, more effective jamming capabilities.

(U) FY 1995:

- (U) Develop technologies for on-board and expendable (active flare) countermeasures to counter IR-guided missiles. ($600K)
  - -- (U) Define and demonstrated key technologies for a distributed architecture decoy countermeasure concept. This approach will be effective against all types of advanced radar threats.
  - -- (U) Design and evaluate combined (on-board and off-board) IR countermeasure concept using non-laser-based IR sources in all cases.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #2, Exploratory Development	PE NUMBER AND TITLE: PE 0602204F, Aerospace Avionics — PROJECT NO.: 2000

- (U) Develop off-board radio frequency (RF) countermeasure concepts (active decoys) which provide baseline technology for affordable operational capability to assure the survivability of our aircraft against advanced radar threats. ($650K)
  - -- (U) Evaluate new countermeasures concepts that exploit a combination of on-board and off-board RF jamming sources.
- (U) Develop on-board RF countermeasure technology and concepts to support affordable solutions to self-protection and support countermeasure systems required by our operational forces. ($808K)
  - -- (U) Research cyclostationary processing concepts to accurately identify and reproduce signal structures and, thus, effectively jam those links.

(U) FY 1996:

- (U) Develop technologies for on-board and off-board (active infrared (IR) decoys) countermeasures to counter IR-guided missiles. ($2,500K)
  - -- (U) Evaluate concepts for countering imaging IR missile seekers using on-board IR jamming resources and appropriate modulations.
  - -- (U) Continue in-house evaluation of both on-board and off-board countermeasures concepts against various types of advanced missile seeker threats using the Dynamic Infrared Missile Evaluator (DIME).
  - -- (U) Evaluate special materials for kinematic decoys to improve affordability and effectiveness in specific operational scenarios.
- (U) Develop off-board RF countermeasure concepts (active decoys) for affordable survivability against advanced radar threats. ($1,150K)
  - -- (U) Evaluate Digital Radio Frequency Memory (DRFM) chip technology for application to active decoys.
  - -- (U) Investigate techniques and jamming modulations for active decoys to ensure effective countering of advanced coherent threat radars.
- (U) Develop on-board RF technology and concepts to achieve affordable solutions to countermeasures requirements related to radar controlled lethal threat systems. ($2,100K)
  - -- (U) Evaluate concepts to affordably counter monopulse tracking radars using the electronic warfare (EW) evaluation facilities.
  - -- (U) Continue development of the coherent digital exciter jammer subsystem to help provide affordable countermeasures against advanced radar threats.
- (U) Develop on-board RF countermeasures technology and concepts for jamming of communications and data link elements of enemy air defense systems. ($1,840K)
  - -- (U) Evaluate cyclostationery signal processing techniques.
  - -- (U) Develop concepts to jam special data signals used for command and control of hostile lethal threat systems.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT NO.
#2, Exploratory Development	PE 0602204F, Aerospace Avionics	2000

(U) FY 1997:

- (U) Develop technologies for on-board and off-board (active infrared (IR) decoys) countermeasures to counter IR-guided missiles. ($2,080K)
  - -- (U) Continue development of on-board IR countermeasures concepts against imaging missile seekers, including in-house evaluations using the Dynamic Infrared Missile Evaluator (DIME) simulator.
  - -- (U) Test IR flare technology which use previously developed special materials.
- (U) Develop off-board radio frequency (RF) countermeasures concepts (active decoys) for affordable survivability against advanced radar threats. ($1,550K)
  - -- (U) Test active decoys using advanced jamming modulations tailored to counter coherent radar threats.
  - -- (U) Identify countermeasures techniques and technology for decoys operating in the high millimeter band frequency range.
- (U) Develop on-board RF countermeasure technology and concepts for support jamming systems against communications and data links which are key elements of enemy air defense systems. ($2,050K)
  - -- (U) Investigate integrated angle, doppler, and range deception techniques to effectively jam coherent monopulse radars.
  - -- (U) Fabricate and test narrow band digital RF memory architecture building blocks.
- (U) Develop on-board RF countermeasure technology and concepts for support jamming systems against voice and data communications which are key elements of enemy air defense systems. ($1,838K)
  - -- (U) Fabricate and test breadboard hardware to demonstrate concepts to jam special data signals used for command and control of hostile lethal threat systems.
  - -- (U) Develop techniques to jam communications systems which use featureless waveforms.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT NO.
#2, Exploratory Development	PE 0602204F, Aerospace Avionics	2000

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	2,991	3,387	3,356	3,541	Cont
Current President's Budget	2,991	2,058	7,590	7,518	Cont

Change Summary Explanation:

Funding: Congressional cut of $1,287 thousand in FY 1995 for laser-based jamming to counter infrared-guided missiles due to implied duplication with Army 6.4 infrared countermeasures effort. Beginning in FY 1996, Project 06AA funding is distributed to the technical projects.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0603270F, Electronic Combat Technology.
- (U) Joint Director of Laboratories, Technology Panel on Electronic Warfare, coordinates this program with the other Services.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602204F, Aerospace Avionics

PROJECT NO.: 2001

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 2001, Electro-Optical Technology	2,276	1,889	5,777	5,722	6,061	6,301	6,498	6,660	Cont	Cont

A. (U) Mission Description and Budget Item Justification: This project evaluates new materials and device concepts for airborne optical sensing, optical processing, and laser target designation. Electro-optic technologies provide faster, more accurate detection and targeting capability combined with benefits of low weight and low-power requirements.

(U) FY 1994:
- (U) Evaluated laser source technology for target designation. ($802K)
  - -- (U) Demonstrated solid state five-watt infrared laser device.
  - -- (U) Demonstrated novel material combinations for tunable infrared lasers.
- (U) Developed high throughput, real-time optical processing technology for imaging and target recognition. ($722K)
  - -- (U) Developed smart pixel array for processing of image data.
- (U) Evaluated visual band and near visible sensing materials and devices for targeting and tracking applications. ($752K)
  - -- (U) Demonstrated single diode ultraviolet sensor built in Gallium Nitride.

(U) FY 1995:
- (U) Develop and evaluate materials and devices for laser targeting and countermeasures. ($527K)
  - -- (U) Demonstrate increased power of tunable infrared source.
  - -- (U) Evaluate materials for short pulse infrared sources.
- (U) Develop high throughput, real-time optical processing technology for imaging and target recognition. ($762K)
  - -- (U) Evaluate novel photolithographic processes in integrated circuit production.
  - -- (U) Demonstrate optical interconnections for improved image processing.
- (U) Develop and evaluate detectors for targeting and tracking of air and ground targets. ($600K)
  - -- (U) Evaluate the utility of arrays of ultra-violet sensitive diode sensors.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #2, Exploratory Development	PE NUMBER AND TITLE: PE 0602204F, Aerospace Avionics — PROJECT NO.: 2001

(U) FY 1996:
- (U) Develop short pulse infrared (IR) source technology for target recognition and designation. ($910K)
  -- (U) Develop solid state and semiconductor technologies for short pulse mid-IR application.
- (U) Develop electro-optic detector technology for advanced reconnaissance and strike sensors. ($1,046K)
  -- (U) Develop Gallium Arsenide (GaAs)-based quantum well detectors and multiplexers.
- (U) Develop high throughput, real-time optical processing technology for target recognizers, imaging, and other areas. ($1,906K)
  -- (U) Develop high bandwidth (100 GigaHertz (GHz)) sources, non-fiber optic polymer waveguides, and on chip test point capability for high-speed optical interconnects.
- (U) Continue development of ultra-violet (UV) technology for imaging, tracking, and jet engine analysis. ($1,915K)
  -- (U) Develop Gallium Nitride (GaN) semiconductor technology for high performance detector arrays/laser diodes.

(U) FY 1997:
- (U) Develop short pulse infrared source technology for target recognition and designation. ($850K)
  -- (U) Continue development and evaluation of short pulse mid-IR solid state and semiconductor technologies.
- (U) Develop electro-optic detector technology for advanced reconnaissance and strike sensors. ($1,000K)
  -- (U) Continue development and evaluation of GaAs-based quantum well detectors and multiplexers.
- (U) Develop high throughput, real-time optical processing technology for target recognizers, imaging, and other areas. ($1,945K)
  -- (U) Continue development and evaluation of high bandwidth (100 GHz) sources, non-fiber optic polymer waveguides and on chip test point capability for high-speed optical interconnects and display technology.
- (U) Continue development of UV technology for imaging, tracking, and jet engine analysis. ($1,927K)
  -- (U) Continue development and evaluation of GaN semiconductor technology for high performance detector arrays/laser diodes.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602204F, Aerospace Avionics

PROJECT NO.: 2001

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	2,276	2,577	2,553	2,694	Cont
Current President's Budget	2,276	1,889	5,777	5,722	Cont

Change Summary Explanation:

Funding: Congressional cut in FY 1995 of $650 thousand for laser power source. Beginning in FY 1996, Project 06AA funding is distributed in technical projects.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0603203F, Advanced Avionics for Aerospace Vehicles.
- (U) PE 0602702F, Command, Control, and Communications.
- (U) PE 0603270F, Electronic Combat Technology.
- (U) Coordinated with DOD Advisory Group on Electron Devices.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602204F, Aerospace Avionics

PROJECT NO.: 2002

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 2002, Microwave Technology	4,575	5,078	10,613	10,003	11,184	11,666	12,062	12,388	Cont	Cont

A. (U) Mission Description and Budget Item Justification: The Microwave Technology Exploratory Development Program focuses on the generation, control, reception, and processing of microwave (MW) and millimeter wave (MMW) power. The technology developed encompasses solid state and vacuum electronics power devices and amplifiers, low noise and signal control components, high temperature electronics, multi-function monolithic integrated circuits, multi-chip assemblies (MCAs) including transmit/receive modules, high density packaging and interconnects, and advanced phased array antenna technology. The requirements for the device and component technology developments are based on meeting advanced Air Force and other DoD weapon system needs in the areas of radar, communications, electronic warfare, navigation, and smart weapons applications. State-of-the-art performance and affordability are emphasized while other factors such as reliability, volume, and weight are major considerations in developing the MW and MMW technology.

(U) FY 1994:

- (U) Developed advanced solid state device and integrated circuit (IC) technology to enable new and upgraded aircraft electronic systems. ($2,475K)
  - -- (U) Developed of an internally impedance matched 25 watt output power, 30% efficient satellite communications power amplifier operating over the 7.25-7.75 GigaHertz (Ghz) frequency range.
  - -- (U) Developed advanced Heterojunction Bipolar Transistor (HBT) transistor structures and fabrication techniques for MW power amplifiers that have improved power dissipation and enhanced reliability.
  - -- (U) Developed silicon carbide semiconductor materials and metal contacts for use in MW transistors.
  - -- (U) Developed silicon carbide field effect transistors for reliable high-power operation at 10 GHz with 20 watts output power and 6 decibel (dB) gain.
- (U) Developed MMW components to provide enhanced weapon transceiver capability. ($600K)
  - -- (U) Developed low-cost micro-machined MMW circuits in the 60 GHz frequency range.
  - -- (U) Developed 35 GHz monolithic IC signal control components for MMW frequency modulated-continuous wave (FM-CW) terminal guidance radars.
- (U) Developed solid state phased array radar, electronic warfare (EW), and communications technology to include multi-chip assemblies. ($650K)
  - -- (U) Developed high-power high efficiency HBT amplifiers for phased array radars with ten watts output power and 40% power-added efficiency in the 7-11 GHz frequency band.
- (U) Developed advanced vacuum electronic devices for new and upgraded airborne radar and EW systems. ($300K)
  - -- (U) Developed non-thermonic cathodes and junction emitters for MW tubes.
  - -- (U) Developed MMW power modules for communications and EW transmitters producing 50 watts of output power and >30 dB gain over the 20 to 40 GHz frequency range.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #2, Exploratory Development	PE NUMBER AND TITLE: PE 0602204F, Aerospace Avionics — PROJECT NO.: 2002

- (U) Developed Microwave (MW)/digital mixed mode components for an advanced airborne multi-function phased array capability. ($550K)
  - -- (U) Developed Indium Phosphide (InP) Heterojunction Bipolar Transistor (HBT) and High Electron Mobility Transistor (HEMT) single chip monolithic integrated circuits (ICs) for receiver 7-11 GigaHertz (GHz) receiver applications.
  - -- (U) Developed advanced modeling and simulation techniques for mixed-mode integrated components.

(U) FY 1995:

- (U) Develop advanced solid state device and IC technology to enable new and upgraded aircraft electronic systems. ($2,750K)
  - -- (U) Demonstrate an internally impedance matched 25 watts output power, 30% efficient satellite communications power amplifier operating over the 7.25-7.75 GHz frequency range.
  - -- (U) Develop advanced HBT transistor structures and fabrication techniques for MW power amplifiers that have improved power dissipation and enhanced reliability.
  - -- (U) Develop reliable, high operating temperature electronics for MW transmitters used in airborne applications.
  - -- (U) Continue development of silicon carbide semiconductor materials and metal contacts for use in MW transistors.
  - -- (U) Develop silicon carbide field effect transistors for reliable high-power operation at 10 GHz with 20 watts output power and six decibel (dB) gain.
- (U) Develop millimeter wave (MMW) components to provide enhanced weapon transceiver capability. ($600K)
  - -- (U) Continue development of low-cost, micro-machined MMW circuits in the 60 GHz frequency range.
  - -- (U) Continue development of 35 GHz monolithic IC signal control components for MMW frequency modulated-continuous wave (FM-CW) terminal guidance radars.
- (U) Develop solid state phased array radar, electronic combat, and communications technology which include multi-chip assemblies. ($678K)
  - -- (U) Demonstrate high-power, high efficiency HBT amplifiers for phased array radars with ten watts output power and 40% power-added efficiency in the 7-11 GHz frequency band.
- (U) Develop advanced vacuum electronic devices for new and upgraded airborne radar and electronic combat systems. ($450K)
  - -- (U) Develop non-thermionic cathodes and junction emitters for MW tubes.
  - -- (U) Develop MMW power modules for communications and EW transmitters producing 50 watts of output power and >30 dB gain over the 20 to 40 GHz frequency range.
- (U) Develop MW/digital mixed mode components for an advanced airborne multi-function phased array capability. ($600K)
  - -- (U) Develop InP HBT and HEMT single chip monolithic ICs for receiver 7-11 GHz receiver applications.
  - -- (U) Develop advanced modeling and simulation techniques for mixed-mode integrated components.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT NO.
#2, Exploratory Development	PE 0602204F, Aerospace Avionics	2002

(U) FY 1996:
- (U) Develop mixed-mode, microwave (MW)/digital multi-function monolithic integrated circuits (ICs) components for radar and electronic warfare (EW) receivers and for digital phased array radars. ($2,413K)
  - -- (U) Demonstrate single chip monolithic ICs for receiver 7-11 GigaHertz (Ghz) receiver applications.
  - -- (U) Develop advanced modeling and simulation techniques for mixed-mode integrated components.
  - -- (U) Develop miniature digital receivers for radar and electronic combat phased array systems.
- (U) Develop high-power, solid state amplifiers for radar and communications applications. ($2,000K)
  - -- (U) Continue development of high-power, high efficiency Heterojunction Bipolar Transistor (HBT) amplifiers for phased array radars with ten watts output power and 40% power-added efficiency on the 7-11 GHz frequency band.
  - -- (U) Develop 35 GHz high-power transmit amplifiers with five watts output power for smart weapons.
  - -- (U) Develop advanced HBT transistor structures and fabrication techniques for MW power amplifiers that have improved power dissipation and enhanced reliability.
- (U) Develop reliable, high operating temperature electronics for MW transmitters used in airborne applications. ($1,900K)
  - -- (U) Continue development of silicon carbide semiconductor materials and metal contacts for use in MW transistors.
  - -- (U) Develop silicon carbide ICs for reliable, high-power operation at 10 GHz with 20 watts output power and 6 decibel (dB) gain.
- (U) Develop high-power vacuum electronics devices and components for EW, radar, and communications applications. ($1,900K)
  - -- (U) Develop non-thermionic cathodes and junction emitters for MW tubes.
  - -- (U) Develop millimeter wave (MMW) power modules for communications and electronic combat transmitters producing 50 watts of output power and >30 dB gain over the 20 to 40 GHz frequency range.
- (U) Develop MMW ICs for terminal guidance and communications systems. ($2,400K)
  - -- (U) Continue development of low-cost, micro-machined MMW circuits in the 60 GHz frequency range.
  - -- (U) Continue development of 35 GHz monolithic IC signal control components for MMW terminal guidance radars.

(U) FY 1997:
- (U) Develop mixed-mode, MW/digital multi-function monolithic ICs components for radar and EW receivers, and for digital phased array radars. ($2,107K)
  - -- (U) Develop single chip monolithic ICs for receiver 1-20 GHz receiver applications.
  - -- (U) Develop advanced modeling and simulation techniques for mixed-mode integrated components.
  - -- (U) Develop miniature digital receivers for radar and electronic combat phased array systems.
  - -- (U) Develop mixed-mode MW-digital-opto-electronic signal control components for airborne systems.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT NO.
#2, Exploratory Development	PE 0602204F, Aerospace Avionics	2002

- (U) Develop high-power, solid state amplifiers for radar and communications applications. ($1,996K)
  - -- (U) Develop high-power high, efficiency power amplifiers for phased array radar and communications systems with greater then five watts output power and 40% power-added efficiency on the 1-20 GigaHertz (GHz) frequency range.
  - -- (U) Develop 35 GHz high-power transmit amplifiers with five watts output power for smart weapons.
  - -- (U) Develop advanced Heterojunction Bipolar Transistor (HBT) transistor structures and fabrication techniques for microwave (MW) power amplifiers that have improved power dissipation and enhanced reliability.
- (U) Develop reliable, high operating temperature electronics for MW transmitters used in airborne applications. ($1,900K)
  - -- (U) Continue development of silicon carbide semiconductor materials and metal contacts for use in MW transistors.
  - -- (U) Develop silicon carbide integrated circuits (ICs) for reliable high-power operation at ten GHz with 20 watts output power and 6 decibel (dB) gain.
- (U) Develop high-power vacuum electronics devices and components for electronic warfare (EW), radar, and communications applications. ($1,900K)
  - -- (U) Develop non-thermionic cathodes and junction emitters for MW tubes.
  - -- (U) Demonstrate millimeter wave (MMW) power modules for communications and electronic combat transmitters producing 50 watts of output power and >30 dB gain over the 20 to 40 GHz frequency range.
- (U) Develop MMW ICs for terminal guidance and communications systems. ($2,100K)
  - -- (U) Continue development of low-cost, micro-machined MMW circuits in the 60 GHz frequency range.
  - -- (U) Continue development of 35 GHz monolithic IC signal control components for MMW terminal guidance radars.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602204F, Aerospace Avionics

PROJECT NO.: 2002

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	4,575	5,181	5,134	5,417	Cont
Current President's Budget	4,575	5,078	10,613	10,003	Cont

Change Summary Explanation:

Funding: Beginning in FY 1996, Project 06AA funding is distributed to the technical projects.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0603203F, Advanced Avionics for Aerospace Vehicles.
- (U) PE 0603270F, Electronic Combat Technology.
- (U) Coordinated with DOD Advisory Group on Electron Devices.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602204F, Aerospace Avionics

PROJECT NO.: 2003

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 2003, Avionics System Design Technology	2,962	287	8,818	8,734	9,251	9,617	9,918	10,165	Cont	Cont

A. (U) Mission Description and Budget Item Justification: Develops new concepts, demonstrates feasibility, and advances technology for Air Force avionics system needs. Develops advanced avionics technology for digital processing, software tools and techniques, and systems architectures. Specifically advances technology for avionics displays, digital processing hardware, sensor integration, real-time distributed software, and machine intelligence to improve weapon system performance, avionics availability, and crew situational awareness. Advances in avionics will multiply weapon systems effectiveness, enhance reliability, and reduce life cycle costs.

(U) FY 1994:

- (U) Developed advanced processor and software technology for increased functionality and flexibility of embedded, real-time airborne data processing. ($2,612K)
  - -- (U) Developed a hardware/software co-design environment to validate a multi-processor cockpit display generator.
  - -- (U) Completed design and coding of Computer Aided Design (CAD) tool suite for inserting Built-In-Self-Test (BIST) circuitry into Very Large Scale Integration (VLSI) chip designs.
  - -- (U) Completed and documented processing requirements analysis for an avionics parallel processor network.
  - -- (U) Demonstrated extremely high throughput, real-time, processing of infrared imagery for missile warning using Field Programmable Gate Array (FPGA) technology.
- (U) Developed advanced integration, fusion, and data management technology that enables increased exploitation of avionics assets for more cost-effective system solutions. ($140K)
  - -- (U) Developed baseline design for reliability and real-time performance enhancements to commercial-off-the-shelf network protocol.
- (U) Developed advanced machine intelligence technology to provide a capability for improved communications, recognition and understanding of sensor data, and pilot-aiding aircraft system controls. ($210K)

(U) FY 1995:

- (U) Develop advanced processor and software technologies to provide for increased functionality and flexibility of embedded, real-time airborne data processing. ($100K)
  - -- (U) Test BIST CAD tool suite on VLSI chip designs, refine tools, demonstrate on large (200 thousand-gate) Application Specific Integrated Circuit (ASIC).

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #2, Exploratory Development	PE NUMBER AND TITLE: PE 0602204F, Aerospace Avionics — PROJECT NO.: 2003

- (U) Develop advanced integration, fusion, and data management technologies that enable increased exploitation of avionics assets to provide for more cost-effective system solutions. ($187K)
  - -- (U) Develop an object-oriented database development methodology, specify application program interface, and select operating system and interface for a consolidated database management system.
  - -- (U) Demonstrate avionics data network using off-the-shelf scalable coherent interface components.

(U) FY 1996:

- (U) Develop advanced software technologies to provide for increased functionality and flexibility of embedded, real-time airborne data processing. ($2,323K)
  - -- (U) Develop a process for translating legacy object code from existing avionics processors to advanced commercial-based avionics processors.
  - -- (U) Develop technology for measuring the performance of distributed, multi-processor avionics software.
  - -- (U) Develop a process to identify features of Ada 9X, and measure the performance of distributed, multi-processor avionics software.
- (U) Develop advanced integration, fusion, and data management technologies that enable increased exploitation of avionics assets to provide for more cost-effective system solutions. ($2,410K)
  - -- (U) Develop simulation model of an avionics scalable coherent interface network with reliability and real-time performance enhancements.
  - -- (U) Design an object-oriented data base management system scenario definition and validation, final object definition, manipulation, and control language specifications.
- (U) Develop advanced machine intelligence technologies to provide a capability for improved communications, recognition and understanding of sensor data, and pilot-aiding aircraft system controls. ($1,935K)
  - -- (U) Apply commercial Personal Computer Memory Card International Association (PCMCIA) technology to avionics; characterize avionics system requirements.
  - -- (U) Develop dynamic, real-time scheduling methodology for distributed, multi-processor avionics architectures and determine scheduling requirements of real-time avionics applications.
  - -- (U) Evaluate the Associative Control Process technology for critical avionics problems.
  - -- (U) Complete the study of the feasibility of using ontogenic technology to reduce Global Positioning System (GPS) error through the mitigation of multi-path signals and ionospheric and tropospheric effects.
- (U) Develop key display techniques for improved cockpit information management and situational awareness. ($2,150K)
  - -- (U) Evaluate affordable, large-area high-definition/resolution displays with all digital interference and sunlight readability.
  - -- (U) Develop technology to increase active matrix liquid crystal display optical efficiency to facilitate dissemination of situational data to the pilot.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #2, Exploratory Development	PE NUMBER AND TITLE: PE 0602204F, Aerospace Avionics — PROJECT NO.: 2003

(U) FY 1997:

- (U) Develop advanced software technologies to provide for increased functionality and flexibility of embedded, real-time airborne data processing. ($2,305K)
  - -- (U) Develop the techniques and tools for translating legacy object code from existing avionics processors to advanced commercial-based avionics processors.
  - -- (U) Develop technology for quantifying trade offs between performance and costs for distributed, multi-processor avionics software.
  - -- (U) Develop and define a maturation strategy for implementing Ada 9X features in a distributed, multi-processor avionics application.
- (U) Develop advanced integration, fusion, and data management technologies that enable increased exploitation of avionics assets to provide for more cost-effective system solutions. ($2,395K)
  - -- (U) Develop and test an avionics brassboard of a scalable coherent interface network with reliability and real-time performance enhancements.
  - -- (U) Develop distributed fault-tolerant extensions to the basic object-oriented data base management system.
- (U) Develop advanced machine intelligence technologies to provide a capability for improved communications, recognition, and understanding of sensor data, and pilot-aiding aircraft system controls. ($1,890K)
  - -- (U) Develop and evaluate two Personal Computer Memory Card International Association (PCMCIA) avionics breadboards.
  - -- (U) Design dynamic, real-time scheduling algorithms for avionics compatible with rate monotonic scheduling.
  - -- (U) Continue technology application of the associative control process.
- (U) Develop key display techniques for improved cockpit information management and situational awareness. ($2,144K)
  - -- (U) Continue to develop technology to increase active matrix liquid crystal display optical efficiency to facilitate dissemination of situational data to the pilot.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT NO.
#2, Exploratory Development	PE 0602204F, Aerospace Avionics	2003

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	3,475	3,935	3,899	4,114	Cont
Current President's Budget	2,962	287	8,818	8,734	Cont

Change Summary Explanation:

Funding: Congressional cut in FY 1995 of $3,642 thousand for advanced processor efforts. Beginning in FY 1996, Project 06AA funding is distributed to the technical projects.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0603253F, Advanced Avionics Integration.
- (U) PE 0602301E, Intelligence System Program.
- (U) PE 0603217N, Maritime Avionics Subsystem Technologies.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602204F, Aerospace Avionics

PROJECT NO.: 2004

COST ($ In Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 2004, Reconnaissance/Strike Electro-Optical Sensors	1,451	1,076	3,685	3,650	3,866	4,019	4,144	4,248	Cont	Cont

A. (U) Mission Description and Budget Item Justification: Determines technical feasibility of technology to improve performance, supportability, and cost of passive and active electro-optical (EO) sensors for reconnaissance, acquisition and strike of aerial and ground targets. Specific improvements will be increases in target detection and identification ranges, system reliability, kill probability, and ownship survivability, while decreasing pilot workload and system cost.

(U) FY 1994:
- (U) Developed advanced EO sensor technology for air-to-ground reconnaissance and targeting in adverse-weather and improved countermeasure (CM) immunity. ($560K)
  - -- (U) Demonstrated a two times range improvement in target recognition capability using image enhancing microscan techniques.
- (U) Developed advanced air-to-surface EO, including multi-frequency, sensor technology that are more uniform in response to target radiation and better adapted to interface with real-time processors for automated target recognition and enhanced situational displays. ($395K)
  - -- (U) Demonstrated eye-safe laser radar imager in tower experiments.
- (U) Developed advanced laser radar technology for adverse-weather navigation, terrain following, and obstacle avoidance. ($496K)
  - -- (U) Evaluated improvements in high altitude cargo drop accuracy using wind profiling technology.
  - -- (U) Demonstrated vibration cancellation in pulsed laser radar system in laboratory experiment.

(U) FY 1995:
- (U) Develop advanced EO sensor technology for air-to-ground reconnaissance and targeting in adverse-weather and improved CM immunity. ($631K)
  - -- (U) Demonstrate a scanning technique to reduce focal plane area by four times for improved reliability and supportability.
  - -- (U) Complete design of breadboard sensor that combines navigation and single region of interest targeting capability.
- (U) Develop advanced air-to-surface EO, including multi-frequency, sensor technology that are more uniform in response to target radiation and better adapted to interface with real-time processors for automated target recognition and enhanced situational displays. ($445K)
  - -- (U) Demonstrate multiplexed field of view concept for improved image recognition capability.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #2, Exploratory Development	PE NUMBER AND TITLE: PE 0602204F, Aerospace Avionics — PROJECT NO.: 2004

(U) FY 1996:
- (U) Develop advanced electro-optic (EO) sensor technology for combined navigation and air-to-ground targeting in a multi-function sensor. This effort is aimed at alleviating the weight, drag, maintenance, and cost problems of a dual sensor approach. ($1,848K)
  - -- (U) Conduct long-range demonstration of combined navigation and targeting capability.
  - -- (U) Complete fabrication of breadboard sensor system.
- (U) Develop and demonstrate a low-cost, maintainable, high performance, non-mechanical method of directing the passive sensor field of view. Mechanical methods of scanning the target scene are inherently bulky, expensive, and unreliable. A non-mechanical approach will also permit the use of low-cost staring focal plane arrays which will enhance overall performance. ($918K)
  - -- (U) Laboratory demonstration of small portable non-mechanical beam steering device.
  - -- (U) Characterize absolute pointing accuracy of the phased array beam steering component
- (U) Develop and demonstrate frequency agile laser radar technologies to enhance air-to-ground and air-to-air sensor performance. A tunable frequency laser will enhance target detection ranges and identification, even against countermeasures. ($919K)
  - -- (U) Complete preliminary assessment of wavelength conversion materials that will provide the capability to tune the frequency of the laser and provide operation in varied atmospheric transmission regions and in turn longer-ranges.

(U) FY 1997:
- (U) Develop advanced EO sensor technology for combined navigation and air-to-ground targeting in a multi-function sensor. This effort is aimed at alleviating the weight, drag, maintenance, and cost problems of a dual sensor approach (e.g., LANTIRN). ($1,644K)
  - -- (U) Complete development of multiple region of interest (ROI) targeting algorithms.
  - -- (U) Complete development of electronic stabilization algorithms allowing for range enhancement.
- (U) Develop and demonstrate a low-cost, maintainable, high performance, non-mechanical method of directing the passive sensor field of view. Mechanical methods of scanning the target scene are inherently bulky, expensive, and unreliable. A non-mechanical approach will also permit the use of low-cost staring focal plane arrays which will enhance overall performance. ($783K)
  - -- (U) Complete the design, fabrication, and test of an optical dispersion correction technique for phased array beam steering.
- (U) Develop and demonstrate frequency agile laser radar technologies to enhance air-to-ground and air-to-air sensor performance. A tunable frequency laser will enhance target detection ranges and identification, even against countermeasures. ($1,223K)
  - -- (U) Complete evaluation of tunable laser radar system for precision targeting of ground based and airborne threats.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602204F, Aerospace Avionics

PROJECT NO.: 2004

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	1,451	1,643	1,628	1,718	Cont
Current President's Budget	1,451	1,076	3,685	3,650	Cont

Change Summary Explanation:

Funding: Congressional cut in FY 1995 of $545 thousand for laser radar developments. Beginning in FY 1996, Project 06AA funding is distributed to the technical projects.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0603203F, Advanced Avionics for Aerospace Vehicles.
- (U) PE 0603707F, Weather Systems Advanced Development.
- (U) PE 0604249F, LANTIRN Night Precision Attack.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602204F, Aerospace Avionics

PROJECT NO.: 6095

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 6095, Inertial Reference and Guidance Technology	1,548	1,719	3,931	3,894	4,125	4,288	4,422	4,532	Cont	Cont

A. (U) Mission Description and Budget Item Justification: Determines technical feasibility of affordable technology to satisfy the growing need for reliable precision navigation, guidance and reference information to support precision targeting and strike, improved situation awareness, and multi-platform cooperative operations. The focus is on inertial component and navigation system integration technology, low-observable multi-function antennas, improved accuracy of jam resistant Global Position System (GPS), techniques for exploiting the capabilities of GPS to provide affordable solutions to offensive and defensive operational capability deficiencies, and passive navigation and reference techniques. Technologies pursued under this project are critical to stealth operations, timely and effective reconnaissance and attack, force multiplication achievable through multi-platform shared resources, and affordable supportable weapon systems.

(U) FY 1994:

- (U) Developed advanced solid state miniature inertial sensor technology suitable for airborne applications to reduce size, weight, power, and cost and to increase system reliability. ($968K)
  - -- (U) Completed development and test of low-cost, low probability of intercept, laser velocimeter.
  - -- (U) Fabricated low-cost optical sensor to measure airframe flexure to aid boresight compensation techniques for sensors and weapons.
- (U) Developed technology for reduced jamming vulnerability and increased precision targeting and strike accuracy of GPS and to exploit the benefits of GPS to improve offensive and defensive combat capabilities at reduced cost. ($130K)
  - -- (U) Completed development of concepts to exploit the capabilities of GPS to allow fast, accurate location of enemy radars.
- (U) Developed technology for low-observable, wideband, multi-function antennas for communication, navigation, and identification (CNI) functions for a reduction in the number of antennas required and an increase in weapon systems survivability. ($450K)
  - -- (U) Developed and tested broadband, conformal, microstrip antenna for GPS and other CNI functions.
  - -- (U) Designed wideband digital antenna electronics for small, low-cost, low-loss, beam forming/beam null steering CNI antennas.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE February 1995
BUDGET ACTIVITY: #2, Exploratory Development	PE NUMBER AND TITLE: PE 0602204F, Aerospace Avionics — PROJECT NO.: 6095

(U) FY 1995:
- (U) Develop advanced solid state miniature inertial sensor technology suitable for airborne applications to reduce size, weight, power, and cost, and to increase system reliability. ($970K)
  - -- (U) Complete analysis and design trade offs for a packaged, navigation-grade, micro-machined silicon accelerometer for highly reliable , all-solid state inertial guidance and navigation system.
  - -- (U) Complete design for a small, low-cost, precision fiber optic gyroscope for highly accurate registration of distributed sensors.
  - -- (U) Complete fabrication of optical sensor to measure airframe flexure to aid boresight compensation techniques for sensors and weapons.
- (U) Develop technology for reduced jamming vulnerability and increased precision targeting and strike accuracy of Global Positioning System (GPS) and to exploit the benefits of GPS to improve offensive and defensive combat capabilities at reduced cost. ($264K)
  - -- (U) Design techniques for direct Y-code acquisition to improve the jam resistance of GPS.
  - -- (U) Develop a wavefront simulator for testing GPS antenna electronics under realistic jamming conditions.
- (U) Develop technology for low-observable, wideband, multi-function antennas for communications, navigation, and identification (CNI) functions for a reduction in the number of antennas required and an increase in weapon systems survivability. ($485K)
  - -- (U) Complete analysis for wideband digital antenna electronics for small low-loss, beam forming/beam null steering CNI antennas.

(U) FY 1996:
- (U) Develop reference sensors, system integration and estimation technology to generate a common precision reference to enable sharing of multiple platform sensor data and high-payoff multiple platform operations. ($957K)
  - -- (U) Complete detailed design of a small, low-cost, precision fiber optic gyroscope needed to drive algorithms for highly accurate registration of distributed sensors.
- (U) Develop advanced solid state miniature inertial sensor technology suitable for airborne applications to reduce size, weight, power, and cost, and to increase system reliability. ($986K)
  - -- (U) Fabricate and test first iteration of a packaged, navigation-grade, micro-machined silicon accelerometer for highly reliable, all-solid state inertial guidance and navigation systems.
- (U) Develop technology for reduced jamming vulnerability and increased precision targeting and strike accuracy of GPS and to exploit the benefits of GPS to improve offensive and defensive combat capabilities at reduced cost. ($995K)
  - -- (U) Complete detailed design and simulation of techniques for direct Y-code acquisition to improve the jam resistance of GPS.
- (U) Develop technology for low-observable, wideband, multi-function antennas for CNI functions for a reduction in the number of antennas required and an increase in weapon systems survivability. ($993K)
  - -- (U) Complete design of a wideband digital antenna electronics unit providing small, low-cost, low-loss, beam forming/null-steering CNI antennas.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #2, Exploratory Development	PE NUMBER AND TITLE: PE 0602204F, Aerospace Avionics — PROJECT NO.: 6095

(U) FY 1997:

- (U) Develop reference sensors, system integration, and estimation technology to generate a common precision reference to enable sharing of multiple platform sensor data and high-payoff multiple platform operations. ($992K)
  - -- (U) Complete fabrication of the first iteration of a small, low-cost, precision fiber optic gyroscope needed to drive algorithms for highly accurate registration of distributed sensors.
- (U) Develop advanced solid state miniature inertial sensor technology suitable for airborne applications to reduce size, weight, power, and cost, and to increase system reliability. ($983K)
  - -- (U) Fabricate and test second iteration of a packaged, navigation-grade, micro-machined silicon accelerometer for highly reliable, all-solid state inertial guidance and navigation systems.
- (U) Develop technology for reduced jamming vulnerability and increased precision targeting and strike accuracy of Global Positioning System (GPS) and to exploit the benefits of GPS to improve offensive and defensive combat capabilities at reduced cost. ($1,013K)
  - -- (U) Conduct laboratory testing of techniques for direct Y-code acquisition to improve the jam resistance of GPS.
- (U) Develop technology for low-observable, wideband, multi-function antennas for communications, navigation, and identification (CNI) functions for a reduction in the number of antennas required and an increase in weapon systems survivability. ($906K)
  - -- (U) Complete fabrication and laboratory evaluation of a breadboard wideband digital antenna electronics unit providing small, low-cost, low-loss, beam forming/null-steering CNI antennas.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT NO.
#2, Exploratory Development	PE 0602204F, Aerospace Avionics	6095

.B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	1,548	1,754	1,738	1,833	Cont
Current President's Budget	1,548	1,719	3,931	3,894	Cont

Change Summary Explanation:

Funding: Beginning in FY 1996, Project 06AA funding is distributed to the technical projects.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0603253F, Advanced Avionics Integration.
- (U) PE 0602232N, Navy Command, Control and Communications (C3) Technology.
- (U) PE 0602782A, C3 Technology.
- (U) PE 0602602F, Conventional Munitions.
- (U) PE 0603311F, Ballistic Missile Technology.
- (U) PE 0603363F, Armament Technology Integration.
- (U) PE 0603270F, Electronic Warfare Technology.
- (U) ARPA-Global Positioning System Guidance Package.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602204F, Aerospace Avionics

PROJECT NO.: 6096

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 6096, Microelectronics Technology	3,477	3,858	10,825	11,241	11,259	11,625	11,926	11,673	Cont	Cont

A. (U) Mission Description and Budget Item Justification: This project focuses on military unique devices and circuits; packaging and power distribution; design tools; and hardware design languages. The requirements for technology developments are based on meeting advanced Air Force and other DOD weapon systems needs in the areas of radar, communications, electronic warfare, navigation, and smart weapons applications. Paramount to success is the development of design, packaging, and power management support technologies that provide for the utilization of Commercial Off The Shelf (COTS) products and military-devices and circuits.

(U) FY 1994:
- (U) Developed advanced integrated circuits (ICs), including analog to digital converter circuits for military radio frequency (RF) and digital support electronics. ($1,646K)
  -- (U) Developed gallium-arsenide-, indium-phosphide-, and silicon carbide-based high-speed and low-power ICs.
- (U) Developed advanced packaging and power management technology for improved cost and reliability of military electronics. ($970K)
  -- (U) Developed micro-sensors for aircraft pressure sensing and missile accelerometers.
- (U) Developed advanced design tools and integrated them into a common software environment to design application specific ICs and multi-chip modules for performance, affordability, and reliability improvements in digital processing hardware. ($861K)
  -- (U) Completed three approaches to automatic multi-component synthesis using Very High Speed Integrated Circuit (VHSIC) Hardware Design Language (VHDL)-based software allowing the trade off of device packaging technology approaches.
  -- (U) Integrated Computer Aided Design (CAD) tools into a commercial design framework.

(U) FY 1995:
- (U) Develop advanced ICs, including analog to digital converter circuits for military RF and digital support electronics. ($1,700K)
  -- (U) Develop gallium-arsenide-, indium-phosphide-, and silicon-carbide-based high-speed and low-power ICs.
- (U) Develop advanced packaging and power management technology for improved cost and reliability of military electronics. ($1,558K)
  -- (U) Develop microsensors for aircraft pressure sensing and missile accelerometers.
  -- (U) Evaluate an advanced surface protective coatings process for ICs.
- (U) Develop advanced design tools and integrated them into a common software environment to design application specific ICs and multi-chip modules for performance, affordability, and reliability improvements in digital processing hardware. ($600K)
  -- (U) Develop a baseline design for a radar signature prediction accelerator and develop design libraries for gallium arsenide circuits.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT NO.
#2, Exploratory Development	PE 0602204F, Aerospace Avionics	6096

(U) FY 1996:
- (U) Develop advanced integrated circuits (ICs), including analog to digital converter circuits for military radio frequency (RF) and digital support electronics. ($4,534K)
  - -- (U) Develop digital electronic engine control ICs.
  - -- (U) Continue development of pressure and accelerometer microsensors to measure aircraft performance.
  - -- (U) Develop devices and ICs for direct X-Band analog-to-digital conversion for radar support electronics.
  - -- (U) Continue development of devices and ICs for mixed digital and RF electronics for reduced cost, weight, volume, and commonality across multiple subsystems.
- (U) Develop surface protective coatings and distributed power management and packaging technology. ($2,118K)
  - -- (U) Evaluate 20 giga sample per second circuits for the direct X-Band analog-to-digital conversion to improve reliability and performance of radar support electronics.
  - -- (U) Continue evaluation of an advanced surface protective coatings process for ICs.
- (U) Develop and integrate advanced design tools into a commercial software environment for affordable model year upgrades. ($2,173K)
  - -- (U) Design model year upgrades of the radar signature prediction accelerator and advanced cockpit three-dimensional graphics generator.
- (U) Develop and make Hardware Design Language (HDL) technology for more effective control of obsolete parts and logistic support costs for existing weapon systems. ($2,000K)
  - -- (U) Develop HDL models and validation suites for existing weapon system electronics.
  - -- (U) Develop HDL and Very High Speed Integrated Circuits (VHSIC) Hardware Design Language (VHDL) paradigms for integration with existing weapon system components.

(U) FY 1997:
- (U) Develop advanced ICs, including analog to digital converter circuits for military RF and digital support electronics. ($4,668K)
  - -- (U) Develop digital electronic engine control ICs.
  - -- (U) Continue development of pressure and accelerometer microsensors to measure aircraft performance.
  - -- (U) Develop devices and ICs for direct X-Band analog-to-digital conversion to improve reliability and performance of radar support electronics.
  - -- (U) Continue development of devices and ICs for mixed digital, RF electronics for reduced cost, weight, volume, and commonality across multiple subsystems.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602204F, Aerospace Avionics

PROJECT NO.: 6096

- (U) Develop surface protective coatings and distributed power management and packaging technology. ($1,900K)
  - -- (U) Demonstrate 20 giga sample per second circuits for the direct X-Band analog-to-digital conversion to improve reliability and performance of radar support electronics.
  - -- (U) Complete evaluation of an advanced surface protective coatings process for integrated circuits.
- (U) Develop and integrate advanced design tools into a commercial software environment for affordable model year upgrades. ($2,173K)
  - -- (U) Develop model year upgrades of the radar signature prediction accelerator, and advanced cockpit three-dimensional graphics generator.
- (U) Develop and make Hardware Design Language (HDL) technology more effective control of obsolete parts and logistic support costs for existing weapon systems. ($2,500K)
  - -- (U) Continue to develop HDL models and validation suite for existing weapon system electronics.
  - -- (U) Continue to develop HDL and Very High Speed Integrated Circuits (VHSIC) Hardware Design Language (VHDL) paradigms for integration with existing weapon system components.
  - -- (U) Perform the integration of analog HDL to support mixed analog and digital electronics.

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	3,477	3,937	3,901	4,116	Cont
Current President's Budget	3,477	3,858	10,825	11,241	Cont

Change Summary Explanation:

Funding: Beginning in FY 1996, Project 06AA funding is distributed to the technical projects

Schedule: Not Applicable.

Technical: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT NO.
#2, Exploratory Development	PE 0602204F, Aerospace Avionics	6096

C. (U) Other Program Funding Summary:

(U) Related Activities:
- (U) PE 0603203F, Advanced Avionics for Aerospace Vehicles.
- (U) PE 0602702F, Command, Control, and Communications.
- (U) PE 0602705A, Electronics and Electronic Devices.
- (U) PE 0602234N, Materials, Electronics and Computers.
- (U) PE 0602712E, Materials and Electronics.
- (U) PE 0603739E, Manufacturing Technology.
- (U) Coordinated with DOD Advisory Group on Electron Devices.
- (U) Coordinated with ODDR&E Detailed Technology Area Plan, Electronics.
- (U) Coordinated with DOD Advisory Group on Electron Devices.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602204F, Aerospace Avionics

PROJECT NO.: 7622

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 7622, Reconnaissance/Strike Radio Frequency Sensors	2,487	2,181	6,313	6,253	6,624	6,886	7,101	7,278	Cont	Cont

A. (U) Mission Description and Budget Item Justification: Determines technical feasibility of technology for reconnaissance and strike radio frequency sensors with emphasis on reliable, all-weather acquisition of surface and airborne targets with difficult signatures due to reduced cross sections, concealment and camouflage measures, severe clutter, and heavy jamming.

(U) FY 1994:

- (U) Developed advanced air-to-air radar sensor and target detection technology, including multi-dimensional, adaptive algorithms, for improved target detection, clutter rejection, and electronic countermeasure mitigation. ($950K)
  - -- (U) Evaluated and characterized radome-induced angle errors.
  - -- (U) Completed data collection, processing, and analysis on bistatic radar experiment.
- (U) Developed air-to-ground synthetic aperture radar (SAR) sensor and discrimination technology for foliage penetration and targeting and advanced motion compensation techniques for ultra-high resolution SAR for use in precision mapping and targeting and recognition. ($945K)
  - -- (U) Completed threat assessment of SAR and Ultra-High Range (UHR)-SAR.
  - -- (U) Evaluated electromagnetic scattering and modeling of branch and truck interaction.
- (U) Developed low-cost radar architecture and technology and exploited emerging advances in microwave and signal processing devices to provide more flexible and affordable capability. ($592K)
  - -- (U) Demonstrated ability to cancel terrain scattered interference with monopulse clustering.

(U) FY 1995:

- (U) Develop advanced air-to-air radar sensor and target detection technology, including multi-dimensional, adaptive algorithms, for improved target detection, clutter rejection, and electronic countermeasure mitigation. ($840K)
  - -- (U) Develop ten decibel (dB) improved solution for fighter aircraft to counter.
  - -- (U) Evaluate adaptive beamforming in frequency-dispersive multi-path environment.
  - -- (U) Develop detection techniques using wavelet sub-band decomposition to mitigate terrain scattering.
- (U) Develop air-to-ground SAR sensor and discrimination technology for foliage penetration and targeting and advanced motion compensation techniques for ultra-high resolution SAR for use in precision mapping and targeting and recognition. ($865K)
  - -- (U) Demonstrate, through joint program with NASA, SAR radar using space-based radar.
  - -- (U) Develop design concept for radar motion compensation technical analysis tool through the integration of existing government models.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #2, Exploratory Development	PE NUMBER AND TITLE: PE 0602204F, Aerospace Avionics — PROJECT NO.: 7622

- (U) Develop two-dimensional imaging technology for enhanced all aspect air-to-air target identification capability. ($476K)
  -- (U) Develop advanced inverse synthetic aperture radar (SAR) processing characteristics on available flight test data.

(U) FY 1996:
- (U) Develop advanced microwave sensor technology for air-to-air radar and target detection, including electronic protection, multi-dimensional image processing, adaptive algorithms that also explore reducing overall system life-cycle-cost. ($1,940K)
  -- (U) Develop and test a high quality radar laboratory signal generator for use in supporting microwave sensor technology development.
  -- (U) Examine and develop advanced techniques for mitigating direct path electronic countermeasures (ECM) with radar rejection for high pulse repetition frequencies (HPRF).
  -- (U) Examine and develop efficient and effective techniques (array manifolding and signal processing) to mitigate direct path interference for medium pulse repetition frequencies (MPRF).
- (U) Develop advanced technology for microwave sensors for air-to-ground and air-to-air clutter rejection. ($1,320K)
  -- (U) Develop application of radar adaptive processing to advanced fighter platforms and scenarios using 12 to 15 decibel (dB) improvement goals.
  -- (U) Examine and develop advanced techniques mitigating radome multi-path reflection.
  -- (U) Examine and develop advanced techniques exploring mutual coupling solutions for adaptive algorithms.
- (U) Develop integrated radar/targeting engineering analysis tools to evaluate sensor targeting errors for front-line fighter aircraft. ($1,723K)
  -- (U) Develop display software for integrated SAR evaluation tools.
  -- (U) Design support modules for radar expert analysis tools.
- (U) Develop two-dimensional imaging technology for enhanced all aspect air-to-air target identification capability. ($1,330K)
  -- (U) Generate synthetic signature validation on collected high quality two-dimensional imagery data.
  -- (U) Develop preliminary radar system design concept.
  -- (U) Integrate one-dimensional and two-dimensional algorithms and assess utility to target identification capability.

(U) FY 1997:
- (U) Develop advanced microwave sensor technology for air-to-air radar and target detection, including electronic protection, multi-dimensional image processing, adaptive algorithms that also explore reducing life cycle cost. ($1,890K)
  -- (U) Develop concept for an integrated radion frequency (RF) and digital systems to reduce receiver hardware specifications and field maintenance.
- (U) Develop advanced microwave sensor technology for clutter rejection and mitigation. ($1,413K)
  -- (U) Develop and evaluate algorithms with mitigation goals of 15 to 20 dB with minimum number of degrees of freedom.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT NO.
#2, Exploratory Development	PE 0602204F, Aerospace Avionics	7622

- (U) Develop integrated radar/targeting engineering analysis tools to evaluate sensor targeting errors for front-line fighter aircraft. ($1,675K)
  - -- (U) Establish baseline radar analysis library with emphasis on object oriented and reusable software.
- (U) Develop two-dimensional radar imaging technology for enhanced all aspect air-to-air target identification capability. ($1,275K)
  - -- (U) Integrate two-dimensional algorithms compatible with high maneuvering environments and advanced radar systems.

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	2,487	2,817	2,791	2,945	Cont
Current President's Budget	2,487	2,181	6,313	6,253	Cont

Change Summary Explanation:

Funding: Congressional cut in FY 1995 of $592 thousand for low-cost radar development. Beginning in FY 1996, Project 06AA funding is distributed to the technical projects.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0603203F, Advanced Avionics for Aerospace Vehicles.
- (U) PE 0603253F, Advanced Avionics Integration.
- (U) PE 0602782A, Command, Control and Communications (C3) Technology.
- (U) PE 0602232N, Navy C3 Technology.
- (U) PE 060379N, Advanced Technology Demonstration Program.
- (U) This project has been coordinated through the Project Reliance process (Joint Directors of Laboratories Sensor and Electronic Warfare Panels) to harmonize efforts and eliminate duplication.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602204F, Aerospace Avionics

PROJECT NO.: 7629

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 7629, Fire Control Avionics	2,969	3,296	7,538	7,467	7,909	8,222	8,479	8,691	Cont	Cont

A. (U) Mission Description and Budget Item Justification: Determines technical feasibility of technology and concepts for fire control that aid in precisely locating, identifying, and targeting airborne and surface targets, with emphasis on reduced signature targets and opportunity targets, to enable new covert tactics for successful accomplishment of air-to-air and air-to-surface strike scenarios.

(U) FY 1994:

- (U) Developed air-to-air fire control, tracking, and sensor management technology for a first shot, first kill capability. This will result in increased kill ratios, increased survivability, and reduced pilot workload. ($750K)
  - -- (U) Designed and coded multiple hypothesis tracking algorithm and neural network tracking techniques for increased detection range.
  - -- (U) Demonstrated, in simulation using actual F-15, radar data an increase in detection range of 37%.
  - -- (U) Evaluated intra-radar fusion system concepts.
- (U) Developed air-to-surface fire control, tracking, and sensor management technology for single pass precision accuracy weapon deployment, increased survivability, force multiplication, and reduced pilot workload. Both on-board and off-board targeting were evaluated. ($299K)
  - -- (U) Developed concepts for real-time targeting of ground-based stationary and moving targets.
- (U) Developed advanced model-based vision (MBV) target recognition technology for longer-range, all-aspect, real-time, high-confidence air-to-air and air-to-surface hostile target identification. ($1,920K)
  - -- (U) Evaluated performance of ultra high range radar (UHRR) algorithms to establish performance baseline.
  - -- (U) Demonstrated automatic target recognition (ATR) features which are invariant to target signature thermal conditions using measurements of a tactical target.
  - -- (U) Demonstrated advanced radar scatterer signature estimation technique.
  - -- (U) Performed synthetic aperture radar (SAR) scene and signature experiments.

(U) FY 1995:

- (U) Develop air-to-air fire control, tracking, and sensor management technology for a first shot, first kill capability. This will result in increased kill ratios, increased survivability, and reduced pilot workload. ($843K)
  - -- (U) Complete coding and laboratory evaluation of neural network tracking algorithms.
  - -- (U) Develop and code intra-radar fusion algorithm for high confidence hostile target identification.
  - -- (U) Laboratory test intra-radar fusion algorithms using operational radar data.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT NO.
#2, Exploratory Development	PE 0602204F, Aerospace Avionics	7629

- (U) Develop air-to-surface fire control, tracking, and sensor management technology for single pass precision accuracy weapon deployment, increased survivability, force multiplication, and reduced pilot workload. Both on-board and off-board targeting will be evaluated. ($300K)
  - -- (U) Evaluate track accuracy requirements for tracking and weapon deployment solutions utilizing off-board threat information.
- (U) Develop advanced model-based vision (MBV) target recognition technology for longer-range, all-aspect, real-time, high-confidence air-to-air and air-to-surface hostile target identification. ($2,153K)
  - -- (U) Investigate thermal invariance theory on tactical target recognition.
  - -- (U) Demonstrate feasibility of high resolution synthetic signature scene generation capability to train automatic target recognition systems.
  - -- (U) Demonstrate feasibility of high resolution synthetic aperture radar (SAR) signature and scene generation.
  - -- (U) Investigate theory for infrared thermal modeling to support high fidelity signature prediction.
  - -- (U) Develop and demonstrate robust ultra-high range resolution (UHRR) algorithms for air-to-air and air-to-ground applications.
  - -- (U) Develop MBV integrated environment for affordable algorithm development.

(U) FY 1996:

- (U) Develop advanced air engagement technologies for detection and tracking of conventional and low cross section threats to increase weapon system lethality and survivability. ($528K)
  - -- (U) Complete evaluation of vector neural network tracking algorithm.
- (U) Develop sensor management and fusion technologies to increase air combat situational awareness, longer-range, high-confidence target identification, and innovative deployment tactics. ($1,884K)
  - -- (U) Evaluate advanced model-based intra-radar fusion techniques in laboratory environment.
  - -- (U) Explore sensor fusion concepts for integrating all sensor data from all on-board offensive and defensive sensors.
- (U) Develop innovative targeting techniques for surface strike applications utilizing all available (on-board and off-board) threat targeting information. ($1,357K)
  - -- (U) Develop concept design for utilizing off-board information in support of theatre missile defense boost phase intercept program.
- (U) Develop advanced automatic target recognition (ATR) algorithm techniques. ($1,432K)
  - -- (U) Develop advanced target information extraction techniques for using the radar phased information to estimate the location of radar target scattering energy to support improved performance ATR algorithms.
  - -- (U) Formulate the physical basis for the invariant thermal features that remain constant as a function of time of day and target thermal conditions to support high performance infrared target recognition algorithms.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #2, Exploratory Development	PE NUMBER AND TITLE: PE 0602204F, Aerospace Avionics — PROJECT NO.: 7629

- (U) Develop advanced synthetic signature and scene generation capability to train automatic target recognition (ATR) algorithms. ($678K)
  - -- (U) Demonstrate feasibility of synthetic infrared target signature to improve the fidelity of the thermal prediction to support improved performance ATR algorithm development.
  - -- (U) Perform verification experiments to establish feasibility to perform high fidelity, high-speed synthetic aperture radar (SAR) signature and scene prediction.
- (U) Develop analytical and empirical ATR modeling techniques to bound ATR performance. ($678K)
  - -- (U) Determine best ATR performance possible for two different target types using synthetic data to support sensor trade off studies.
- (U) Develop robust ultra high range radar (UHRR) algorithms for both air-to-air and air-to-ground applications. ($981K)
  - -- (U) Evaluate performance of advanced UHRR algorithms over baseline operational identification technologies.

(U) FY 1997:

- (U) Develop advanced air engagement technologies for detection and tracking of conventional and low cross section threats to increase weapon system lethality and survivability. ($560K)
  - -- (U) Evaluate operational pay-off on innovative tracking schemes utilizing computer-based system level simulation.
- (U) Develop sensor management and fusion technologies to increase air combat situational awareness, longer-range, high-confidence target identification, and innovative deployment tactics. ($1,867K)
  - -- (U) Support ground-to-air evaluation of intra-radar fusion algorithms.
- (U) Develop innovative targeting techniques for surface strike applications utilizing all available (on-board and off-board) threat targeting information. ($1,306K)
  - -- (U) Design targeting scheme for utilizing off-board information for final weapon solution.
- (U) Develop advanced automatic target recognition (ATR) algorithm techniques. ($1,232K)
  - -- (U) Integrate advanced feature extraction techniques using the radar phase with advanced matching techniques to evaluate performance improvement.
  - -- (U) Evaluate performance of ATR using advanced thermal invariance algorithms.
  - -- (U) Demonstrate feasibility of intra-infrared (IR) fusion of thermal, spatial, and motion features.
- (U) Develop advanced synthetic signature and scene generation capability to train ATR algorithms. ($709K)
  - -- (U) Integrate advanced IR target generation capability with scene generation.
  - -- (U) Demonstrate high fidelity, high-speed SAR signature and scene prediction.
- (U) Develop analytical and empirical ATR modeling techniques to bound ATR performance. ($635K)
  - -- (U) Evaluate performance of multi-class problem using real and synthetic data.
- (U) Develop robust UHRR algorithms for both air-to-air and air-to-ground applications. ($1,158K)
  - -- (U) Demonstrate advanced UHRR algorithms with robust performance using synthetically generated data.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT NO.
#2, Exploratory Development	PE 0602204F, Aerospace Avionics	7629

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	2,969	3,363	3,332	3,516	Cont
Current President's Budget	2,969	3,296	7,538	7,467	Cont

Change Summary Explanation:

Funding: Beginning in FY 1996, Project 06AA funding is distributed to the technical projects.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0603203F, Advanced Avionics for Aerospace Vehicles.
- (U) Tri-Service Joint Services Guidance and Control Committee.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602204F, Aerospace Avionics

PROJECT NO.: 7633

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 7633, Passive Electronic Countermeasures	2,741	3,043	6,960	6,894	7,302	7,591	7,828	8,024	Cont	Cont

A. (U) Mission Description and Budget Item Justification: This program determines the feasibility of technology and then explores, expands, develops, and refines the most promising and cost-effective technology for application into passive electronic countermeasures (ECM). The technology pursued is in support of the passive sensing of the entire electromagnetic spectrum in order to provide signal collection, detection, recognition, analysis, identification, location, and passive countering of enemy electronic emissions whether intentional or unintentional. Specifically the program exploits the emerging technology to provide increased capability for: 1) radar warning, electronic warfare (EW), and electronic intelligence applications; 2)infrared detection for passive missile warning and signature exploitation; 3) laser detection for threat warning; 4) passive and combined passive/active off-board expendables (chaff, decoys, etc.); and 5) hardware and software for associated processing and system integration requirements.

(U) FY 1994:
- (U) Developed technology for generic hardware and software modules to enable low-cost block upgrades to existing operational EW receivers. ($806K)
  -- (U) Developed and evaluated software for improved data correlation and signal identification.
  -- (U) Developed and tested algorithms to provide enhanced threat angle and location capability.
- (U) Developed all-digital EW receiver and antenna for improved reliability and flexibility in response to ever changing EW threat environment. ($760K)
  -- (U) Tested fundamental components and integrated channelizers for an all-digital receiver.
- (U) Developed an enhanced warning capability with advanced detector and processing technology and integrated missile warning, laser warning, and targeting sensors for an improved pilot protection capability. ($1,175K)
  -- (U) Designed models of high altitude missile infrared signature measurements for evaluation.

(U) FY 1995:
- (U) Develop technology for generic hardware and software modules to enable low-cost block upgrades to existing operational EW receivers. ($761K)
  -- (U) Develop threat recognition software and integrate with signal correlation software.
  -- (U) Develop hardware and software to allow normalization and transfer of threat parameters among systems.
- (U) Develop all-digital EW receiver and antenna for improved reliability and flexibility in response to ever changing EW threat environment. ($800K)
  -- (U) Evaluate and modify the all digital baseband receiver for application to EW.
- (U) Develop an enhanced warning capability with advanced detector and processing technology and integrated missile warning, laser warning, and targeting sensors for an improved pilot protection capability. ($1,482K)
  -- (U) Develop models of high altitude missile infrared signature measurements for evaluation.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #2, Exploratory Development	PE NUMBER AND TITLE: PE 0602204F, Aerospace Avionics — PROJECT NO.: 7633

(U) FY 1996:
- (U) Develop generic hardware and software modules to enable low-cost block upgrades to existing operational electronic warfare (EW) receivers. ($1,613K)
  - -- (U) Host combined de-interleaving, correlation, and threat identification software on laboratory hardware.
  - -- (U) Continue hardware and software development to allow normalization and transfer of threat parameters among systems.
- (U) Develop all-digital EW receiver and antenna for improved reliability and flexibility in response to ever changing EW threat environment. ($1,556K)
  - -- (U) Test fundamental radio frequency hardware correlator for channelized receiver out-of-band discrimination.
- (U) Develop an enhanced warning capability with advanced detector and processing technology and integrated missile warning, laser warning, and targeting sensors for an improved pilot protection capability. ($2,557K)
  - -- (U) Complete high altitude missile infrared signature measurements and model.
  - -- (U) Identify focal plane array suitable for combined laser/missile detection receiver design.
  - -- (U) Define laser receiver specifications for countermeasures cueing for aircrew cockpit protection.
- (U) Continue development of off-board expendables electronic countermeasures modeling capability for definition of chaff and decoy dispensing programs. ($1,234K)
  - -- (U) Incorporate NATO chaff flight test measurements into laboratory computer model.

(U) FY 1997:
- (U) Develop technology for generic hardware and software modules to enable low-cost block upgrades to existing operational EW receivers. ($1,999K)
  - -- (U) Test and validate software through combined simulation and ground tests.
  - -- (U) Host parameter normalization software on two systems and perform initial concept testing.
- (U) Develop all-digital EW receiver and associated antenna for improved reliability and flexibility in response to ever changing EW threat environment. ($1,560K)
  - -- (U) Test fundamental angle and radio frequency hardware correlator for channelized receiver out-of-band discrimination.
  - -- (U) Continue to develop angle/frequency discrimination concepts.
- (U) Develop an enhanced warning capability with advanced detector and processing technology and integrated missile warning, laser warning, and targeting sensors for an improved pilot protection capability. ($1,886K)
  - -- (U) Demonstrate low-cost multicolor infrared filtering technique for infrared focal plane array system.
- (U) Continue development of off-board expendables electronic countermeasures modeling capability for definition of chaff and decoy dispensing programs. ($1,449K)
  - -- (U) Demonstrate flight-tested "environmental chaff" suitable for training without adverse environmental affects.
  - -- (U) Demonstrate breadboard for advanced passive Radio Frequency Doppler expendable off-board countermeasures.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602204F, Aerospace Avionics

PROJECT NO.: 7633

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	2,741	3,105	3,076	3,246	Cont
Current President's Budget	2,741	3,043	6,960	6,894	Cont

Change Summary Explanation:

Funding: Beginning in FY 1996, Project 06AA funding is distributed to the technical projects.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0603270F, Electronic Combat Technology.
- (U) Joint Director of Laboratories, Technology Program for Electronic Warfare, Tri-Service Coordinating Body.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602204F, Aerospace Avionics

PROJECT NO.: 7662

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 7662, Avionics Data Transmission and Reception	869	964	2,206	2,185	2,315	2,406	2,482	2,544	Cont	Cont

A. (U) Mission Description and Budget Item Justification: Determines technical feasibility of technology for the growing need to transmit data between aircraft with high integrity, low probability of detection (LPD), and high jam resistance (JR). LPD communications are required to reduce aircraft physical and electromagnetic vulnerability and eliminate requirement for 'no communications' operations providing major improvements in strike effectiveness.

(U) FY 1994:
- (U) Developed technology for a capability of improved communication system electromagnetic interference rejection which in turn will provide the pilot more reliable communications in the combat environment. ($114K)
  -- (U) Completed design and analysis of techniques to reduce radiated co-site interference for assured communications.
- (U) Developed adaptive technology for a capability of medium capacity LPD/JR airborne air-to-air exchange of time-critical threat, sensor, and cooperative operations information. ($395K)
  -- (U) Evaluated transmission techniques for secondary dissemination of reconnaissance/inteligence data and imagery to support real-time precision targeting and strike.
  -- (U) Performed simulation to evaluate deformable mirror devices for laser communications.
- (U) Developed technology for short-range voice and low-data-rate LPD/JR information transfer capability to eliminate the need for "comm out" operations and increase survivability. ($360K)
  -- (U) Completed detailed design of omni-directional laser communications breadboard for highly covert short-range communications.

(U) FY 1995:
- (U) Develop technology for a capability of improved communication system electromagnetic interference rejection which in turn will provide the pilot more reliable communications in the combat environment. ($304K)
  -- (U) Evaluate techniques to reduce radiated co-site interference for assured communications.
- (U) Develop adaptive technology for a capability of medium capacity LPD/JR airborne air-to-air exchange of time-critical threat, sensor, and cooperative operations information. ($75K)
  -- (U) Perform laboratory hardware experiments to evaluate deformable mirrors for laser communications.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #2, Exploratory Development	PE NUMBER AND TITLE: PE 0602204F, Aerospace Avionics — PROJECT NO.: 7662

- (U) Develop technology for short-range voice and low-data-rate low probability of detection (LPD)/jam resistant (JR) information transfer capability to eliminate the need for "comm out" operations and increase survivability. ($310K)
  - -- (U) Fabricate omni-directional laser communications breadboard for highly covert short range communications.
- (U) Develop technology for automation of cockpit communications to reduce pilot workload and increase the availability of communications during combat operations. ($275K)
  - -- (U) Perform laboratory experiments to evaluate voice actuated expert system to control cockpit communications.

(U) FY 1996:

- (U) Develop technology to improve communication system electromagnetic interference rejection which in turn will provide the pilot more reliable communications in the combat environment. ($728K)
  - -- (U) Continue development and evaluation of low-cost techniques to reduce radiated co-site interference for assured communications.
- (U) Develop technology for short-range voice and low-data-rate LPD/JR information transfer capability to eliminate the need for "comm out" operations and increase survivability. ($746K)
  - -- (U) Complete development and laboratory evaluation of omni-directional laser communications breadboard for highly covert short-range communications.
  - -- (U) Complete system design and initiate fabrication of joint Army/Air Force ultra violet non-line-of-site communications breadboard to enable effective communications during nap-of-the-earth flight operations.
- (U) Develop technology for automation of cockpit communications to reduce pilot workload and increase the availability of communications during combat operations. ($732K)
  - -- (U) Design voice actuated expert system brassboard to automatically control cockpit communications.

(U) FY 1997:

- (U) Develop technology to improve communication system electromagnetic interference rejection which in turn will provide the pilot more reliable communications in the combat environment. ($690K)
  - -- (U) Complete development and evaluation of low-cost techniques to reduce radiated co-site interference for assured communications.
- (U) Develop technology for short-range voice and low-data-rate LPD/JR information transfer capability to eliminate the need for "comm out" operations and increase survivability. ($774K)
  - -- (U) Complete fabrication and initiate test of joint Army/Air Force ultra-violet non-line-of-site communications breadboard to enable effective communications during nap-of-the-earth flight operations.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #2, Exploratory Development	PE NUMBER AND TITLE: PE 0602204F, Aerospace Avionics — PROJECT NO.: 7662

- (U) Develop technology for automation of cockpit communications to reduce pilot workload and increase the availability of communications during combat operations. ($721K)
  -- (U) Complete design and initiate fabrication of voice actuated expert system brassboard to automatically control cockpit communications.

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	869	984	976	1,028	Cont
Current President's Budget	869	964	2,206	2,185	Cont

Change Summary Explanation:

Funding: Beginning in FY 1996, Project 06AA funding is distributed to the technical projects.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(U) Related Activities:
- (U) PE 0603203F, Advanced Avionics for Aerospace Vehicles.
- (U) PE 0603253F, Advanced Avionics Integration.
- (U) PE 0602782A, Command, Control and Communications (C3) Technology.
- (U) PE 0602232N, Navy C3 Technology.
- (U) PE 060379N, Advanced Technology Demonstration Program.
- (U) Coordinated through Joint Directors of Laboratories Sensor and Electronic Warfare Panels.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602269F, Hypersonic Technology Development

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Total PE 0602269F Cost	0	44,760	19,900	19,901	19,901	19,901	19,898	19,894	Cont	Cont
Project 1025, Hypersonic Technology	0	44,760	19,900	19,901	19,901	19,901	19,898	19,894	Cont	Cont

A. (U) Mission Description and Budget Item Justification: This Exploratory Development program develops advanced hypersonic technology and will provide revolutionary technology options to satisfy future Air Force needs such as future hypersonic weapons and space launch concepts. This new plan will transition the accomplishments made in hypersonic technologies by the National Aero-Space Plane (NASP) program into an exploratory development program to demonstrate the feasibility of hypersonic technologies. Technologies developed under this program will be dual use and applicable to both DOD and NASA requirements. Planned efforts include analyses, hypersonic materials, structures, airbreathing and non-airbreathing propulsion, aerodynamics, flight controls, and integrated technology test demonstrations. All efforts in this program element contain the resources necessary, including civilian salaries, to manage, conduct, and document the technical activities.

(U) FY 1994: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT NO.
#2, Exploratory Development	0602269F, Hypersonic Technology Development	1025

(U) FY 1995:

- (U) Complete Hypersonic Systems Technology Program (HySTP) and National Aero Space Plane (NASP) program terminations, final documentation, and archiving. ($14,760K)
- (U) Design, develop, and test propulsion components and integrated propulsion designs for advanced hypersonic propulsion concepts. ($10,500K)
  - -- (U) Perform component testing of a high thrust-to-weight combined cycle engine that can be used to accelerate a vehicle from low speed to hypersonic speeds (Mach 0-5).
  - -- (U) Fabricate and test a hydrocarbon-fueled scramjet combustor capable of demonstrating positive thrust at Mach 5-8.
  - -- (U) Evaluate and ground test a foreign-built scramjet engine to leverage foreign design methodology and investment.
  - -- (U) Validate design/mass property methodology for high-temperature/lightweight hypersonic vehicle structures (e.g., fuselage sections).
  - -- (U) Characterize high-temperature, lightweight materials and coatings for the internal sections of hypersonic propulsion engines.
- (U) Design, develop, and test advanced high-temperature, high-strength materials and structures for hypersonic applications. ($6,900K)
  - -- (U) Characterize new lightweight materials and structures to support rocket-launched transatmospheric vehicles and reusable launch vehicles that can withstand re-entry Mach stresses and temperatures.
  - -- (U) Characterize current materials for high-temperature, lightweight primary hypersonic vehicle structures (e.g., fuselage sections).
- (U) Develop technologies for instrumentation and test in realistic hypersonic conditions. ($6,300K)
  - -- (U) Continue feasibility study of radiatively driven hypersonic wind tunnel concept.
  - -- (U) Modify current air supply, heaters, and exhaust systems of the Wright Laboratory engine test cell to prepare for the combined cycle component demonstration.
  - -- (U) Characterize technologies needed for hypersonic test instrumentation that can withstand and accurately sense internal flow conditions, (e.g., temperature, pressure, heat flux, etc.) without disturbing airflow or engine operating conditions.
- (U) Develop and extend aeromechanical and computational technologies from low-speed and supersonic flight to the hypersonic environment. ($2,000K)
  - -- (U) Evaluate analytical tools available for aeromechanical, structural, propulsion, flight path dynamics, etc. to determine the necessary interactions for an integrated design methodology to create an affordable hypersonic design.
- (U) Develop technologies for avionics and sensors to satisfy unique requirements of hypersonic flight. ($2,000K)
  - -- (U) Evaluate concepts for sensor windows that can operate without degradation during hypersonic flight.
- (U) Conduct feasibility studies, design trades, and simulations to integrate hypersonic technologies into advanced vehicle designs for hypersonic applications which will improve warfighting capability and satisfy the requirements of Global Reach/Global Power. ($2,300K)
  - -- (U) Conduct mission analyses to characterize user requirements and technology maturity.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: 0602269F, Hypersonic Technology Development

PROJECT NO.: 1025

(U) FY 1996:

- (U) Design, develop, and test propulsion components and integrated propulsion designs for advanced hypersonic propulsion concepts. ($7,150K)
  - -- (U) Conduct detailed design and begin fabrication of a high thrust-to-weight combined cycle engine that can be used to accelerate a vehicle from low speed to hypersonic speeds (Mach 0-5).
  - -- (U) Conduct detailed design of a scramjet engine (e.g., inlet, combustor, and nozzle) capable of demonstrating positive thrust at Mach 5-8.
  - -- (U) Perform detailed design of high-temperature, lightweight materials and structures for the internal sections of hypersonic propulsion engines.
  - -- (U) Study endothermic fuel concepts to extend hydrocarbon-fueled scramjet capability from Mach 4-8 to Mach 10.
- (U) Design, develop, and test advanced high-temperature, high-strength materials and structures for hypersonic applications. ($4,100K)
  - -- (U) Conduct development/detailed design of lightweight materials and structures to support rocket-launched transatmospheric vehicles and reusable launch vehicles that can withstand re-entry Mach stresses and temperatures.
  - -- (U) Conduct materials development and preliminary designs for high-temperature, lightweight primary vehicle structures.
- (U) Develop technologies for instrumentation and test in realistic hypersonic conditions. ($3,600K)
  - -- (U) Validate structural test methodology for high-temperature and lightweight hypersonic vehicle structures (e.g., fuselage sections).
  - -- (U) Design hypersonic test instrumentation that can withstand and accurately sense internal flow conditions (e.g., temperature, pressure, heat flux, etc.) without disturbing airflow or engine operating conditions.
- (U) Develop and extend aeromechanical and computational technologies from low speed and supersonic flight to the hypersonic environment. ($2,150K)
  - -- (U) Evaluate analytical tools available for aeromechanical, structural, propulsion, flight path dynamics, etc. to determine the necessary interactions for an integrated design methodology to create an affordable hypersonic design.
  - -- (U) Conduct design studies for vehicle flight control and architecture development/simulation to characterize stability and maneuverability parameters.
- (U) Develop technologies for avionics and sensors to satisfy unique requirements of hypersonic flight. ($1,850K)
  - -- Develop preliminary concepts for sensors that can operate through the shock wave generated during hypersonic flight.
  - -- (U) Conduct characterization of antenna structures that can operate without degradation in the high-temperature hypersonic environment.
- (U) Conduct feasibility studies, design trades, and simulations to integrate hypersonic technologies into advanced vehicle designs for hypersonic applications which will improve warfighting capability and satisfy the requirements of Global Reach/Global Power. ($1,050K)
  - -- (U) Conduct mission analyses to characterize user requirements and technology maturity.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE February 1995
BUDGET ACTIVITY #2, Exploratory Development	PE NUMBER AND TITLE 0602269F, Hypersonic Technology Development
	PROJECT NO. 1025

(U) FY 1997:

- (U) Design, develop, and test propulsion components and integrated propulsion designs for advanced hypersonic propulsion concepts. ($7,600K)
  - -- (U) Fabricate and test components of a high thrust-to-weight combined cycle engine that can be used to accelerate a vehicle from low speed to hypersonic speeds (Mach 0-5).
  - -- (U) Complete detailed design and fabricate a scramjet engine (e.g., inlet, combustor, and nozzle) capable of demonstrating positive thrust at Mach 5-8 while withstanding the severe internal conditions.
  - -- (U) Fabricate and test high-temperature, lightweight materials and structures for the internal sections of hypersonic propulsion engines.
  - -- (U) Demonstrate endothermic fuel concepts to extend hydrocarbon-fueled scramjet capability from Mach 4-8 to Mach 10.
- (U) Design, develop, and test advanced high-temperature, high-strength materials and structures for hypersonic applications. ($4,101K)
  - -- (U) Conduct detailed design and fabrication of lightweight materials and structures to support rocket-launched transatmospheric vehicles and reusable launch vehicles that can withstand re-entry Mach stresses and temperatures.
  - -- (U) Conduct materials development and preliminary designs for high-temperature, lightweight primary vehicle structures.
- (U) Develop technologies for instrumentation and test in realistic hypersonic conditions. ($4,250K)
  - -- (U) Validate structural test instrumentation for high-temperature and lightweight hypersonic vehicle structures (e.g., fuselage sections).
  - -- (U) Design, fabricate, and test hypersonic test instrumentation that can withstand and accurately sense internal flow conditions (e.g., temperature, pressure, heat flux, etc.) without disturbing airflow or engine operating conditions.
- (U) Develop and extend aeromechanical and computational technologies from low speed and supersonic flight to the hypersonic environment. ($1,600K)
  - -- (U) Develop initial concepts to extend interdisciplinary computational fluid dynamics for an integrated design methodology to create an affordable hypersonic design.
  - -- (U) Conduct vehicle flight control breadboard and hardware-in-the-loop simulations to characterize stability and maneuverability parameters.
- (U) Develop technologies for avionics and sensors to satisfy unique requirements of hypersonic flight. ($1,400K)
  - -- (U) Complete preliminary concepts for sensors that can operate through the shock wave generated during hypersonic flight.
  - -- (U) Design and fabricate antenna structures that can operate without degradation in the high-temperature hypersonic environment.
- (U) Conduct feasibility studies, design trades, and simulations to integrate hypersonic technologies into advanced vehicle designs for hypersonic applications which will improve warfighting capability and satisfy the requirements of Global Reach/Global Power. ($950K)
  - -- (U) Conduct mission analyses to characterize user requirements and technology maturity.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602269F, Hypersonic Technology Development

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	0	45,000	46,164	46,614	Cont
Appropriated Value	0	45,000			
Adjustments to Appropriated Value					
a. Congressional General Reductions		-240			
Current President's Budget	0	44,760	19,900	19,901	Cont

Change Summary Explanation:

Funding: Development of hypersonic technologies was previously conducted under the National Aero-Space Plane (NASP) program and the Hypersonic Systems Technology Program (HySTP). In FY 1995, the Air Force canceled HySTP and refocused efforts into a hypersonic technology initiative.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(U) Related Activities:

- (U) 0602102F, Materials
- (U) 0602201F, Flight Dynamics
- (U) 0602203F, Aerospace Propulsion
- (U) 0603112F, Advanced Materials for Weapon Systems
- (U) 0603211F, Aerospace Structures
- (U) 0603216F, Aerospace Propulsion and Power Technology
- (U) 0603302F, Space and Missile Rocket Propulsion
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February 1995

BUDGET ACTIVITY: 2 - Exploratory Development

PE NUMBER AND TITLE: 0602601F Phillips Laboratory

COST (*In Thousands*)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	132,358	158,315	124,446	121,764	124,286	126,556	132,473	136,457	Continuing	Continuing
1010 Geophysics Technology	31,676	34,640	24,296	23,410	23,689	23,866	24,081	24,201	Continuing	Continuing
1011 Rocket Propulsion Technology	31,487	36,228	32,328	31,492	31,930	32,645	34,408	36,438	Continuing	Continuing
3326 Lasers and Imaging Technology	30,986	32,457	18,752	17,276	17,545	17,865	18,628	19,070	Continuing	Continuing
5797 Advanced Weapons Technology and Assessments	14,820	18,368	17,340	16,972	17,120	17,435	18,374	18,716	Continuing	Continuing
8809 Space Vehicle Technology	23,389	36,622	31,730	32,614	34,002	34,745	36,982	38,032	Continuing	Continuing

(U) Note: In FY 1995, the three Exploratory Development PEs at the Phillips Laboratory (PE 0602601F, Advanced Weapons; PE 0602101F, Geophysics; and PE 0602302F, Rocket Propulsion and Astronautics Technology) were combined into this PE. The funding for FY 1994 includes funding from all three PEs distributed according to the current project alignment.

(U) A. **Mission Description and Budget Item Justification:** This is the Exploratory Development technology program for the Phillips Laboratory's mission areas of spacecraft, launch vehicles, ballistic missiles, directed energy weapons (lasers and high power microwaves), long-range optical imaging, geophysics, and rocket propulsion (space launch, orbit transfer/maneuvering, ballistic and tactical missiles). All efforts in this program element contain the resources necessary, including civilian salaries, to manage, conduct, and document the technical activities.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1995
BUDGET ACTIVITY 2 - Exploratory Development	PE NUMBER AND TITLE 0602601F Phillips Laboratory

(U) B. **Program Change Summary ($ in Thousands):**

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
(U) Previous President's Budget	132,195	125,202	119,807	122,605	Cont
(U) Appropriated Value	132,878	159,502			
(U) Adjustments to Appropriated Value					
a. Congressional General Reductions	-683	-1,187			
b. SBIR	-974				
c. Below Threshold Reprogrammings	1,137				
(U) Current President's Budget	132,358	158,315	124,446	121,764	Cont

(U) Change Summary Explanation:

Funding: In FY 1995, Congressional actions impacted the following projects: 1010, $5 million added for High Altitude Active Auroral Research Program; 1011, $5 million added for Integrated High Performance Rocket Propulsion Technology; 3326, $13 million added for the Maui Supercomputer and $1.3 million added for the Advanced Electro-Optical System Spectrograph; and 8809, $10 million added for thermionics.

Schedule: Not Applicable.

Technical: Not Applicable.

(U) C. **Other Program Funding Summary:** Not Applicable.

(U) D. **Schedule Profile:** Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1995
BUDGET ACTIVITY 2 - Exploratory Development	PE NUMBER AND TITLE 0602601F Phillips Laboratory PROJECT 1010

COST (*In Thousands*)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
1010 Geophysics Technology	31,676	34,640	24,296	23,410	23,689	23,866	24,081	24,201	Continuing	Continuing

(U) A. Mission Description and Budget Item Justification: This project develops the technology to understand, mitigate, and exploit the effects of the natural environment on the design and operation of Air Force systems. This includes: defining, modeling, and developing techniques to predict the solar and space environment; developing models that specify and predict optical and infrared backgrounds and signatures of spacecraft and other targets; characterizing plasmas generated by aerospace vehicles; developing techniques to predict when and where ionospheric disturbances will occur; specifying atmospheric drag effects on satellites; measuring and modeling space debris; advancing technology in earth motions and seismology for nuclear test monitoring and test band treaty verification; and developing new techniques for measuring, modeling, simulating, and predicting meteorological properties impacting the Air Force mission. The project also develops modeling and simulation programs to enhance military system design and testing capabilities.

(U) FY 1994:

- (U) Continued development of space radiation specification and solar hazard prediction techniques for space system design and operations. ($5,570K)
  - (U) Delivered the first of the newly designed plasma and particle sensors for Block 5D3 (S-16) of the Defense Meteorological Satellite Program spacecraft.
  - (U) Delivered the Magnetospheric Specification and Forecasting Model for alerts of geomagnetic disturbances to spacecraft operators.
- (U) Continued development of atmospheric optical background simulations, models, and integrated codes for space system design and operation. ($4,950K)
  - (U) Delivered optical background and transmission codes for inclusion in the Standard Scene Generator Model.
  - (U) Delivered artificially obtained auroral data for use in the nuclear optical background codes needed to design systems that operate in a nuclear disturbed environment.
- (U) Continued development of active and passive remote sensing techniques for target signature identification and atmospheric wind profile measurements. ($2,970K)
  - (U) Used ballistic winds data obtained by laser imaging, detection, and ranging to improve targeting accuracy during AC-130H gunship live-fire and B-52G high altitude bombing exercises.
  - (U) Delivered extensive new infrared signature databases for the B-2, F-117, and C-17.
- (U) Continued development of global ionosphere models for communications, system applications, and neutral atmosphere models for satellite orbit forecasts. ($8,600K)
  - (U) Transitioned the Parameterized Real-Time Ionospheric Specification Model which has twice the accuracy of current operational models.
  - (U) Launched experiment on the Atmospheric Density Satellite to measure neutral densities for spacecraft operational specification and prediction models.
- (U) Continued measuring and modeling effects of local plasmas on Air Force space systems. ($2,300K)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1995
BUDGET ACTIVITY 2 - Exploratory Development	PE NUMBER AND TITLE 0602601F Phillips Laboratory PROJECT 1010

- (U) Used a one-of-a-kind laboratory chamber to characterize plasmas associated with hypervelocity aerospace vehicles which degrade sensor performance and guidance accuracy.

- (U) Continued development of seismic event identification techniques for nuclear test ban treaty verification. ($2,256K)
  - (U) Delivered seismic attenuation and magnitude factors as well as a geophysical model for monitoring nuclear test activities.
- (U) Continued development of global and theater weather analysis, simulation, and prediction techniques for combat weather system applications. ($5,030K)
  - (U) Developed algorithms which will form the basis for a revolutionary upgrade to the Air Force Operational Global Cloud Analysis Capability.

(U) FY 1995:

- (U) Continue development of space radiation specification and solar hazard prediction techniques for space system design and operations. ($6,370K)
  - (U) Formulate quasi-static radiation belt model for space systems design and operations.
  - (U) Deliver space sensors for Defense Meteorological Support Program satellite S-17.
- (U) Continue development of atmospheric optical background simulations, models, and integrated codes for space system design and operation. ($5,550K)
  - (U) Start transition of key optical background data from successful space shuttle and rocket-borne experiments into optical background codes for operational use.
- (U) Continue development of active and passive remote sensing techniques for target signature identification and atmospheric wind profile measurements. ($3,400K)
  - (U) Initiate measurements of effluent plumes and chemical clouds by an airborne laser imaging, detection, and ranging to develop stand-off measurement capabilities.
  - (U) Complete the analysis of ballistic wind tests of bombs dropped from B-52s for bombing correction capabilities.
- (U) Continue development of global ionosphere models for communications, system applications, and neutral atmosphere models for satellite orbit forecasts. ($6,050K)
  - (U) Complete development of a model to simulate radio frequency propagation anywhere in the world under all possible ionospheric conditions.
  - (U) Transition Ionospheric Forecast Model for operational use.
- (U) Continue measuring and modeling effects of local plasmas on Air Force space systems. ($2,600K)
- (U) Continue development of seismic event identification techniques for nuclear test ban treaty verification. ($530K)
  - (U) Deliver an improved seismic array analysis technique for monitoring foreign underground detonation.
- (U) Continue development of global and theater weather analysis, simulation, and prediction techniques for combat weather system applications. ($5,400K)
  - (U) Verify recently developed theater-scale atmospheric models using ground-based radar wind profiles.
  - (U) Complete an artificial intelligence-based theater forecast model to give 12-hour forecasts.
  - (U) Deliver a weather model that realistically and accurately depicts clouds and rain for use in tactical situations.
- (U) Continue the High Frequency Active Auroral Research Project. ($4,740K)
  - (U) Conduct research to characterize the background ionospheric and electrojet conditions.
  - (U) Demonstrate utility for communications and subterranean tunnel detection.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1995
BUDGET ACTIVITY 2 - Exploratory Development	PE NUMBER AND TITLE 0602601F Phillips Laboratory	PROJECT 1010

(U) FY 1996:
- (U) Continue development of space radiation specification and solar hazard prediction techniques for space system design and operations. ($5,175K)
  - (U) Formulate and update advanced radiation belt models that are essential for Air Force and DOD space system designs and operations.
  - (U) Develop adaptive optical techniques for improved solar imaging of disruptive solar events.
- (U) Continue development of atmospheric optical background simulations, models, and integrated codes for space system design and operation. ($4,510K)
  - (U) Collect data from the mid-course space experiment for use in developing stellar on-board calibration sources for advanced space-based surveillance and tracking systems.
- (U) Continue development of active and passive remote sensing techniques for target signature identification and atmospheric wind profile measurements. ($2,765K)
  - (U) Use the Flying Infrared Signatures Technology Aircraft to collect infrared signatures of the F-22 and other aircraft/missiles to validate the operational targets and scenes code.
  - (U) Test an airborne laser imaging, detection, and ranging demonstrator on the Flying Infrared Signatures Technology Aircraft to characterize the optical path between the aircraft and the target to increase the accuracy of target measurements.
- (U) Continue development of global ionosphere models for communications, system applications, and neutral atmosphere models for satellite orbit forecasts. ($4,915K)
  - (U) Extend the Parameterized Real-Time Ionospheric Specification Model to 22,000 kilometers and transition for operational use.
- (U) Continue measuring and modeling effects of local plasmas on Air Force space systems. ($2,115K)
  - (U) Measure degradation of radio frequency transmissions passing through plasmas generated around aerospace vehicles at shock tunnel and ballistic range facilities.
- (U) Continue development of seismic event identification techniques for nuclear test ban treaty verification. ($430K)
  - (U) Deliver a physical model for guided crustal waves for applications in the Eurasian and Middle East region.
- (U) Continue development of global and theater weather analysis, simulation, and prediction techniques for combat weather system applications. ($4,386K)
  - (U) Deliver an advanced parameter global cloud analysis model to Air Force Global Weather Central.
  - (U) Complete data fusion project to integrate disparate weather data in a battlefield setting to enhance theater weather forecasting.

(U) FY 1997:
- (U) Continue development of space radiation specification and solar hazard prediction techniques for space system design and operations. ($4,910K)
  - (U) Design the follow-on Compact Radiation Effects Satellite payload to characterize potentially dangerous high energy space particles.
  - (U) Deliver new spacecraft charging algorithms to assess spacecraft-plasma interactions.
- (U) Continue development of atmospheric optical background simulations, models, and integrated codes for space system design and operation. ($4,330K)
  - (U) Extend the wavelength coverage of the operational atmospheric backgrounds code into the ultraviolet and millimeter wavelength regions.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1995
BUDGET ACTIVITY: 2 - Exploratory Development	PE NUMBER AND TITLE: 0602601F Phillips Laboratory — PROJECT: 1010

- (U) Continue development of active and passive remote sensing techniques for target signature identification and atmospheric wind profile measurements. ($2,770K)
  - (U) Use Flying Infrared Signatures Technology Aircraft measurements to expand and validate the spectral in-band radiance images of targets and scenes code.
- (U) Continue development of global ionosphere models for communications, system applications, and neutral atmosphere models for satellite orbit forecasts. ($4,740K)
  - (U) Obtain data from the instruments on the atmospheric density satellite to validate operational, global, neutral density specification, and forecast models.
- (U) Continue measuring and modeling effects of local plasmas on Air Force space systems. ($2,025K)
  - (U) Test chemical and other techniques for modifying plasma effects around aerospace vehicles to mitigate their effects.
- (U) Continue development of seismic event identification techniques for nuclear test ban treaty verification. ($430K)
  - (U) Deliver a model of Eurasian and Middle East crust and mantle structure to improve capabilities for monitoring these areas.
- (U) Continue development of global and theater weather analysis, simulation, and prediction techniques for combat weather system applications. ($4,205K)
  - (U) Transition techniques that will improve vehicle space launch capabilities by identifying potentially dangerous electric fields in clouds near launch sites.

(U) B. Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
(U) Previous President's Budget	31,676	29,900	28,750	28,800	Cont
(U) Current President's Budget	31,676	34,640	24,296	23,410	Cont

(U) Change Summary Explanation:

Funding: In FY 1995, Congressional actions added $5 million for High Altitude Active Auroral Research Program. FY 1996 and 1997 changes are due to Air Force reprioritization.

Schedule: Not Applicable.

Technical: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1995
BUDGET ACTIVITY 2 - Exploratory Development	PE NUMBER AND TITLE 0602601F Phillips Laboratory	PROJECT 1010

(U) C. Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0305160F, Defense Meteorological Satellite Program.
- (U) PE 0601102F, Defense Research Sciences.
- (U) PE 0602204F, Aerospace Avionics.
- (U) PE 0603410F, Space Systems Environmental Interactions Technology.
- (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) D. Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February 1995

BUDGET ACTIVITY: 2 - Exploratory Development

PE NUMBER AND TITLE: 0602601F Phillips Laboratory

PROJECT: 1011

COST (*In Thousands*)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
1011 Rocket Propulsion Technology	31,487	36,228	32,328	31,492	31,930	32,645	34,408	36,438	Continuing	Continuing

(U) A. **Mission Description and Budget Item Justification:** This project conducts exploratory development and transitions the most promising basic research and fundamental rocket propulsion technologies for boost and orbit transfer, satellite maneuvering, tactical, and ballistic missile applications into component and subsystem applications to demonstrate feasibility and potential mission payoffs. Technologies of interest are those which will improve reliability, operability, survivability, affordability, environmental compatibility, and performance of future propulsion systems while reducing material, manufacturing, and support costs. Technology will be developed to reduce the weight and cost of components using materials, improved designs, and improved manufacturing techniques. All efforts are part of the Integrated High Payoff Rocket Propulsion Technology (IHPRPT) initiative, a joint DOD, NASA, and industry effort to focus rocket propulsion technology to the needs of the nation.

(U) FY 1994:

- (U) Continued development of components necessary for the incorporation of advanced environmentally friendly propellants into existing and future missile systems. ($13,627K)
  - (U) Completed studies which documented payoffs from non-toxic, non-cryogenic, high performance, storable liquid fuel/oxidizer ingredient development.
  - (U) Evaluated and selected ingredients to boost the performance of environmentally friendly solid rocket motor propellants.
- (U) Continued development of solid and liquid propulsion technology for environmentally safe and low-cost access to space. ($12,860K)
  - (U) Analyzed advanced fluid film bearing wear to quantify their benefits in turbopump assemblies for restartable engines.
  - (U) Designed a non-eroding altitude compensating nozzle which will increase solid rocket motor performance.
  - (U) Developed polymeric nozzles to decrease motor weight and increase reliability.
  - (U) Developed a computer code to model the structural and ballistic interaction of solid propellants and cases to allow motor designers to design lighter weight motors with more accurate margins of safety.
  - (U) Completed proof-of-concept development of a solid rocket motor with greatly reduced ozone depleting hydrochloric acid in the exhaust.
  - (U) Completed proof-of-concept development of a catalytic ignitor as a low-cost, multiple thrust chamber ignition source.
  - (U) Installed hydrostatic bearing test rig and performed initial screen testing of turbopump bearing coatings using liquid nitrogen.
- (U) Continued development of high energy density materials. ($5,000K)
  - (U) Identified possible high energy oxidizers and fuels, such as nitrogen, hydrogen, strained-ring hydrocarbon, and oxygen-based propellant ingredients.

(U) FY 1995:

- (U) Continue development of components necessary for the incorporation of advanced environmentally friendly propellants into existing and future missile systems. ($11,800K)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1995
BUDGET ACTIVITY 2 - Exploratory Development	PE NUMBER AND TITLE 0602601F Phillips Laboratory
	PROJECT 1011

- (U) Develop non-toxic, non-cryogenic, high performance, storable liquid fuel/oxidizer ingredients.
- (U) Analyze propellant, explosive, and pyrotechnic waste products.
- (U) Complete scale-up and testing of energetic ingredients to boost the performance of environmentally friendly solid rocket motor propellants.

– (U) Continue development of solid and liquid propulsion technology for environmentally safe and low-cost access to space. ($18,728K)
- (U) Develop and analytically validate a representative hydrogen turbopump design incorporating advanced fluid-film bearing technologies that meet the performance and system integrity requirements.
- (U) Demonstrate fabrication techniques to reduce cost of investment casting of combustion chambers.
- (U) Complete testing of hydrostatic bearing coatings in liquid hydrogen and quantify the life enhancement benefits.
- (U) Develop carbon-carbon coating methods using a plasma torch to create lightweight, high strength, high temperature components.
- (U) Demonstrate a new rapid densification process for carbon-carbon and ceramic nozzles that will greatly reduce manufacturing time and cost.
- (U) Design a functionally integrated solid rocket motor which uses polymeric-based propellants and components to eliminate all bond lines and increase reliability.
- (U) Perform proof-of-concept testing on the non-eroding altitude compensating nozzle which will increase motor performance.
- (U) Formulate an environmentally friendly solid rocket motor propellant which will eliminate all toxic products from the manufacturing and operation process.

– (U) Continue development of high energy density materials. ($5,700K)
- (U) Determine the chemical and physical properties of the oxidizer/fuel molecules and begin performance prediction analysis.
- (U) Conduct synthetic and theoretical searches for new strained ring hydrocarbon and novel high energy compounds for both solid and liquid propulsion.
- (U) Conduct analysis of potential cryogenic solid propellant ingredients.

(U) FY 1996:

– (U) Continue development of high energy density materials. ($5,600K)
- (U) Determine feasibility of solid hydrogen and metallic clusters, metal atom doped cryogenic-solids, and solids with impurities as high energy density materials candidates.
- (U) Continue development of cryogenic solids, high-pressure solids, extended solid properties, and maximized high energy density material additives in cryogenic solids for future use in a solid or hybrid rocket with revolutionary performance increases.
- (U) Test fire solid oxygen combustor.
- (U) Test fire first new liquid high energy density materials additive (quadricyclane) in a 4,000 pound engine and begin scale-up demonstrations.
- (U) Continue searches for strained ring hydrocarbon and high energy compounds for solid and liquid propulsion.
- (U) Conduct synthesis on new solid, non-halogenated oxidizers, which do not deplete the ozone, for environmentally safe rocket motors.
- (U) Develop scale-up capability for liquid high energy density materials.

– (U) Continue development of propulsion technologies for tactical missile system applications. ($2,900K)
- (U) Fabricate and begin demonstrations of component technologies such as no-erosion, altitude compensating nozzles (for use in solid missile systems).

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1995
BUDGET ACTIVITY 2 - Exploratory Development	PE NUMBER AND TITLE 0602601F Phillips Laboratory PROJECT 1011

- (U) Conduct analysis to develop lightweight liners.
- (U) Test environmental propellants and processes to produce minimum smoke, environmentally safe propellants for use in tactical missiles.

– (U) Continue development of propulsion technology to meet the needs of reliable, safe, and low-cost boost and orbit transfer applications. ($18,978K)
- (U) Manufacture low-cost, coated carbon-carbon ceramic components and hybrid polymers for future demonstration of high temperature, non-erosive, lightweight components for use in solid rocket motors.
- (U) Fabricate and assemble the fluid film bearings into the breadboard turbopump using advanced manufacturing and fabrication methods to validate added cost and weight savings, and begin testing hydrostatic bearings in turbopump assemblies ("real" conditions).
- (U) Fabricate a combustion chamber using powder metallurgy technology to increase their performance.
- (U) Design and fabricate an altitude compensating nozzle to integrate into a liquid engine.
- (U) Develop and evaluate new injector concepts that reduce costs, increase reliability, and increase engine performance.
- (U) Compile data on hybrid propulsion concepts to develop state-of-the-art hybrid rocket motor technologies.

– (U) Continue development of advanced boost and orbit transfer propellants which are environmentally safe during manufacture, storage, use, and disposal. ($2,900K)
- (U) Characterize and evaluate the synthesized non-toxic, non-cryogenic, high performance, storable liquid fuel/oxidizer components and identify candidate solutions.
- (U) Design non-toxic, non-cryogenic, high performance, storable liquid fuel/oxidizer components.
- (U) Develop and optimize lab procedures to minimize propellant, explosive, and pyrotechnic waste products and optimize disposal procedures.
- (U) Conduct sub-scale synthesis of alternate clean propellants to increase the ballistic mechanical and stability properties of the environmentally acceptable propellants.
- (U) Test to determine ways to increase the processability (e.g., rapid and more efficient manufacturing) of new environmentally compliant solid rocket fuels.
- (U) Manufacture and quantify laboratory quantities of new, high energy ingredients to be used in environmental propellants.

– (U) Continue development of satellite propulsion technology for control and on-orbit transfer. ($1,950K)
- (U) Investigate the beam divergence of a 1000-watt anode layer thruster and evaluate methods that could reduce divergence.

(U) FY 1997:

– (U) Continue development of high energy density materials. ($5,642K)
- (U) Complete studies and analysis of solid hydrogen and metallic clusters, metal atom doped cryogenic solids, and solids with impurities. Write final technical report and transition best high energy density materials candidates into the cryogenic solid properties and combustion programs.
- (U) Finish exploring cryogenic solid, high-pressure solid, and extended solid properties. Determine candidate selections for cryogenic solid and extended solid combustion programs.
- (U) Develop techniques to accurately measure high energy density materials additive concentrations in cryogenic solids.
- (U) Test fire cryogenic hybrid rocket demonstrator.
- (U) Perform large-scale quadricyclane engine tests/demonstrations.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1995
BUDGET ACTIVITY 2 - Exploratory Development	PE NUMBER AND TITLE 0602601F Phillips Laboratory
	PROJECT 1011

- (U) Complete strained ring hydrocarbon high energy compound development. Write final technical reports identifying the best candidates for a scale-up program.
- (U) Select solid, non-halogenated oxidizer, candidates and other synthesized new high energy density materials ingredients for scale-up programs.
- (U) Scale-up solid and liquid high energy density materials to begin large-scale thrust demonstrations.

– (U) Continue development of propulsion technologies for tactical missile system applications. ($2,800K)
- (U) Test fabrication techniques to manufacture lightweight liners.
- (U) Complete testing and demonstration of environmental propellants and processes to produce minimum smoke, environmentally safe tactical missiles.
- (U) Evaluate commercial technologies and practices for incorporation into low-cost, high performance, environmentally compliant tactical missiles.
- (U) Analyze new propellant and component technologies to develop a lightweight, highly maneuverable propulsion system that will assure high kill ratios against the next generation of highly maneuverable planes and meet tactical performance goals.

– (U) Continue development of propulsion technology to meet the needs of reliable, safe, and low-cost boost and orbit transfer applications. ($18,250K)
- (U) Demonstrate low-cost, high temperature, non-erosive, lightweight coated carbon-carbon ceramic and hybrid polymer components for use in solid rocket motors.
- (U) Demonstrate the fluid film bearing designs and verify the performance and integrity of the turbopump.
- (U) Test and evaluate the performance increase obtained by integrating an altitude compensating nozzle in a liquid engine.
- (U) Hot fire test and demonstrate the long life capabilities of a high performance thrust cell.
- (U) Fabricate a thrust chamber designed to extend thermal cycle life.
- (U) Design low torque valves, electromechanical actuators, and connectors which are leak-free with non-precision alignment during installation in cryogenic systems to increase system reliability and operability while reducing maintenance costs.
- (U) Analyze new, low-cost, and highly reliable manufacturing techniques such as electron beam cure and new design tools to improve solid rocket motor flaws and ballistic interactions.
- (U) Design injectors that enable reduced cost, increased reliability, and increased engine performance.
- (U) Analyze and quantify the benefits of hybrid rocket motor technology and report on best candidate technologies available to create a hybrid rocket motor for enhanced operational flexibility and low-cost, assured space access.

– (U) Continue development of advanced boost and orbit transfer propellants which are environmentally safe during manufacture, storage, and use. ($2,800K)
- (U) Evaluate ignition characteristics, determine combustion efficiencies, and report the results of the synthesized non-toxic, non-cryogenic, high performance, storable liquid fuel/oxidizer components.
- (U) Fabricate and test non-toxic, non-cryogenic, high performance, storable liquid fuel/oxidizer components.
- (U) Determine alternative disposal procedures/technologies to thermolyze or breakdown propellant, explosive, and pyrotechnic wastes into their non-hazardous constituent parts.
- (U) Scale-up and demonstrate state-of-the-art ingredients to bolster the performance of the next generation of environmentally acceptable propellants.
- (U) Integrate all of the current solid propellant work being done under high energy density materials and incorporate the most promising ingredients into state-of-the-art propellants.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1995
BUDGET ACTIVITY 2 - Exploratory Development	PE NUMBER AND TITLE 0602601F Phillips Laboratory PROJECT 1011

- (U) Evaluate and analyze radically new methods of solid rocket motor manufacture to develop low-cost solid rocket motors that exceed the performance of current liquid rocket propellants.
- (U) Scale-up and demonstrate the innovative energetic ingredients that are currently being built within government and contractor laboratories. The most promising ingredients (solid or liquid) will be fed into an innovative propellants type project to be used in next generation propellant.

- (U) Continue development of satellite propulsion technology for control and on-orbit transfer. ($2,000K)
  - (U) Optimize the internal magnetic field for the 1000-watt anode layer thruster.
  - (U) Develop and evaluate improved designs to fabricate a pulsed plasma thruster.

(U) B. **Program Change Summary ($ in Thousands):**

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
(U) Previous President's Budget	31,487	31,500	30,600	30,800	Cont
(U) Current President's Budget	31,487	36,228	32,328	31,492	Cont

(U) Change Summary Explanation:

Funding: In FY 1995, Congressional actions added $5 million for Integrated High Performance Rocket Propulsion Technology.

Schedule: Not Applicable.

Technical: Not Applicable.

(U) C. **Other Program Funding Summary:**

(U) Related Activities:

- (U) PE 0602111N, Anti-Air/Anti-Surface Warfare Technology.
- (U) PE 0602303A, Missile Technology.
- (U) PE 0603302F, Space and Missile Rocket Propulsion Technology.
- (U) PE 0603311F, Ballistic Missile Technology.
- (U) PE 0603401F, Advanced Spacecraft Technology.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) D. **Schedule Profile:** Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1995
BUDGET ACTIVITY: 2 - Exploratory Development	PE NUMBER AND TITLE: 0602601F Phillips Laboratory — PROJECT: 3326

COST (*In Thousands*)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
3326 Lasers and Imaging Technology	30,986	32,457	18,752	17,276	17,545	17,865	18,628	19,070	Continuing	Continuing

(U) A. Mission Description and Budget Item Justification: This project examines the technical feasibility of moderate to high power lasers, associated optical components, and long-range optical imaging concepts for Air Force mission requirements. This includes: advanced short wavelength laser devices for applications such as illuminators and imaging sources; advanced optical imaging techniques for target identification and assessment as well as aimpoint selection, maintenance, and damage assessment; high power laser device and optical component technology; advanced beam control and atmospheric compensation technology, tools, and techniques for laser target vulnerability assessments; and nonlinear optics processes and techniques.

(U) FY 1994:

- (U) Continued development of various laser device technologies for applications such as illuminators and wavelength-specific military missions. ($5,742K)
  - (U) Demonstrated high efficiency, solid-state, frequency-doubled neodymium-yttrium-aluminum-garnet laser.
  - (U) Demonstrated near diffraction-limited diode-pumped solid-state laser for use as a master oscillator for illuminator applications.
  - (U) Demonstrated power scaling for laser at four micrometers wavelength, addressing requirements for countermeasure applications.
- (U) Continued development of long-range optical imaging technologies for increased resolution and data fusion to support missions such as space object identification. ($5,240K)
  - (U) Applied hyperspectral sensing techniques to demonstrate feasibility of satellite spectral "fingerprinting" to support space object identification.
  - (U) Completed analytical evaluation of interferometric imaging concepts, demonstrating payoff for passive deep space imaging.
  - (U) Demonstrated three-dimensional imaging of turbulent flow fields in laboratory testing.
- (U) Continued to investigate and develop nonlinear optics technologies. ($4,128K)
  - (U) Demonstrated intracavity nonlinear optics concept for high efficiency wavelength shifting to arbitrary wavelengths.
- (U) Continued the investigation and development of advanced high energy laser optical components. ($235K)
  - (U) Completed development of advanced optical coating process and demonstrated ultra-low absorption, high reliability optical coatings at 1.3 micron wavelength.
- (U) Continued laser assessment studies to identify technologies required for high payoff military applications of laser and optical systems. ($641K)
  - (U) Completed laser effects tests and initial assessment of the potential of laser concepts to degrade or destroy infrared guidance systems in tactical missiles.
- (U) Continued development of the Maui supercomputer facility. ($15,000K)
  - (U) Maui High Performance Computing Center became operational.
  - (U) Upgraded facility from 80 processors to 400 processors.
  - (U) Established capability to process classified data.

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(U) FY 1995:

- (U) Continue development of generic high energy laser device technology for applications such as illuminators and wavelength-specific military missions. ($2,251K)
  - (U) Develop high-average power diode-pumped lasers.
  - (U) Demonstrate power scaling for wavelength agile laser in mid-infrared wavelength region.
- (U) Develop basic laser source and target coupling technology for high payoff applications such as laser-induced microwave emission effects phenomenology. ($4,125K)
  - (U) Complete development and deliver an improved laser source for fundamental target coupling phenomenology studies to address the potential of laser-induced microwave effects.
- (U) Continue developing long-range optical imaging technologies for increased resolution and data fusion to support missions such as space object identification. ($6,383K)
  - (U) Begin investigation of improved image reconstruction algorithms applicable to sparsely-filled, synthetic aperture imaging concepts (active and passive).
  - (U) Complete theory development for daytime imaging using adaptive optics to support optimum configuration of field experiments under advanced development funding.
  - (U) Transition hyperspectral imaging technology to standoff detection applications.
  - (U) Complete evaluation of the payoff of hyperspectral "fingerprinting" to the space object identification/mission payload assessment mission for deep space objects.
- (U) Continue to develop nonlinear optics technologies to support imaging and other applications. ($2,403K)
  - (U) Demonstrate feasibility of using chaos control concepts with laser devices to produce wavelength agility.
  - (U) Complete evaluation of nonlinear optics concepts for scaling visible wavelength lasers to kilowatt average power.
- (U) Continue the investigation and development of advanced high energy laser optical components. ($2,995K)
  - (U) Complete fabrication and delivery of high performance, low-cost cooled deformable mirror.
  - (U) Initiate development and scaling of low-flow cooled optics concepts to meet requirements for mirrors, aperture sharing elements, and cooled windows in full-scale laser systems.
  - (U) Complete evaluation of environmental and thermal cycling stability for high performance coating samples.
- (U) Continue development of the Maui supercomputer facility. ($13,000K)
  - (U) Increase high speed storage capability by 20 trillion bytes.
  - (U) Provide near-real-time images to Air Force Space Command.
- (U) Develop the advanced electro-optical system spectrograph. ($1,300K)

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(U) FY 1996:
- (U) Continue development of generic high energy laser device technology for applications such as illuminators and wavelength-specific military missions. ($3,639K)
  - (U) Complete development and delivery of a high power (up to one kilowatt), wavelength agile, visible laser source.
- (U) Continue to develop basic laser source and target coupling technology for high payoff applications such as the laser-induced microwave effects phenomenology. ($2,874K)
  - (U) Complete initial investigation of laser-induced microwave effects phenomenology.
  - (U) Begin evaluation of laser-induced microwave effect on military system materials.
- (U) Continue development of long-range optical imaging technologies for increased resolution and data fusion to support missions such as space object identification. ($5,413K)
  - (U) Conduct fundamental risk reduction experiments and demonstrations for technology critical to selected deep space imaging concepts.
  - (U) Identify and begin investigation of key fundamental technologies to establish the feasibility of high-payoff applications identified in the Imaging and Sensing Mission study.
  - (U) Initiate effort to incorporate real-time imaging processing algorithms into generic on-board processing schemes.
- (U) Continue to investigate and develop nonlinear optics technologies to support imaging and other applications. ($3,491K)
  - (U) Demonstrate high-power frequency conversion to visible wavelengths from solid-state lasers using nonlinear optics concepts.
  - (U) Demonstrate ultra-fast (gigahertz) control mechanisms using nonlinear optics concepts in unstable laser systems.
- (U) Continue the investigation and development of advanced high energy laser optical components. ($3,335K)
  - (U) Demonstrate producibility of low-flow cooled optics as a precursor to full-scale development.

(U) FY 1997:
- (U) Continue development of generic high energy laser device technology for applications such as illuminators and wavelength-specific military missions. ($3,200K)
  - (U) Demonstrate a multi-joule, frequency agile laser device for remote sensing applications.
- (U) Continue to develop basic laser source and target coupling technology for high payoff applications such as the laser-induced microwave effects phenomenology. ($2,612K)
  - (U) Complete experiment evaluation and analysis to assess the effectiveness of laser-induced microwave effects technology in specific military applications.
- (U) Continue development of long-range optical imaging technologies for increased resolution and data fusion to support missions such as space object identification. ($5,135K)
  - (U) Complete initial development and laboratory experiments on a key technology for high-payoff imaging applications and transition to advanced development.
  - (U) Complete laboratory demonstration of breadboard on-board image processing concept.

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- (U) Continue to investigate and develop nonlinear optics technologies to support imaging and other applications. ($4,000K)
  - (U) Demonstrate multi-gigahertz control mechanisms in laser sources suitable for high-data rate laser communications applications.
- (U) Continue the investigation and development of advanced high energy laser optical components. ($2,329K)
  - (U) Complete development and testing of full-scale optical components based on low-flow cooling concepts.
  - (U) Complete assessment of advanced coating processes and materials, recommending best coatings for full-scale laser system applications.

(U) B. **Program Change Summary ($ in Thousands):**

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
(U) Previous President's Budget	30,986	18,400	17,050	17,900	Cont
(U) Current President's Budget	30,986	32,457	18,752	17,276	Cont

(U) Change Summary Explanation:

Funding: In FY 1995, Congress added $13 million for the Maui supercomputer and $1.3 million for the advanced electro-optical system spectrograph.

Schedule: Not Applicable.

Technical: Not Applicable.

(U) C. **Other Program Funding Summary:**

(U) Related Activities:
- (U) PE 0602101N, Directed Energy Weapons.
- (U) PE 0602307A, Laser Weapon Technology.
- (U) PE 0603314A, High Energy Laser and Directed Energy Components.
- (U) PE 0603319F, Airborne Laser Demonstrator.
- (U) PE 0603605F, Advanced Weapons Technology.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) D. **Schedule Profile:** Not Applicable.

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COST (*In Thousands*)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
5797 Advanced Weapons Technology and Assessments	14,820	18,368	17,340	16,972	17,120	17,435	18,374	18,716	Continuing	Continuing

(U) A. **Mission Description and Budget Item Justification:** This project explores high power microwave and other unconventional weapon concepts using innovative technologies such as compact toroids. Technologies are developed that support a wide range of Air Force missions such as space control, command and control warfare, and counter-air warfare. This project also provides vulnerability assessments of representative U.S. strategic and tactical systems to directed energy weapons, directed energy weapon technology assessment for specific Air Force missions, and directed energy weapon lethality assessments against foreign targets. In addition to directed energy weapon threats, this project conducts assessments of specific space environmental (natural and man-made) effects on space systems and develops hardening technologies and methodologies.

(U) FY 1994:

- (U) Develop generic advanced weapon technologies that support many Air Force applications. ($3,051K)
  - (U) Completed new design of a pulse forming network for high power microwave ultra-wideband sources to increase efficiency to 100%.
  - (U) Obtained first radio frequency power from magnetic injection line oscillator device.
  - (U) Completed pyramidal horn antenna to obtain 70 kilovolts per meter from ultra-wideband source at ten meters.
  - (U) Developed high-power solid-state gallium arsenide switching technology that provided 10,000 shots, a 100 times improvement to previous design.
  - (U) Began development of solid-liner plasma-driven hypervelocity projectiles.
- (U) Continue to assess effects/lethality of directed energy weapon technologies against representative air and ground military systems. ($1,134K)
  - (U) Completed low frequency, high power microwave effects on F-16.
  - (U) Completed assessment of Stinger launch tube high power microwave susceptibilities.
- (U) Develop high power microwave technologies that will support applications such as suppression of enemy air defense, counter-air, command and control warfare, and aircraft self-protection. ($4,510K)
  - (U) Developed miniature monocone antenna to support command and control warfare using high power microwaves.
  - (U) Developed new virtual antenna design to support command and control warfare applications using high power microwaves.
  - (U) Completed concept exploration development for suppression of enemy air defense using high power microwaves.
- (U) Continued to develop high power microwave technologies, including susceptibility and effects experiments and modeling and data base development, to support space control applications. ($3,005K)
  - (U) Completed high power microwave effects tests of first generation silicon focal plane arrays and single element mercury/cadmium/telluride detectors.
  - (U) Completed preliminary assessment of Global Positioning System receiver susceptibility to high power microwaves and made recommendation to Global Positioning System program office.

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- (U) Continued to assess the vulnerability of various space assets to natural and man-made threats such as solar radiation, space debris, and directed energy weapons. ($3,120K)
  - (U) Completed predictive radio frequency effects coupling tool that performs end-to-end simulation and investigates component/subsystem susceptibilities.
  - (U) Collected shuttle engine thruster plume spectra to characterize optical missions and identify contaminants.
  - (U) Develop satellite directed energy weapon lethality and assessment models for four assets.

(U) FY 1995:

- (U) Develop generic advanced weapon technologies that support many Air Force applications. ($3,726K)
  - (U) Develop alternative directed energy weapon sources that will destroy advanced/future enemy integrated air defense systems.
  - (U) Continue to develop advanced pulse power technologies that will power new high power microwave source designs.
  - (U) Continue development of solid-liner plasma-driven hypervelocity projectiles.
- (U) Continue to assess effects/lethality of directed energy weapons technologies against representative air and ground military systems. ($1,460K)
  - (U) Complete fixed-site design for high power microwave effects hardening testing for command and control warfare applications.
  - (U) Complete communications network response experiments to identify network susceptibilities to high power microwaves.
- (U) Develop high power microwave technologies that will support applications such as suppression of enemy air defenses, counter-air, command and control warfare, and aircraft self-protection. ($5,590K)
  - (U) Complete high power microwave weapons concept investigations for command and control warfare mission.
  - (U) Downselect wideband high power microwave source which provides aircraft self-protection.
- (U) Continue to develop high power microwave technologies, including susceptibility and effects experiments and modeling and data base development, to support space control applications. ($3,725K)
  - (U) Perform tests of susceptibility of advanced focal plane arrays to electromagnetic emissions.
  - (U) Begin multi-threat directed energy weapon warning/reporting/protection technology efforts.
  - (U) Deliver integrated multi-subsystem survivability/vulnerability modeling capability.
- (U) Continue to assess the vulnerability of various space assets to natural and man-made threats such as solar radiation, space debris, and directed energy weapons. ($3,867K)
  - (U) Develop satellite directed energy weapon lethality and assessment models for five assets.
  - (U) Develop multi-threat survivability/vulnerability capability.
  - (U) Continue space payload assessment and environmental interaction experiments and quantify ultraviolet/visible/infrared satellite signatures.

(U) FY 1996:

- (U) Develop generic advanced weapon technologies that support many Air Force applications. ($6,871K)
  - (U) Develop advanced pulse power technologies that will power new high power microwaves source designs.
  - (U) Continue development of narrowband and ultra-wideband high power microwave sources and antennas for command and control warfare efforts.

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- (U) Develop high performance computer codes to support plasma and pulsed power research.
- (U) Investigate agent defeat technology, using high power microwaves, to neutralize biological weapons.
- (U) Transition ultra-wideband antenna to PE 0603605F.

– (U) Continue to assess effects/lethality of directed energy weapon technologies against representative air and ground military systems. ($3,005K)
- (U) Develop computer modeling codes that predict high power microwave coupling into aircraft and complete B-2 shielding survey.
- (U) Develop technologies to harden military assets against high power microwave damage and effects.
- (U) Continue high power microwave upset characterization of various system hardware, including command and control network equipment.
- (U) Develop specifications and standards and hardness maintenance technologies for systems such as F-16, Hawk missile, and F-22.
- (U) Complete counter-air effectiveness analyses of high power microwave weapons.

– (U) Develop high power microwave technologies that will support applications such as suppression of enemy air defenses, counter-air, command and control warfare, and aircraft self-protection. ($3,528K)
- (U) Complete high power microwave weapons concept exploration for command and control warfare.
- (U) Continue theoretical analysis of predicted high power microwave weapon effectiveness for suppression of enemy air defense and command and control warfare.
- (U) Develop downselected narrowband source technology for suppression of enemy air defense applications.
- (U) Complete high power microwave weapons application analysis for counter-air applications.

– (U) Continue to develop high power microwave technologies, including susceptibility and effects experiments and modeling and data base development, to support space control applications. ($1,836K)
- (U) Continue multi-threat warning/protection technologies.
- (U) Develop hardened space sensor.
- (U) Develop high power microwave weapon applications concept designs.

– (U) Continue to assess the vulnerability of various space assets to natural and man-made threats such as solar radiation, space debris, and directed energy weapons. ($2,100K)
- (U) Develop satellite lethality and assessment models for four assets.
- (U) Provide advanced sensor design and assessments for multi-spectral, multi-sensor data analysis workstation.
- (U) Complete space payload assessment and environmental interaction experiments.

(U) FY 1997:

– (U) Continue to develop generic advanced weapon technologies that support many Air Force applications. ($6,390K)
- (U) Develop advanced pulse power technologies.
- (U) Develop high performance computer codes to support plasma and pulsed power research.
- (U) Continue to investigate agent defeat technology, using high power microwave technologies, to neutralize biological weapons.
- (U) Continue to develop narrowband and wideband sources and antennas and complete compact toroid effort.

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- (U) Continue to assess effects/lethality of directed energy weapon technologies against representative air and ground military systems. ($3,051K)
  - (U) Develop computer modeling codes that predict high power microwave coupling into advanced technology aircraft and complete F-22 coupling experiments.
  - (U) Develop fratricide protection technology for advanced technology fighter aircraft.
  - (U) Complete command and control warfare effectiveness analyses using high power microwaves.
  - (U) Transition specifications and standards and high power microwave hardness surveillance technologies to F-16 and F-22 program offices.
  - (U) Continue directed energy weapon lethality/survivability enhancements and equipment upset characterization of various foreign and U.S. systems.
  - (U) Develop high power microwave hardening criteria for large aircraft, such as cargo transport, air refueling, and bomber aircraft.
- (U) Develop high power microwave technologies that will support applications such as suppression of enemy air defenses, counter-air, command and control warfare, and aircraft self-protection. ($3,671K)
  - (U) Continue in situ experimentation with installed systems for command and control warfare using high power microwaves.
  - (U) Begin in situ demonstrations of selected high power microwave sources that provide aircraft self-protection.
  - (U) Refine computer models of weapon effectiveness for all weapon applications.
  - (U) Perform experiment using downselected narrowband source for suppression of enemy air defense.
- (U) Continue to develop high power microwave technologies, including susceptibility and effects experiments and modeling and data base development, to support space control applications. ($1,760K)
  - (U) Select one high power microwave weapon concept for development.
- (U) Continue to assess the vulnerability of various space assets to natural and man-made threats such as solar radiation, space debris, and directed energy weapons. ($2,100K)
  - (U) Develop directed energy weapon lethality and assessment models for five satellites.
  - (U) Transition satellite survivability/vulnerability/lethality assessments to the ground-based laser technology program.
  - (U) Transition advanced data fusion techniques to the multi-spectral, multi-sensor data analysis workstation.

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(U) B. Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
(U) Previous President's Budget	14,820	18,505	17,104	17,977	Cont
(U) Current President's Budget	14,820	18,368	17,340	16,972	Cont

(U) Change Summary Explanation:

Funding: Changes due to budget constraints.

Schedule: Not Applicable.

Technical: Not Applicable.

(U) C. Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0602120A, Electronic Survivability and Fuzing Technology.
- (U) PE 0602111N, Anti-Air/Anti-Surface Warfare Technology.
- (U) PE 0602202F, Human Systems Technology.
- (U) PE 0603605F, Advanced Weapons Technology.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) D. Schedule Profile: Not Applicable.

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BUDGET ACTIVITY: 2 - Exploratory Development

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PROJECT: 8809

COST (*In Thousands*)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
8809 Space Vehicle Technology	23,389	36,622	31,730	32,614	34,002	34,745	36,982	38,032	Continuing	Continuing

(U) A. **Mission Description and Budget Item Justification:** In FY 1995, this project consolidated all Air Force spacecraft, launch vehicle, and ballistic missile Exploratory Development efforts from several prior program elements and projects. This project focuses on five major space and missile technology areas: spacecraft platform technologies (e.g., structures, controls, power, and thermal management); space-based payload technologies (e.g., sensors, satellite communications, and survivable electronics); satellite control technologies (e.g., spacecraft software and modeling/simulation), vehicle integration technologies (e.g., payload/platform/launch vehicle merging); and ballistic missile/launch vehicle specific technologies (e.g., astrodynamics and guidance, navigation, and control avionics).

(U) FY 1994:

- (U) Continued developing hardening technologies for future space systems. ($1,000K)
  - (U) Discovered previously unknown space induced vulnerability in critical semiconductor devices.
  - (U) Developed first ever silicon-on-diamond transistor.
- (U) Continued developing wide range of advanced spacecraft platform and payload technologies. ($10,726K)
  - (U) Conducted proof-of-concept non-pyrotechnic release device development experiments.
  - (U) Initiated multi-functional structures technology development program.
  - (U) Fabricated thin-film on flexible metal foil solar cells.
  - (U) Completed initial investigation of solid-state energy storage cells for future space applications.
  - (U) Characterized thermal control device components and spacecraft thermal bus components.
- (U) Developed thermionic space power technology. ($10,000K)
  - (U) Ground tested alkali metal thermal to electric conversion cells.
  - (U) Designed and developed a tacitron device.
  - (U) Initiated an in-house bimodal conceptual design study for near-space experience.
- (U) Continue developing balloon, sounding rocket, and small satellite integration technologies for space and near-space experiments. ($1,663K)
  - (U) Completed user friendly sounding rocket trajectory prediction program.
  - (U) Developed standard telemetry interface and control system for balloon, sounding rocket, and small satellite control.
  - (U) Supported and participated in off-board balloon jammer system tests and super pressure balloon flight tests.
  - (U) Developed and launched a triggered lightening sounding rocket experiment.

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(U) FY 1995:

- (U) Continue developing technologies for space platform subsystems such as cryocoolers, space vehicle thermal management, compact solar power cells, lightweight batteries, and innovative power generation concepts. ($14,325K)
  - (U) Design and fabricate flex-array deployment mechanisms, increasing overall efficiency to 15% solar to electric energy conversion.
  - (U) Assemble solid-state primary battery for future space and missile launch vehicle applications.
  - (U) Develop alkali metal thermal to electric conversion power subsystem components.
  - (U) Complete bimodal conceptual design study.
  - (U) Continue former Ballistic Missile Defense Organization 35-80 degrees kelvin cryocooler development work.
- (U) Continue developing technologies for space platform structures such as spacecraft structural controls for vibration suppression and lightweight composite satellite and launch vehicle structures. ($6,900K)
  - (U) Complete first experiments on adaptive neural control concepts for spacecraft structural vibration suppression.
  - (U) Complete carbon-carbon radiator structure fabrication.
  - (U) Initiate the launch vibration isolation technology development program.
  - (U) Complete preliminary concept design for the multi-functional structures technology program.
- (U) Continue developing technologies for space-based payload subsystems such as hardened sensors and satellite communications. ($6,000K)
  - (U) Initiate improvements to long wavelength mercury cadmium telluride infrared detectors under low background (space) conditions.
  - (U) Develop and characterize low noise, high performance quantum well infrared photodetectors.
  - (U) Evaluate and characterize radio frequency and laser communication modem and modem controller components.
  - (U) Develop integrated space-based surveillance performance models for technology trade studies.
  - (U) Complete space-based surveillance antenna architecture technology surveys and trade studies.
- (U) Continue developing technologies for space-based payload components such as hardened electronics and memories. ($3,900K)
  - (U) Investigate space radiation effects on advanced electronics materials including silicon-on-diamond.
  - (U) Investigate potential for orders of magnitude improvements in commercial device space radiation tolerance by processing improvements.
- (U) Continue developing technologies for satellite control such as standardized, reusable software, astrodynamics, and modeling/simulation. ($1,397K)
  - (U) Complete development and test the multi-mission advanced ground intelligent control architecture for telemetry analysis and install in the Space Operations Complex at Falcon Air Force Base.
  - (U) Enhance the expert system in multi-mission advanced ground intelligent control to provide intelligent assistance to satellite operators in anomaly resolution.
  - (U) Demonstrate integration of high accuracy laser measurements for orbit determination into astrodynamics routines.
  - (U) Develop algorithms to improve current operational orbit accuracy by several orders of magnitude.
- (U) Continue developing balloon, sounding rocket, and small satellite integration technologies for space and near-space experiments. ($3,000K)
  - (U) Initiate the MightySat technology evaluation program, providing frequent access to space for exploratory development space qualification.

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- (U) Develop standard telemetry interface and control program for balloon, sounding rocket, and small satellite control.
- (U) Evaluate balloon, sounding rocket, and small satellite integration techniques, and concepts.

- (U) Continue developing technologies supporting launch vehicles and ballistic missile such as guidance, navigation, and control avionics. ($1,100K)
  - (U) Design and fabricate advanced navigational instruments for ballistic missile applications.
  - (U) Design next generation thrust axis accelerometer.

(U) FY 1996:

- (U) Continue developing technologies for space platform subsystems such as cryocoolers, space vehicle thermal management, compact solar power cells, lightweight batteries, and innovative power generation concepts. ($6,500K)
  - (U) Fabricate and test solar cell flex array deployment and solar to electric energy conversion efficiency.
  - (U) Fabricate and evaluate solid-state primary battery for space and missile launch vehicle applications.
  - (U) Characterize and evaluate lightweight thermal bus components for future space vehicle thermal management subsystems.
- (U) Continue developing technologies for space platform structures such as spacecraft structural controls for vibration suppression and lightweight composite satellite and launch vehicle structures. ($6,000K)
  - (U) Initiate advanced 'mechanisms' technology development program to replace current generation pin pullers, tie down bolts, reaction wheels, etc.
  - (U) Complete non-pyrotechnic release device technology development.
  - (U) Complete preliminary design for the launch vibration isolation program.
  - (U) Complete multi-functional structures technology program.
- (U) Continue developing technologies for space-based payload subsystems such as hardened sensors and satellite communications. ($6,000K)
  - (U) Continue improvements to long-wavelength mercury cadmium telluride detectors under low background and space radiation conditions.
  - (U) Develop optimized low noise, high performance quantum well infrared photodetectors in the mid-, long-, and very long-wavelength spectral regions.
  - (U) Design radio frequency and laser communication modem and modem controller components for evaluation and characterization.
  - (U) Continue development of integrated space-based surveillance models and address background clutter, target cross section, and propagation losses.
  - (U) Evaluate candidate component technologies for large aperture space-based surveillance antennas.
- (U) Continue developing technologies for space-based payload components such as hardened electronics and memories. ($4,224K)
  - (U) Design and evaluate advanced packaging technology whose goal is a ten times size/volume/weight reduction.
  - (U) Fabricate standard space-based surveillance signal processing module.
- (U) Continue developing technologies for satellite control such as standardized, reusable software, astrodynamics, and modeling/simulation. ($3,128K)
  - (U) Design and develop satellite control software common architectures.
  - (U) Develop astrodynamics, parallel processing for propagation, and differentiated correction program.
  - (U) Construct modeling and simulation routines for integrated space technology product development.
- (U) Continue developing balloon, sounding rocket, and small satellite integration technologies for space and near-space experiments. ($5,027K)

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- (U) Launch the MightySat-1 experiment, demonstrating space exploratory development technologies.
- (U) Assemble the MightySat-2 experiment to demonstrate hyperspectral imaging exploratory development technologies.
- (U) Design high altitude balloon, sounding rocket, and small satellite payload integration technologies, techniques, and concepts.

– (U) Continue developing technologies supporting launch vehicles and ballistic missile such as guidance, navigation, and control avionics. ($851K)
- (U) Design solid-state micro-mechanical guidance instruments for future Air Force ballistic missile environments.
- (U) Fabricate next generation thrust axis accelerometer which could provide low life cycle cost Minuteman III guidance upgrade.

(U) FY 1997:

– (U) Continue developing technologies for space platform subsystems such as cryocoolers, space vehicle thermal management, compact solar power cells, lightweight batteries, and innovative power generation concepts. ($6,435K)
- (U) Complete solar cell flex array exploratory technology development effort.
- (U) Complete solid-state primary battery for space and missile launch vehicle applications.
- (U) Develop ten degrees kelvin cryocoolers for evaluation and characterization.

– (U) Continue developing technologies for space platform structures such as spacecraft structural controls for vibration suppression and lightweight composite satellite and launch vehicle structures. ($5,929K)
- (U) Initiate the advanced adaptive structures technology development program.
- (U) Conduct proof-of-concept experiments for the launch vehicle vibration isolation program.
- (U) Initiate the advanced launch vehicle structures technology development program.

– (U) Continue developing technologies for space-based payload subsystems such as hardened sensors and satellite communications. ($6,000K).
- (U) Continue improvements to long-wavelength mercury cadmium telluride detectors and optimize for large focal plane arrays.
- (U) Develop large format quantum well infrared photodetector focal plane arrays.
- (U) Continue to evaluate and characterize radio frequency and laser communications modem and modem controller components.
- (U) Integrate space-based surveillance models into wargaming simulations for immediate performance feedback.
- (U) Integrate and test space-based surveillance antenna component technologies to support system level design concepts.

– (U) Continue developing technologies for space-based payload components such as hardened electronics and memories. ($4,224K)
- (U) Evaluate and fabricate advanced packaging technology whose goal is a ten times size/volume/weight reduction.
- (U) Construct a standard space-based surveillance signal processing module.

– (U) Continue developing technologies for satellite control such as standardized, reusable software, astrodynamics, and modeling/simulation. ($3,141K)
- (U) Develop satellite control software architectures for applications such as multi-mission advanced ground intelligent control.
- (U) Assemble next generation gravitational astrodynamics model, permitting non-maintainable orbits analysis.
- (U) Write modeling and simulation routines for integrated space technology product development.

– (U) Continue developing balloon, sounding rocket, and small satellite integration technologies for space and near-space experiments. ($6,034K)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1995
BUDGET ACTIVITY: 2 - Exploratory Development	PE NUMBER AND TITLE: 0602601F Phillips Laboratory — PROJECT: 8809

- (U) Complete MightySat-1 mission to validate a large set of space exploratory development technologies having operational user interest.
- (U) Assemble and integrate exploratory balloon, sounding rocket, and small satellite technologies, techniques, and concepts onto flight platforms.
- (U) Integrate hyperspectral imaging payload onto MightySat-2 satellite technology demonstrator for planned FY 1998 launch.

– (U) Continue developing technologies supporting launch vehicles and ballistic missile such as guidance, navigation, and control avionics. ($851K)

- (U) Fabricate solid-state micro-mechanical guidance instruments for future ballistic missile environments.
- (U) Evaluate and test next generation thrust axis accelerometer.

(U) B. Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
(U) Previous President's Budget	23,226	26,897	26,303	27,128	Cont
(U) Current President's Budget	23,389	36,622	31,730	32,614	Cont

(U) Change Summary Explanation:

Funding: In FY 1995, Congressional actions added $10 million for thermionics. FY 1996 and FY 1997 changes reflect increased Air Force priority on space-related Science and Technology efforts.

Schedule: Not Applicable.

Technical: Not Applicable.

(U) C. Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0602203F, Aerospace Propulsion.
- (U) PE 0602102F, Materials.
- (U) PE 0603302F, Space and Missile Rocket Propulsion.
- (U) PE 0603311F, Ballistic Missile Technology.
- (U) PE 0603401F, Advanced Spacecraft Technology.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) D. Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602602F, Conventional Munitions

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Total PE 0602602F Cost	34,140	43,627	44,954	43,830	44,570	46,076	47,666	48,351	Cont	Cont
Project 06AL, Armament Directorate Operations	15,938	16,769	0	0	0	0	0	0	Cont	Cont
Project 2068, Advanced Guidance Technology	5,045	8,299	17,485	16,818	17,024	17,696	18,778	18,917	Cont	Cont
Project 2502, Ordnance Technology	8,502	12,699	21,431	20,627	21,100	22,240	23,506	23,982	Cont	Cont
Project 2543, Weapons Effectiveness Methodology	902	2,311	6,038	6,385	6,446	6,140	5,382	5,452	Cont	Cont
Project 2567, Aeromechanics Technology	3,753	3,549	0	0	0	0	0	0	Cont	Cont

A. (U) Mission Description and Budget Item Justification: This Exploratory Development effort develops and establishes the feasibility of advanced technologies for air-to-air and air-to-surface conventional weapons to support non-nuclear Air Force missions. Project 2567 funding for Weapon Airframe and Carriage Technology for FY 1996 and out is included in Project 2502. Project 2567 funding for midcourse guidance technology for advanced missile airframes for FY 1996 and out is included in Project 2068. Starting in FY 1996, separate infrastructure projects have been eliminated. All efforts in this program element contain the resources necessary, including civilian salaries, to manage, conduct, and document the technical activities.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602602F, Conventional Munitions

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	34,858	44,685	46,639	48,368	Cont
Appropriated Value	35,053	44,685			
Adjustments to Appropriated Value:					
a. Congressional General Reductions	-195	-1,058			
b. SBIR	-218				
c. Below Threshold Reprogramming	-500				
Current President's Budget	34,140	43,627	44,954	43,830	Cont

Change Summary Explanation:

Funding: Not Applicable.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary: Not Applicable.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602602F, Conventional Munitions

PROJECT NO.: 06AL

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 06AL, Armament Directorate Operations	15,938	16,769	0	0	0	0	0	0	Cont	Cont

A. (U) Mission Description and Budget Item Justification: This project supports and complements all other projects in the Program Element and provides for management, support, and operation of the Wright Laboratory Armament Directorate, Eglin AFB, FL. It provides civilian salaries, transportation, rents, maintenance, communications, supplies and equipment, and facilities maintenance. Starting in FY 1996, Project 06AL funding will be included in Projects 2068, 2502, and 2543.

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	18,873	19,959	19,300	19,540	Cont
Current President's Budget	15,938	16,769	0	0	Cont

Change Summary Explanation:

Funding: Changes due to consolidation of Project 06AL into the technical projects.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary: Not Applicable.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602602F, Conventional Munitions

PROJECT NO.: 2068

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 2068, Advanced Guidance Technology	5,045	8,299	17,485	16,818	17,024	17,696	18,778	18,917	Cont	Cont

A. (U) Mission Description and Budget Item Justification: This project develops precision guidance technologies for air-launched conventional weapons and technologies for midcourse guidance for advanced missile airframes. Project payoffs include: adverse-weather and "launch and leave" precision guidance capability; increased number of kills per sortie; increased aircraft survivability; improved reliability and affordability; reduced test costs; shorter development programs; and improved survivability and effectiveness of conventional air-to-air and air-to-surface weapons.

(U) FY 1994:
- (U) Continued to develop and demonstrate guidance component technology for low-cost precision adverse-weather, autonomous seekers. ($3,257K)
  - -- (U) Completed development of a high speed image processor architecture for future autonomous guidance systems.
  - -- (U) Developed an Air Force-owned laser radar algorithm set for ground target identification.
  - -- (U) Demonstrated detection of targets by a solid state laser sensor at ten kilometers, a fivefold increase in range.
- (U) Continued to develop and demonstrate advanced weapons seeker simulation capability. ($300K)
  - -- (U) Incorporated active infrared and passive millimeter-wave scene generation in the infrared modeling program for future multispectral seeker development.
- (U) Continued to develop and demonstrate instrumentation for weapons guidance development and test. ($1,488K)
  - -- (U) Designed subminiature telemetry units for improved development/test of munitions and submunitions.
  - -- (U) Developed airborne video time insertion unit to provide highly accurate test data for weapons development and test.

(U) FY 1995:
- (U) Continue to develop and demonstrate guidance component technology for low-cost precision adverse-weather, autonomous seekers. ($5,161K)
  - -- (U) Flight test an optical correlator integrated with a video camera to investigate passive autonomous target recognition in a severe clutter environment.
  - -- (U) Integrate an optical correlator with a laser radar to investigate target identification in a severe clutter environment.
  - -- (U) Design an adverse weather, wide field-of-view, high resolution, passive, millimeter wave sensor for use in future covert seekers.
  - -- (U) Demonstrate initial operating capability for a unique research and evaluation seeker emulation radar to investigate next generation passive and active millimeter wave seeker concepts.
- (U) Continue to develop and demonstrate advanced weapons seeker simulation capability. ($300K)
  - -- (U) Complete the improved infrared modeling program which will spatially correlate active and passive, infrared, and millimeter-wave scenes.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #2, Exploratory Development	PE NUMBER AND TITLE: PE 0602602F, Conventional Munitions — PROJECT NO.: 2068

- (U) Continue to develop and demonstrate instrumentation for weapons guidance development and test. ($2,838K)
  - -- (U) Develop weapon/bomb damage assessment instrumentation using subminiature telemetry and hard target smart fuze technology.
  - -- (U) Conduct study using holographic data reduction to provide improved warhead hydrocode test data.
  - -- (U) Complete high-speed charge-coupled device imager development to provide sensor for weapons development and test.
  - -- (U) Fabricate and flight test subminiature telemetry units for improved development/test of munitions and submunitions.

(U) FY 1996:

- (U) Continue to develop and demonstrate guidance component technology for low-cost precision adverse-weather, autonomous seekers. ($9,136K)
  - -- (U) Flight test an optical correlator with a laser radar to investigate target identification in a severe clutter environment.
  - -- (U) Conduct in-house experiments on an adverse weather, wide field-of-view, high resolution, passive, millimeter wave sensor for use in future covert seekers.
  - -- (U) Complete design of an electronic processor using image algebra for use in future missile systems.
  - -- (U) Complete the conformal antenna design for an air superiority missile to enable the design of a smaller diameter missile.
- (U) Continue to develop and demonstrate advanced navigation/control technologies for weapon airframes. ($5,028K)
  - -- (U) Conduct initial design of a smaller, lighter, less expensive Global Position System/Inertial Navigation System that provides an improvement in accuracy over current technology to achieve an affordable future weapon designs.
  - -- (U) Complete design for an improved tactical-grade inertial measurement unit to investigate micro machined inertial sensor technology.
  - -- (U) Fabricate an inertial sensor utilizing silicon chip micro machining technology to allow for manufacture of small and inexpensive IMUs without sacrificing performance.
- (U) Continue to develop and demonstrate instrumentation for weapon guidance development and test. ($3,321K)
  - -- (U) Conduct telemetry signal processing experiments to enhance subminiature telemetry transmission range and provide weapon in-flight time-space-position information.
  - -- (U) Complete telemetry instrumentation development system to provide expert system programming capability to weapons development and test community users of subminiature telemetry.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #2, Exploratory Development	PE NUMBER AND TITLE: PE 0602602F, Conventional Munitions — PROJECT NO.: 2068

(U) FY 1997:

- (U) Continue to develop and demonstrate guidance component technology for low-cost precision adverse-weather, autonomous seekers. ($8,852K)
  - -- (U) Complete experiments on an adverse weather, wide field-of-view, high resolution, passive, millimeter wave sensor for use in future covert seekers.
  - -- (U) Integrate a conformal antenna design for an air superiority missile with a high speed munition processor and conduct ground tests.
  - -- (U) Design and fabricate affordable, passive, electro-optical/infrared seekers which are sensitive to longwave, infrared, multi-color, and polarization phenomena to provide improved air-to-air terminal seekers.
- (U) Continue to develop and demonstrate advanced navigation/control technologies for weapon airframes. ($4,837K)
  - -- (U) Complete design, fabricate and initiate test planning for an advanced Global Position System/Inertial Navigational System that is 40 percent of the size and cost of FY 1995 technology.
  - -- (U) Complete fabrication of micro machined inertial sensor and begin fabrication of a breadboard inertial measurement unit.
- (U) Continue to develop and demonstrate instrumentation for weapons guidance development and test. ($3,129K)
  - -- (U) Complete telemetry signal flight tests to validate subminiature telemetry transmission range and provide weapon with in-flight time-space-position information.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602602F, Conventional Munitions

PROJECT NO.: 2068

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	4,780	8,525	9,423	9,937	Cont
Current President's Budget	5,045	8,299	17,485	16,818	Cont

Change Summary Explanation:

Funding: FY 1996 changes due to incorporation of midcourse guidance technology for advanced missile airframes from Project 2567, higher priority given to developing affordable precision guidance technologies, and incorporation of Project 06AL.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0603601F, Conventional Weapons Technology
- (U) PE 0604314F, Advanced Medium Range Air-to-Air Missile.
- (U) PE 0604940D, Central Test and Evaluation Improvement Program.
- (U) PE 0604604F, Submunitions Development.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602602F, Conventional Munitions

PROJECT NO.: 2502

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 2502, Ordnance Technology	8,502	12,699	21,431	20,627	21,100	22,240	23,506	23,982	Cont	Cont

A. (U) Mission Description and Budget Item Justification: This project develops technologies for advanced weapon dispensers, submunitions, safe and arm devices, fuzes, explosives, and warheads for air-to-surface and air-to-air conventional weapons, instrumentation technology and techniques, and weapon airframe and carriage technology. The payoffs include: improved storage capability and transportation safety of fully assembled weapons; improved non-nuclear warhead and fuze effectiveness; improved submunition dispensing; selectable multimode kill capability; low-cost airframe/subsystem components and structures; and reduced aircraft/weapons drag and radar signature.

(U) FY 1994:

- (U) Continued to develop and demonstrate fuze technology to reduce cost and increase supportability, safety, and performance. ($1,369K)
  - -- (U) Completed development of hard target fuze for AC-130 gunship 105mm rounds.
  - -- (U) Completed insensitive fuze testing with a large primary booster and solid-state electronics fire set which has the capability to initiate future insensitive bomb fills in the current Mk-80 series fuze well.
  - -- (U) Completed development of an aerosol test chamber to provide verification of countermeasure capabilities of anti-material fuzes.
- (U) Continued to develop and demonstrate affordable explosives for higher performance and lower sensitivity. ($1,069K)
  - -- (U) Developed test methodology for quantifying performance of penetrating weapon explosives.
  - -- (U) Demonstrated an Air Force developed insensitive explosive for the Sensor Fuzed Weapon warhead.
- (U) Continued to develop and demonstrate advanced analytical tools for calculating weapons effects to reduce development time and cost. ($535K)
  - -- (U) Completed design and evaluation studies to reduce number of design iterations required for new weapons.
  - -- (U) Developed detonation shock dynamics methodology for tracking explosive detonation process as it propagates through the weapon
- (U) Continued to develop and demonstrate advanced warhead development technologies. ($5,529K)
  - -- (U) Determined penetration of warhead fragments into targets representative of trucks and missile sites to improve warhead designs.
  - -- (U) Conducted feasibility study of penetration performance of dense-cased warheads; quantified penetration improvements obtainable with thick wall steel and heavy metal 1,000-LB and 2,000-LB warheads.
  - -- (U) Developed simulation for determining the lateral loads experienced by a penetrating warhead during target penetration.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #2, Exploratory Development	PE NUMBER AND TITLE: PE 0602602F, Conventional Munitions — PROJECT NO.: 2502

(U) FY 1995:
- (U) Continue to develop and demonstrate fuze technology to reduce cost and increase supportability, safety, and performance. ($2,586K)
  - -- (U) Complete warhead detonation algorithm and breadboard of an active hard target smart fuze.
  - -- (U) Integrate fuze simulation into a six degree-of-freedom missile simulation to provide system-level evaluation and design.
- (U) Continue to develop and demonstrate affordable explosives for higher performance and lower sensitivity. ($2,150K)
  - -- (U) Conduct explosive sensitivity and performance evaluations to provide enhanced weapon effectiveness for penetrating warheads.
  - -- (U) Characterize tailorable blast explosives to increase weapon effectiveness with minimal collateral damage.
  - -- (U) Develop reactive fills for warheads which provide a greater impulse than high explosives for a given volume.
- (U) Continue to develop and demonstrate advanced analytical tools for calculating weapons effects to reduce development time and cost. ($765K)
  - -- (U) Develop models and verify code for the antimaterial multimode warhead to optimize its lethality against multiple target sets.
  - -- (U) Develop target/warhead interaction simulation development to provide improved understanding of weapon kill mechanisms.
- (U) Continue to develop and demonstrate advanced warhead development technologies. ($7,198K)
  - -- (U) Demonstrate primary and secondary kill mechanisms for agent defeat of biological and chemical weapons payloads.
  - -- (U) Develop options for dense cased warheads, i.e., thick wall steel and heavy metal warheads for improved hard target penetration.

(U) FY 1996:
- (U) Continue to develop fuze technology to reduce cost and increase supportability, safety, and performance. ($4,525K)
  - -- (U) Design and initiate fabrication of ground penetrating radar fuze for interrogation of target prior to penetration to improve weapon burst point selection and increased weapon effectiveness.
  - -- (U) Conduct trade studies to determine feasibility of fuze systems for a dual role missile capable of defeating air-to-air and air-to-surface targets which will provide ordnance packages for improving effectiveness for defeating air targets and selected ground targets.
- (U) Continue to develop and demonstrate affordable explosives for higher performance and lower sensitivity. ($510K)
  - -- (U) Install explosive demilitarization equipment for technology evaluation and demonstration to provide low cost, environmentally compatible methods for disposal, conversion, or recycling of explosives.
  - -- (U) Conduct sensitivity experiments of advanced penetrator explosive formulations to provide insensitive explosive fills which survive penetration while increasing blast performance.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE February 1995
BUDGET ACTIVITY: #2, Exploratory Development	PE NUMBER AND TITLE: PE 0602602F, Conventional Munitions — PROJECT NO.: 2502

- (U) Continue to develop and demonstrate advanced analytical tools for calculating weapons effects to reduce development time and cost. ($2,577K)
  - -- (U) Complete study to verify optimum nose shape for penetrating weapons to increase penetration capability.
  - -- (U) Verify detonation shock dynamics methodology for tracking an explosive detonation process as it propagates through weapon payload.
  - -- (U) Verify target/warhead interaction simulation to provide improved understanding of weapon kill mechanisms.
- (U) Continue development of aeroballistic analysis tools to enhance and reduce the cost/schedule of weapons testing/certification. ($590K)
  - -- (U) Develop and install a high resolution, solid-state, digital camera system to record flight data for the Aeroballistic Research Facility to maintain high experimentation rates while greatly decreasing cost.
  - -- (U) Study applications of advanced flow field visualization instrumentation for collection of quantitative density information around a projectile in free flight to greatly enhance design process of new munitions.
- (U) Develop advanced weapon airframe and carriage technology. ($2,370K)
  - -- (U) Study designs of affordable methods of external weapon carriage for future fighter aircraft.
  - -- (U) Investigate designs of compressed weapons to reduce the size of stores to improve weapon payload capability on aircraft.
- (U) Continue to develop and demonstrate advanced warhead development technologies and advanced kill mechanisms for materiel target defeat. ($9,278K)
  - -- (U) Characterize candidate high strength penetrator warhead materials which will provide greater penetration capability/warhead survivability.
  - -- (U) Perform reactive material explosive cratering experiments to increase warhead effectiveness without increasing weapon size for small payload volume penetrators.
  - -- (U) Conduct theoretical investigations into new warhead technology involving magnetically formed warheads which will provide additional kill methods for enhancing weapons effectiveness.
  - -- (U) Conduct design trades for an all-up general purpose bomb to reduce test costs and design period required to develop advanced weapons.
- (U) Continue to develop and demonstrate instrumentation for weapon test and evaluation ($1,581K)
  - -- (U) Integrate high speed electronic imaging components and validate through laboratory tests.
  - -- (U) Develop techniques for holographic data reduction to provide improved warhead hydrocode test data.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #2, Exploratory Development	PE NUMBER AND TITLE: PE 0602602F, Conventional Munitions — PROJECT NO.: 2502

(U) FY 1997:

- (U) Continue to develop and demonstrate fuze technology to reduce cost and increase supportability, safety, and performance. ($3,595K)
  - -- (U) Fabricate a brassboard fuze for general purpose bombs which reduce logistic support and weapons build-up time.
  - -- (U) Conduct preliminary design studies of a hard target penetrating radar fuze to optimize burst point selection.
- (U) Continue to develop and demonstrate affordable explosives for higher performance and lower sensitivity. ($2,905K)
  - -- (U) Conduct explosive recycling experiments to provide low cost recycling technologies for demilitarization of weapon explosives.
  - -- (U) Continue sensitivity experiments of insensitive explosive fills which survive hard target penetration while increasing blast performance.
- (U) Continue to develop and demonstrate advanced analytical tools for calculating weapons effects to reduce development time and cost. ($2,481K)
  - -- (U) Convert weapon design simulation to allow operation on a massively parallel computer to reduce computer aided weapon design time by an order of magnitude.
  - -- (U) Continue improvement of warhead/target interaction models to provide improved capability to design warhead kill mechanisms for defeat of antimateriel targets.
- (U) Continue development of aeroballistic analysis tools to enhance and reduce the cost/schedule of weapons testing/certification. ($556K)
  - -- (U) Complete installation of high resolution, solid-state, digital shadowgraph system to allow for quick and less expensive data collection, processing, and analysis to reduce time to evaluate projectile configurations.
  - -- (U) Conduct multi-view holography/interferometer experiments to provide improved capability in munition aerodynamic evaluation.
- (U) Develop and demonstrate advanced weapon airframe and carriage technology. ($2,897K)
  - -- (U) Develop initial design of rapid response weapon for effectively engaging time-critical targets.
  - -- (U) Complete fabrication of selected fin folding and deployment mechanisms for compressed carriage.
- (U) Continue to develop and demonstrate advanced warhead development technologies and advanced kill mechanisms for materiel target defeat. ($6,669K)
  - -- (U) Conduct preliminary evaluation of single penetrator with multiple payloads for agent defeat penetrator weapons to minimize collateral damage while defeating chemical and biological weapons.
  - -- (U) Complete experiments with advanced penetrator weapon shapes to increase penetrator weapon performance without increasing weight.
- (U) Continue to develop and demonstrate instrumentation for weapon test and evaluation ($1,524K)
  - -- (U) Complete techniques for holographic data reduction to provide improved warhead hydrocode test data.
  - -- (U) Develop a high performance solid state recorder to support high speed electronic imaging.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602602F, Conventional Munitions

PROJECT NO.: 2502

B.(U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	7,065	8,685	9,605	10,127	Cont
Current President's Budget	8,502	12,699	21,431	20,627	Cont

Change Summary Explanation:

Funding: FY 1996 funding changes due to incorporation of Project 06AL funding, movement of Weapon Airframe and Carriage Technology from Project 2567, and increased emphasis on numerous armament technology efforts.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(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) PE 0604604F, Submunitions Development.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602602F, Conventional Munitions 2543

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 2543, Weapons Effectiveness Methodology	902	2,311	6,038	6,385	6,446	6,140	5,382	5,452	Cont	Cont

A. (U) Mission Description and Budget Item Justification: This project assesses the lethality and effectiveness of current and planned air-to-surface and air-to-air conventional weapons technology programs, and assesses the vulnerability of targets against which conventional weapons are designed. Project payoffs include more thoroughly tested weapon systems.

(U) FY 1994:
- (U) Continued to extend effectiveness vulnerability assessment code to increase prediction accuracy of deeply buried hardened target facilities. ($620K)
  - -- (U) Completed development and implemented configuration management plan for the effectiveness vulnerability assessment (EVA) code.
  - -- (U) Conducted penetration experiments and developed data base to enhance existing penetration algorithm for concrete reinforced with steel.
- (U) Continued to develop and demonstrate new analytical methods for assessing the coupling of destructive energy into the target. ($282K)
  - -- (U) Completed plan for modification and integration of existing codes for assessing weapon effectiveness against weapons of mass destruction.
  - -- (U) Developed and validated methodology to quantify blast and fragment damage against chemical/biological production and storage facilities.

(U) FY 1995:
- (U) Continue to extend effectiveness vulnerability assessment code to increase prediction accuracy of deeply buried hardened target facilities. ($1,744K)
  - -- (U) Conduct EVA code configuration management activities to ensure software changes are authorized, validated, documented, and distributed to user community.
  - -- (U) Analyze rebar reinforced concrete penetration data base and update existing penetration algorithm.
  - -- (U) Conduct embedded detonation experiments to quantify the effects of detonating munitions in burster slabs and thick walls.
  - -- (U) Implement plans to enhance existing blast algorithms and quantify vulnerabilities of mission critical equipment to enable development of component fragility algorithms for predicting functional damage to targets.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #2, Exploratory Development	PE NUMBER AND TITLE: PE 0602602F, Conventional Munitions 2543

- (U) Continue to develop and demonstrate analytical methods of predicting the coupling of destructive energy into the target. ($567K)
  - -- (U) Modify existing source, transport, and diffusion codes to develop methodology for assessing weapon effectiveness against weapons of mass destruction storage, production, and logistic facilities.
  - -- (U) Plan development of systems level lethality/vulnerability assessment codes to predict the effectiveness of emerging munition technologies and inventory weapons against tunnels, buildings, and linear targets such as runways, bridges, railroads, etc.
  - -- (U) Develop predictive effectiveness algorithms for high velocity penetration and advanced munition case technologies.

(U) FY 1996:

- (U) Continue to extend effectiveness vulnerability assessment code (EVA) to increase accuracy of weapon effectiveness predictions against fixed hardened targets. ($3,345K)
  - -- (U) Conduct EVA code configuration management activities to ensure software changes are authorized, validated, documented, and distributed to user community.
  - -- (U) Analyze embedded detonation data base and update existing blast damage algorithms for detonations in burster slabs and thick walls.
  - -- (U) Conduct component vulnerability experiments, develop first set of fragility algorithms for integration into EVA code, and conduct code validation experiments.
  - -- (U) Integrate modified source, transport, and diffusion codes to build a systems-level network for assessing weapon effectiveness against weapons of mass destruction storage, production, and logistic facilities and to predict potential for collateral damage.
- (U) Continue to develop and demonstrate analytical methods of predicting weapon effectiveness and the coupling of destructive energy into the target. ($1,784K)
  - -- (U) Integrate high velocity penetration and advanced munitions case technology algorithms into systems-level weapon assessment codes.
  - -- (U) Develop weapon assessment methodologies to significantly reduce requirements for expensive lethality/vulnerability data collection experiments.
- (U) Continue to develop and demonstrate advanced weapons simulation capability. ($909K)
  - -- (U) Adapt and extend,existing analytical tools to enable efficient, one-time development of complex munition simulations.
  - -- (U) Develop a modular munition simulation taxonomy for interconnecting munition subsystem models.
  - -- (U) Develop munition-specific models which allow component trades to be conducted for anti-jam Global Positioning System (GPS) technologies.
  - -- (U) Conduct technology trade studies for antimateriel submunitions.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #2, Exploratory Development	PE NUMBER AND TITLE: PE 0602602F, Conventional Munitions 2543

(U) FY 1997:

- (U) Continue to extend effectiveness vulnerability assessment code (EVA) to increase accuracy of weapon effectiveness predictions against fixed hardened targets. ($3,440K)
  - -- (U) Conduct EVA code configuration management activities to ensure software changes are authorized, validated, documented, and distributed to user community.
  - -- (U) Conduct component vulnerability experiments, develop final set of fragility algorithms for integration in EVA code, and complete code validation experiments.
  - -- (U) Develop algorithms and new functional modules to accurately predict the effectiveness of advanced munitions technology concepts.
  - -- (U) Complete development/integration of systems level lethality/vulnerability assessment codes for buried targets, above ground buildings, tunnels, linear targets, and weapons of mass destruction for innovations in both weapon design and target construction.
- (U) Continue to develop and demonstrate analytical methods of predicting weapon effectiveness and the coupling of destructive energy into the target. ($2,070K)
  - -- (U) Complete development of weapon assessment methodologies that significantly reduce requirements for expensive lethality/vulnerability data collection experiments.
  - -- (U) Conduct phenomenology and weapon effects experiments, and analyze data to characterize and quantify lethal kill mechanisms for advanced munition concepts.
  - -- (U) Conduct experiments and analyses to investigate phenomena such as synergistic effects from blast and fragments, simultaneous detonations, penetration dynamics through rock, rubble, and geological material of various hardness, and vulnerabilities of structures constructed with carbon fiber reinforced plastics.
- (U) Continue to develop and demonstrate advanced weapons simulation capability. ($875K)
  - -- (U) Verify consistency of extended codes to reflect actual test vehicle configurations.
  - -- (U) Enhance anti-jam codes to reflect actual test vehicle configurations.
  - -- (U) Validate antimateriel submunition simulations versus actual flight test data, and perform studies to verify potential munition performance in suppression of enemy air defenses (SEAD), theater missile defense (TMD), and other roles.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602602F, Conventional Munitions 2543

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	902	2,311	1,558	1,644	Cont
Current President's Budget	902	2,311	6,038	6,385	Cont

Change Summary Explanation:

Funding: FY 1996 funding increase due to incorporation of Project 06AL and program to reduce weapons testing costs by better analytical prediction methods.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0603601F, Conventional Weapons Technology.
- (U) PE 0604602F, Armament Ordnance Development.
- (U) PE 0604604F, Submunitions Development.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602602F, Conventional Munitions

PROJECT NO.: 2567

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 2567, Aeromechanics Technology	3,753	3,549	0	0	0	0	0	0	Cont	Cont

A. (U) Mission Description and Budget Item Justification: This project develops technologies to improve the aerodynamic performance, survivability, and effectiveness of conventional air-to-surface weapons and air-to-air weapons. These technologies provide advanced midcourse guidance equipment for advanced missile airframes.

(U) FY 1994:
- (U) Continued to develop and demonstrate advanced navigation/control technologies for weapon airframes. ($2,211K)
  - -- (U) Completed design and fabrication of a jam-resistant tactical weapon guidance brassboard demonstrator consisting of a Global Positioning System (GPS) receiver coupled with a low cost inertial measurement unit.
  - -- (U) Completed fabrication and test of a breadboard inertial measurement unit using an interferometric fiber optic gyroscope to produce a highly reliable unit at significantly lower cost.
- (U) Continued to develop and demonstrate computational fluid dynamics store separation codes and aeroballistic analysis to enhance weapon design and reduce the cost/schedule of weapons testing/certification. ($842K)
  - -- (U) Completed design of an electronic shadowgraph system to replace the labor-intensive film system in the aeroballistic research facility.
- (U) Continued to develop and demonstrate advanced weapon airframe and carriage technology. ($700K)
  - -- (U) Evaluated design concepts for alternate control mechanisms to increase missile kinematics and decrease munition size.

(U) FY 1995:
- (U) Continue to develop and demonstrate advanced navigation/control technologies for weapon airframes. ($1,803K)
  - -- (U) Complete testing of a brassboard anti-jam, low-cost, tactical GPS/inertial navigation system using simulated satellite and jamming signals.
  - -- (U) Complete fabrication and testing of an interferometric fiber optic gyroscope to improve reliability and lower cost.
- (U) Continue to develop and demonstrate computational fluid dynamics store separation codes and aeroballistic analysis to enhance weapon design and reduce the cost/schedule of weapons testing/certification. ($1,546K)
  - -- (U) Fabricate and install an electronic shadowgraph camera system in the aeroballistic research facility.
- (U) Continue to develop and demonstrate advanced weapon airframe and carriage technology. ($200K)
  - -- (U) Perform feasibility studies of affordable methods of external weapon carriage to preserve near "clean" aircraft performance.

(U) FY 1996: Not Applicable.

(U) FY 1997: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602602F, Conventional Munitions

PROJECT NO.: 2567

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	3,753	3,549	6,753	7,120	Cont
Current President's Budget	3,753	3,549	0	0	Cont

Change Summary Explanation:

Funding: Project 2567 midcourse guidance technology for advanced missile airframes for FY 1996 and out transferred to Project 2068; Project 2567 weapon airframe and carriage technology for FY 1996 and out transferred to Project 2502.

Schedule: Not Applicable.

Technical: Not Applicable.

C.(U) Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0603601F, Conventional Weapons Technology.
- (U) PE 0604602F, Armament Ordnance Development.
- (U) PE 0604604F, Submunitions Development.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602702F, Command, Control, and Communications (C3)

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Total PE 0602702F Cost	89,305	91,563	98,477	95,578	98,668	100,323	101,945	105,187	Cont	Cont
Project 06RA, C3 Laboratory Operations	42,134	41,225	0	0	0	0	0	0	Cont	Cont
Project 2338, Reliability Sciences Technology	5,063	5,120	11,370	11,186	11,683	11,693	11,946	12,235	Cont	Cont
Project 4506, Surveillance Technology	8,725	9,568	17,704	17,261	17,837	18,214	18,410	18,895	Cont	Cont
Project 4519, Communications Technology	6,860	7,557	12,570	12,352	12,694	12,691	12,934	13,437	Cont	Cont
Project 4594, Information Technology	7,275	7,896	13,042	12,722	13,061	13,065	13,281	13,834	Cont	Cont
Project 4600, Electromagnetic Technology	11,300	11,243	26,085	25,155	26,024	26,850	27,226	28,001	Cont	Cont
Project 5581, Command and Control (C2) Technology	7,948	8,954	17,706	16,902	17,369	17,810	18,148	18,785	Cont	Cont

A. (U) Mission Description and Budget Item Justification: This Exploratory Development program is the primary source of new concepts, feasibility demonstrations, and advanced technology for Air Force C3. Current developments include: increased operational availability of C3 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 data acquisition for decision making. The program addresses six technology areas: reliability sciences; surveillance; communications; information; electromagnetic; and command and control. Starting in FY 1996, separate infrastructure projects have been eliminated. All efforts in this program element contain the resources necessary, including civilian salaries, to manage, conduct, and document the technical activities.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602702F, Command, Control, and Communications (C3)

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	90,432	95,444	95,948	97,932	Cont
Appropriated Value	90,957	95,444			
Adjustments to Appropriated Value:					
a. Congressional General Reductions	-525	-3,881			
b. SBIR	-564				
c. Below Threshold Reprogramming	-563				
Current President's Budget	89,305	91,563	98,477	95,578	Cont

Change Summary Explanation:

Funding: Increases from FY 1995 to FY 1996 are to address added emphasis on C3 technology user-identified deficiencies. This technology directly supports the Joint Chiefs of Staff Future Joint Warfighting Capability: "To maintain near perfect real-time knowledge of the enemy and communicate that to all forces in near-real-time."

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary: Not Applicable.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602702F, Command, Control, and Communications (C3)

PROJECT NO.: 06RA

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 06RA, C3 Laboratory Operations	42,134	41,225	0	0	0	0	0	0	Cont	Cont

A. (U) Mission Description and Budget Item Justification: This project provides for management, support, and operation of Rome Laboratory, Griffiss AFB, NY, and another directorate of Rome Laboratory at Hanscom AFB, MA. It provides: the pay and related cost 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 other projects within the PE.

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	42,134	41,225	43,080	45,000	Cont
Current President's Budget	42,134	41,225	0	0	Cont

Change Summary Explanation:

Funding: Changes due to incorporation of personnel and laboratory support costs into the technical projects.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary: Not Applicable.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602702F, Command, Control, and Communications (C3)

PROJECT NO.: 2338

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 2338, Reliability Sciences Technology	5,063	5,120	11,370	11,186	11,683	11,693	11,946	12,235	Cont	Cont

A. (U) Mission Description and Budget Item Justification: The Air Force requires 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 technology to identify and eliminate design and fabrication characteristics that result in poor reliability. It develops equipment and system reliability and diagnostic techniques to be applied in development of military systems with improved operational readiness and supportability. Areas of emphasis include electronic technology reliability assessment, diagnostic development and integration, and design for reliability.

(U) FY 1994:

- (U) Developed electronic reliability techniques to evaluate new devices in an operational environment and recommend corrective action. ($1,385K)
  - -- (U) Developed quality assurance technology to assess the reliability of advanced packaging technologies for multichip modules and monolithic microwave integrated circuit transmit and receive modules.
  - -- (U) Employed finite element modeling and analysis techniques to provide a computer-based, intelligent, and efficient reliability assessment of high-density multichip module interconnects.
- (U) Developed diagnostics technologies and integrated them into existing tools and techniques to address high-priority user requirements. ($1,730K)
  - -- (U) Developed an integrated chip-to-system design test approach using tools, techniques, guidelines, and methodologies.
  - -- (U) Assessed the feasibility of developing modeling techniques to evaluate electronic system diagnostic capabilities.
- (U) Developed a system design process for reliability technologies to create tools, techniques, and guidelines to improve C3 devices. ($1,948K)
  - -- (U) Identified and characterized the effect electromagnetic fields have on the long-term reliability of electronic devices and systems; developed design tools and procedures to minimize/eliminate adverse effects.
  - -- (U) Developed and implemented computer-aided techniques for assessing the reliability of very large scale integration microcircuit designs to detect where a design violates reliability specifications.
  - -- (U) Enhanced the intelligent multichip module analyzer thermal analysis capabilities to provide more efficient and timely reliability assessments.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #2, Exploratory Development	PE NUMBER AND TITLE: PE 0602702F, Command, Control, and Communications (C3) 2338 — PROJECT NO.

(U) FY 1995:
- (U) Develop electronic reliability techniques to evaluate new devices in an operational environment and recommend corrective action. ($1,340K)
  - -- (U) Improve reliability of high power monolithic microwave integrated circuits by determining limiting factors which affect overall reliability.
  - -- (U) Develop measurement and modeling techniques to evaluate electromagnetic effects on electronic systems.
- (U) Develop diagnostics technologies and integrate them into existing tools and techniques to address high-priority user requirements. ($1,710K)
  - -- (U) Develop techniques for modeling analog and mixed mode circuits to predict manufacturing and operational fielding failures.
  - -- (U) Define an operating environment and computational tools to provide the ability to model system faults and assess performance degradation.
- (U) Develop reliability system design process enhancements to create tools, techniques, and guidelines to improve C3 devices. ($2,070K)
  - -- (U) Develop techniques to monitor, in real-time, transient electromagnetic events occurring during mission operations; correlate these events with disruption and/or failure of system/subsystems to provide improved repair and maintenance.
  - -- (U) Develop techniques to assess and estimate the reliability/readiness of commercial equipment intended for use in military environments.
  - -- (U) Develop reliability assurance and control methods to improve product quality, process (design, manufacture, test, etc.) improvement, and control of combined hardware/software systems.

(U) FY 1996:
- (U) Develop electronic reliability techniques to evaluate new devices in an operational environment and recommend corrective action. ($3,793K)
  - -- (U) Develop reliability prediction, modeling, analysis, and tracking techniques to assess the reliability of electronic systems throughout all phases of the system life cycle.
  - -- (U) Assess the effects of metal oxide semiconductor degradation in deep sub-micron main operating system transistors to improve the reliability of ultra-large scale integrated circuits.
- (U) Develop diagnostics technologies and integrate them into existing tools and techniques to address high-priority user requirements. ($3,763K)
  - -- (U) Develop, evaluate, and demonstrate non-destructive injection and fault sampling techniques for digital systems.
  - -- (U) Develop test automation techniques for microcircuit devices that are tested algorithmically.
  - -- (U) Develop electromagnetic simulation, analysis, and measurement tools to predict susceptibility thresholds and radio frequency performance in operational environments.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #2, Exploratory Development	PE NUMBER AND TITLE: PE 0602702F, Command, Control, and Communications (C3) / PROJECT NO.: 2338

- (U) Develop reliability system design process enhancements to create tools, techniques, and guidelines to improve C3 devices. ($3,814K)
  - -- (U) Improve design techniques for solid-state monolithic microwave integrated circuit high power amplifiers to meet high power, low cost, reliable, and energy efficient system requirements.
  - -- (U) Develop techniques for building reliability into the design of ultra-large scale integrated circuits by evaluating the effects of decisions made early in the design process on reliability.

(U) FY 1997:

- (U) Develop electronic reliability techniques to evaluate new devices in an operational environment and recommend corrective action. ($3,825K)
  - -- (U) Assess the quality, reliability, and electromagnetic effects performance of advanced packaging concepts.
  - -- (U) Define performance of advanced microelectronics devices and measure their potential for system applications.
  - -- (U) Assess electromagnetic performance and reliability of microwave/millimeter-wave and optoelectronic devices targeted for future systems.
- (U) Develop diagnostics technologies and integrate them into existing tools and techniques to address high-priority user requirements. ($3,508K)
  - -- (U) Develop design techniques that integrate computer-aided design with insertion of established built-in test modules.
  - -- (U) Develop electromagnetic simulation, analysis, and measurement tools to predict susceptibility thresholds and radio frequency performance in operational environments.
- (U) Develop reliability system design process enhancements to create tools, techniques, and guidelines to improve C3 devices. ($3,853K)
  - -- (U) Improve systems reliability by characterizing the electrical, electromagnetic, and mechanical stress-inducing parameters of the aerospace operational environment.
  - -- (U) Develop computer-based reliability and maintainability tools and techniques for the design of electronic circuits, devices, and systems.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602702F Command, Control, and Communications (C3)

PROJECT NO.: 2338

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	5,190	5,515	5,380	5,330	Cont
Current President's Budget	5,063	5,120	11,370	11,186	Cont

Change Summary Explanation:

Funding: Increases from FY 1995 to FY 1996 are due to the incorporation of personnel and laboratory support costs into the project and to increased emphasis on reliability sciences technology to address user-identified deficiencies. This technology directly supports the Joint Chiefs of Staff Future Joint Warfighting Capability: "To maintain near perfect real-time knowledge of the enemy and communicate that to all forces in near-real-time."

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0603617F, C3 Applications.
- (U) PE 0603726F, C3 Subsystems Integration.
- (U) PE 0603728F, Advanced Computer Technology.
- (U) PE 0603789F, C3 Advanced Development.
- (U) PE 0604609F, Reliability and Maintainability Technology Insertion Program.
- (U) PE 0708026F, Producibility, Reliability, Availability, and Maintainability.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602702F, Command, Control, and Communications (C3)

PROJECT NO.: 4506

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 4506, Surveillance Technology	8,725	9,568	17,704	17,261	17,837	18,214	18,410	18,895	Cont	Cont

A. (U) Mission Description and Budget Item Justification: The Air Force requires advanced surveillance technologies to improve the performance and reduce the cost of Air Force surveillance systems. Major Exploratory Development programs include: low-observable surveillance; passive surveillance; and advanced processing technologies. Technologies being developed include: advanced passive bistatic radar; spatial coordinate and time processing techniques; sensor and data fusion; signal generation; and advanced array antennas.

(U) FY 1994:

- (U) Developed, tested, and demonstrated processing technologies and algorithms to enhance small target detection in a complex electromagnetic background. ($3,727K)
  - -- (U) Completed the collection of airborne data for evaluation of spatial coordinate and time processing techniques and algorithms.
  - -- (U) Completed research in artificial intelligence reprocessing methods for enhancing clutter characteristics and improving target detection.
- (U) Developed technologies and concepts for passive surveillance with emphasis on electronic support measures and bistatics for enhanced detection, track, and classification in severe clutter and jamming environments. ($2,588K)
  - -- (U) Demonstrated tracking of theater ballistic missile targets using non-cooperative bistatic radar technology; airborne sensors used ambient illumination sources and successfully recorded bistatic signature data.
  - -- (U) The airborne multimode sensors successfully collected bistatic clutter data using the aircraft's radar as a non-cooperative illuminator and a small aircraft as a receiver platform.
- (U) Developed, tested, and demonstrated advanced multispectral/multisensor fusion techniques for enhanced target detection and tracking. ($1,134K)
  - -- (U) Fusion laboratory successfully demonstrated adapted angle control and sensor feedback in a multisensor suite for optimized performance against weak signal targets.
  - -- (U) Implemented and tested object-oriented software framework; allowed common performance base for diverse multisensor tracking algorithms.
- (U) Tested ultra-high fidelity microwave electronics for radar applications. ($1,276K)
  - -- (U) Developed a dynamic digital beamformer receiver to improve target detection in clutter.
  - -- (U) Developed a high-stability power amplifier test system capable of measuring stability in excess of 70 decibels.

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BUDGET ACTIVITY: #2, Exploratory Development	PE NUMBER AND TITLE: PE 0602702F, Command, Control, and Communications (C3) / PROJECT NO.: 4506

(U) FY 1995:
- (U) Develop, test, and demonstrate processing technologies and algorithms to enhance small target detection in a complex electromagnetic background. ($4,812K)
  - -- (U) Complete analysis of data from the airborne data collection experiment including performance evaluation of spatial coordinate and time adaptive processing techniques.
  - -- (U) Complete bistatic multichannel airborne radar measurements data collection experiment and analysis.
  - -- (U) Fabricate a wafer scale signal processor multichip module delivering five billion floating point operations per second.
- (U) Develop enabling technologies and concepts for passive surveillance with emphasis on electronic support measures and bistatics for enhanced detection, track, and classification in severe clutter and jamming environments. ($2,484K)
  - -- (U) Demonstrate non-cooperative bistatic synthetic aperture radar techniques in combination with electronic support measures for high confidence target identification.
  - -- (U) Suppress surveillance aircraft target and tracking data to improve bistatic clutter suppression and monitor the associated results.
- (U) Develop, test, and demonstrate advanced multispectral/multisensor fusion techniques for enhanced target detection and tracking. ($1,134K)
  - -- (U) Demonstrate adaptive threshold control for enhanced detection and tracking of weak targets.
  - -- (U) Implement measures of performance and conduct preliminary evaluation of diverse multisensor tracking algorithms.
- (U) Design, develop, and test ultrahigh fidelity microwave electronics for radar applications. ($1,138K)
  - -- (U) Complete development of wideband receiver modules for employment in bistatic radar system testbed.

(U) FY 1996:
- (U) Develop, test, and demonstrate processing technologies and algorithms to enhance small target detection in a complex electromagnetic background. ($8,486K)
  - -- (U) Complete Phase 1 of the multi-chip module wafer scale signal processor with a capability to perform five billion operations per second.
  - -- (U) Complete real-time, airborne spatial coordinate and time processing experiments using an embedded parallel processing computer.
  - -- (U) Demonstrate applicability of expert system constant false alarm rate technology in an operational airborne radar system.
  - -- (U) Analyze and evaluate space-time processing algorithms using the multichannel airborne radar measurements test bed.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #2, Exploratory Development	PE NUMBER AND TITLE: PE 0602702F, Command, Control, and Communications (C3) / PROJECT NO.: 4506

- (U) Develop technologies and concepts for passive surveillance with emphasis on electronic support measures and bistatics for enhanced detection, track, and classification in severe clutter and jamming environments. ($4,573K)
  - -- (U) Perform concept studies in support of the advanced airborne radar technology demonstration. These efforts will lead to the preliminary system design for the real-time, airborne, bistatic capability demonstration.
  - -- (U) Continue advanced airborne radar software development effort; implement into the static wing testbed; provide baseline test data for transition to the bistatic test integration experiment and the advanced airborne radar technology demonstration.
  - -- (U) Extend integrated electronic support measures and bistatic technology developed under the adaptive multimode airborne sensor program to include a target imaging mode integrated with the present surveillance mode; integrate fusion algorithms into airborne sensor processor to provide enhanced detection capability.
- (U) Develop, test, and demonstrate advanced multispectral/multisensor fusion techniques for enhanced target detection and tracking. ($2,340K)
  - -- (U) Exploit fusion and artificial intelligence (AI) technologies to develop an "AI fusion black box" for enhanced target detection and tracking.
  - -- (U) Develop algorithms for a sensor level AI approach to multispectral, multisensor fusion.
- (U) Design, develop, and test ultrahigh fidelity microwave electronics for radar applications. ($2,305K)
  - -- (U) Develop wideband pre-selector technology for bistatic radar systems.
  - -- (U) Develop increased dynamic range radar array emulation hardware for test and evaluation of microwave components.

(U) FY 1997:

- (U) Develop, test, and demonstrate processing technologies and algorithms to enhance small target detection in a complex electromagnetic background. ($8,584K)
  - -- (U) Develop knowledge-based adaptive processing for bistatic radar applications.
  - -- (U) Complete Phase 2 of the multi-chip module wafer scale signal processor with a capability to perform twenty billion operations per second.
  - -- (U) Evaluate embedded parallel processing architecture for integrating wafer scale signal processor chips for a real-time signal processor enhancement demonstration.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #2, Exploratory Development	PE NUMBER AND TITLE: PE 0602702F, Command, Control, and Communications (C3) / PROJECT NO.: 4506

- (U) Develop technologies and concepts for passive surveillance with emphasis on electronic support measures and bistatics for enhanced detection, track, and classification in severe clutter and jamming environments. ($4,622K)
  - -- (U) Conduct concept studies to refine system design for the advanced airborne radar technology demonstration.
  - -- (U) Complete data collection, hardware integration, and software development for the static wing testbed; conduct ground based field test.
  - -- (U) Conduct extensive field tests and demonstrations using integrated electronic support measures and bistatic passive surveillance and imaging technology on board a small aircraft; enhance integrated passive surveillance and imaging technology capabilities through an airborne demonstration with a very broad frequency bandwidth controlled phase array.
- (U) Develop, test, and demonstrate advanced multispectral/multisensor fusion techniques for enhanced target detection and tracking. ($2,096K)
  - -- (U) Demonstrate special purpose artificial intelligence machines for both "expert" and 'blackboard" systems.
  - -- (U) Develop and demonstrate graphical user interface software and platform based displays; analyze, test, and demonstrate integrated knowledge-based fusion concepts.
- (U) Design, develop, and test ultrahigh fidelity microwave electronics for radar applications. ($1,959K)
  - -- (U) Develop high fidelity power conditioning system for active radar apertures.
  - -- (U) Develop transmit and receive module technology incorporating digital preprocessing.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602702F, Command, Control, and Communications (C3)

PROJECT NO.: 4506

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	8,925	10,305	10,050	10,000	Cont
Current President's Budget	8,725	9,568	17,704	17,261	Cont

Change Summary Explanation:

Funding: Increases from FY 1995 to FY 1996 are due to the incorporation of personnel and laboratory support costs into the project and to increased emphasis on surveillance technology to address user-identified deficiencies. This technology directly supports the Joint Chiefs of Staff Future Joint Warfighting Capability: "To maintain near perfect real-time knowledge of the enemy and communicate that to all forces in near-real-time."

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0603726F, C3 Subsystems Integration
- (U) PE 0603789F, C3 Advanced Development.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602702F, Command, Control, and Communications (C3)

PROJECT NO.: 4519

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 4519, Communications Technology	6,860	7,557	12,570	12,352	12,694	12,691	12,934	13,437	Cont	Cont

A. (U) Mission Description and Budget Item Justification: The Air Force requires technologies which will provide worldwide communications. The rapid application of air power via assured connectivity for timely, reliable, responsive, affordable transfer of information using all available communications media is essential to support rapid build-up of U.S. presence abroad. This program provides the technologies for: multi-level, secure, seamless networks; advanced communications processors; anti-jam and low probability of intercept techniques, such as spread spectrum and adaptive null steering; lightweight antennas and phased array antennas; and modular, programmable, low-cost radios and C3 across the electromagnetic and optical spectrums. It includes technologies for advanced processors and devices, advanced network protocols, artificial intelligent communications management and control, advanced algorithms, and enabling processing techniques.

(U) FY 1994:

- (U) Developed critical communications technologies employing programmable devices, enabling processing technologies, and monolithic microwave integrated circuits to provide survivable radios and transceivers. ($2,465K)
  - -- (U) Demonstrated a programmable ultra high frequency (UHF)/super high frequency (SHF) radio with demand assigned multiple access protocol capability.
  - -- (U) Demonstrated the demand assigned multiple access standard using experimental system and network control terminals.
- (U) Developed enabling technologies for improved security, survivability, timeliness, and reconstruction of communications networks. ($2,350K)
  - -- (U) Demonstrated performance of adaptive protocols incorporating artificial intelligence methods in dynamic communications networks.
- (U) Developed advanced electronic and photonic processors, advanced network protocols, advanced algorithms, and enabling processing technologies essential for survivable communications. ($2,045K)
  - -- (U) Demonstrated radio development testbed with embedded signal processing algorithms, using multiple digital processing capabilities, and analog-to-digital interfaces.
  - -- (U) Demonstrated processing algorithm using high-level, icon-driven communications package.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE February 1995
BUDGET ACTIVITY #2, Exploratory Development	PE NUMBER AND TITLE PE 0602702F, Command, Control, and Communications (C3)
	PROJECT NO. 4519

(U) FY 1995:
- (U) Develop critical communications technologies employing programmable devices, enabling processing technologies, and monolithic microwave integrated circuits to provide survivable radios and transceivers. ($2,755K)
  - -- (U) Define commercially compatible switching concepts for worldwide military communications, focusing on the interface of existing low data rate communications equipment to asynchronous switches.
  - -- (U) Analyze the relationship between radio multiple access data links technology and secure, survivable communications networking.
  - -- (U) Analyze state-of-the-art data compression techniques for their utility in an ultra high frequency (UHF) communications environment.
  - -- (U) Design a wideband communications extension and remoting capability using commercial-off-the-shelf equipment.
- (U) Develop technologies for improved security, survivability, timeliness, and reconstruction of communications networks. ($2,625K)
  - -- (U) Define smart networking strategies for emerging military tactical multiband multifunction radios and commercial communications equipment.
  - -- (U) Determine how a multiband, multifunction radio capacity could best provide commercially compatible radio links to support a distributed computing environment in the battlefield.
  - -- (U) Design an information system that effectively utilizes the underlying commercially available asynchronous communications infrastructure.
  - -- (U) Develop intelligent, survivable network management concepts which leverages current work in management of distributed command and control applications to provide system-wide optimization of resource usage, down to the user service level.
- (U) Develop advanced electronic and photonic processors, advanced network protocols, advanced algorithms, and enabling processing technologies essential for survivable communications. ($2,177K)
  - -- (U) Develop smart and adaptive communications signal processing concepts and techniques applicable to enhancing the capability of multiband multifunction radios to sense and adapt to their link environment and demands for service; investigate the use of time-frequency analysis to diagnose and mitigate interference.
  - -- (U) Apply computer-aided design, modeling, and analysis tool-sets to support the development of smart radio technology.
  - -- (U) Develop new high bandwidth, efficient, anti-jam/low probability of intercept waveforms; investigate new signal modulation and transformation.

(U) FY 1996:
- (U) Develop critical communications technologies employing programmable devices, processing technologies, and monolithic microwave integrated circuits to provide survivable radios and transceivers. ($3,758K)
  - -- (U) Demonstrate commercially compatible switching concepts for UHF communications to aircraft, and other systems.
  - -- (U) Develop modifications of state-of-the-art data compression techniques to emphasis their utility in a UHF communications environment.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #2, Exploratory Development	PE NUMBER AND TITLE: PE 0602702F, Command, Control, and Communications (C3) 4519 — PROJECT NO.

-- (U) Upgrade the wideband communications extension and remoting capability for multimedia integrated services demonstrations.
-- (U) Assess supporting operations involving remote local area networks, voice, and slow scan/compressed video within the wide band communications for distributed computing environments.

- (U) Develop technologies for improved security, survivability, timeliness, and reconstruction of communications networks. ($6,371K)
  -- (U) Assess secure, survivable communications networking, multiple accessing, and radio networking to enhance implementation planning.
  -- (U) Analyze evolving components within the asynchronous switching infrastructure to support a distributed information system.
  -- (U) Design and implement a peer-to-peer management interface for intelligent, survivable network management.
- (U) Develop advanced electronic and photonic processors, advanced network protocols, advanced algorithms, and processing technologies essential for survivable communications. ($2,441K)
  -- (U) Demonstrate new "smart" adaptive communications signal processing techniques and wave forms.
  -- (U) Explore and advance potentially high payoff signal processing control technologies applicable to the development of smart radios.

(U) FY 1997:

- (U) Develop critical communications technologies employing programmable devices, processing technologies, and monolithic microwave integrated circuits to provide survivable radios and transceivers. ($3,725K)
  -- (U) Demonstrate ultra high frequency (UHF) and super high frequency (SHF) communications technologies.
  -- (U) Develop and demonstrate data compression techniques for use in a UHF and SHF communications environment.
  -- (U) Investigate supporting a distributed air operations center, lower echelon theater air control system, and theater missile defense operations centers with wideband access to a distributed command and control network.
- (U) Develop technologies for improved security, survivability, timeliness, and reconstruction of communications networks. ($6,297K)
  -- (U) Demonstrate selected multiple access and asynchronous switching protocols.
  -- (U) Complete demonstration of standards-based, interactive, secure user services which optimally employ the underlying commercially compatible communications network.
  -- (U) Demonstrate intelligent, survivable network management that provides secure, system-wide optimization of resource usage.
- (U) Develop advanced electronic and photonic processors, advanced network protocol, advanced algorithms, and enabling processing technologies essential for survivable communications. ($2,330K)
  -- (U) Develop specifications for the next generation smart radio, incorporating proven smart adaptive signal processing technologies.
  -- (U) Develop and demonstrate potentially high payoff communications signal processing technologies applicable to future smart radio systems.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602702F, Command, Control, and Communications (C3)

PROJECT NO.: 4519

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	7,060	8,140	7,940	7,900	Cont
Current President's Budget	6,860	7,557	12,570	12,352	Cont

Change Summary Explanation:

Funding: Increases from FY 1995 to FY 1996 are due to the incorporation of personnel and laboratory support costs into the project and to increased emphasis on communications technology to address user-identified deficiencies. This technology directly supports the Joint Chiefs of Staff Future Joint Warfighting Capability: "To maintain near perfect real-time knowledge of the enemy and communicate that to all forces in near-real-time."

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0603726F, C3 Subsystems Integration.
- (U) PE 0603728F, Advanced Computer Technology.
- (U) PE 0603789F, C3 Advanced Development.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602702F, Command, Control, and Communications (C3)

PROJECT NO.: 4594

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 4594, Information Technology	7,275	7,896	13,042	12,722	13,061	13,065	13,281	13,834	Cont	Cont

A. (U) Mission Description and Budget Item Justification: The Air Force requires technologies which improve and automate capabilities to process, manage, fuse, generate, exploit, interpret, and disseminate information in a timely manner. This project: improves recording, storage, and retrieval of high data rate, large volume data; develops speech processing technologies for signal exploitation, information deception, and exploiting unintentional emissions; develops technology for correlation and fusion of multisource data; develops natural language capabilities that can read text and extract data of interest; develop tools and techniques to build and manage a scaleable client sever environment; 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 multispectral, multisource imagery; and provides advanced techniques for mapping, charting, and geodesy data processing.

(U) FY 1994:

- (U) Developed processing technologies responsive to operational deficiencies by improving information timeliness, reliability, and accessibility. ($3,050K)
  - -- (U) Successfully demonstrated the first read/write 14-inch optical disk system during flight tests on the COMBAT SENT aircraft.
  - -- (U) Language identification technology was transitioned for efficient categorization of intercept data.
  - -- (U) Delivered computerized speech enhancement capability; improved both understanding of noisy speech and reception quality.
  - -- (U) Delivered the warfighter a validated baseline threat assessment support environment for use in simulations.
- (U) Developed information data handling techniques to automatically extract event data and update databases for prediction purposes. ($2,100K)
  - -- (U) Delivered the capability to analyze foreign C3 activity on a global level and identify threatening situations using a timeline analysis system.
  - -- (U) Delivered the extended integrated data base for use with distributed data bases; transitioned it to the user.
  - -- (U) Provided the warfighter with automated changes to readiness status on a real-time basis using the defense automated warning system.
- (U) Developed sensor exploitation techniques for faster and more efficient imaging to support targeting, planning, and mission execution. ($2,125K)
  - -- (U) Demonstrated secondary information dissemination system that could "push and pull" imagery products from a centralized production center to various sub-units.
  - -- (U) Delivered unit-level brassboard which provides cartographic functions for information and surveillance analysts.
  - -- (U) Transitioned rapid application of air power targeting analysis tool to several operational sites; successfully provided target nominations and supporting surveillance information to the air strike planning process.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #2, Exploratory Development	PE NUMBER AND TITLE: PE 0602702F, Command, Control, and Communications (C3) / PROJECT NO.: 4594

(U) FY 1995:
- (U) Develop processing technologies responsive to operational deficiencies by improving information timeliness, reliability, and accessibility. ($3,250K)
  - -- (U) Complete design/fabrication of compact, breadboard, three-dimensional, read-only-memory system using a two photon absorption concept.
  - -- (U) Perform the first live field test of platform identification technology which differentiates military helicopters based on audio acoustics.
  - -- (U) Develop channel normalization technology which significantly improves the automatic sorting and routing of communications.
  - -- (U) Develop modeling and integration technology for application to theater-level models.
- (U) Develop information data handling techniques to automatically extract event data and update databases for prediction purposes. ($2,300K)
  - -- (U) Transition the exercise timeline analysis system at user sites to provide the tools to graphically build exercises on timelines and maps.
  - -- (U) Integrate and test the transition of 28 information and surveillance migration systems to the client server environment.
  - -- (U) Develop and install data handling system software at operational sites, providing enhanced message handling, situational assessment, database, client server, and imagery management technologies.
  - -- (U) Develop, test, and install the client server environment system to provide common computing, uniform system administration tools, and common support applications.
- (U) Develop sensor exploitation techniques for faster and more efficient imaging to support targeting, planning, and mission execution. ($2,346K)
  - -- (U) Develop an imagery/information server, image exploitation tool kit, and continued migration towards and object oriented environment for the imagery testbed facility.
  - -- (U) Demonstrate the rapid application of air power tool utility to the warfighter at several national and international exercises.
  - -- (U) Integrate the mapping application-client/server software as a mapping server for theater battle management.

(U) FY 1996:
- (U) Develop processing technologies responsive to operational deficiencies by improving information timeliness, reliability, and accessibility. ($5,535K)
  - -- (U) Develop three-dimensional holographic read-only-memory optical disk for information storage and retrieval to provide higher capacity, faster throughput, and decreased access time for today's systems to provide timely imagery/information.
  - -- (U) Develop techniques to analyze background sound so that aircraft status and configuration can be recognized.
  - -- (U) Develop techniques to support the release of beyond-visual-range weapons only against high confidence air targets.
  - -- (U) Develop model abstraction and advanced data display techniques to exploit electronic imagery/information.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #2, Exploratory Development	PE NUMBER AND TITLE: PE 0602702F, Command, Control, and Communications (C3) / PROJECT NO.: 4594

- (U) Develop information data handling techniques to automatically extract event data and update databases for prediction purposes. ($3,625K)
  - -- (U) Develop techniques to rapidly assess situations and warn decision makers and warfighters.
  - -- (U) Develop message processing techniques which extract only pertinent information from free text and multimedia sources so decision makers and war planners have the most recent information available and on-line.
  - -- (U) Develop techniques to configure and manage a scaleable distributed information computing environment.
- (U) Develop sensor exploitation techniques for faster and more efficient imaging to support targeting, planning, and mission execution. ($3,882K)
  - -- (U) Develop techniques to manage, query, and exploit digital imagery databases.
  - -- (U) Develop techniques to apply artificial neural networks to problems associated with finding objects in aerial imagery.
  - -- (U) Investigate applications of modeling technology to battle damage assessment.

(U) FY 1997:

- (U) Develop processing technologies responsive to operational deficiencies by improving information timeliness, reliability, and accessibility. ($5,429K)
  - -- (U) Develop enhanced storage and retrieval devices with reduced size, weight, power requirements, and lower cost.
  - -- (U) Develop speech coding algorithms to automatically sort and route large volumes of communication signals to assist information analysts.
  - -- (U) Develop techniques that correlate non-cooperative radar signals with processing of signal emanations.
  - -- (U) Develop techniques to exploit modeling integration.
- (U) Develop information data handling techniques to automatically extract event data and update databases for prediction purposes. ($3,521K)
  - -- (U) Develop analytical tools to extract multimedia information for concise, efficient cockpit display.
  - -- (U) Develop techniques to build intelligent, single point, multimedia databases.
  - -- (U) Develop techniques to configure and manage a scaleable distributed information computing environment.
- (U) Develop sensor exploitation techniques for faster and more efficient imaging to support targeting, planning, and mission execution. ($3,772K)
  - -- (U) Develop techniques to exploit video to satisfy battle damage assessment requirements.
  - -- (U) Develop techniques to improve the methodology required to manage and query imagery databases.
  - -- (U) Develop information currency techniques and data consistency techniques to support combat imagery/information systems.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602702F, Command, Control, and Communications (C3)

PROJECT NO.: 4594

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	7,475	8,505	8,295	8,355	Cont
Current President's Budget	7,275	7,896	13,042	12,722	Cont

Change Summary Explanation:

Funding: Increases from FY 1995 to FY 1996 are due to the incorporation of personnel and laboratory support costs into the project and to increased emphasis on information technology to address user-identified deficiencies. This technology directly supports the Joint Chiefs of Staff Future Joint Warfighting Capability: "To maintain near perfect real-time knowledge of the enemy and communicate that to all forces in near-real-time."

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0603726F, C3 Subsystems Integration.
- (U) PE 0603789F, C3 Advanced Development.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602702F, Command, Control, and Communications (C3)

PROJECT NO.: 4600

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 4600, Electromagnetic Technology	11,300	11,243	26,085	25,155	26,024	26,850	27,226	28,001	Cont	Cont

A. (U) Mission Description and Budget Item Justification: This project consists of three subset technologies: electromagnetics; solid state sciences; and photonics. Future surveillance, communications, and imagery/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. Promising technologies for improving C3 systems are electromagnetic propagation and scattering (from targets and clutter), and monolithic microwave and millimeter wave integrated components and antennas. This project develops: a technology base for electronic and photonic devices and device materials for C3 systems; optical technology for electronic data processing and storage; real-time target recognition and high-speed fiber optic interconnects; control techniques for large phased array antennas; and characterizes phenomena for low-observable surveillance.

(U) FY 1994:

- (U) Developed electromagnetic technologies for advanced surveillance and communications systems applications. ($3,400K)
  - -- (U) Demonstrated high frequency array technology using new ionospheric clutter and coherence models; successfully tested bistatic radar clutter and radar cross section phenomenology for improved target detection.
  - -- (U) Demonstrated feasibility of extremely high frequency phased arrays using advanced communications technology.
- (U) Developed advanced materials and components capable of higher processing speeds at reduced power levels for telecommunications and survivable server applications. ($2,600K)
  - -- (U) Achieved first-ever growth of phosphorous-rich indium phosphide crystals which provides an enhanced electronic an optoelectronic semiconductor performance over conventional materials.
  - -- (U) Fabricated premium quality yttrium copper oxide superconducting films using pulsed laser deposition in ambient air.
  - -- (U) Transferred actively cooled effuser technology for high quality semiconductor thin film growth to industry.
- (U) Developed photonic components and related materials for insertion into core C3 programs. ($5,300K)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #2, Exploratory Development	PE NUMBER AND TITLE: PE 0602702F, Command, Control, and Communications (C3) / PROJECT NO.: 4600

(U) FY 1995:
- (U) Develop electromagnetic technologies for advanced surveillance and communications systems applications. ($3,650K)
  - -- (U) Develop clutter and target radar cross section models for adaptive surveillance simulations; optimize high temperature superconductor phased array feeds; improve array packaging with innovative, multi-layer radio frequency connections.
  - -- (U) Finalize algorithms and initiate hardware development for small target motion discrimination.
- (U) Develop advanced materials and components capable of higher processing speeds at reduced power levels for telecommunications and survivable server applications. ($2,750K)
  - -- (U) Determine how hydrogen impurities affect the concentration of electrons in semiconducting indium phosphide for millimeter wave and photonic component hardware development for infrared spectral imagery.
  - -- (U) Produce advanced high temperature superconductive films suitable for phased array high frequency antennas.
  - -- (U) Develop advanced processing techniques for the deposition of high temperature superconductive films on substrates.
- (U) Define concept design approaches exploiting photonic components and related materials for insertion into core C3 programs. ($4,843K)

(U) FY 1996:
- (U) Develop electromagnetic technologies for advanced surveillance and communications systems applications. ($7,854K)
  - -- (U) Develop parallel processing algorithms for digital beamforming for antenna testbed; formulate new models of complex scattering mechanisms to improve radar cross-section codes.
  - -- (U) Develop "ducted" mode high frequency communications for super-long distance, covert links.
  - -- (U) Evaluate and refine hardware for infrared small target motion discriminator, and initiate hardware development for infrared spectral imager.
- (U) Develop advanced materials and components capable of higher processing speeds at reduced power levels for telecommunications and survivable server applications. ($6,512K)
  - -- (U) Design, build, and test monolithic transmit chip with integrated amplifier and phase shifter; integrate phase shifter and antenna feed network.
  - -- (U) Fabricate brassboard high temperature superconductor films suitable for antenna components; develop new crystal growth methods.
- (U) Develop photonic components and related materials for insertion into core C3 programs. ($11,719K)
  - -- (U) Demonstrate feasibility of spectrum shaping technology for target tracking; analyze optoelectronic integration on indium phosphide.
  - -- (U) Fabricate and test multi-chip module interconnect technology in cooperation with commercial vendor.
  - -- (U) Develop design concepts for an ultra-high-speed multiple access testbed with specialized components for unique switching architecture, radar processors, and communications protocols.
  - -- (U) Develop design concepts for unique photonic signal processor brassboards to demonstrate optical logic and optical neural networks.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #2, Exploratory Development	PE NUMBER AND TITLE: PE 0602702F, Command, Control, and Communications (C3) 4600

(U) FY 1997:
- (U) Develop electromagnetic technologies for advanced surveillance and communications systems applications. ($7,517K)
  - -- (U) Conduct experimental assessment of techniques to improve bistatic signal-to-clutter ratios for low radar cross section target detection.
  - -- (U) Finalize algorithm and initiate hardware development for infrared small target spectral discriminator.
- (U) Develop advanced materials and components capable of higher processing speeds at reduced power levels for telecommunications and survivable server applications. ($6,363K)
  - -- (U) Design and fabricate brassboard, high-temperature transmit array; design, fabricate, and test monolithic low noise amplifier.
  - -- (U) Fabricate brassboard aluminum/gallium nitride substrates using new crystal growth methods.
- (U) Develop photonic components and related materials for insertion into core C3 programs. ($11,275K)
  - -- (U) Demonstrate next level spectrum shaping for high range resolution target recognition based on optoelectric integration.
  - -- (U) Conduct Phase 1 development of the ultra-high-speed multiple access testbed and associated components for unique switching architecture, radar processors and communications protocols.
  - -- (U) Conduct Phase 1 development of unique photonic signal processor brassboards to demonstrate optical logic and optical neural networks.
  - -- (U) Demonstrate radio frequency optical beamforming and anti-jamming processors for radar and communication systems.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602702F, Command, Control, and Communications (C3)

PROJECT NO.: 4600

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	11,500	12,109	11,798	11,842	Cont
Current President's Budget	11,300	11,243	26,085	25,155	Cont

Change Summary Explanation:

Funding: Increases from FY 1995 to FY 1996 are due to the incorporation of personnel and laboratory support costs into the project and to increased emphasis on electromagnetic technology to address user-identified deficiencies. This technology directly supports the Joint Chiefs of Staff Future Joint Warfighting Capability: "To maintain near perfect real-time knowledge of the enemy and communicate that to all forces in near-real-time."

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0603617F, C3 Applications.
- (U) PE 0603726F, C3 Subsystems Integration.
- (U) PE 0603789F, C3 Advanced Development.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602702F, Command, Control, and Communications (C3)

PROJECT NO.: 5581

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 5581, Command and Control (C2) Technology	7,948	8,954	17,706	16,902	17,369	17,810	18,148	18,785	Cont	Cont

A. (U) Mission Description and Budget Item Justification: The Air Force requires technologies which provide next generation battlefield commanders with improved processing and presentation of information for real-time battle management. Technologies being developed will increase capability, quality, and reliability while reducing the cost of computer resources in command and control systems. This project develops advanced computer software modeled after human information processing and is capable of providing vast improvements in military decision making. It also develops software engineering tools, software development methodologies, and software quality specification and assessment techniques. It develops: technology for distributed systems, data bases, and fault tolerance mechanisms; and knowledge-based technologies, systems, and data bases.

(U) FY 1994:

- (U) Developed information technologies for real-time battle management and command and control for time-critical air operations. ($3,573K)
  - -- (U) Completed technology demonstrations for high performance scheduling and knowledge-based generative planning.
  - -- (U) Developed concept designs for multi-agent distributed planning and schedule rationale capture techniques.
- (U) Developed software technologies to provide increased capability, quality, and reliability while reducing support cost. ($2,545K)
  - -- (U) Completed PROTO, a high level requirements engineering language code generation tool.
  - -- (U) Developed techniques to establish levels of confidence and support certification of reusable software components; developed methods to automate the conversion of existing archival documentation.
  - -- (U) Developed software for parallel processing computers including simulation tools, development methodology, mapping methods, and design techniques for real-time systems.
  - -- (U) Developed technology approaches for advanced capabilities in learning, fault tolerance, and software visualization applicable to the knowledge based software assistant (KBSA).
- (U) Developed distributed computing and database systems using cluster technologies to allow secure management of multimedia data by theater commanders. ($1,830K)
  - -- (U) Investigated the impact of commercially compatible switching communications and high performance processors on distributed computing environment design.
  - -- (U) Implemented a preliminary version of an interactive visualization environment and interface to a distributed computing environment.
  - -- (U) Developed a distributed transaction model for a multimedia database management system.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #2, Exploratory Development	PE NUMBER AND TITLE: PE 0602702F, Command, Control, and Communications (C3) / PROJECT NO.: 5581

(U) FY 1995:
- (U) Develop information technologies for real-time battle management and command and control for time-critical air operations. ($4,019K)
  - -- (U) Complete demonstrations of rational capture, multi-agent distributed planning, plan characterization, and planning framework.
  - -- (U) Create mixed initiative scheduling and autonomous software agents.
- (U) Develop software technologies to provide increased capability, quality, and reliability while reducing support cost. ($2,920K)
  - -- (U) Develop certification methods for reusable software components; define process controls and security for system engineering environments.
  - -- (U) Define system specifications needed to expand the requirements engineering language technology to deal with system level functions of hardware and software, including a capability for parallel systems.
  - -- (U) Develop software for parallel computers including benchmarks for parallel software, a concept of operations for a virtual machine, and optimization of computing vs. communication in a parallel architecture.
  - -- (U) Complete techniques for fault tolerance and software visualization for an enhanced knowledge-based-software-assistant capability.
- (U) Develop software for distributed computing and database technology using cluster technique to allow secure management of multimedia data by commanders at all echelons. ($2,015K)
  - -- (U) Demonstrate feasibility of distributed shared memory within a distributed computing environment.
  - -- (U) Complete preliminary design for a high resolution interactive datawall.
  - -- (U) Extend object oriented database model to accommodate time dependent multimedia data objects.

(U) FY 1996:
- (U) Develop information technologies for real-time battle management and command and control for time-critical air operations. ($6,535K)
  - -- (U) Develop concept design approaches for initiative planning and approximate planning.
  - -- (U) Complete demonstration of dynamic backscattering search for generative planning.
- (U) Develop software technolpgies to provide increased capability, quality, and reliability while reducing support cost. ($5,648K)
  - -- (U) Enhance process controls and security for system engineering environments and the certification of reusable software components.
  - -- (U) Provide automated scenario generation for requirements in engineering environment.
  - -- (U) Develop benchmarks and a specifications for parallel processing software.
  - -- (U) Complete technology efforts to support learning and define architectural improvements for the knowledge-based-software-assistant.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #2, Exploratory Development	PE NUMBER AND TITLE: PE 0602702F, Command, Control, and Communications (C3) / PROJECT NO.: 5581

- (U) Develop distributed computing and database systems using cluster technologies to allow secure management of multimedia data by theater commanders ($5,523K)
  - -- (U) Demonstrate feasibility of shared collaborative context workspace across a distributed computing environment.
  - -- (U) Demonstrate feasibility of interactive datawall with non-tethered, interactive input devices.
  - -- (U) Demonstrate feasibility of synthetic visualization environment to command center applications.

(U) FY 1997:

- (U) Develop information technologies for real-time battle management and command and control for time-critical air operations. ($6,259K)
  - -- (U) Demonstrate integration of planning and scheduling technology, autonomous software agents, and mixed initiative scheduling toolbox.
  - -- (U) Demonstrate dialog-based, man-machine integration planning task.
- (U) Develop software technologies to provide increased capability, quality, and reliability while reducing support cost. ($5,165K)
  - -- (U) Conduct Phase 1 development of the high level requirements engineering language development with scenario generation for the requirements engineering environment.
  - -- (U) Develop concept design approaches for visualization techniques for parallel systems, parallel object oriented programming methods, and advanced techniques for parallel real-time systems.
  - -- (U) Complete development of benchmarks for parallel processing software.
- (U) Develop distributed computing and database systems using cluster technologies to allow secure management of multimedia data by theater commanders. ($5,478K)
  - -- (U) Demonstrate asynchronous switching technology as a local interconnect mechanism for a distributed computing environment.
  - -- (U) Demonstrate an optical storage and retrieval mechanism for multimedia database management brassboard.
  - -- (U) Demonstrate feasibility application based reconfiguration of multiple distributed computing clusters.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #2, Exploratory Development

PE NUMBER AND TITLE: PE 0602702F, Command, Control, and Communications (C3)

PROJECT NO.: 5581

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	8,148	9,645	9,405	9,505	Cont
Current President's Budget	7,948	8,954	17,706	16,902	Cont

Change Summary Explanation:

Funding: Increases from FY 1995 to FY 1996 are due to the incorporation of personnel and laboratory support costs into the project and to increased emphasis on command and control technology to address user-identified deficiencies. This technology directly supports the Joint Chiefs of Staff Future Joint Warfighting Capability: "To maintain near perfect real-time knowledge of the enemy and communicate that to all forces in near-real-time."

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0603617F, C3 Applications.
- (U) PE 0603728F, Advanced Computer Technology.
- (U) PE 0603789F, C3 Advanced Development.
- (U) PE 0303401F, Communications-Computer Systems (C-CS) Security RDT&E.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

D (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE **February 1995**

BUDGET ACTIVITY
#3, Advanced Development

PE NUMBER AND TITLE
PE 0603106F, Logistics Systems Technology

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Total PE 0603106F Cost	14,589	14,715	17,960	19,465	22,494	24,102	26,627	28,181	Cont	Cont
Project 2745, Logistics for Contingency Operations and Weapon Systems Support	3,802	5,095	5,057	6,355	7,482	8,066	8,908	9,428	Cont	Cont
Project 2940, Technology for Design and Maintenance	4,478	4,865	6,440	6,516	7,437	8,047	8,889	9,408	Cont	Cont
Project 2950, Improved Logistics and Maintenance Performance	6,309	4,755	6,463	6,594	7,575	7,989	8,830	9,345	Cont	Cont

A. (U) Mission Description and Budget Item Justification: This Advanced Development program develops and demonstrates cost-effective technologies to improve the design, acquisition, and supportability of current and future weapon systems. This program will incorporate maintenance and support considerations into the weapon systems design process and will make engineering, product support, and maintenance data electronically available throughout weapon systems' life cycles. It will: provide more realistic logistics planning and combat capability assessment tools; provide critical risk reduction technology; and include test and diagnostics technologies, flight line and deployment support, critical aircraft battle/accident damage assessment and repair technology, military aircraft fire suppression agents, and other logistics technologies. All efforts in this program element contain the resources necessary, including civilian salaries, to manage, conduct, and document the technical activities.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #3, Advanced Development

PE NUMBER AND TITLE: PE 0603106F, Logistics Systems Technology

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	14,238	18,200	18,049	18,678	Cont
Appropriated Value	14,318	15,000			
Adjustments to Appropriated Value					
a. Congressional General Reductions	-81	-285			
b. SBIR	-198				
c. Below Threshold Reprogramming	550				
Current President's Budget	14,589	14,715	17,960	19,465	Cont

Change Summary Explanation:

Funding: Increases in FY 1996 and FY 1997 support initiatives to improve reliability/maintainability of existing and future weapon systems.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary: Not Applicable.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #3, Advanced Development

PE NUMBER AND TITLE: PE 0603106F, Logistics Systems Technology

PROJECT NO.: 2745

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 2745, Logistics for Contingency Operations and Weapon Systems Support	3,802	5,095	5,057	6,355	7,482	8,066	8,908	9,428	Cont	Cont

A. (U) Mission Description and Budget Item Justification: This project develops, demonstrates, and transitions technology to improve the performance and supportability of Air Force weapon systems in peacetime and deployed wartime environments. This project will develop and demonstrate the technologies needed for more reliable aircraft support equipment, enhance our capability to rapidly return battle damaged aircraft to a combat ready status, and support rapid and flexible deployments.

(U) FY 1994:
- (U) Completed Halon replacement screening with selection of best agents. ($2,842K)
  - (U) Fabricated full-scale engine nacelle and dry bay fixture for testing Halon replacements.
  - (U) Tested finalist replacement agents in both engine nacelle and dry bay.
- (U) Developed repair techniques for battle damaged/accident damaged aircraft and fielded special purpose battle damage repair tools. ($960K)
  - (U) Assessed the types of battle/accident damage and the application of repair technologies.

(U) FY 1995:
- (U) Develop and demonstrate fire suppression/extinguishing technologies. ($3,082K)
  - (U) Complete Phase III testing and finalize Halon alternative design equations.
  - (U) Develop gas generator technology for dry bay and engine nacelle.
  - (U) Develop inflatable bag fire extinguishing technology.
- (U) Continue to develop and demonstrate repair techniques for battle damaged/accident damaged aircraft. ($2,013K)
  - (U) Develop technologies for repairing battle damaged/low observable structures.
  - (U) Develop technologies for repairing battle damaged composite structures.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #3, Advanced Development	PE NUMBER AND TITLE: PE 0603106F, Logistics Systems Technology
	PROJECT NO.: 2745

(U) FY 1996:
- (U) Continue to develop and demonstrate fire suppression/extinguishing technologies. ($1,722K)
  - -- (U) Develop and flight-test gas generator extinguisher technology.
  - -- (U) Develop inflatable bag fire extinguisher technology.
- (U) Continue to develop and demonstrate repair techniques for battle accident damaged aircraft. ($1,840K)
  - -- (U) Develop and evaluate technologies for repairing and electrically measuring battle damaged low observable structures
  - -- (U) Develop technologies for repairing battle damaged composite structures
  - -- (U) Determine technology needs and select concepts for repairing battle damaged turbine engines.
- (U) Develop needs assessment and technology for multi-purpose, easily deployable supppt equipment. ($410K)
  - -- (U) Develop upgrades for the Aircraft Battle Damage Repair (ABDR) trailer
- (U) Identify processes, models, technologies, and equipment to enhance contingency operations while decreasing the logistics footprint. ($1,085K)
  - -- (U) Define and evaluate configuration options for multi-function aerospace ground equipment that reduce support costs and deployment footprint.

(U) FY 1997:
- (U) Continue to develop and demonstrate fire suppression/extinguishing technologies. ($1,022K)
  - -- (U) Complete testing on the gas generator technology for aircraft suppression systems and make available for transition.
  - -- (U) Further develop and flight test the inflatable bag extinguisher technology for aircraft fire suppression
- (U) Continue to develop and demonstrate repair techniques for battle damaged/accident damaged aircraft. ($2,051K)
  - -- (U) Field demonstrate and verify concepts for repairing and electrically measuring battle damaged low observable structures.
  - -- (U) Evaluate technologies for repairing battle damaged composite structures
  - -- (U) Develop and evaluate technologies and tools for repairing battle damaged turbine engines
- (U) Identify processes, models, technologies, and equipment to enhance contingency operations while decreasing the logistics footprint. ($3,282K)
  - -- (U) Design, fabricate, and test technologies for multi-function aerospace ground equipment that reduce support costs and deployment footprint.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #3, Advanced Development	PE NUMBER AND TITLE: PE 0603106F, Logistics Systems Technology — PROJECT NO.: 2745

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	3,908	6,260	5,080	6,070	Cont
Current President's Budget	3,802	5,095	5,057	6,355	Cont

Change Summary Explanation:

Funding: Increases in FY 1996 and FY 1997 support initiatives to improve reliability/maintainability of existing and future weapon systems.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0602201F, Aerospace Flight Dynamics.
- (U) PE 0602202F, Human Systems Technology.
- (U) PE 0603721N, Integrated Diagnostic Support.
- (U) PE 0605801A, Pollution Prevention Research and Development.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #3, Advanced Development

PE NUMBER AND TITLE: PE 0603106F, Logistics Systems Technology

PROJECT NO.: 2940

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 2940, Technology for Design and Maintenance	4,478	4,865	6,440	6,516	7,437	8,047	8,889	9,408	Cont	Cont

A. (U) Mission Description and Budget Item Justification: This project develops new technologies to enable design, procurement, repair, and modification of more supportable and affordable weapon systems. These technologies permit integration of design trade off decisions among survivability, producibility, and supportability, including development and use of analyses to assess impacts on system supportability while initiatives are still in the concept design stage.

(U) FY 1994:

- (U) Developed engineering design and analysis methods and tools to improve Air Force maintenance and address requirements for improved reliability/maintainability of Air Force systems. ($3,003K)
  - -- (U) Developed technology for an animated 3-D computer graphics software program that takes human motions and links them together to replicate human maintenance actions.
  - -- (U) Completed technology to assess a B-1B maintenance task for Oklahoma City Air Logistics Center using a computer-aided design modeled work cell and human figure simulation of a reach/lift task
  - -- (U) Developed requirements and draft specifications for a proof-of-concept operability tool that when complete will allow program offices to evaluate user-system concepts prior to software and hardware procurement
- (U) Conducted technology needs analysis and developed analytical tools to meet Air Force logistics needs and improve aircraft repair/support methods and equipment effectiveness. ($1,475K)
  - -- (U) Developed new logistics information analysis methods to support maintenance efforts at Air Logistics Centers
  - -- (U) Developed experimental software to support planning, scheduling, and maintenance operations for E-3 Program Depot Maintenance

(U) FY 1995:

- (U) Continue to develop and demonstrate engineering design and analysis methods and tools to improve Air Force maintenance and address requirements for improved reliability/maintainability of Air Force systems. ($4,042K)
  - -- (U) Develop and integrate an improved human hand model with a virtual reality hand control device for use by systems designers and human factors/logistics support engineers.
  - -- (U) Develop a distributed, virtual reality interface for human engineering analysis tools.
  - -- (U) Continue building operability analysis tools.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #3, Advanced Development	PE NUMBER AND TITLE: PE 0603106F, Logistics Systems Technology — PROJECT NO.: 2940

- (U) Continue to develop and demonstrate analysis tools to identify and meet Air Force logistics needs and improve aircraft repair/support methods and equipment effectiveness. ($823K)
  - -- (U) Complete demonstration of Program Depot Maintenance (PDM) information modeling support for AF maintenance operations.

(U) FY 1996:

- (U) Continue development of engineering design and analysis methods and technologies to improve Air Force maintenance and address requirements for improved system reliability/maintainability. ($2,555K)
  - -- (U) Build mockups and conduct functional demonstration of operability assessment software tools for analysis of satellite control operations.
  - -- (U) Develop technology to assess multiple human model maintenance tasks for improved operator interfaces early in the design cycle, including environmental conditions in a simulated work cell.
- (U) Continue development of analysis tools to identify and needs and improve aircraft repair/support methods and equipment effectiveness. ($2,813K)
  - -- (U) Develop variable deployment readiness assessment methods, criteria and metrics.
  - -- (U) Develop and verify methods to help Air Force logisticians more effectively support the analysis process.
- (U) Develop and demonstrate engineering design trade off methods and software tools to make acquisition/support of Air Force systems more affordable. ($1,072K)
  - -- (U) Build and demonstrate analytic trade-off methods to allow designers and users to assess affordability versus performance, support cost, risk, etc., in early development.
  - -- (U) Develop decision analysis criteria and metrics for affordability integration.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #3, Advanced Development	PE NUMBER AND TITLE: PE 0603106F, Logistics Systems Technology / PROJECT NO.: 2940

(U) FY 1997:

- (U) Continue development of engineering design, analysis methods and technologies to improve Air Force maintenance and address requirements for improved reliability/maintainability. ($3,513K)
  - -- (U) Create and validate methods for documenting maintenance technician performance requirements for automatic insertion in the Logistics Support Analysis Record
  - -- (U) Develop criteria/metrics for design engineering assessment of system deployment footprint, supportability, airlift/transportation requirements and on-site support. Demonstrate tool feasibility on new support equipment concepts.
  - -- (U) Develop analysis tools to improve material handling processes within the logistics community
- (U) Continue to develop and demonstrate analysis tools to identify and meet Air Force logistics needs and improve aircraft repair/support methods. ($1,352K)
  - -- (U) Build and demonstrate data collection and decision support technologies for operational logistics requirements.
  - -- (U) Test the flexibility and accuracy of this multi-user technology with commercial analytical tools.
- (U) Continue development of engineering design trade off methods and software tools to make acquisition/support of Air Force systems more affordable. ($1,651K)
  - -- (U) Develop and/or modify existing technologies to capture relevant data during technical development. Demonstrate the feasibility these technologies have for assessing system affordability early in development
  - -- (U) Build software tools to define affordability metrics and exit criteria during technology design and development.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #3, Advanced Development

PE NUMBER AND TITLE: PE 0603106F, Logistics Systems Technology

PROJECT NO.: 2940

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	5,904	5,936	6,472	6,258	Cont
Current President's Budget	4,478	4,865	6,440	6,516	Cont

Change Summary Explanation:

Funding: Increases in FY 1996 and FY 1997 support initiatives to improve reliability/maintainability of existing and future weapon systems.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0602202F, Human Systems Technology.
- (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.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: **February 1995**

BUDGET ACTIVITY: **#3, Advanced Development**

PE NUMBER AND TITLE: **PE 0603106F, Logistics Systems Technology**

PROJECT NO.: **2950**

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 2950, Improved Logistics and Maintenance Performance	6,309	4,755	6,463	6,594	7,575	7,989	8,830	9,345	Cont	Cont

A. (U) Mission Description and Budget Item Justification: This project develops technologies that will improve logistics and maintenance support including: development and demonstration of technology essential to field and depot maintenance operations; implementation of near-term logistics technology to shorten the time between user requirement definition and usable product delivery; and development and demonstration of technologies for flightline and Air Logistics Center maintenance technicians.

(U) FY 1994:
- (U) Completed Integrated Maintenance Information System (IMIS) field demonstration software and began field testing and analysis of impact on field maintenance operations. ($5,480K)
  - -- (U) Completed software development and cockpit integration for demonstrating automated integrated technical information to user.
  - -- (U) Completed the end-to-end and constrained field tests at Luke AFB AZ for transitioning proven technology to implementation
- (U) Conducted needs assessment and evaluation of the effects of electronic technical data on various types of field and depot maintenance. ($829K)
  - -- (U) Developed an initial data collection to support a maintenance model development effort for programmed depot maintenance operation.
  - -- (U) Collected required data to support development of a functional economic analysis model for an integrated system to support programmed depot maintenance operations.

(U) FY 1995:
- (U) Complete IMIS field demonstration and transition IMIS function specifications to users. ($1,755K)
  - -- (U) Complete IMIS field demonstrations.
  - -- (U) Make available for transition the hardware, software, and specifications to the Integrated Maintenance Data System Program Office.
- (U) Develop and demonstrate methodologies and tools to evaluate the benefits of electronic technical data for planning and implementing various types of field and depot maintenance. ($3,000K)
  - -- (U) Complete information model development for the Integrated Technical Information program.
  - -- (U) Complete integrated Technical Information program architecture and software specifications

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)		DATE
		February 1995
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT NO.
#3, Advanced Development	PE 0603106F, Logistics Systems Technology	2950

(U) FY 1996:
- (U) Continue to develop and demonstrate methodologies and technologies to evaluate the benefits of electronic technical data for planning and implementing various types of field and depot maintenance. ($3,509K)
  -- (U) Evaluate various software technology systems to automatically convert aircraft drawings and technical orders into electronic formats.
  -- (U) Complete requirements analysis for the Aircraft Battle Damage Repair (ABDR) combat maintenance environment.
  -- (U) Evaluate various logistical technology designs for development, demonstration and evaluation at user field sites.
- (U) Develop and demonstrate technologies for improved logistics planning and deployed maintenance operations. ($2,954K)
  -- (U) Demonstrate advanced virtual reality technologies.
  -- (U) Develop software tools for wing level logistics planners.

(U) FY 1997:
- (U) Continue to develop and demonstrate methodologies and technologies to evaluate the benefits of electronic technical data for planning and implementing various types of field and depot maintenance. ($4,800K)
  -- (U) Continue the ABDR design development for determining readiness for field testing.
  -- (U) Continue evaluation and demonstrate designs for application to logistical systems at user field sites.
  -- (U) Complete the system design for the automatic conversion of aircraft drawings and technical orders into electronic format.
- (U) Continue to develop and demonstrate technologies for improved logistics planning and deployed maintenance operations. ($1,794K)
  -- (U) Complete information analysis required to develop a technology to improve wing level logistics planner environment.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #3, Advanced Development

PE NUMBER AND TITLE: PE 0603106F, Logistics Systems Technology

PROJECT NO.: 2950

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	4,426	6,004	6,497	6,350	Cont
Current President's Budget	6,309	4,755	6,463	6,594	Cont

Change Summary Explanation:

Funding: Increases in FY 1996 and FY 1997 support initiatives to improve reliability/maintainability of existing and future weapon systems.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0207219F, Advanced Tactical Fighter.
- (U) PE 0602202F, Human Systems Technology.
- (U) PE 0603721N, Integrated Diagnostic Support.
- (U) PE 0604708F, Generic Integrated Maintenance Diagnostics Systems.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #3, Advanced Development

PE NUMBER AND TITLE: PE 0603112F, Advanced Materials for Weapon Systems

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Total PE 0603112F Cost	21,883	19,972	23,283	24,018	25,798	25,951	27,542	29,148	Cont	Cont
Project 2100, Laser Hardened Materials	8,232	9,937	10,574	10,736	12,014	11,600	12,312	13,028	Cont	Cont
Project 3153, Non-Destructive Inspection Development	3,005	4,034	5,840	6,139	6,444	6,761	7,175	7,595	Cont	Cont
Project 3946, Materials Transition	10,646	6,001	6,869	7,143	7,340	7,590	8,055	8,525	Cont	Cont

A. (U) Mission Description and Budget Item Justification: This Advanced Development program develops, demonstrates, and transitions laser hardening techniques, Non-Destructive Inspection/Evaluation (NDI/E), and technology maturation of new aerospace materials. The developed material technologies improve the affordability, supportability, reliability, survivability, and operational performance of current and future warfighting systems. All efforts in this program contain the resources necessary, including civilian salaries, to manage, conduct, and document the technical activities.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #3, Advanced Development

PE NUMBER AND TITLE: PE 0603112F, Advanced Materials for Weapon Systems

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	22,698	19,900	20,399	21,132	Cont
Appropriated Value	22,825	20,400			
Adjustments to Appropriated Value:					
a. Congressional General Reductions	-127	-428			
b. SBIR	-315				
c. Omnibus Reprogramming	-500				
Current President's Budget	21,883	19,972	23,283	24,018	Cont

Change Summary Explanation:

Funding: Changes due to additional emphasis on improved manufacturing processes and aging aircraft.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary: Not Applicable.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #3, Advanced Development

PE NUMBER AND TITLE: PE 0603112F, Advanced Materials for Weapon Systems 2100

PROJECT NO.

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 2100, Laser Hardened Materials	8,232	9,937	10,574	10,736	12,014	11,600	12,312	13,028	Cont	Cont

A. (U) Mission Description and Budget Item Justification: This project develops new materials and concepts for protecting Air Force assets such as aircrews, munitions, sensors, transparencies, and structures against laser radiation. The goal is to ensure mission capability before, during, and after laser exposure. The world laser market is rapidly expanding with easy export to any nation. Survivability solutions must account for a variety of lasers facing a mission. Current protection schemes are activated by intensity or color and are only capable of countering a specific portion of the laser threat. To harden systems against all potential lasers, a combination of approaches is required. Concepts are demonstrated on representative hardware to ensure that demonstrated hardening options are available for transition to Air Force systems.

(U) FY 1994:
- (U) Developed advanced materials technologies that enhance laser hardening for Air Force aircraft structures. ($1,092K)
  - -- (U) Installed 1.06 micron laser in the Laser Hardening Materials Evaluation Laboratory (LHMEL) providing the Air Force with a unique test capability.
  - -- (U) Completed laser susceptibility testing of special structural materials.
- (U) Developed advanced materials technologies that enhance laser hardening for Air Force aircrews. ($3,832K)
  - -- (U) Evaluated holographic technology application to aircrew spectacles.
  - -- (U) Identified potential materials technologies to provide laser protection for night vision goggles.
- (U) Developed advanced materials technologies that enhance laser hardening for sensors, avionics, and components. ($3,308K)
  - -- (U) Completed work on advanced solid state limiter for broadband sensor laser protection.
  - -- (U) Completed work on advanced spatial light modulator for broadband laser sensor protection.

(U) FY 1995:
- (U) Develop advanced materials technologies that enhance laser hardening for Air Force aircraft structures. ($1,206K)
  - -- (U) Completed the laser hardening design portion of the Mission Integrated Transparency System (MITS) program for the next generation canopy.
  - -- (U) Investigate hardening approaches for special structural materials.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #3, Advanced Development	PE NUMBER AND TITLE: PE 0603112F, Advanced Materials for Weapon Systems 2100 — PROJECT NO.

- (U) Develop advanced materials technologies that enhance laser hardening for Air Force aircrews. ($4,571K)
  - -- (U) Complete work on interim statistical laser eye protection using advanced coating (rugate) technology.
  - -- (U) Complete work on visor hardcoats and dyes.
- (U) Develop advanced materials technologies that enhance laser hardening for sensors, avionics, and components. ($4,160K)
  - -- (U) Complete systems survey of current Air Force sensor systems to determine optimum hardening approaches.
  - -- (U) Investigate feasibility of hybrid switch approach to protect sensors from a wide variety of wavelengths and pulse widths.

(U) FY 1996:
- (U) Develop advanced materials technologies that enhance laser hardening for Air Force aircraft structures. ($1,546K)
  - -- (U) Evaluate canopy protection technologies in preparation for hardened transparency demonstration.
  - -- (U) Investigate applicability of laser hardening technologies for missile and aircraft radomes.
- (U) Develop advanced materials technologies that enhance laser hardening for Air Force aircrews. ($4,541K)
  - -- (U) Complete program to provide laser eye protection for Military Airlift Command aircrews at night.
  - -- (U) Complete effort to develop holographic technologies for aircrew laser eye protection.
- (U) Develop advanced materials technologies that enhance laser hardening for sensors, avionics, and components. ($4,487K)
  - -- (U) Complete program to provide laser protection technologies for laser radars.
  - -- (U) Complete survivable, high performance optical sensor program.

(U) FY 1997:
- (U) Develop advanced materials technologies that enhance laser hardening for Air Force aircraft structures. ($1,625K)
  - -- (U) Complete evaluation of structural materials laser susceptibility under various mission profiles.
  - -- (U) Fabricate sub-scale canopy for demonstration of canopy laser protection technologies.
- (U) Develop advanced materials technologies that enhance laser hardening for Air Force aircrews. ($4,665K)
  - -- (U) Evaluate demonstrated laser hardening approaches for application in Helmet-Mounted Displays.
  - -- (U) Investigate the use of advanced protection coatings in night vision goggles.
- (U) Develop advanced materials technologies that enhance laser hardening for sensors, avionics, and components. ($4,446K)
  - -- (U) Complete hardened Forward Looking Infrared (FLIR) system demonstration.
  - -- (U) Develop technologies to protect low light level television systems.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #3, Advanced Development

PE NUMBER AND TITLE: PE 0603112F, Advanced Materials for Weapon Systems 2100

PROJECT NO.

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	8,682	9,990	11,081	11,687	Cont
Current President's Budget	8,232	9,937	10,574	10,736	Cont

Change Summary Explanation:

Funding: Not Applicable.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0602102F, Materials.
- (U) PE 0602202F, Human Systems Technology.
- (U) PE 0603231F, Crew Systems and Personnel Protection Technology.
- (U) PE 0604706F, Life Support System.
- (U) PE 0708011F, Industrial Base Program.
- (U) Coordinated through the Tri-Service Laser Hardening Materials and Structures Working Group and the Joint Service Agile Laser Eye Protection Program.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #3, Advanced Development

PE NUMBER AND TITLE: PE 0603112F, Advanced Materials for Weapon Systems 3153

PROJECT NO.: 3153

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 3153, Non-Destructive Inspection Development	3,005	4,034	5,840	6,139	6,444	6,761	7,175	7,595	Cont	Cont

A. (U) Mission Description and Budget Item Justification: Develops and demonstrates advanced Non-Destructive Inspection/Evaluation (NDI/E) methods and procedures to monitor performance integrity and to detect failure causing conditions in weapon system components and materials. NDI/E capabilities greatly influence and/or limit many designs, manufacturing, and maintenance practices. Reduction in the number of fighter wings and the need for rapid sortie generation demand an ability to perform real-time NDI/Es faster than current capability. This project provides technology to satisfy critical Air Force requirements to extend lifetimes of current systems through increased reliability and cost-effectiveness at field and depot maintenance levels, as well as assuring manufacturing quality, integrity, and safety requirements.

(U) FY 1994:
- (U) Developed advanced technologies for improved capabilities in materials corrosion testing, monitoring, and inspection of aging aircraft. ($1,425K)
  -- (U) Cataloged system requirements for corrosion inspection of aging aircraft in preparation for implementation of corrosion program.
- (U) Developed advanced electromagnetic radiation (i.e., x-ray, gamma-ray, and laser) NDI/E technologies for improved capabilities in materials testing, monitoring, inspection, and maintenance. ($1,580K)
  -- (U) Evaluated non-destructive evaluation approaches for man portable large area composite inspection of aircraft wing and fuselage sections.
  -- (U) Completed development of high resolution three-dimensional computed tomography for complex aircraft structures.

(U) FY 1995:
- (U) Continue development of advanced technologies for improved capabilities in materials corrosion testing, monitoring, and inspection of aging aircraft. ($2,121K)
  -- (U) Evaluate corrosion non-destructive evaluation data fusion to simplify inspection of aircraft structures.
- (U) Continue development of advanced electromagnetic radiation (i.e., x-ray, gamma-ray, and laser) NDI/E technologies for improved capabilities in materials testing, monitoring, inspection, and maintenance. ($1,913K)
  -- (U) Investigate advanced non-destructive evaluation techniques for turbine engine components.
  -- (U) Complete demonstration of high resolution three-dimensional computed tomography for complex aircraft structures.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #3, Advanced Development	PE NUMBER AND TITLE: PE 0603112F, Advanced Materials for Weapon Systems 3153 — PROJECT NO.

(U) FY 1996:
- (U) Continue development of advanced technologies for improved capabilities in materials corrosion testing, monitoring, and inspection of aging aircraft. ($3,157K)
  -- (U) Continue to evaluate corrosion non-destructive evaluation data fusion to simplify inspection of aircraft structures.
  -- (U) Develop corrosion detection systems for passive detection of aircraft structural corrosion.
- (U) Continue development of advanced electromagnetic radiation (i.e., x-ray, gamma-ray, and laser) Non-Destructive Inspection/Evaluation (NDI/E) technologies for improved capabilities in materials testing, monitoring, inspection, and maintenance. ($2,683K)
  -- (U) Develop high resolution, real-time radioscopy for digitized (filmless) inspection of aircraft structures.
  -- (U) Develop man portable large area composite inspection technologies for inspection of aircraft wing and fuselage sections.

(U) FY 1997:
- (U) Continue development of advanced technologies for improved capabilities in materials corrosion testing, monitoring, and inspection of aging aircraft. ($4,311K)
  -- (U) Continue to develop corrosion detection systems for passive detection of aircraft structural corrosion.
  -- (U) Develop technologies for detection of hidden flaws in complex aircraft structures.
- (U) Continue development of advanced electromagnetic radiation (i.e., x-ray, gamma-ray, and laser) NDI/E technologies for improved capabilities in materials testing, monitoring, inspection, and maintenance. ($1,828K)
  -- (U) Evaluate the use of computed tomography for failure analysis of complex structures.
  -- (U) Develop remote inspection microwave non-destructive evaluation techniques for aircraft structures.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #3, Advanced Development

PE NUMBER AND TITLE: PE 0603112F, Advanced Materials for Weapon Systems 3153

PROJECT NO.: 3153

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	3,170	4,019	4,120	4,268	Cont
Current President's Budget	3,005	4,034	5,840	6,139	Cont

Change Summary Explanation:

Funding: Changes due to emphasis on sustainment of aging aircraft.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0602102F, Materials.
- (U) PE 0708011F, Manufacturing Technology.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #3, Advanced Development

PE NUMBER AND TITLE: PE 0603112F, Advanced Materials for Weapon Systems 3946

PROJECT NO.: 3946

COST ($ In Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 3946, Materials Transition	10,646	6,001	6,869	7,143	7,340	7,590	8,055	8,525	Cont	Cont

A. (U) Mission Description and Budget Item Justification: Develops processing and scale-up data on new materials to achieve their acceptance by designers, to shorten transition time into applications, and to provide the initial incentive for their industrial development.

(U) FY 1994:

- (U) Developed technologies and data bases to facilitate timely transition of advanced structures, propulsion, and subsystems materials to warfighters, industry, and academia. ($2,025K)
  - -- (U) Completed characterization of materials for space structures.
  - -- (U) Evaluated high temperature composite materials for use in aircraft aft fuselage sections.
- (U) Developed technologies and data bases to facilitate timely transition of advanced electronics, optics, and survivability materials to warfighters, industry, and academia. ($1,276K)
  - -- (U) Completed high thermal resistant coatings for use on strategic aircraft systems.
  - -- (U) Developed high durability infrared window materials and coatings for use in extreme environments.
- (U) Developed technologies and data bases to facilitate timely transition of advanced materials for improved systems support and operational support to warfighters, industry, and academia. ($7,345K)
  - -- (U) Characterized the physical properties of advanced structural materials and provided design allowable data to designers.

(U) FY 1995:

- (U) Continue development of technologies and data bases to facilitate timely transition of advanced structures, propulsion, and subsystems materials to warfighters, industry, and academia. ($2,460K)
  - -- (U) Complete demonstration of the use of ceramic composites in advanced engine components.
  - -- (U) Complete characterization of thermoplastics for application in load bearing aircraft doors.
- (U) Continue development of technologies and data bases to facilitate timely transition of advanced electronics, optics, and survivability materials to warfighters, industry, and academia. ($1,740K)
  - -- (U) Continue development of high durability infrared window materials and coatings for use in extreme environments.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #3, Advanced Development	PE NUMBER AND TITLE: PE 0603112F, Advanced Materials for Weapon Systems 3946 — PROJECT NO.

- (U) Continue development of technologies and data bases to facilitate timely transition of advanced materials for improved systems support and operational support to warfighters, industry, and academia. ($1,801K)
  - -- (U) Characterize the physical properties of advanced structural materials and provide design allowable data to designers.

(U) FY 1996:

- (U) Continue development of technologies and data bases to facilitate timely transition of advanced structures, propulsion, and subsystems materials to warfighters, industry, and academia. ($2,800K)
  - -- (U) Complete transition of high temperature organic matrix composite material to aircraft aft fuselage sections.
  - -- (U) Demonstrate affordable permanent mold casting technology for titanium.
- (U) Continue development of technologies and data bases to facilitate timely transition of advanced electronics, optics, and survivability materials to warfighters, industry, and academia. ($3,459K)
  - -- (U) Develop infrared (IR) countermeasures materials which will provide lasers with the capability to counter a variety of IR threat munitions.
  - -- (U) Develop IR detector materials for high performance, very long wavelength for space applications.
- (U) Continue development of technologies and data bases to facilitate timely transition of advanced materials for improved systems support and operational support to warfighters, industry, and academia. ($610K)
  - -- (U) Continue to characterize the physical properties of advanced structural materials and provide design allowable data to designers.
  - -- (U) Evaluate improved materials and materials processes for potential use in aircraft systems.

(U) FY 1997:

- (U) Continue development of technologies and data bases to facilitate timely transition of advanced structures, propulsion, and subsystems materials to warfighters, industry, and academia. ($2,865K)
  - -- (U) Complete demonstration of nickel aluminide turbine engine blades.
  - -- (U) Develop new wrought gamma titanium processes for application in advanced turbine engines.
- (U) Continue development of technologies and data bases to facilitate timely transition of advanced electronics, optics, and survivability materials to warfighters, industry, and academia. ($3,634K)
  - -- (U) Complete demonstration of IR window materials and coatings for durability in supersonic and extreme environments.
  - -- (U) Develop thermal control coatings for space applications.
- (U) Continue development of technologies and data bases to facilitate timely transition of advanced materials for improved systems support and operational support to warfighters, industry, and academia. ($644K)
  - -- (U) Continuue to characterize the physical properties of advanced structural materials and provide design allowable data to designers.
  - -- (U) Continue to evaluate improved materials and materials processes for potential use in aircraft systems.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #3, Advanced Development

PE NUMBER AND TITLE: PE 0603112F, Advanced Materials for Weapon Systems 3946

PROJECT NO.:

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	10,846	5,981	5,198	5,177	Cont
Current President's Budget	10,646	6,001	6,869	7,143	Cont

Change Summary Explanation:

Funding: Increase in FY 1994 due to Congressional add of $7.0 million for the National Center for Industrial Competitiveness. Changes due to additional emphasis on improved materials and materials processes and sustainment of aging aircraft.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0602102F, Materials.
- (U) PE 0603211F, Aerospace Structures.
- (U) PE 0603202F, Aerospace Propulsion Subsystem Integration.
- (U) PE 0603203F, Advanced Avionics for Aerospace Vehicles.
- (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.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #3, Advanced Development

PE NUMBER AND TITLE: PE 0603202F, Aircraft Propulsion System Integration

PROJECT NO.: 668A

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
PE 0603202F Cost	26,452	29,408	29,818	29,149	30,356	31,094	32,843	34,606	Cont	Cont
Project 668A, Aircraft Propulsion Subsystem Integration	26,452	29,408	29,818	29,149	30,356	31,094	32,843	34,606	Cont	Cont

A. (U) Mission Description and Budget Item Justification: This Advanced Development program develops and demonstrates gas turbine propulsion system technologies applicable to a broad range of aircraft. The Aircraft Propulsion Subsystem Integration (APSI) program has three distinct tasks. Task I develops affordable and durable system component technology such as low pressure fans and low pressure turbines (LPT), engine controls, and nozzles. Task II includes demonstrator engines such as the Joint Technology Demonstrator Engine (JTDE) for manned systems and the Joint Expendable Turbine Engine Concept (JETEC) for cruise missile applications. These demonstrator engines apply the core technology developed under the Advanced Turbine Engine Gas Generator (ATEGG) program. Task III focuses on the system integration aspects of inlets, nozzles, engine/airframe compatibility, and low-observable technologies. This program will provide aircraft with: potential for longer range, higher cruise speed with lower specific fuel consumption; surge power for successful engagements; high sortie rates with reduced maintenance; reduced life cycle cost; and improved survivability resulting in increased mission effectiveness. The APSI program supports the demonstration of performance, cost, and durability goals of the Integrated High Performance Turbine Engine Technology (IHPTET) program. IHPTET is a three phase, totally integrated DOD, ARPA, NASA, and industry initiative focused on doubling turbine engine propulsion capabilities while reducing cost of ownership. The IHPTET program structure provides continuous technology transition for military turbine engine upgrades and derivatives and has the added benefit of enhancing the U.S. turbine engine industry's international competitiveness. All efforts in this program element contain the resources necessary, including civilian salaries, to manage, conduct, and document the technical activities.

(U) FY 1994:

- (U) Designed, fabricated, and demonstrated fans, low pressure turbines, engine controls, exhaust nozzles, and integration technology for turbofan/turbojet engines for current and future Air Force aircraft. ($4,746K)
  - -- (U) Demonstrated lightweight, multi-functional nozzle technology.
  - -- (U) Fabricated and demonstrated lightweight composite actuators.
  - -- (U) Demonstrated multi-variable control technology.
  - -- (U) Designed and fabricated low signature axisymmetric nozzle.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #3, Advanced Development	PE NUMBER AND TITLE: PE 0603202F, Aircraft Propulsion System Integration — PROJECT NO.: 668A

- (U) Designed, fabricated, and tested technology demonstration engines for turbofan/turbojet engines for fighters, attack aircraft, bombers, and transports. ($17,297K)
  - -- (U) Fabricated and demonstrated a lightweight, organic composite intermediate case.
  - -- (U) Demonstrated three stage, three-dimensional (3-D) swept aerodynamics fan technology.
  - -- (U) Demonstrated high work, multi-lug low pressure turbine technology.
  - -- (U) Demonstrated high temperature brush seals.
  - -- (U) Designed a swept aerodynamic fan with hollow metal matrix composite blades.
  - -- (U) Designed and fabricated advanced, high throughflow fan and high stability fan casing treatment technologies.
  - -- (U) Designed and fabricated advanced low pressure turbine cooling technology.
- (U) Designed, fabricated, and tested technology demonstration engines for expendable engines for missile applications. ($4,409K)
  - -- (U) Designed high heat release combustor and hybrid ceramic bearings.
  - -- (U) Fabricated mixed flow turbine, ceramic matrix composite (CMC) turbine shroud ,and propfan propulsor with counter rotating, vaneless turbines.

(U) FY 1995:

- (U) Design, fabricate, and demonstrate fans, low pressure turbines, engine controls, exhaust nozzles, and integration technology for turbofan/turbojet engines for current and future Air Force aircraft. ($4,355K)
  - -- (U) Fabricate and demonstrate low signature, lightweight axisymmetric nozzle.
  - -- (U) Rig test an advanced concepts fan incorporating two-stage swept aero fan technology.
- (U) Design, fabricate, and test technology demonstration engines for turbofan/turbojet engines for fighters, attack aircraft, bombers, and transports. ($20,825K)
  - -- (U) Fabricate and demonstrate a swept aerodynamic fan with hollow metal matrix composite blades.
  - -- (U) Fabricate and demonstrate advanced, high throughflow fan and high stability fan casing treatment technologies.
  - -- (U) Fabricate and demonstrate advanced low pressure turbine cooling technology.
  - -- (U) Design forward swept fan technology.
  - -- (U) Design Castcool, Nickel Aluminide, and Internal Convective Enhancement (ICE) turbines.
  - -- (U) Design integration technologies including metal matrix composite shafts, hybrid ceramic bearings, and counterrotating vaneless turbine.
  - -- (U) Design variable cycle engine with fixed geometry, fluidic area control, and fluidic thrust vectoring exhaust nozzle technologies.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE February 1995
BUDGET ACTIVITY: #3, Advanced Development	PE NUMBER AND TITLE: PE 0603202F, Aircraft Propulsion System Integration — PROJECT NO.: 668A

- (U) Design, fabricate, and test technology demonstration engines for expendable engines for missile applications. ($4,228K)
  - -- (U) Design carbon/silicon carbide (C/SiC) exhaust nozzle and high throughflow combustor.
  - -- (U) Design efficient, lightweight lamilloy hot section, including first use of MA754 sheet material for turbine nozzle.
  - -- (U) Demonstrate mixed flow turbine and ceramic matrix composite (CMC) turbine shroud on a very low fuel consumption propfan engine.

(U) FY 1996:

- (U) Design, fabricate, and demonstrate fans, low pressure turbines, engine controls, exhaust nozzles, and integration technology for turbofan/turbojet engines for current and future Air Force aircraft. ($4,418K)
  - -- (U) Design and fabricate distributed and model-based engine controls.
- (U) Design, fabricate, and test technology demonstration engines for turbofan/turbojet engines for fighters, attack aircraft, bombers, and transports. ($21,112K)
  - -- (U) Design and fabricate forward swept fan technology.
  - -- (U) Design and fabricate Castcool, Nickel Aluminide, and Internal Convective Enhancement (ICE) turbines.
  - -- (U) Design and fabricate integration technologies including metal matrix composite shafts, hybrid ceramic bearings, and counterrotating vaneless turbine.
  - -- (U) Design and fabricate variable cycle engine with fixed geometry, fluidic area control, and fluidic thrust vectoring exhaust nozzle technologies.
- (U) Design, fabricate, and test technology demonstration engines for expendable engines for missile applications. ($4,288K)
  - -- (U) Fabricate high pressure ratio, forward swept compressor stage.
  - -- (U) Fabricate efficient, lightweight lamilloy hot section with first use of high temperature capable MA754 sheet material for turbine nozzle.
  - -- (U) Fabricate low-cost, uncooled ceramic hot sections.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT NO.
#3, Advanced Development	PE 0603202F, Aircraft Propulsion System Integration	668A

(U) FY 1997:

- (U) Design, fabricate, and demonstrate fans, low pressure turbines, engine controls, exhaust nozzles, and integration technology for turbofan/turbojet engines for current and future Air Force aircraft. ($4,175K)
  - -- (U) Complete fabrication and demonstrate distributed and model-based engine controls.
- (U) Design, fabricate, and test technology demonstration engines for turbofan/turbojet engines for fighters, attack aircraft, bombers, and transports. ($20,924K)
  - -- (U) Complete fabrication and demonstrate forward swept fan technology.
  - -- (U) Complete fabrication and demonstrate Castcool, Nickel Aluminide, and Internal Convective Enhancement (ICE) turbines.
  - -- (U) Complete fabrication and demonstrate integration technologies including metal matrix composite shafts, hybrid ceramic bearings, and counterrotating vaneless turbine.
  - -- (U) Complete fabrication and demonstrate variable cycle engine with fixed geometry, fluidic area control, and fluidic thrust vectoring exhaust technologies.
- (U) Design, fabricate, and test technology demonstration engines for expendable engines for missile applications. ($4,050K)
  - -- (U) Demonstrate high pressure ratio, forward swept compressor stage.
  - -- (U) Demonstrate efficient, lightweight lamilloy hot section with first use of high temperature capable MA754 sheet material.
  - -- (U) Demonstrate low-cost, uncooled ceramic hot section.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #3, Advanced Development

PE NUMBER AND TITLE: PE 0603202F, Aircraft Propulsion System Integration

PROJECT NO.: 668A

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	27,848	29,941	28,968	30,300	Cont
Appropriated Value	28,004	29,941			
Adjustments to Appropriated Value:					
a. Congressional General Reductions	-165	-533			
b. SBIR	-387				
c. Omnibus Reprogramming	-1,000				
Current President's Budget	26,452	29,408	29,818	29,149	Cont

Change Summary Explanation:

Funding: Not Applicable.

Schedule: Not Applicable.

Technical: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #3, Advanced Development	PE NUMBER AND TITLE: PE 0603202F, Aircraft Propulsion System Integration — PROJECT NO.: 668A

C. (U) Other Program Funding Summary:

(U) Related Activities:
- (U) PE 0602203F, Aerospace Propulsion.
- (U) PE 0603112F, Advanced Materials for Weapon Systems.
- (U) PE 0603216F, Aerospace Propulsion and Power Technology.
- (U) PE 0602122N, Aircraft Technology.
- (U) PE 0603217N, Air Systems Advanced Technology Demonstration.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #3, Advanced Development

PE NUMBER AND TITLE: 0603203F, Advanced Avionics for Aerospace Vehicles

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Total PE 0603203F Cost	25,077	27,983	32,131	31,013	32,853	34,490	36,488	37,516	Cont	Cont
Project 1177, Target Recognition	3,627	0	0	0	0	0	0	0	Cont	Cont
Project 2334, Airborne Radar Electronic Counter-Countermeasures	4,250	0	0	0	0	0	0	0	Cont	Cont
Project 665A, Airborne Sensor Technology	13,837	15,793	14,528	13,779	13,930	14,550	15,689	16,171	Cont	Cont
Project 69CK, Advanced Electronics	0	3,712	3,534	3,411	3,614	3,794	4,014	4,127	Cont	Cont
Project 69DF, Target Attack and Recognition Technology	3,363	8,478	14,069	13,823	15,309	16,146	16,785	17,218	Cont	Cont

A. (U) Mission Description and Budget Item Justification: This Advanced Development program provides advanced technology to enable continued avionics superiority. Military force structures must contain combat aircraft able to defeat increasingly sophisticated active and passive countermeasures, destroy a wide variety of targets with precision, and reliably perform complex missions with less logistics support in a world of proliferating threats. This program responds to these needs by developing and demonstrating technologies and techniques for advanced radio frequency sensors (i.e., radar) and active and passive electro-optical sensors for airborne and ground targeting including: electronic counter-countermeasures; advanced electronics technologies for improvements in cost, weight, and reliability; and fire control/weapon delivery and target identification and recognition technologies and techniques for precision air and ground target kills. Emphasis is on detecting, locating, and targeting airborne and fixed and mobile time-critical ground threat targets with capability to adapt to changes in target signatures and background environments. These advanced avionics will provide for flexible, multi-function/multi-mission combat aircraft that can safely penetrate threat areas, destroy multiple ground targets per pass, perform air combat with positive beyond visual range detection and identification within a complex mix of look-alike friendly, neutral, and enemy aircraft, and return to fight again. All efforts in this program element contain the resources necessary, including civilian salaries, to manage, conduct, and document the technical activities.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #3, Advanced Development

PE NUMBER AND TITLE: PE 0603203F, Advanced Avionics for Aerospace Vehicles

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	25,531	34,500	40,302	41,178	Cont
Appropriated Value	25,725	28,500			
Adjustments to Appropriated Value:					
a. Congressional General Redutions	-194	-517			
b. SBIR	-354				
c. Below Threshold Reprogramming	-100				
Current President's Budget	25,077	27,983	32,131	31,013	Cont

Change Summary Explanation:

Funding: Increases due to increased program emphasis in Project 69DF for detecting and tracking relocatable ground-based targets.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary: Not Applicable.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #3, Advanced Development

PE NUMBER AND TITLE: PE 0603203F, Advanced Avionics for Aerospace Vehicles

PROJECT NO.: 1177

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 1177, Target Recognition	3,627	0	0	0	0	0	0	0	Cont	Cont

A. (U) Mission Description and Budget Item Justification: Develops and demonstrates avionics technologies and techniques required to achieve positive, high-confidence cueing, recognition, and identification of either airborne or ground-based targets at ranges compatible with tactical air-to-air and air-to-ground weapons, day or night, in adverse-weather, and in high-threat, multiple-target areas.

(U) FY 1994:

- (U) Develop dynamically adaptable target recognition technologies for radar and electro-optical systems using model-based vision (MBV) approach for targets, background, environment, and sensor. ($500K)
  - -- (U) Demonstrated feasibility of modeling tactical targets with high frequency signature codes.
- (U) Develop advanced MBV-based target recognition technologies applied to high resolution synthetic aperture radar for detecting, identifying, and targeting time-critical surface targets. ($1,627K)
  - -- (U) Baselined automatic radar target acquisition program (ARAGTAP) algorithms against tactical targets using synthetic signature data.
  - -- (U) Evaluated three different forward looking infrared algorithms to determine performance against tactical and critical mobile targets.
  - -- (U) Integrated performance evaluation tools into algorithm development environment.
- (U) Develop hostile target identification technologies for beyond visual range all-aspect identification and classification of airborne targets. ($1,500K)
  - -- (U) Demonstrated high performance on difficult ten target class problem with three unknowns.

(U) FY 1995: Not Applicable.

(U) FY 1996: Not Applicable.

(U) FY 1997: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #3, Advanced Development

PE NUMBER AND TITLE: PE 0603203F, Advanced Avionics for Aerospace Vehicles

PROJECT NO.: 1177

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	3,627	0	0	0	Cont
Current President's Budget	3,627	0	0	0	Cont

Change Summary Explanation:

Funding: Consolidated into Project 69DF beginning in FY 1995.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary: Not Applicable.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #3, Advanced Development

PE NUMBER AND TITLE: PE 0603203F, Advanced Avionics for Aerospace Vehicles

PROJECT NO.: 2334

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 2334, Airborne Radar Electronic Counter-Countermeasures	4,250	0	0	0	0	0	0	0	Cont	Cont

A. (U) Mission Description and Budget Item Justification: Develops and demonstrates electronic counter-countermeasure (ECCM) technologies and techniques for current and future airborne weapon system radars that must operate in intense electronic combat environments, with emphasis on methods to reduce radar susceptibilities to enemy electronic countermeasures (ECM).

(U) FY 1994:

- (U) Demonstrated a radar concept which will exploited advanced microwave and signal processing components to provide a more flexible and adaptive capability to respond to the ECM threat of the future. ($3,600K)
  - -- (U) Incorporated digital radio frequency memory ECM module into in-house airborne ECM simulation.
  - -- (U) Developed electronic counter-countermeasures (ECCM) algorithm for off-boresight tracking.
  - -- (U) Evaluated ECCM algorithms in airborne system using multiple fighters actively jamming the test radar system.
- (U) Developed and evaluated ECCM techniques to counter air intercept and synthetic aperture radar air-to-surface ECM threats to operational radar sensors. ($600K)
  - -- (U) Performed electronic warfare vulnerability assessment investigating neural net as ECM recognition technique.
  - -- (U) Designed conventional range doppler cumulative false alarm rate algorithms to use in experiments.
- (U) Evaluated simultaneous transmit and receiver along with wide bandwidth technology for multi-function aperture operation in new and upgraded radars. ($50K)
  - -- (U) Completed wide band adaptive cancellation techniques assessment for airborne radar systems.

(U) FY 1995: Not Applicable.

(U) FY 1996: Not Applicable.

(U) FY 1997: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #3, Advanced Development

PE NUMBER AND TITLE: PE 0603203F, Advanced Avionics for Aerospace Vehicles

PROJECT NO.: 2334

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	4,450	0	0	0	Cont
Current President's Budget	4,250	0	0	0	Cont

Change Summary Explanation:

Funding: Consolidated into Project 665A beginning in FY 1995.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary: Not Applicable.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #3, Advanced Development

PE NUMBER AND TITLE: PE 0603203F, Advanced Avionics for Aerospace Vehicles

PROJECT NO.: 665A

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 665A, Airborne Sensor Technology	13,837	15,793	14,528	13,779	13,930	14,550	15,689	16,171	Cont	Cont

A. (U) Mission Description and Budget Item Justification: Develops and demonstrates airborne sensor technologies, including electro-optical (EO) sensors, radars, and electronic counter-countermeasures (ECCM) for radars. This project provides the warfighter with the capability to precisely detect and target both airborne targets (conventional and low radar cross section) and ground-based high-value time-critical targets. Work includes developing both complete sensor capabilities as well as components. The desired warfighting capability includes the ability to detect and target in difficult background conditions, with emphasis on countering improvements in camouflage, concealment, and deception techniques that limit current capability to detect and track threats obscured by these means. Adaptive radar processing and ECCM techniques are developed to transition to operational and new systems and provide for continued sensor performance in the presence of an electromagnetic interference environment that can include both intentional and unintentional clutter and interference. EO sensors include passive, active, and integrated passive and active technologies. Passive sensors have the advantage of allowing the warfighter to detect, target, and strike, both airborne and ground targets, while remaining covert. Active sensors provide for high confidence target recognition capability at long-range and also provide for a wind sensing capability. Long-range target recognition will give our warfighters the operational advantage. Wind sensing enables precision weapon deployment and air cargo drop. The synergistic integration of these technologies will provide operational users the capability for an EO target engagement system that will maintain the combat advantage.

A memorandum of agreement has been established between the Air Force Wright Laboratory and the Advanced Research Project Agency (ARPA) to jointly develop the technology required to detect high-value time-critical targets in a variety of environments including camouflage, concealment, deception, and deep hide. This technology also has significant application on the civil sector, and the ARPA/Air Force program will collaborate with civil agencies where appropriate.

(U) FY 1994:

- (U) Developed advanced EO sensors for air-to-ground reconnaissance and targeting in adverse-weather with improved countermeasure immunity against concealed and camouflaged targets. ($1,053K)
  - -- (U) Evaluated multi-spectral ground target detection algorithms using data from a multi-agency data collection.
- (U) Developed advanced air-to-air EO sensors for target detection and tracking in high clutter environments with interface for real-time automated target recognition processing and enhanced situational displays. ($10,525K)
  - -- (U) Completed preliminary sensor system design for air-to-air infrared search and track (IRST) system.
  - -- (U) Reduced the size and radar cross section of the IRST window subsystem.
  - -- (U) Developed high fidelity EO sensor performance model.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #3, Advanced Development	PE NUMBER AND TITLE: 0603203F, Advanced Avionics for Aerospace Vehicles 665A

- (U) Developed laser radar technologies to provide for a wind profiling capability for precision first shot and air drop. Laser radar technologies will also be developed to provide a capability to detect, target, and identify high-value ground-based time-critical targets. ($2,259K)
  -- (U) Quantified AC-130H gunship performance with on-board wind profiler through use of end-to-end system models and experiments.

(U) FY 1995:
- (U) Fabricate a conformal, low-observable infrared search and track (IRST) window capable of meeting long-range detection requirements while minimizing adverse impacts to the aircraft platform. Integrate sensor, algorithm, and infrared phenomenology models into an IRST end-to-end simulation to evaluate sensor performance. Evaluate concepts for improving look down performance and reducing IRST size, weight, and cost. ($2,098K)
  -- (U) Complete testing of IRST window components.
  -- (U) Complete sensor performance prediction model.
  -- (U) Evaluate sensor performance through sensor performance simulations.
- (U) Develop affordable air-to-air electro-optical (EO) sensor concepts for target detection and tracking in high clutter with interface for real-time automated target declaration processing. ($981K)
  -- (U) Design sensor and evaluate for performance and affordability.
- (U) Develop advanced air-to-ground EO sensors for target detection and tracking in high clutter environments with interface for real-time automated target recognition processing. ($1,331K)
  -- (U) Perform multi-spectral tower-based data collection.
  -- (U) Evaluate multi-spectral sensor for the detection of ground-based threats in an open or obscured target environment.
- (U) Develop technologies for a wind profiling capability for precision first shot and air drop. Technologies will also be developed to provide a capability to detect, target, and identify high-value ground-based time-critical targets. ($2,453K)
  -- (U) Demonstrate airborne brassboard wind profiler by conducting a flight evaluation.
  -- (U) Develop eye-safe, flight worthy, high-power, high reliability laser transceiver for wind profiling system.
- (U) Develop and demonstrate radar electronic counter-countermeasure (ECCM) techniques for negating air intercept and synthetic aperture radar (SAR) (for air-to-surface) electronic countermeasure (ECM) threats. Evaluate operational sensors susceptibility to validated ECM threats. ($3,800K)
  -- (U) Collect SAR data against multiple jammers for use in developing system upgrades for potential application to APG-70 and APQ-164 weapon systems.
  -- (U) Develop adaptive processing algorithms to counter SAR jammers.
  -- (U) Develop ECCM techniques to negate the effects of digital radio frequency memory technologies.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #3, Advanced Development

PE NUMBER AND TITLE: 0603203F, Advanced Avionics for Aerospace Vehicles

PROJECT NO.: 665A

- (U) Develop adaptive processing techniques to negate clutter and electromagnetic interference, both intentional and intentional, for uninterrupted sensor performance and for increased detection and targeting performance against sophisticated and low radar cross section targets. ($869K)
  - -- (U) Develop adaptive processing algorithms and evaluate against raw radar data.
  - -- (U) Perform electronic protection vulnerability assessment using APG-68 and APG-70 radar data.
- (U) Develop and demonstrate, through a multi-Service program, the sensor and algorithm technology required to detect, identify, and target high-value time-critical targets obscured by foliage or concealed through deceptive techniques. ($1,933K)
  - -- (U) Collect instrumented airborne data and evaluate target detection algorithms for ground-based threats.
  - -- (U) Develop real-time signal processing capability to detect concealed time-critical targets with low false alarm rates.
- (U) Develop critical components required to achieve a low-cost radar architecture with improved weapon system life cycle cost. ($1,900K)
  - -- (U) Develop fighter aircraft aperture technology concepts to meet operational payoff requirements.
- (U) Develop and demonstrate, through a multi-Service program, the radar sensor technology required for a two-dimensional image of airborne high-value threats. This technology will aid in real-time, high confidence target detection. ($428K)
  - -- (U) Collect and analyze airborne data of fighter aircraft signatures for characteristics conducive to identification of airborne targets.

(U) FY 1996:

- (U) Fabricate a conformal, low-observable infrared search and track (IRST) window capable of meeting long-range detection requirements while minimizing adverse impacts to the aircraft platform. Integrate sensor, algorithm and infrared phenomenology models into an IRST end-to-end simulation for purposes of evaluating sensor performance. Evaluate concepts for improving look down performance and reducing IRST size, weight, and cost. ($1,666K)
  - -- (U) Complete evaluation of aero-optical effects in a supersonic wind tunnel.
- (U) Develop affordable air-to-air electro-optic (EO) sensor technology for long-range target detection and tracking. This effort incorporates the latest advances in technology to further reduce complexity, size, and cost of EO sensors. ($1,645K)
  - -- (U) Complete design of compact, affordable sensor for airborne weapon systems which require a long-range passive target detection capability.
- (U) Develop airborne, air-to-ground, wind profiling technologies to enhance first shot hit capability on the AC-130H gunships and greater precision air drops from cargo aircraft. Technology will decrease loiter time and increase operational altitude, thus improving survivability. ($1,507K)
  - -- (U) Demonstrate AC-130H gunship performance enhancement with airborne wind profiler.
  - -- (U) Transition wind profiling technologies program to Warner Robins Air Logistic Command for application to gunship platforms.
  - -- (U) Complete fabrication of flight worthy, high-power, high reliability laser transceiver for airborne evaluation of wind profiling sensor system.
- (U) Develop and demonstrate, through a multi-Service program, the EO multi-spectral sensor and algorithm technology required to passively search large areas, detect, and target ground-based threats in open or obscured environment. This is a cooperative effort between the Army, Navy, and Air Force. Passive search allows the user to remain covert. ($959K)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #3, Advanced Development	PE NUMBER AND TITLE: 0603203F, Advanced Avionics for Aerospace Vehicles 665A — PROJECT NO.

-- (U) Perform tower-based multi-spectral imaging data collection to enable design of airborne sensor for reconnaissance platforms.
-- (U) Demonstrate passive targeting of ground-based threats at extended weapon stand-off ranges (>20km from target).

- (U) Develop, demonstrate, and evaluate advanced laser technologies that provide pilots with positive, timely, and reliable identification. The identification (ID) information is compatible with existing ID/identify friend or foe (IFF) techniques. This technology will be packaged for existing electro-optic (EO) systems, and provide the multi-mission capability of supporting air-to-air missile launch at 60 km and air-to-ground weapon launch at 15-25 km. ($1,097K)
  -- (U) Demonstrate sensor capability at operationally useful ranges (>20km).
  -- (U) Evaluate three-dimensional imaging technologies in simulations using tower data and compare to conventional imaging and range-only techniques.
- (U) Develop and demonstrate radar electronic counter-countermeasure (ECCM) techniques to provide for a capability to negate air intercept and synthetic aperture radar (SAR) electronic countermeasure (ECM) threats. ($1,600K)
  -- (U) Develop/train neural net algorithms and test.
  -- (U) Perform SAR technique development, test, and evaluate its susceptibility to jamming.
  -- (U) Develop and evaluate digital radio frequency (RF) memory ECCM techniques to negate airborne electronic countermeasures.
- (U) Develop adaptive processing techniques to negate clutter and electromagnetic interference, both intentional and intentional, for uninterrupted sensor performance and increased detection and targeting performance against sophisticated and low radar cross section targets. ($1,500K)
  -- (U) Develop and evaluate algorithms to reduce effects of terrain scattering or radome reflections/clutter and improve target detection range.
  -- (U) Define data collection requirements and data analysis plan for selection of algorithms and techniques for airborne radar systems.
  -- (U) Perform data collection and data reduction/processing for adaptive processing algorithms.
- (U) Develop and demonstrate, through an Air Force-Navy-Advanced Research Projects Agency (ARPA) program, the sensor and algorithm technology required to detect, identify, and target high-value time-critical targets obscured by foliage or concealed through deceptive techniques. ($2,336K)
  -- (U) Perform data collections for algorithm development and selection.
  -- (U) Develop real-time, concealed target detection algorithms.
- (U) Develop technology required to achieve improved life cycle cost for current and future airborne radar apertures and systems. ($2,218K)
  -- (U) Design radar subsystem interface improvements for affordability and reliability.
  -- (U) Evaluate low-cost SAR motion compensation derived from Global Positioning System technology.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #3, Advanced Development

PE NUMBER AND TITLE: 0603203F, Advanced Avionics for Aerospace Vehicles

PROJECT NO.: 665A

(U) FY 1997:

- (U) Develop affordable air-to-air electro-optical (EO) sensor technology for long-range target detection and tracking, incorporating novel technology to further reduce complexity, size, and cost of EO sensors. ($1,961K)
  - -- (U) Complete design of compact, affordable EO sensor for long-range, passive detection of ground-based threats.
  - -- (U) Fabricate EO sensor breadboard.
- (U) Develop affordable multi-function EO sensor technology for long-range target detection and track/missile warning. This effort will combine the offensive and defensive functions into a single EO sensor, reducing volume and cost of the overall system. ($218K)
  - -- (U) Define multi-function sensor technologies for an integrated offensive and defensive sensor system.
- (U) Develop airborne, air-to-ground, wind profiling technologies to enhance first shot hit capability on the AC-130H gunships and greater precision air drops from cargo aircraft. Technology will decrease loiter time and increase operational altitude, thus improving survivability. ($872K)
  - -- (U) Complete evaluation of wind profiling system in cooperation with Warner Robins Air Logistics Command.
  - -- (U) Investigate technology issues related to improving cargo drop performance on C-130 aircraft utilizing wind profiling.
- (U) Develop and demonstrate, through a tri-Service program, the multi-spectral electro-optical sensor and algorithm technology required to passively search large areas, detect, and target ground-based targets in the open or obscured. Passive search allows the user to remain covert. ($872K)
  - -- (U) Verify multi-spectral targeting sensor performance using simulations on tower data for joint United Kingdom/France/U.S. Air Force/U.S. Navy fire control system development.
- (U) Develop, demonstrate, and evaluate advanced laser technologies that provide pilots with positive, timely, and reliable identification (ID). The ID information is compatible with existing ID/identify friend or foe (IFF) techniques. This technology will be packaged for existing EO systems, and provide the multi-mission capability of supporting air-to-air missile launch at 60 km and air-to-ground weapon launch at 15-25 km. ($2,252K)
  - -- (U) Demonstrate three-dimensional imaging capability in a field test.
- (U) Develop and demonstrate radar electronic counter-countermeasure (ECCM) techniques to negate air intercept and synthetic aperture radar (SAR) electronic countermeasure threats. ($1,700K)
  - -- (U) Develop synthetic SAR ECCM techniques.
  - -- (U) Evaluate SAR ECCM techniques utilizing a B-1B radar as an experimental testbed.
  - -- (U) Demonstrate electronic protection techniques using APG-70 radar as an experimental testbed.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #3, Advanced Development

PE NUMBER AND TITLE: 0603203F, Advanced Avionics for Aerospace Vehicles

PROJECT NO.: 665A

- (U) Develop adaptive processing techniques to negate clutter and electromagnetic interference, both intentional and intentional, for uninterrupted sensor performance and increased detection and targeting performance against sophisticated and low radar cross section targets. ($1,700K)
  - -- (U) Develop innovative concepts for additional target range "buy-back" using the limited degrees of freedom of the modern fighter and its projected environments.
  - -- (U) Evaluate high-payoff adaptive processing techniques with airborne radar performance data.
- (U) Develop and demonstrate, through an Air Force-Navy-Advanced Research Projecta Agency program, the radio frequency sensor and algorithm technology required to detect, identify, and target high-value time-critical targets obscured by foliage or concealed through deceptive techniques. ($1,930K)
  - -- (U) Evaluate required throughput of ground/airborne processor.
  - -- (U) Integrate the subject real-time capability into the airborne testbed for evaluation against concealed targets.
  - -- (U) Develop sensor specification for radar system capable of operating from an airborne platform such as an unmanned aerial vehicle.
- (U) Develop critical components required to achieve improved life cycle cost for radar apertures and systems for operational and future radar systems. ($2,274K)
  - -- (U) Fabricate low-cost antenna aperture for improved electronic scanned array performance.
  - -- (U) Evaluate aperture through laboratory and environmental experiments.
  - -- (U) Develop radar aperture improvement with life cycle cost reduction goal of 20-40%.

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	14,091	16,250	18,500	18,300	Cont
Current President's Budget	13,837	15,793	14,528	13,779	Cont

Change Summary Explanation:

Funding: Not Applicable.

Schedule: Not Applicable.

Technical: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #3, Advanced Development

PE NUMBER AND TITLE: 0603203F, Advanced Avionics for Aerospace Vehicles

PROJECT NO.: 665A

C. (U) Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0602204F, Aerospace Avionics.
- (U) PE 0603205F, Flight Vehicle Component and Subsystem Technology.
- (U) PE 0603707F, Weather Systems Advanced Development.
- (U) PE 062111N, Weapons Technology.
- (U) PE 062232N, Space and Electronic Warfare (SEW) Technology.
- (U) PE 0604249F, LANTIRN Night Precision Attack.
- (U) PE 0603270F, Electronic Combat Technology.
- (U) Advanced Research Projects Agency (ARPA) coordinated concealed target Memorandum of Agreement.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication. JDL Avionics TAP coordinated following PE's: 0603741D; 0603326E; 0602111N; 0602702F; 0603772A; 0603792N; 0603789F; 0603215C; 0602120A; 0603238N; 0603737D; and 0603710A.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #3, Advanced Development

PE NUMBER AND TITLE: PE 0603203F, Advanced Avionics for Aerospace Vehicles

PROJECT NO.: 69CK

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 69CK, Advanced Electronics	0	3,712	3,534	3,411	3,614	3,794	4,014	4,127	Cont	Cont

A. (U) Mission Description and Budget Item Justification: Develops and demonstrates devices, tools, and components that improve performance, reliability, and affordability of radar, communication, and electronic counter-countermeasure systems for both retrofit and new system applications. This includes monolithic solid state transmit/receive modules for airborne radar, high-speed analog-to-digital converters and advanced memory/logic for electronic countermeasures, high reliability electronics power distribution, microwave and microelectronics packaging and interconnect techniques, and integration of laser radar sources and electro-optical (EO) detector arrays.

(U) FY 1994: Not Applicable.

(U) FY 1995:

- (U) Develop advanced microelectronics component, power distribution, packaging, and interconnect technologies to provide for reduction in power consumption, cost, weight, and volume of target detection electronics. ($1,829K)
  - -- (U) Complete Phase I development of inorganic coatings for the encapsulation of integrated circuits in multichip assemblies for significant cost reduction of target detection electronic systems.
- (U) Develop advanced radio frequency (RF) component technologies to integrate multi-function microwave (MW) and millimeter wave (MMW) circuits for reduced airborne sensor cost, weight, and volume, and improved reliability of radar and targeting electronics. ($1,126K)
  - -- (U) Build the first wideband klystron which will meet Airborne Warning and Control System (AWACS) specifications which could replace two existing narrowband devices.
- (U) Develop advanced multi-function sensor electronics, including merged RF, EO, and digital elements for the capability of increased reliability and functionality at lower cost, weight, and volume in integrated airborne avionics. ($757K)
  - -- (U) Design multiplexers for receivers in transmit/receive modules for multi-mode phased array radar systems.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #3, Advanced Development	PE NUMBER AND TITLE: PE 0603203F, Advanced Avionics for Aerospace Vehicles PROJECT NO.: 69CK

(U) FY 1996:
- (U) Develop advanced microelectronics component, power distribution, packaging, and interconnect technologies to provide for reduction in power consumption, cost, weight, and volume of target detection electronics. ($1,736K)
  - -- (U) Develop Phase II multichip assemblies under the integrated circuit encapsulation program.
  - -- (U) Develop new power architectures and active devices for multi-function phased array systems containing both radio frequency (RF) and digital subsystems.
  - -- (U) Complete a Very High Speed Integrated Circuitry (VHSIC) hardware description language (VHDL) functional design of a radar signature prediction algorithm accelerator for reduced computational requirements.
  - -- (U) Build a graphics generator chip in 0.8 micrometer complimentary metal oxide semiconductor (CMOS) technology.
- (U) Develop advanced RF component technologies to integrate multi-function microwave (MW) and millimeter wave (MMW) circuits for reduced airborne sensor cost, weight, and volume, and improved reliability of radar and targeting electronics. ($919K)
  - -- (U) Demonstrate the reproducibility and manufacturability of the wide band klystron for Airborne Warning and Control System (AWACS).
  - -- (U) Initiate the development of low band MW power module for interrogator, transponder, communications, and navigation applications.
- (U) Develop advanced multi-function sensor electronic components, including merged RF, electro-optic (EO), and digital elements for the capability of increased reliability and functionality at lower cost, weight, and volume in integrated airborne avionics. ($879K)
  - -- (U) Fabricate and test the multiplexers for transmit/receive (TR) module receivers.
  - -- (U) Complete initial component and circuit designs for highly integrated MW/digital receivers which will move the digital interface closer to the front end of the system to reduce cost and improve performance.

(U) FY 1997:
- (U) Develop advanced microelectronics component, power distribution, packaging, and interconnect technologies to provide for reduction in power consumption, cost, weight, and volume of target detection electronics. ($1,665K)
  - -- (U) Fabricate and test power modules based on optimum backplane voltages, conversion techniques, and packaging.
  - -- (U) Verify the radar signature prediction algorithm and chip design using conventional 0.8 micrometer CMOS technology.
  - -- (U) Fabricate the full function graphics generator chip using advanced 0.35 micrometer minimum features.
- (U) Develop advanced RF component technologies to integrate multi-function MW and MMW circuits for reduced airborne sensor cost, weight, and volume, and improved reliability of radar and targeting electronics. ($1,033K)
  - -- (U) Demonstrate the initial driver and booster amplifier designs and complete the final design of the low band microwave power module.
- (U) Develop advanced multi-function sensor electronic components, including merged RF, EO, and digital elements for the capability of increased reliability and functionality at lower cost, weight, and volume in integrated airborne avionics. ($713K)
  - -- (U) Fabricate and test the candidate MW/digital receivers which offer greatest overall improvement in cost and performance.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #3, Advanced Development

PE NUMBER AND TITLE: PE 0603203F, Advanced Avionics for Aerospace Vehicles

PROJECT NO.: 69CK

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	0	3,785	4,433	4,530	Cont
Current President's Budget	0	3,712	3,534	3,411	Cont

Change Summary Explanation:

Funding: This project was denied funding by Congress in FY 1994.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0602204F, Aerospace Avionics.
- (U) PE 0603270F, Electronic Combat Technology.
- (U) PE 0603739E, Electronic Manufacturing Technology.
- (U) PE 0603706E, Microwave/Millimeter Wave Integrated Circuits.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #3, Advanced Development

PE NUMBER AND TITLE: PE 0603203F, Advanced Avionics for Aerospace Vehicles

PROJECT NO.: 69DF

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 69DF, Target Attack and Recognition Technology	3,363	8,478	14,069	13,823	15,309	16,146	16,785	17,218	Cont	Cont

A. (U) Mission Description and Budget Item Justification: Develops and demonstrates advanced technologies to provide for attack management, fire control, and target identification and recognition capabilities. The objective of this project includes developing and demonstrating integrated fire control techniques to provide for a capability of adverse-weather air-to-surface precision strike against multiple targets-per-pass and air-to-air engagement at maximum weapon launch range with cooperative launch deployment flexibility. Specific fire control technologies include attack management, sensor fusion, automated decision aids, advanced tracking for low radar cross section threats, and targeting using both on-board and off-board sensor information. These fire control developments will provide force multiplication and a reduction of exposure to hostile fire. The objective of this project also includes developing and demonstrating technologies to provide for positive, high confidence cueing, recognition, and identification of both airborne and ground-based high-value time-critical targets at ranges compatible with tactical air-to-air and air-to-surface weapons in bad weather, day or night, and in high-threat multiple target battle areas. Model-based vision (MBV) algorithms and target signature development techniques are key to the identification and recognition solution and are pursed in this project in partnership with the Advanced Research Projects Agency. The techniques developed are evaluated to support the Theater Missile Defense (TMD) efforts in surveillance and attack. The fire control and recognition technologies developed and demonstrated in this project are high leverage in that they provide for significant advancements in operational capabilities largely through software improvements which can be readily transitioned to new and existing systems.

(U) FY 1994:

- (U) Developed advanced air-to-air engagement and weapon delivery technologies to defeat sophisticated and reduced observable threats. ($2,076K)
  - -- (U) Collected airborne data and evaluated the tracking performance achievable with side mounted radar arrays.
  - -- (U) Evaluated weapon deployment increases achieved through cued target detection.
- (U) Developed advanced air-to-surface tracking, fire control, and weapon delivery technologies for precision attack of multiple targets in a single pass from an aircraft maneuvering to survive complex threats. ($650K)
  - -- (U) Completed evaluation and technology transition of the automated target cuer to the LANTIRN weapon system for improved target detection.
- (U) Developed advanced cooperative engagement methods, decision aids, and intra-flight mission management to improve combat performance. ($637K)
  - -- (U) Developed techniques for fusing on-board sensor data to increase target detection and identification for air-to-air engagements.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #3, Advanced Development	PE NUMBER AND TITLE: PE 0603203F, Advanced Avionics for Aerospace Vehicles — PROJECT NO.: 69DF

(U) FY 1995:

- (U) Develop synthetic signature capability for ground targets to train Automatic Target Recognition (ATR) algorithms. ($1,361K)
  - -- (U) Baseline synthetic signature validation methodology using tactical targets.
  - -- (U) Develop first set of target signatures for incorporation into ground-based target recognition systems.
- (U) Evaluate ATR algorithms including model-based vision algorithms for moving and stationary target acquisition and recognition and for consideration of Theater Missile Defense (TMD) surveillance and attack efforts. ($2,266K)
  - -- (U) Evaluate automatic radar air-to-ground target acquisition algorithms using measured and synthetic signature data.
- (U) Develop advanced hostile target identification technologies to provide a capability for beyond visual range, all aspect, high confidence classification and identification of airborne targets. ($1,500K)
  - -- (U) Evaluated synthetic airborne target signatures with sufficient fidelity to support hostile target identification program.
- (U) Develop advanced air-to-air engagement and weapon delivery technologies to provide for beyond visual range detection, targeting, and weapon deployment against sophisticated and reduced observable airborne threats. ($267K)
  - -- (U) Complete system concept definition and evaluation for cooperative engagement techniques for air-to-air engagement.
- (U) Develop advanced information fusion technologies to increase air engagement situation awareness and lethality through longer range, high confidence identification, integration of offensive and defensive sensor technology, and exploitation of off-board targeting information. ($120K)
  - -- (U) Complete architecture design and intra-radar fusion algorithm development to increase confidence and opportunity for identification of airborne threats.
- (U) Develop advanced tracking algorithms to increase detection range of conventional threats and maintain detection range against low cross section threats. This effort will also increase identification range of airborne threats. ($230K)
  - -- (U) Demonstrate advanced tracking algorithm in roof-house test to validate laboratory results of greater than 50% increase in target detection range.
- (U) Develop technologies for targeting ground-based threats both stationary and moving with precision, utilizing both on-board and off-board targeting information. Technologies provide the targeting solution required to deploy air-to-surface weapons. ($1,234K)
  - -- (U) Evaluate potential to target ground-based threats using off board sources using flight data from F-15 aircraft.
  - -- (U) Evaluate through in laboratory simulation the ability to conduct real-time targeting of simulated threats using off-board information.
- (U) This is a congressional add to develop the Advanced Anti-Radiation Guided Missile (AARGM). ($1,500K)
  - -- (U) Evaluate potential for AARGM to aid in the lethal destruction and suppression of enemy defense mission.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #3, Advanced Development	PE NUMBER AND TITLE: PE 0603203F, Advanced Avionics for Aerospace Vehicles — PROJECT NO.: 69DF

(U) FY 1996:

- (U) Develop synthetic signature capability for ground targets to train Automatic Target Recognition (ATR) algorithms. ($2,886K)
  - -- (U) Develop and perform initial demonstration of camouflage and obscuration models for partially hidden targets.
  - -- (U) Demonstrate models for targets in clear for use in training of ATR algorithms.
- (U) Evaluate ATR algorithms including model-based vision (MBV) algorithms for moving and stationary target acquisition and recognition (MSTAR) and for Theater Missile Defense (TMD) surveillance and attack efforts. ($2,237K)
  - -- (U) Evaluate ATR algorithms including component MSTAR algorithms using synthetic and measured data to assess maturity of algorithms for insertion into TMD efforts.
- (U) Develop advanced hostile target identification technologies to provide a capability for beyond visual range, all aspect, high confidence classification, and identification of airborne targets. ($1,500K)
  - -- (U) Demonstrate turnkey synthetic signature generation capability for intelligence user to support hostile target identification program.
- (U) Develop advanced air-to-air engagement and weapon delivery technologies to provide for a capability for beyond visual range detection, targeting,and weapon deployment against sophisticated and reduced observable airborne threats. ($2,575K)
  - -- (U) Complete critical design for cooperative engagement system for fighter weapon systems.
  - -- (U) Conduct simulation and ground-based experiments of cooperative engagement and tracking accuracy improvements for air-to-air weapon deployment.
- (U) Develop advanced information fusion technologies to increase air engagement situation awareness and lethality through longer range, high confidence identification, integration of offensive and defensive sensor technology and exploitation of off-board targeting information. ($616K)
  - -- (U) Integrate MBV algorithms into laboratory test environment verifying operational payoff.
  - -- (U) Evaluate advanced intra-radar fusion MBV algorithms.
- (U) Develop advanced tracking algorithms to increase detection range of conventional threats and maintain detection range against low cross section threats. This effort will also increase identification range of airborne threats. ($1,680K)
  - -- (U) Integrate advanced tracking system into airborne data collection device.
  - -- (U) Complete airborne data collection and analysis to prove a greater than 50% increase in detection range.
- (U) Develop technologies for targeting ground-based threats both stationary and moving with precision, utilizing both on-board and off-board targeting information. Technologies provide the targeting solution required to deploy air-to-surface weapons. ($2,575K)
  - -- (U) Complete evaluation of real-time, off-board targeting solutions in support of precision synthetic aperture radar weapon systems.
  - -- (U) Evaluate off-board targeting schemes for real-time information in the cockpit study using laboratory and airborne data.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #3, Advanced Development	PE NUMBER AND TITLE: PE 0603203F, Advanced Avionics for Aerospace Vehicles PROJECT NO.: 69DF

(U) FY 1997:
- (U) Develop synthetic signature capability for ground targets to train Automatic Target Recognition (ATR) algorithms. ($3,050K)
  - -- (U) Demonstrate capability for rapid target insertion.
  - -- (U) Demonstrate tactical target models under camouflage and partial obscuration conditions.
- (U) Evaluate ATR algorithms including model-based vision (MBV) algorithms for moving and stationary target acquisition and recognition (MSTAR) and for Theater Missile Defense (TMD) surveillance and attack efforts. ($2,073K)
  - -- (U) Demonstrate and evaluate maturity of end to end ATR algorithms, including MSTAR, for insertion into TMD demonstration efforts.
- (U) Develop advanced hostile target identification technologies to provide a capability for beyond visual range, all aspect, high confidence classification, and identification of airborne targets. ($1,500K)
  - -- (U) Demonstrate turnkey synthetic aperture signature generation capability for intelligence user to support fielded ATRs.
- (U) Develop advanced air-to-air engagement and weapon delivery technologies to provide for a beyond visual range detection, targeting, and weapon deployment capability against sophisticated and reduced observable airborne threats. ($299K)
  - -- (U) Develop cooperative engagement system for fighter weapon systems.
  - -- (U) Evaluate cooperative engagement and tracking accuracy development for air-to-air weapon deployment through continued simulation and ground-based experiments.
- (U) Develop advanced information fusion technologies to increase air engagement situation awareness and lethality through longer range, high confidence identification, integration of offensive and defensive sensor technology and exploitation of off-board targeting information. ($624K)
  - -- (U) Complete ground-to-air testing at the Radar Test Facility of intra-radar fusion techniques.
  - -- (U) Integrate intra-radar fusion system into airborne data collection system.
  - -- (U) Conduct airborne data collection and analysis of intra-radar fusion technologies.
- (U) Develop advanced tracking algorithms to increase detection range of conventional threats and maintain detection range against low cross section threats. This effort will also increase identification range of airborne threats. ($2,835K)
  - -- (U) Conduct airborne data collection and evaluation of advanced tracking system.
  - -- (U) Evaluate increase in identification range provided by the advanced tracking algorithms.
- (U) Develop technologies for targeting ground-based threats both stationary and moving with precision, utilizing both on-board and off-board targeting information. Technologies provide the targeting solution required to release air-to-surface weapons. ($3,442K)
  - -- (U) Complete performance evaluation of advanced targeting techniques utilizing real-time off-board information from airborne data collection.
  - -- (U) Complete simulation and analysis of off-board targeting concepts for transition to operational aircraft.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #3, Advanced Development

PE NUMBER AND TITLE: PE 0603203F, Advanced Avionics for Aerospace Vehicles

PROJECT NO.: 69DF

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	3,363	14,465	17,369	18,348	Cont
Current President's Budget	3,363	8,478	14,069	13,823	Cont

Change Summary Explanation:

Funding: In FY 1995, Project 1177 was consolidated into Project 69DF. Congressional cut in FY 1995 of $7,500 thousand for perceived duplication with Advanced Research Projects Agency (ARPA) in the development of target recogniton systems. Project restructured to provide focus on evaluation of automatic target recognition algorithms and development of synthetic signature generation techniques through coordinated plan with ARPA.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0602204F, Aerospace Avionics.
- (U) PE 0603253F, Advanced Avionics Integration.
- (U) Advanced Research Projects Agency, Moving/Stationary Target Acquisition and Recognition.
- (U) Theater Missile Defense System Program Office.
- (U) Low Altitude Navigation Infrared system for Night (LANTIRN) System Program Office.
- (U) Coordinated with Joint Directorate of Laboratories Sensors Panel.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #3, Advanced Development

PE NUMBER AND TITLE: PE 0603205F, Flight Vehicle Technologies

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Total PE 0603205F Cost	12,860	6,643	10,793	10,150	11,170	12,495	13,878	14,271	Cont	Cont
Project 2506, Control of Flight	3,401	548	0	0	0	0	0	0	Cont	Cont
Project 2508, Aeromechanics/Vehicle Subsystems	1,729	0	0	0	0	0	0	0	Cont	Cont
Project 2978, Flight Vehicle Technologies	3,869	6,095	8,017	7,224	8,724	10,458	11,265	11,910	Cont	Cont
Project 3422, Cockpit Technology	3,861	0	0	0	0	0	0	0	Cont	Cont
Project 4398, Air Base Technology	0	0	2,776	2,926	2,446	2,037	2,613	2,361	Cont	Cont

A. (U) Mission Description and Budget Item Justification: This Advanced Development program develops and demonstrates advanced vehicle subsystems, aerodynamic/flight control, cockpit technologies for improved performance, improved survivability, reduced logistics support, technology transition, user evaluation, and air base technologies. Demonstrates technologies for fixed and bare base assets, including airfield pavements, energy systems, automation, air base survivability, air base recovery, protective systems, fire protection, and crash rescue. Project 4398 assumes the efforts previously conducted under PE 0603723F, Project 2104. All efforts in this program element contain the resources necessary, including civilian salaries, to manage, conduct, and document the technical activities.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #3, Advanced Development

PE NUMBER AND TITLE: PE 0603205F, Flight Vehicle Technologies

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	13,041	14,339	14,361	15,797	Cont
Appropriated Value	13,114	6,718			
Adjustments to Appropriated Value:					
a. Congressional General Reductions	-73	-75			
b. SBIR	-181				
Current President's Budget	12,860	6,643	10,793	10,150	Cont

Change Summary Explanation:

Funding: Changes due to assumption of responsibility for air base technology efforts previously conducted under PE 0602206F, Project 2673.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary: Not Applicable.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #3, Advanced Development

PE NUMBER AND TITLE: PE 0603205F, Flight Vehicle Technologies

PROJECT NO.: 2506

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 2506, Control of Flight	3,401	548	0	0	0	0	0	0	Cont	Cont

A. (U) Mission Description and Budget Item Justification: Develops flight control technologies, including integration of flight/propulsion control and vehicle management system technologies, for improved total aircraft efficiency, performance, and maneuverability. Develops electrically powered control surface actuator and brake systems to eliminate centralized hydraulic systems and associated maintenance/safety problems. Develops "smart" actuators that utilize embedded sensors and computer actuation to enhance performance (e.g., compensate for battle damage). Develops integration technologies to reduce the number of individual control and subsystems boxes in an aircraft by combining electrical, environmental, hydraulic, oxygen-generating, and other utility functions.

(U) FY 1994:
- (U) Continued to develop and demonstrate advanced flight control concepts to provide a combat advantage for 21st century aircraft by increasing performance and survivability while decreasing cost and supportability requirements. ($1,977K)
  -- (U) Developed and ground demonstrated electrohydrostatic and electromechanical actuators in an F-18 aileron.
  -- (U) Completed hardware and test fixture fabrication for evaluation of an electrically actuated brake system.
- (U) Continued to develop and demonstrate technologies for integrated, multifunction aircraft utility (e.g., electrical, environmental control, subsystem management) components. ($1,424K)
  -- (U) Established baseline arrangement for primary energy management module components for an integrated aircraft utility subsystem suite.
  -- (U) Complete assembly of break test hardware for the elimination of aircraft hydraulic fires.

(U) FY 1995:
- (U) Continue to develop and demonstrate technologies for integrated, multifunction aircraft utility (e.g., electrical, environmental control, and subsystem management components. ($548K)
  -- (U) In a joint Air Force/Navy/NASA program, flight demonstrate electrohydrostatic and electromechanical actuators in an F-18 aileron.

(U) FY 1996: Not Applicable.

(U) FY 1997: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #3, Advanced Development

PE NUMBER AND TITLE: PE 0603205F, Flight Vehicle Technologies

PROJECT NO.: 2506

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	3,415	4,265	100	0	Cont
Current President's Budget	3,401	548	0	0	Cont

Change Summary Explanation:

Funding: Funding incorporated in Project 2978.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0602201F, Aerospace Flight Dynamics.
- (U) PE 0603216F, Aerospace Propulsion and Power.
- (U) PE 0603245F, Advanced Flight Vehicle Multidisciplinary Technologies.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #3, Advanced Development

PE NUMBER AND TITLE: PE 0603205F, Flight Vehicle Technologies

PROJECT NO.: 2508

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 2508, Aeromechanics/Vehicle Subsystems	1,729	0	0	0	0	0	0	0	Cont	Cont

A. (U) Mission Description and Budget Item Justification: Develops aerodynamic technology and subsystems for improved aircraft maneuverability, agility, reliability, and performance at a lower cost. Develops and demonstrates aerodynamic technologies for safe high angles-of-attack operation. Develops aerodynamic and propulsion control devices for improved air vehicle flight maneuvers and reduced fighter aircraft vertical tails. Develops low-drag/low-observable, external weapon carriage concepts for incorporating air-to-surface weapons on fighter aircraft. Develops advanced environmental control system concepts for cockpit/avionics cooling and increased range by reducing the engine bleed air requirement. Integrates aeromechanical crew escape technologies for full mission crew escape capability.

(U) FY 1994:
- (U) Continued to develop and demonstrate subsystem/component technologies for improved crew escape capabilities. ($1,729K)
  -- (U) Completed initial test of an advanced ejection seat propulsion and flight control system.
  -- (U) Flight demonstrated a forebody chine configuration and compared/optimized mechanical forebody vortex control designs for increased aircraft maneuverability

(U) FY 1995: Not Applicable.

(U) FY 1996: Not Applicable.

(U) FY 1997: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #3, Advanced Development

PE NUMBER AND TITLE: PE 0603205F, Flight Vehicle Technologies

PROJECT NO.: 2508

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	1,611	846	5,952	9,912	Cont
Current President's Budget	1,729	0	0	0	Cont

Change Summary Explanation:

Funding: Funding incorporated into Project 2978.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(U) Related Activities

- (U) PE 0602201F, Aerospace Flight Dynamics.
- (U) PE 0602602F, Conventional Munitions.
- (U) PE 0603231F, Crew Systems and Personnel Protection Technology.
- (U) PE 0603245F, Advanced Flight Vehicle Multidisciplinary Technologies.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #3, Advanced Development

PE NUMBER AND TITLE: PE 0603205F, Flight Vehicle Technologies

PROJECT NO.: 2978

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 2978, Flight Vehicle Technologies	3,869	6,095	8,017	7,224	8,724	10,458	11,265	11,910	Cont	Cont

A. (U) Mission Description and Budget Item Justification: Designs and develops air vehicle technologies for improved performance, reliability, maintainability, and supportability while increasing performance, survivability, and mission effectiveness. Develops air vehicle component and subsystem technologies, aerodynamic/flight control technologies, and cockpit technologies. This project continues activities in FY 1996 that were previously conducted in Projects 2506, 2508, and 3422.

(U) FY 1994:
- (U) Continued to develop and demonstrate technologies that reduce logistics support (e.g., reduce the volume, weight, and cost of spares deployed (e.g., improve reliability, availability, and maintainability). ($1,656K)
  - -- (U) Identified, cataloged, and compiled climatic data to create engineering prediction models of accumulated environmentally-induced stress over system life cycles.
  - -- (U) Evaluated tire-wheel interface loads and tread materials for F-16 aircraft
- (U) Continued to develop and demonstrate technologies that increase air vehicle survivability and safety. ($2,213K)
  - -- (U) Developed automated traceability and referencing for Ada-based critical flight control system design and verification capability.

(U) FY 1995:
- (U) Develop and demonstrate component and subsystem technologies that reduce logistics support (e.g., reduce the volume, weight, and cost of spares deployed, or improve reliability, availability, and maintainability). ($5,583K)
  - -- (U) Complete initial capability to quantitatively predict aircraft life cycle environmental conditions for early design trade analyses.
  - -- (U) Complete optimized F-16 Block 40/50 main tire evaluation to provide a replacement that has significantly longer lifetime and reduced logistics deployment requirements.
- (U) Continued to develop and demonstrate technologies that increase air vehicle survivability and safety. ($512K)
  - -- (U) Test and assess the Ada-based critical flight control design and verification system.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #3, Advanced Development	PE NUMBER AND TITLE: PE 0603205F, Flight Vehicle Technologies — PROJECT NO.: 2978

(U) FY 1996:
- (U) Develop and demonstrate advanced/integrated air vehicle component and subsystem technologies that reduce the volume, weight, cost, and number of spares required (e.g., improve reliability, availability, and maintainability). ($7,917K)
  -- (U) Complete knowledge-based system to predict life cycle environmental conditions for early design trade analyses of future air vehicle components, subsystems, and stores.
  -- (U) Complete final design of full scale specialized test equipment for evaluating air vehicle tread wear.
  -- (U) Complete initial planning of subsystem technologies for improved air vehicles performance.
- (U) Develop and demonstrate cockpit technologies to improve situational awareness and crew member productivity, especially during night/adverse-weather, low-level operations. ($100K)
  -- (U) Demonstrate on-board route and mission planning to improve cockpit effectiveness and reduce workload/crew size.

(U) FY 1997:
- (U) Develop and demonstrate advanced/integrated air vehicle subsystem technologies that reduce the volume, weight, cost, and number of spares required (e.g., improve reliability, availability, and maintainability). ($6,584K)
  -- (U) Fabricate and install specialized test equipment to demonstrate extended life of new tire/wheel design technology.
  -- (U) Conduct trade off studies for subsystem energy management utilities to determine the benefits and payoffs with respect to affordability, supportability, weight reduction, and increased range.
- (U) Develop and demonstrate cockpit technologies to improve situational awareness and crew member productivity, especially during night/adverse-weather, low-level operations. ($640K)
  -- (U) Demonstrate for user evaluation an integrated single-seat cockpit design to improve pilot productivity during night, adverse weather, low level.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #3, Advanced Development

PE NUMBER AND TITLE: PE 0603205F, Flight Vehicle Technologies

PROJECT NO.: 2978

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	3,973	6,561	7,029	5,685	Cont
Current President's Budget	3,869	6,095	8,017	7,224	Cont

Change Summary Explanation:

Funding: FY 1995 changes due to consolidation of Projects 2606, 2508, and 3422 into this project. FY 1996 increase due to Air Force initiatives in aging aircraft and affordability.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0602201F, Aerospace Flight Dynamics.
- (U) PE 0603216F, Aerospace Propulsion and Power.
- (U) PE 0603245F, Advanced Flight Vehicle Multidisciplinary Technologies.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #3, Advanced Development

PE NUMBER AND TITLE: PE 0603205F, Flight Vehicle Technologies

PROJECT NO.: 3422

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	4,042	2,667	1,280	200	Cont
Current President's Budget	3,861	0	0	0	Cont

Change Summary Explanation:

Funding: Funding incorporated into Project 2978.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0603231F, Crew Systems and Personnel Protection Technology.
- (U) PE 0603253F, Advanced Avionics Integration.
- (U) PE 0603245F, Advanced Flight Vehicle Multidisciplinary Technologies
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #3, Advanced Development

PE NUMBER AND TITLE: PE 0603205F, Flight Vehicle Technologies

PROJECT NO.: 4398

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 4398, Air Base Technology	0	0	2,776	2,926	2,446	2,037	2,613	2,361	Cont	Cont

A. (U) Mission Description and Budget Item Justification: This project develops technologies for fixed and bare base assets, including airfield pavements, energy systems, automation, air base survivability, air base recovery, protective systems, fire protection, and crash rescue. This project assumes the efforts started under PE 0603723F, Project 2104.

(U) FY 1994: Not Applicable.

(U) FY 1995: Not Applicable.

(U) FY 1996:

- (U) Develop and demonstrate design criteria for improved bare-base/fixed-site applications (e.g., power and environmental utilities, survivable air base structures, and durable/repairable airfield surfaces). ($2,011K)
  - -- (U) Complete development of a lightweight electric generator system for bare base application. This generator will be 30% lighter and 40% smaller than existing units, resulting in improved air transportability and reduced logistic support.
  - -- (U) Continue validation for environmentally-clean boiler system for combustion of waste fuels and lubricants. This project will reduce energy costs and obviate the need for landfill disposal of waste fuels and lubricants.
  - -- (U) Develop new air mobile structures and on-site hardening techniques to improve bare base and contingency site operations.
  - -- (U) Develop deployable pavement evaluation techniques and equipment for rapid evaluation of bare base runway conditions.
- (U) Develop aircraft/air base fire-fighting technologies (e.g., clean, environmentally-safe fire-fighting agents, vehicles, equipment, personnel protective clothing, fire risk assessment techniques, and firefighter training systems). ($765K)
  - -- (U) Complete development of an advanced technology prototype combined fire fighting/hazardous materials ensemble. The ensemble will incorporate a new body-cooling and breathing-air system and use high temperature-resistant materials, providing firefighters with a greatly increased ability to operate in intense heat and/or hazardous materials environments.
  - -- (U) Continue advanced development of hypergolic vapor/fuel fire detection/suppression technologies. Current technologies cannot reliably and quickly detect and suppress incipient hypergolic fuel vapor leaks/fires, placing critical Air Force space lift facilities and payloads at high risk.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #3, Advanced Development	PE NUMBER AND TITLE: PE 0603205F, Flight Vehicle Technologies — PROJECT NO.: 4398

(U) FY 1997:

- (U) Develop and demonstrate design criteria for improved bare-base/fixed-site applications (e.g., power and environmental utilities, survivable air base structures, and durable/repairable airfield surfaces). ($1,416K)
  - -- (U) Continue development of an advanced cycle mobile heat pump unit.
  - -- (U) Continue development of an environmentally-clean boiler system for combustion of waste fuels and lubricants.
  - -- (U) Continue development of control improvements in backup power generation systems.
  - -- (U) Continue and expand development of pavement evaluation equipment to include development of portable ground-penetrating radar.
- (U) Develop aircraft/air base fire-fighting technologies (e.g., clean, environmentally-safe fire-fighting agents, vehicles, equipment, personnel protective clothing, fire risk assessment techniques, and firefighter training systems). ($1,510K)
  - -- (U) Initiate advanced development of an environmentally-acceptable Aqueous Film Forming Foam (AFFF) replacement agent. Current AFFF formulations used for aircraft fire fighting operations are not biodegradable and contain EPA-reportable toxic solvents.
  - -- (U) Develop an environmentally-safe replacement agent for Halon 1211. Halon 1211, used in flightline and aircraft-portable fire extinguishers, is a strong ozone depleter. DOD and Air Force directives require replacement of this chemical as soon as a suitable replacement agent can be developed.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #3, Advanced Development

PE NUMBER AND TITLE: PE 0603205F, Flight Vehicle Technologies

PROJECT NO.: 4398

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	0	0	0	0	Cont
Current President's Budget	0	0	2,776	2,926	Cont

Change Summary Explanation:

Funding: This project assumes responsibility for air base technology efforts started under PE 0603723F, Project 2104, starting in FY 1996 and continuing.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0602201F, Aerospace Flight Dynamics.
- (U) PE 0602206F, Civil Engineering and Environmental Quality.
- (U) PE 0603307F, Air Base Operability Advanced Development.
- (U) PE 0603231F, Crew Systems and Personnel Protection Technology
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #3, Advanced Development

PE NUMBER AND TITLE: PE 0603211F, Aerospace Structures

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Total PE 0603211F Cost	12,390	12,064	13,269	12,828	14,840	15,948	17,854	19,172	Cont	Cont
Project 486U, Advanced Metallics	6,071	6,160	6,502	6,286	7,272	7,815	8,748	9,394	Cont	Cont
Project 69CW, Advanced Composites	6,319	5,904	6,767	6,542	7,568	8,133	9,106	9,778	Cont	Cont

A. (U) Mission Description and Budget Item Justification: This Advanced Development program in aircraft structures develops both metallic and composite technologies to reduce the cost of airframe ownership through innovative structural concepts established through concurrent engineering and integrated product development approaches. Innovative structural concepts integrate these two types of materials with new design, manufacturing, and monitoring techniques. The goals of this program are to develop technologies to extend the life of the current fleet, to develop concurrent engineering techniques for aircraft structures, to develop new capabilities to survive extreme environments, and to develop technologies to integrate sensors and processors into airframes. The results are lighter, stronger, less maintenance intensive, and 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, damage/threat tolerance, and design for supportability), and reduced observability (both radar cross section and infrared). All efforts in this program element contain the resources necessary, including civilian salaries, to manage, conduct, and document the technical activities.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #3, Advanced Development

PE NUMBER AND TITLE: PE 0603211F, Aerospace Structures

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	12,571	12,300	13,335	12,892	Cont.
Appropriated Value	12,641	12,300			
Adjustments to Appropriated Value:					
a. Congressional General Reductions	-76	-236			
b. SBIR	-175				
Current President's Budget	12,390	12,064	13,269	12,828	Cont

Change Summary Explanation:

Funding: FY 1996 funding increase due to Air Force aging aircraft initiative to extend the life of existing operational aircraft.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary: Not Applicable.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #3, Advanced Development

PE NUMBER AND TITLE: PE 0603211F, Aerospace Structures

PROJECT NO.: 486U

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 486U, Advanced Metallics	6,071	6,160	6,502	6,286	7,272	7,815	8,748	9,394	Cont	Cont

A. (U) Mission Description and Budget Item Justification: This project 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 could transition to fielded and future military and civilian flight vehicle structures to yield lower weight, greater reliability, improved survivability (ballistic/laser damage, etc.), reduced signature, supportability, and affordability.

(U) FY 1994:

- (U) Continued to develop metallic structural design concepts and repair techniques for future and existing air vehicles. ($2,256K)
  - -- (U) Completed detailed component design of advanced technology redesign of highly loaded structures which demonstrates replacement capability of degraded structures in operational aircraft.
- (U) Continued to demonstrate feasibility of advanced metallic structures via algorithms, simulations, and demonstrations. ($3,815K)
  - -- (U) Completed component preliminary design for a smart metallic structures demonstration of structural health monitoring for present and future operational aircraft.

(U) FY 1995:

- (U) Continue to develop metallic structural design concepts and repair techniques for future and existing air vehicles. ($2,302K)
  - -- (U) Complete preliminary design for exhaust impinged metallic structures via algorithms and simulations to overcome structural failures of components in severe thermoacoustic environments.
- (U) Continue to demonstrate feasibility of advanced metallic structures via algorithms, simulations, and demonstrations. ($3,858K)
  - -- (U) Complete detailed design analysis of smart metallic structures component for demonstration of structural health monitoring for present and future operational aircraft.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #3, Advanced Development	PE NUMBER AND TITLE: PE 0603211F, Aerospace Structures — PROJECT NO.: 486U

(U) FY 1996:
- (U) Continue to develop metallic structural design concepts and repair techniques for future and existing air vehicles. ($4,224K)
  - -- (U) Complete fabrication of a T-38 wing spar that demonstrates replacement of corrosion-sensitive components in existing aircraft.
  - -- (U) Complete detailed design for an exhaust-impinged aft deck component to overcome structural failures of components in severe thermoacoustic environments.
- (U) Continue to demonstrate feasibility of advanced metallic structures via algorithms, simulations, and demonstrations. ($2,278K)
  - -- (U) Complete full-scale test of a structural demonstration article for a fighter bulkhead and/or wing spar with health monitoring capability to automate the inspections for crack growth while decreasing the maintenance/repair/replacement requirements.

(U) FY 1997:
- (U) Continue to develop metallic structural design concepts and repair techniques for future and existing air vehicles. ($4,184K)
  - -- (U) Complete ground and flight tests of a T-38 wing spar that demonstrates replacement of corrosion-sensitive components in existing aircraft.
  - -- (U) Complete ground testing of an exhaust-impinged aft deck component to overcome structural failures of components in severe thermoacoustic environments.
  - -- (U) Complete detailed design of survivable aircraft structures technology demonstration component that significantly increases survivability of military aircraft.
  - -- (U) Conduct preliminary design of widespread fatigue damage demonstration component that supports the Air Force aging aircraft initiative to prevent catastrophic structural failures due to multi-site fatigue damage.
- (U) Continue to demonstrate feasibility of advanced metallic structures via algorithms, simulations, and demonstrations. ($2,102K)
  - -- (U) Complete preliminary design of active cavity acoustic attenuation structural concepts that permit bomb bays to be designed and operated over a wide range of speeds rather than at a single speed without damaging weapon systems.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #3, Advanced Development

PE NUMBER AND TITLE: PE 0603211F, Aerospace Structures

PROJECT NO.: 486U

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	6,124	6,396	6,942	6,704	Cont
Current President's Budget	6,071	6,160	6,502	6,286	Cont

Change Summary Explanation:

Funding: Not Applicable.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0602102F, Materials.
- (U) PE 0602201, Aerospace Flight Dynamics.
- (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.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #3, Advanced Development

PE NUMBER AND TITLE: PE 0603211F, Aerospace Structures

PROJECT NO.: 69CW

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 69CW, Advanced Composites	6,319	5,904	6,767	6,542	7,568	8,133	9,106	9,778	Cont	Cont

A. (U) Mission Description and Budget Item Justification: This project demonstrates new non-metallic structures technology using fiber reinforced thermoset, thermoplastic, carbon-carbon, ceramic, and other non-metallic materials to yield lower weight, greater reliability, improved survivability (ballistic/laser damage, etc.), reduced signature, supportability, and affordability.

(U) FY 1994:
- (U) Continued to develop low-cost composite design concepts and repair techniques for future and existing air vehicles. ($6,319K)
  - -- (U) Demonstrated a low-observable missile exhaust duct, via an engine test, for cruise missile applications.
  - -- (U) Completed design of a thermoplastic access panel targeted to replace current F-22 panels.
  - -- (U) Completed bonded wing fabrication using design and manufacture of low-cost composites for increased affordability and supportability.

(U) FY 1995:
- (U) Continue to develop low-cost composite design concepts and repair techniques for future and existing air vehicles. ($5,904K)
  - -- (U) Complete development and transition of F110 low-observable engine flap for increased survivability.
  - -- (U) Expand design and manufacture of low-cost composites to include live fire testing capability for increased battle damage survivability.
  - -- (U) Initiate development of robust composite sandwich structures to provide acquisition and maintenance cost reductions.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #3, Advanced Development	PE NUMBER AND TITLE: PE 0603211F, Aerospace Structures / PROJECT NO.: 69CW

(U) FY 1996:
- (U) Continue to develop non-metallic structural design concepts and repair techniques for future and existing air vehicles. ($3,316K)
  - -- (U) Complete core and skin material selection to replace corroded sandwich structures on existing aircraft.
  - -- (U) Complete initial concept selection of a composite high temperature aft fuselage section to integrate the nozzle into the load carrying aircraft structure, reducing overall weight and improving low-observable characteristics.
- (U) Continue to demonstrate feasibility of advanced non-metallic structures via algorithms, simulations, and demonstrations. ($3,451K)
  - -- (U) Complete live fire test on a bonded composite wing to demonstrate survivability of a composite wing.

(U) FY 1997:
- (U) Continue to develop non-metallic structural design concepts and repair techniques for future and existing air vehicles. ($3,158K)
  - -- (U) Complete preliminary design of primary and secondary sandwich components resistant to corrosion and suitable for use in existing aircraft.
  - -- (U) Complete preliminary design of a composite high temperature aft fuselage section to reduce weight and improve low-observable characteristics.
- (U) Continue to demonstrate feasibility of advanced non-metallic structures via algorithms, simulations, and demonstrations. ($3,384K)
  - -- (U) Complete preliminary design of a flexible wing that warps to control flight, leading to the elimination of leading and trailing flaps and ailerons and significantly improving low-observable characteristics.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #3, Advanced Development

PE NUMBER AND TITLE: PE 0603211F, Aerospace Structures

PROJECT NO.: 69CW

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	6,447	5,904	6,393	6,188	Cont
Current President's Budget	6,319	5,904	6,767	6,542	Cont

Change Summary Explanation:

Funding: Not Applicable.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0602102F, Materials.
- (U) PE 0602201, Aerospace Flight dynamics.
- (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.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #3, Advanced Development

PE NUMBER AND TITLE: PE 0603216F, Aerospace Propulsion and Power Technology

COST ($ In Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Total PE 0603216F Cost	35,901	36,579	41,779	41,222	43,136	43,646	45,645	46,677	Cont	Cont
Project 2480, Aerospace Fuels Technology	1,257	1,784	2,436	1,561	1,603	1,557	1,589	1,592	Cont	Cont
Project 2697, Atmospheric Propulsion Concepts	3,377	4,914	4,743	1,584	1,628	1,638	1,775	1,777	Cont	Cont
Project 3035, Aerospace Power Technology	2,045	1,010	2,728	4,213	5,608	5,641	6,109	6,115	Cont	Cont
Project 3036, Battery Technology	480	0	0	0	0	0	0	0	Cont	Cont
Project 681B, Advanced Turbine Engine Gas Generator (ATEGG)	28,742	28,871	31,872	33,864	34,297	34,810	36,172	37,193	Cont	Cont

A. (U) Mission Description and Budget Item Justification: This Advanced Development program ensures continuous development and demonstration of affordable 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: turbine engine improvements providing a 33% reduction in aircraft takeoff gross weight for tactical fighter aircraft and a 100% increase in aircraft range/loiter; ducted rocket improvements that increase missile average and terminal velocity by 50% and range by 100% for enhanced lethality; higher temperature fuels for propulsion and thermal management; an aircraft battery with a 20-year maintenance-free life expectancy; and electric aircraft power components projected to provide a two- to five-fold improvement in reliability and maintainability, a 20% reduction in power system weight, and enhanced survivability. All efforts in this program element contain the resources necessary, including civilian salaries, to manage, conduct, and document the technical activities.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #3, Advanced Development

PE NUMBER AND TITLE: PE 0603216F, Aerospace Propulsion and Power Technology

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	36,410	40,662	39,994	40,423	Cont
Appropriated Value	36,614	37,345			
Adjustments to Appropriated Value:					
a. Congressional General Reductions	-207	-766			
b. SBIR	-506				
Current President's Budget	35,901	36,579	41,779	41,222	Cont

Change Summary Explanation:

Funding: Turbine engine efforts restored in FY 1996 and FY 1997 to achieve Phase II Integrated High Performance Turbine Engine Technology goals by FY 1997.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary: Not Applicable.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #3, Advanced Development

PE NUMBER AND TITLE: PE 0603216F, Aerospace Propulsion and Power Technology

PROJECT NO.: 2480

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 2480, Aerospace Fuels Technology	1,257	1,784	2,436	1,561	1,603	1,557	1,589	1,592	Cont	Cont

A. (U) Mission Description and Budget Item Justification: Demonstrates new thermally stable (JP-8+100) and high heat sink (supercritical/endothermic) fuels and advanced fuel system components that minimize cost, reduce maintenance, and improve performance of aircraft and missiles. Emphasis is on demonstrating the effects/benefits of: 1) JP-8+100 on current systems; and 2) advanced high temperature fuel system designs and components on upgraded and advanced systems.

(U) FY 1994:

- (U) Demonstrated thermally stable JP-8+100 and high heat sink fuels that reduce fuel system maintenance on current aircraft and provide greater cooling capacity (performance) for upgraded and future aircraft and missiles. ($1,003K)
  - -- (U) Demonstrated flight-worthiness of JP-8+100 through component tests, engine stand tests of F100-PW-200 engines, and flight test of an F-16A aircraft.
- (U) Demonstrated advanced fuel system designs and high temperature components that permit utilization of the increased cooling capacity of JP-8+100 and high heat sink fuels. ($254K)
  - -- (U) Completed design/analysis of an advanced aircraft thermal management/fuel system which identified the highest probability areas for high-temperature fuel fouling problems and determined design changes and advanced components that could permit the higher operating temperatures of JP-8+100.

(U) FY 1995:

- (U) Demonstrate thermally stable JP-8+100 and high heat sink fuels that reduce fuel system maintenance on current aircraft and provide greater cooling capacity (performance) for upgraded and future aircraft and missiles. ($1,384K)
  - -- (U) Demonstrate reduced fuel system maintenance in F-16s by conducting field trial of JP-8+100 at the 114TS Air National Guard, Kingsley Field, OR.
- (U) Demonstrate advanced fuel system designs and high temperature components that permit utilization of the increased cooling capacity of JP-8+100 and high heat sink fuels. ($400K)
  - -- (U) Conduct design analysis of conceptual fuel system design/hardware modifications for potential upgrades to aircraft to permit utilization of the higher cooling capacity of JP-8+100.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #3, Advanced Development	PE NUMBER AND TITLE: PE 0603216F, Aerospace Propulsion and Power Technology — PROJECT NO.: 2480

(U) FY 1996:
- (U) Demonstrate thermally stable JP-8+100 and high heat sink fuels that reduce fuel system maintenance on current aircraft and provide greater cooling capacity (performance) for upgraded and future aircraft and missiles. ($1,726K)
  - -- (U) Complete demonstration of JP-8+100 effects on turbine materials and on fuel gauging systems.
  - -- (U) Demonstrate effects/benefits of JP-8+100 in component and engine stand tests of GE F101 and F110 engines.
- (U) Demonstrate advanced fuel system designs and high temperature components that permit utilization of the increased cooling capacity of JP-8+100 and high heat sink fuels. ($710K)
  - -- (U) Demonstrate operation of a scaled fan bleed-air/fuel heat exchanger, designed as an aircraft upgrade that will eliminate recirculation of hot fuel through a less efficient ram air/fuel heat exchanger.
  - -- (U) Conduct analysis of conceptual fuel system design/hardware modifications for an aircraft upgrade to permit utilization of the higher cooling capacity of JP-8+100.

(U) FY 1997:
- (U) Demonstrate thermally stable JP-8+100 and high heat sink fuels that reduce fuel system maintenance on current aircraft and provide greater cooling capacity (performance) for upgraded and future aircraft and missiles. ($1,300K)
  - -- (U) Demonstrate effects/benefits of JP-8+100 in component and engine stand tests of GE F404 engines.
  - -- (U) Demonstrate reduced fuel system maintenance in B-1s by conducting field trial of JP-8+100 at a selected base.
- (U) Demonstrate advanced fuel system designs and high temperature components that permit utilization of the increased cooling capacity of JP-8+100 and high heat sink fuels. ($261K)
  - -- (U) Demonstrate high heat sink fuel/air heat exchanger suitable for incorporation into subsystem integration packages.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #3, Advanced Development

PE NUMBER AND TITLE: PE 0603216F, Aerospace Propulsion and Power Technology

PROJECT NO.: 2480

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	1,274	1,950	2,270	1,560	Cont
Current President's Budget	1,257	1,784	2,436	1,561	Cont

Change Summary Explanation:

Funding: FY 1995 reduction restored in FY 1996 to maintain schedule for field transition of JP-8+100.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(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.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #3, Advanced Development

PE NUMBER AND TITLE: PE 0603216F, Aerospace Propulsion and Power Technology

PROJECT NO.: 2697

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 2697, Atmospheric Propulsion Concepts	3,377	4,914	4,743	1,584	1,628	1,638	1,775	1,777	Cont	Cont

A. (U) Mission Description and Budget Item Justification: Demonstrates unconventional airbreathing propulsion subsystems such as ramjets, air turborockets, and combined-cycle engines to assure future propulsion options for high speed missiles. Currently, the Variable Flow Ducted Rocket (VFDR) concept is being developed as an improved propulsion system for current missile upgrades or future missile systems developments.

(U) FY 1994:

- (U) Continued development of VFDR for airbreathing missile applications. This effort transitions technology to current and future tactical missiles providing longer range, higher velocities, and increased maneuverability, resulting in improved overall missile effectiveness. ($3,277K)
  - -- (U) Successfully demonstrated full-scale, flightweight port cover opening and lock mechanism.
  - -- (U) First flightweight arm/fire device built and successfully cold tested. Completed laser diode/optical initiator testing. Flightweight units successfully used to ignite gas generator.
  - -- (U) Completed flightweight inlet design.
  - -- (U) Updated integrated engine design, now 90% complete.
- (U) Planned development of high-speed propulsion systems for manned and unmanned applications. This effort provides technology for future missile systems where time-to-target is critical and technology for next generation reconnaissance/strike vehicles and airbreathing boosters. ($100K)
  - -- (U) The High-Speed Airbreathing Engine (HiSABrE) planning initiative was started by discussions with industry and government agencies. This initiative will investigate the feasibility of dual-mode ramjets for unmanned applications and combined-cycle engines for both manned and unmanned applications.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #3, Advanced Development	PE NUMBER AND TITLE: PE 0603216F, Aerospace Propulsion and Power Technology — PROJECT NO.: 2697

(U) FY 1995:
- (U) Continue development of Variable Flow Ducted Rocket (VFDR) for airbreathing missile applications. This effort transitions technology to current and future tactical missiles providing longer range, higher velocities, and increased maneuverability, resulting in improved overall missile effectiveness. ($4,814K)
  - -- (U) Complete development testing of flightweight nozzleless booster motors.
  - -- (U) Demonstrate gas generator/ramburner operation by completing verification testing at worst case thermal conditions (Mach 3.5).
  - -- (U) Demonstrate flightweight arm/fire device operation via environmental testing.
  - -- (U) Initiate fabrication of integrated flightweight engines for future rocket-to-ramjet transition and performance documentation testing.
  - -- (U) Update integrated engine design, 95% complete.
- (U) Plan development of high-speed propulsion systems for manned and unmanned applications. This effort provides technology for future missile systems where time-to-target is critical and technology for next generation reconnaissance/strike vehicles and airbreathing boosters. ($100K)
  - -- (U) Continue High-Speed Airbreathing Engine (HiSABrE) analysis and evaluations, including the National Aerospace Plane/Hypersonic Systems Technology Program (NASP/HySTP) office and industry, to ensure a coordinated and focused future direction for high-speed propulsion options for manned and unmanned Air Force systems.

(U) FY 1996:
- (U) Continue development of Variable Flow Ducted Rocket (VFDR) for airbreathing missile applications. This effort transitions technology to current and future tactical missiles providing longer range, higher velocities, and increased maneuverability, resulting in improved overall missile effectiveness. ($4,643K)
  - -- (U) Complete environmental (temperature, shock, vibration) and rocket-to-ramjet mode transition testing to demonstrate technology maturity for advanced missile propulsion applications.
- (U) Plan development of high-speed propulsion systems for manned and unmanned applications. This effort provides technology for future missile systems where time-to-target is critical and technology for next generation reconnaissance/strike vehicles and airbreathing boosters. ($100K)
  - -- (U) Plan design/development of dual-mode ramjet engines for high-speed missiles for destroying high value, time-critical targets.
  - -- (U) Plan design/development of combined-cycle engines for manned and unmanned high-speed vehicles applicable to reconnaissance/strike missions.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #3, Advanced Development	PE NUMBER AND TITLE: PE 0603216F, Aerospace Propulsion and Power Technology — PROJECT NO.: 2697

(U) FY 1997:

- (U) Continue development of VFDR for airbreathing missile applications. This effort transitions technology to current and future tactical missiles providing longer range, higher velocities, and increased maneuverability, resulting in improved overall missile effectiveness. ($100K)
  -- (U) Complete ground technology demonstration of VFDR technology and document results.
- (U) Demonstrate dual-mode ramjets for unmanned applications. This effort enables technology transition for future missile systems where time-to-target is critical. ($1,434K)
  -- (U) Initiate engine design and critical component testing for dual-mode ramjet development to support a flight-type engine demonstration.
- (U) Demonstrate turboramjet and turborocket engines for high-speed manned and unmanned systems. This effort supports technology transition for next generation reconnaissance/strike vehicles and airbreathing boosters. ($50K)
  -- (U) Initiate design study of combined-cycle engines to validate concept integration with advanced technology turbo machinery.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #3, Advanced Development

PE NUMBER AND TITLE: PE 0603216F, Aerospace Propulsion and Power Technology

PROJECT NO.: 2697

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	3,425	4,914	4,743	1,785	Cont
Current President's Budget	3,377	4,914	4,743	1,584	Cont

Change Summary Explanation:

Funding: Reduction in FY 1997 reflects completion of Variable Flow Ducted Rocket (VFDR) demonstration.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(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.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #3, Advanced Development

PE NUMBER AND TITLE: PE 0603216F, Aerospace Propulsion and Power Technology

PROJECT NO.: 3035

COST ($ In Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 3035, Aerospace Power Technology	2,045	1,010	2,728	4,213	5,608	5,641	6,109	6,115	Cont	Cont

A. (U) Mission Description and Budget Item Justification: Develops and demonstrates aircraft and ground power systems including engine starters, auxiliary power units, and electrical power distribution systems. The principal focus is to provide a two- to five-fold improvement in reliability and maintainability and significantly reduced cost of ownership for aircraft and ground power systems. This will be accomplished by replacing fluid-powered (hydraulics/bleed air) accessories with electrically-powered systems. Representative improvements include: increased reliability (8-18%); improved maintainability (9-12%); and reduced vulnerability (12-14%).

(U) FY 1994:

- (U) Designed, fabricated, and tested components supporting a demonstrator aircraft distribution system. The electrical distribution system ensures fault tolerant architecture, improving aircraft reliability and survivability. ($1,295K)
  - -- (U) Completed development/fabrication of power conditioning and load management units to ensure fault tolerance of electrical power system.
  - -- (U) Completed development of computerized control center for electrical power system used to monitor progress of testing.
- (U) Designed, fabricated, and tested a demonstrator aircraft electrical generator/motor subsystem. The electrical generator/motor subsystem is critical for aircraft engine starting, auxiliary power, and emergency power. ($750K)
  - -- (U) Demonstrated external starter/generator which provides a two-fold improvement in reliability over existing generators. This is the first step toward demonstrating an internal version.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #3, Advanced Development	PE NUMBER AND TITLE: PE 0603216F, Aerospace Propulsion and Power Technology — PROJECT NO.: 3035

(U) FY 1995:
- (U) Design, fabricate, and test components supporting a demonstrator aircraft electrical distribution system. The electrical distribution system ensures fault tolerant architecture, improving aircraft reliability and survivability. ($1,010K)
  - -- (U) Integrate power conditioning and load management components to develop electrical load management center (electronic brain of electrical distribution network) which guarantees a two-fold increase in fault tolerance.
  - -- (U) Complete fabrication of electrical power system that integrates power generation and electrical distribution functions.

(U) FY 1996:
- (U) Design, fabricate, and test components supporting a demonstrator aircraft electrical distribution system. The electrical distribution system ensures fault tolerant architecture, improving aircraft reliability and survivability. ($2,000K)
  - -- (U) Complete hardware fabrication of fault tolerant 270 Volts direct current (Vdc) aircraft electrical power system to demonstrate a two-fold increase in reliability and a 40% weight reduction for the secondary power system.
  - -- (U) Complete detail design of an advanced motor controller for aircraft offering a 50% improvement in power density and reliability.
- (U) Design, fabricate, and test a demonstrator aircraft on-board Integrated Power Unit (IPU). The IPU is critical for aircraft engine starting, auxiliary power, and emergency power. ($728K)
  - -- (U) Complete detailed design and fabrication of aircraft on-board IPU hardware for demonstration testing in FY 1997.

(U) FY 1997:
- (U) Design, fabricate, and test components supporting a demonstrator aircraft electrical distribution system. The electrical distribution system ensures fault tolerant architecture, improving aircraft reliability and survivability. ($3,413K)
  - -- (U) Complete testing of fault tolerant 270 Vdc power system demonstrating fault tolerance and a 40% reduction in weight.
  - -- (U) Fabricate and test advanced motor controller for aircraft demonstrating a 50% improvement in power density.
- (U) Design, fabricate, and test a demonstrator aircraft on-board IPU. The IPU is critical for aircraft engine starting, auxiliary power, and emergency power. ($800K)
  - -- (U) Test aircraft on-board IPU hardware to demonstrate the integration of auxiliary and engine electrical starting power functions providing a two- to three-fold increase in reliability and a two-fold reduction in weight.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #3, Advanced Development

PE NUMBER AND TITLE: PE 0603216F, Aerospace Propulsion and Power Technology

PROJECT NO.: 3035

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	2,081	3,327	4,228	5,313	Cont
Current President's Budget	2,045	1,010	2,728	4,213	Cont

Change Summary Explanation:

Funding: Low level of funding in FY 1995 was due to Congressional reductions. Increase in FY 1997 is partial restoration of funding for this high priority project.

Schedule: Fault tolerant electrical distribution system schedule will slip.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(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.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #3, Advanced Development

PE NUMBER AND TITLE: PE 0603216F, Aerospace Propulsion and Power Technology

PROJECT NO.: 3036

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 3036, Battery Technology	480	0	0	0	0	0	0	0	Cont	Cont

A. (U) Mission Description and Budget Item Justification: Develops and demonstrates advanced battery technology for aircraft and missiles to provide higher energy density (more energy per volume) with improved life. A major focus is the development of a nickel-cadmium aircraft battery with a 20-year maintenance-free life expectancy. Current nickel-cadmium 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 from decreased life cycle and maintenance costs. This project will be terminated in FY 1995 and the efforts transferred into Project 3035, Aerospace Power Technology.

(U) FY 1994:
- (U) Completed charger packaging and qualification testing of a flight ready battery charger. ($243K)
- (U) Integrated battery and charger systems and check circuit logic and communications. ($95K)
- (U) Performed full range of battery/charger system testing including life cycle, temperature cycling, vibration, and electromagnetic interference. ($142K)

(U) FY 1995: Not Applicable.

(U) FY 1996: Not Applicable.

(U) FY 1997: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #3, Advanced Development

PE NUMBER AND TITLE: PE 0603216F, Aerospace Propulsion and Power Technology

PROJECT NO.: 3036

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	480	0	0	0	Cont
Current President's Budget	480	0	0	0	Cont

Change Summary Explanation:

Funding: In FY 1995, these efforts are transferred into Project 3035, Aerospace Power Technology.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(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.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #3, Advanced Development

PE NUMBER AND TITLE: PE 0603216F, Aerospace Propulsion and Power Technology

PROJECT NO.: 681B

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 681B, Advanced Turbine Engine Gas Generator (ATEGG)	28,742	28,871	31,872	33,864	34,297	34,810	36,172	37,193	Cont	Cont

A. (U) Mission Description and Budget Item Justification: This 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, durability, repairability, and maintainability 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 and commercial systems including aircraft, missiles, land combat vehicles, and ships. The ATEGG project supports the Integrated High Performance Turbine Engine Technology (IHPTET) initiative. IHPTET is a three phase, totally integrated DOD, ARPA, NASA, and industry initiative focused on doubling turbine engine propulsion capabilities while reducing cost of ownership. The IHPTET program structure provides continuous technology transition for military turbine engine upgrades and derivatives and has the added benefit of enhancing the U.S. turbine engine industry's international competitiveness and demonstrates affordable turbine engine high pressure core components.

(U) FY 1994:

- (U) Designed, fabricated, and tested technology demonstration core engines for turbofan/turbojet engines for fighters, attack aircraft, bombers, and transports. ($28,477K)
  - -- (U) Completed testing of a turbofan/turbojet core with a 20% reduction in fuel consumption and a 30% increase in thrust-to-weight ratio (relative to 1986 baseline).
  - -- (U) Completed testing of a turbofan/turbojet core with a 600^{O}F increase in maximum temperature capability (relative to 1986 baseline).
  - -- (U) Designed and fabricated hardware in support of turbofan/turbojet core testing in FY 1995.
- (U) Designed, fabricated, and tested technology demonstration core engines for turboshaft/turboprop and small turbofan engines for trainers, rotorcraft, special operations aircraft, and theater transports. ($265K)
  - -- (U) Completed testing of turboprop/turboshaft core engines with an 18% reduction in fuel consumption and a 24% increase in power-to-weight ratio (relative to 1986 baseline).

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #3, Advanced Development	PE NUMBER AND TITLE: PE 0603216F, Aerospace Propulsion and Power Technology — PROJECT NO.: 681B

(U) FY 1995:
- (U) Design fabricate, and test technology demonstration core engines for turbofan/turbojet engines for fighters, attack aircraft, bombers, and transports. ($27,391K)
  - -- (U) Conduct testing of turbofan/turbojet cores with a 600^{O}F increase in maximum temperature capability and a 40% increase in thrust-to-weight ratio (relative to 1986 baseline).
  - -- (U) Design and fabricate turbofan/turbojet core engine hardware (flexible, variable cycle core; high temp metal matrix composite compressor rotor; low-cost, cast-cooled turbine blade) in support of performance core engine testing in FY 1997.
  - -- (U) Design and fabricate turbofan/turbojet core engine hardware (titanium aluminide (TiAl) compressor blades; supercooled turbine components; Lamilloy turbine vanes) in support of durability core engine testing in FY 1997.
- (U) Design, fabricate, and test technology demonstration core engines for turboshaft/turboprop and small turbofan engines for trainers, rotorcraft, special operations aircraft, and theater transports. ($1,480K)
  - -- (U) Conduct turboprop/turboshaft core engine testing demonstrating a 21% reduction in fuel consumption and a 54% increase in power-to-weight ratio (relative to 1986 baseline).
  - -- (U) Design and fabricate turboprop/turboshaft core engine hardware for demonstrator engine testing in FY 1996 and FY 1997.

(U) FY 1996:
- (U) Design, fabricate, and test technology demonstration core engines for turbofan/turbojet engines for fighters, attack aircraft, bombers, and large transports. ($30,345K)
  - -- (U) Fabricate turbofan/turbojet core engine hardware (flexible, variable cycle core; high temp metal matrix composite compressor rotor; low-fan/turbojet core engine hardware (titanium aluminide (TiAl) compressor blades; super cooled turbine components; Lamilloy turbine vanes) in support of durability core engine testing in FY 1997.
- (U) Design, fabricate, and test technology demonstration core engines for turboshaft/turboprop and small turbofan engines for trainers, rotorcraft, special operations aircraft, and theater transports. ($1,527K)
  - -- (U) Test turboprop/turboshaft cores with a 25% reduction in fuel consumption and a 60% increase in power-to-weight ratio (relative to 1986 baseline).
  - -- (U) Fabricate turboprop/turboshaft core engine hardware in support of core engine testing in FY 1997.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #3, Advanced Development	PE NUMBER AND TITLE: PE 0603216F, Aerospace Propulsion and Power Technology — PROJECT NO.: 681B

(U) FY 1997:

- (U) Design, fabricate, and test technology demonstration core engines for turbofan/turbojet engines for fighters, attack aircraft, bombers, and large transports.($32,864K)
  - -- (U) Test a turbofan/turbojet core engine demonstrating a 30% reduction in fuel consumption, a 60% increase in thrust-to-weight ratio, and a 25% reduction in manufacturing cost (relative to 1986 baseline).
  - -- (U) Conduct durability tests of turbofan/turbojet core engine demonstrating critical technology potential life characteristics.
  - -- (U) Fabricate turbofan /turbojet core engine hardware for FY 1998 demonstration of critical path technologies to provide a 40% reduction in fuel consumption, a 100% increase in thrust-to-weight ratio, and a 35% reduction in manufacturing cost by FY 2003 (goals relative to 1986 baseline).
- (U) Design, fabricate, and test technology demonstration core engines for turboshaft/turboprop and small turbofan engines for trainers, rotorcraft, special operations aircraft, and theater transports. ($1,000K)
  - -- (U) Test a turboprop/turboshaft core engine demonstrating a 30% reduction in fuel consumption and an 80% increase in power-to-weight ratio (relative to 1986 baseline).

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #3, Advanced Development

PE NUMBER AND TITLE: PE 0603216F, Aerospace Propulsion and Power Technology

PROJECT NO.: 681B

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	29,150	30,471	28,753	31,765	Cont
Current President's Budget	28,742	28,871	31,872	33,864	Cont

Change Summary Explanation:

Funding: Turbine engine efforts restored in FY 1996 and FY 1997 to achieve Phase II Integrated High Performance Turbine Engine Technology goals by FY 1997.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0602201F, Aerospace Flight Dynamics.
- (U) PE 0602203F, Aerospace Propulsion.
- (U) PE 0603202F, Aircraft Propulsion Subsystem Integration.
- (U) PE 0602122N, Aircraft Technology.
- (U) PE 0603210N, Aircraft Propulsion.
- (U) PE 0603003A, Aviation Advanced Technology.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #3, Advanced Development

PE NUMBER AND TITLE: PE 0603227F, Personnel, Training, and Simulation Technology

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Total PE 0603227F Cost	8,120	8,889	8,930	7,695	7,840	7,969	8,206	8,451	Cont	Cont
Project 2743, Combat Aircrew Training Technology	4,597	5,129	5,180	4,550	4,635	4,714	4,855	5,000	Cont	Cont
Project 2922, Manpower and Force Management	1,379	1,579	1,518	1,620	1,653	1,676	1,726	1,778	Cont	Cont
Project 2949, Advanced Training Technology	2,144	2,181	2,232	1,525	1,552	1,579	1,625	1,673	Cont	Cont

A. (U) Mission Description and Budget Item Justification: This Advanced Development program develops and demonstrates improved operational readiness and combat training through Manpower, Personnel, and Training (MPT) technologies. MPT includes: systems to write computer-based training programs; decision-aiding systems to optimize personnel use; job performance measurement technologies; analytical tools to better consider MPT in systems design; and realistic aircrew combat training. All efforts in this program element contain the resources necessary, including civilian salaries, to manage, conduct, and document the technical activities.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #3, Advanced Development

PE NUMBER AND TITLE: PE 0603227F, Personnel, Training, and Simulation Technology

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	8,769	9,241	8,974	8,733	Cont
Appropriated Value	8,818	9,000			
Adjustments to Appropriated Value					
a. Congressional General Reductions	-49	-111			
b. SBIR	-122				
c. Omnibus Reprogramming	-500				
d. Below Threshold Reprogramming	-27				
Current President's Budget	8,120	8,889	8,930	7,695	Cont

Change Summary Explanation:

Funding: Not Applicable.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary: Not Applicable.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #3, Advanced Development

PE NUMBER AND TITLE: PE 0603227F, Personnel, Training, and Simulation Technology

PROJECT NO.: 2743

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 2743, Combat Aircrew Training Technology	4,597	5,129	5,180	4,550	4,635	4,714	4,855	5,000	Cont	Cont

A. (U) Mission Description and Budget Item Justification: 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 contributing to combat success. Evaluates technologies for long-distance computer networking to enhance current methods for joint-Service training.

(U) FY 1994:
- (U) Developed and demonstrated simulators and associated technologies for use in armed forces personnel training. ($2,534K)
  - -- (U) Developed low-cost, full color, high-acuity screen technology for projection displays to be used in training.
  - -- (U) Developed and evaluated a tri-Service, wide area network of simulators for the development of joint-Service training guidelines; part of the Multi-Service Distributed Training Testbed.
- (U) Developed and demonstrated technologies and/or evaluation methods for specific Air Force training arenas (i.e., control debriefs, night vision goggles, and situational awareness). ($2,063K)
  - -- (U) Developed control, debrief, and Air Combat Maneuvering Instrumentation-like viewing stations for manned multi-ship scenarios and mission rehearsals.
  - -- (U) Transitioned introductory night vision goggle (NVG) training course to Air Education and Training Command.

(U) FY 1995:
- (U) Develop and demonstrate simulator and associated technology for armed forces personnel training. ($3,176K)
  - -- (U) Develop low-cost, high fidelity, deployable demonstrator technology for the A-10.
  - -- (U) Demonstrate an F-15 four-ship network of simulators in an integrated threat environment; evaluate this technology for unit training.
  - -- (U) Demonstrate deployable visual display technology for simulation in combat units.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE February 1995
BUDGET ACTIVITY: #3, Advanced Development	PE NUMBER AND TITLE: PE 0603227F, Personnel, Training, and Simulation Technology — PROJECT NO.: 2743

- (U) Develop and demonstrate night vision goggle (NVG) training and guidelines to meet Air Force mission requirements. ($1,953K)
  - -- (U) Develop and evaluate distance estimation training program for rotor wing NVG use.
  - -- (U) Develop and evaluate NVG training media and facility alternatives.
  - -- (U) Develop high fidelity visual simulation imagery for NVG training.

(U) FY 1996:
- (U) Develop and demonstrate simulators and associated technologies for armed forces personnel training. ($2,745K)
  - -- (U) Develop, integrate, and evaluate existing joint-Service training environments for Distributed Mission Training.
  - -- (U) Perform training utility evaluation of a multi-ship training air-to-ground technology testbed.
  - -- (U) Develop advanced network gateway technology for distributed simulation.
- (U) Continue to develop and demonstrate NVG training and guidelines to meet Air Force mission requirements. ($2,435K)
  - -- (U) Continue development of high fidelity visual simulation of NVG imagery for NVG training.
  - -- (U) Develop and demonstrate advanced NVG training course.

(U) FY 1997:
- (U) Develop and demonstrate simulators and associated technologies for armed forces personnel training. ($1,697K)
  - -- (U) Develop secure, networked, dynamic databasing.
  - -- (U) Demonstrate mobile, interactive, air and ground threat environment technology.
  - -- (U) Develop C-130 low-cost, high fidelity demonstrator technology.
- (U) Demonstrate virtual and constructive environments for distributed mission training. ($1,067K)
  - -- (U) Demonstrate multi-Service capable virtual and constructive environments for Distributed Mission Training.
  - -- (U) Develop functional specification for networked simulation.
- (U) Develop and demonstrate NVG training and guidelines to meet Air Force requirements. ($1,786K)
  - -- (U) Develop and demonstrate NVG mission specific courseware.
  - -- (U) Develop and demonstrate low cost visual display technology suitable for simulated NVG training.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT NO.
#3, Advanced Development	PE 0603227F, Personnel, Training, and Simulation Training	2743

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	5,324	5,328	5,294	5,106	Cont
Current President's Budget	4,597	5,129	5,180	4,550	Cont

Change Summary Explanation:

Funding: Not Applicable.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0602202F, Human Systems Technology.
- (U) PE 0604227F, Flight Simulator Development.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #3, Advanced Development

PE NUMBER AND TITLE: PE 0603227F, Personnel, Training, and Simulation Technology

PROJECT NO.: 2922

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 2922, Manpower and Force Management	1,379	1,579	1,518	1,620	1,653	1,676	1,726	1,778	Cont	Cont

A. (U) Mission Description and Budget Item Justification: This project develops technologies to analyze Manpower, Personnel, and Training (MPT) factors early in weapon systems design and acquisition to ensure the factors 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.

(U) FY 1994:

- (U) Completed development of technologies and procedures to assist in linking the design and procurement of new weapon systems and major systems modifications to personnel capabilities and training factors to ensure that future acquisitions are acquired and maintained at lowest life cycle cost. ($1,379K)
  - -- (U) Developed and assessed initial version of a manpower estimation model for new weapon system design and maintenance manpower planning.
  - -- (U) Developed and assessed initial version of a baseline comparison technology for estimating training and manpower requirements for new weapon systems.

(U) FY 1995:

- (U) Continue development of technologies and procedures to assist in linking the design and procurement of new weapon systems and major systems modifications to personnel capabilities and training factors to ensure that future acquisitions are acquired and maintained at lowest life cycle cost. ($1,379K)
  - -- (U) Complete analysis of the MPT Decision Support System (DSS) for use in weapon system acquisition.
  - -- (U) Develop and demonstrate MPT decision support technology to aircraft design community.
  - -- (U) Develop training technology for effective use of MPT decision support technology for weapon acquisition.
- (U) Develop situational awareness pilot selection test battery technology. ($200K)
  - -- (U) Identify test battery content to include multi-tasking ability, spatial processing ability, and working memory.
  - -- (U) Develop alternative technologies including software, scoring algorithms, and computer-based technologies.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #3, Advanced Development	PE NUMBER AND TITLE: PE 0603227F, Personnel, Training, and Simulation Technology — PROJECT NO.: 2922

(U) FY 1996:
- (U) Continue development of technology and procedures to assist in linking the design and procurement of new weapon systems and major systems modifications to personnel capabilities and training factors to ensure that future acquisitions are acquired and maintained with lowest life cycle cost. ($1,275K)
  - -- (U) Deliver the Manpower Personnel and Training (MPT) Decision Support System (DSS) technology to user community.
  - -- (U) Make available for transition the MPT DSS technology to 6.4 program and define necessary modifications and enhancements.
  - -- (U) Develop an integration procedure to link critical joint service individual attributes to joint service readiness.
  - -- (U) Define the requirements for a technology that determines wartime training requirements and optimally match personnel to wartime jobs.
  - -- (U) Develop a joint-Service job classification technology for use during wartime missions.
- (U) Develop technology for collection of field data for validation of situational awareness. ($243K)
  - -- (U) Deploy applied technology analysis and hardware for the conduction at diverse locations including Undergraduate Pilot Training bases and ROTC detachments.
  - -- (U) Conduct front-end analyses to determine if test battery software can be hosted in selected higher order language programs on Pentium-based test stations.

(U) FY 1997:
- (U) Continue development of technologies and procedures to assist in linking the design and procurement of new weapon systems and major systems modifications to personnel capabilities and training factors to ensure that future acquisitions are acquired and maintained with lowest life cycle cost. ($1,370K)
  - -- (U) Develop a methodology, plan, and schedule for restructuring joint-Service jobs.
  - -- (U) Develop technologies to specify minimum acceptable performance levels for entry-level and career jobs.
  - -- (U) Define key personnel and job attributes necessary for establishing neutral job classifications.
- (U) Continue field data collection for validation of situational awareness pilot selection test battery. ($250K)
  - -- (U) Conduct analyses of pilot training performance metrics to determine criterion sufficiency in preparation of validation.
  - -- (U) Baseline and compare alternate forms of situational awareness pilot selection test technology.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #3, Advanced Development

PE NUMBER AND TITLE: PE 0603227F, Personnel, Training, and Simulation Technology

PROJECT NO.: 2922

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	1,488	1,642	1,640	1,622	Cont
Current President's Budget	1,379	1,579	1,518	1,620	Cont

Change Summary Explanation:

Funding: Not Applicable.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0602202F, Human Systems Technology.
- (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.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #3, Advanced Development

PE NUMBER AND TITLE: PE 0603227F, Personnel, Training, and Simulation Technology

PROJECT NO.: 2949

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 2949, Advanced Training Technology	2,144	2,181	2,232	1,525	1,552	1,579	1,625	1,673	Cont	Cont

A. (U) Mission Description and Budget Item Justification: This project develops and demonstrates computer-based intelligent tutoring technology, for adaptive expertise across tasks in high-technology jobs, and software enabling Air Force training developers to rapidly and affordably build intelligent computer-assisted training systems which continually interact with students for effective individualized training.

(U) FY 1994:
- (U) Developed tutor technology for avionics and mechanical job families. ($544K)
  - -- (U) Evaluated and delivered to Air Combat Command (ACC) avionics intelligent tutor technology for aircraft maintenance troubleshooting skills.
- (U) Developed and demonstrated software and authoring tools for intelligent tutors. ($1,181K)
  - -- (U) Developed pre-transition-version of Rapid Intelligent Tutor System (ITS) Development System (RIDES) technology.
  - -- (U) Developed tutors for UHF radio test procedures and for disassembling equipment using RIDES authoring technology.
  - -- (U) Developed ITS authoring shell for building procedural training tutors.
- (U) Developed career field training decision support software for personal computer use. ($419K)
  - -- (U) Demonstrated effectiveness of career field education and training plan shell and transitioned it to Air Force career field managers.
  - -- (U) Developed initial specifications for integrated training decision support technology.

(U) FY 1995:
- (U) Develop and demonstrate advanced tutors and intelligent tutor authoring technologies for avionics and mechanical job families. ($609K)
  - -- (U) Evaluate and deliver to ACC troubleshooting tutor technology for hydraulics, radar and penetration aid shops, and flightline maintenance.
- (U) Continue to develop and demonstrate software and authoring tools for intelligent tutors. ($797K)
  - -- (U) Continue field evaluation of RIDES authoring technology by building a tutor technology for B-2 aircraft maintainance technicians and for missile launch console operations.
  - -- (U) Develop virtual environment-based ITS authoring technology.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #3, Advanced Development	PE NUMBER AND TITLE: PE 0603227F, Personnel, Training, and Simulation Technology — PROJECT NO.: 2949

- (U) Continue to develop career field decision support software for personal computer use. ($775K)
  - -- (U) Validate components of an integrated career field training management technology.
  - -- (U) Evaluate user interface for the training impacts decision technology and develop specifications.

(U) FY 1996:
- (U) Continue to develop and demonstrate software and authoring tools for intelligent tutors. ($1,741K)
  - -- (U) Deliver Rapid Intelligent Tutor System (ITS) Development System (RIDES) authoring technology to Air Force customers.
  - -- (U) Continue to develop and evaluate virtual environment (VE) based ITS authoring technology.
- (U) Continue to develop career field training decision support software for personal computer use. ($312K)
  - -- (U) Develop and deliver operator and analyst training programs for the training impacts decision technology.
  - -- (U) Evaluate training impacts on decision technology in the field.
- (U) Begin development of advanced instructional design advisor technology to reduce the cost and time to design and develop interactive courseware. ($179K)
  - -- (U) Develop functional specifications for the Advanced Instructional Design Advisor (AIDA).
  - -- (U) Develop architecture for AIDA.

(U) FY 1997:
- (U) Develop advanced instructional design support tools. ($200K)
  - -- (U) Begin developing objective pilot instruction and evaluation technology to automate pilot instruction and performance assessment.
- (U) Continue to develop and demonstrate software and authoring tools for intelligent tutors. ($677K)
  - -- (U) Continue to develop VE-based ITS authoring technology.
  - -- (U) Develop and evaluate tutors using VE-based ITS authoring technology.
- (U) Deliver career field decision support software for personal computer use to Air Force customers. ($335K)
  - -- (U) Complete field assessment of the training impacts decision technology.
  - -- (U) Transition training impacts decision technology to operational Air Force.
- (U) Continue to develop advanced instructional design advisor technology to reduce the cost and time to design and develop interactive courseware. ($313K)
  - -- (U) Integrate functional and procedural instructional design guidance into AIDA.
  - -- (U) Develop field assessment plan to evaluate AIDA.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #3, Advanced Development

PE NUMBER AND TITLE: PE 0603277F, Personnel, Training, and Simulation Technology

PROJECT NO.: 2949

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	1,957	2,271	2,040	2,005	Cont
Current President's Budget	2,144	2,181	2,232	1,525	Cont

Change Summary Explanation:

Funding: Changes in FY 1996 due to increased emphasis on intelligent tutor technologies.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0602202F, Human Systems Technology.
- (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.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: **February 1995**

BUDGET ACTIVITY: **#3, Advanced Development**

PE NUMBER AND TITLE: **PE 0603231F, Crew Systems and Personnel Protection Technology**

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Total PE 0603231F Cost	12,609	17,332	18,953	19,081	19,709	19,966	21,461	22,982	Cont	Cont
Project 2722, Aerospace Chemical, Biological, and Directed Energy Defense	2,499	-0-	-0-	-0-	-0-	-0-	-0-	-0-	Cont	Cont
Project 2829, Crew-Centered Cockpit Design	2,329	2,319	1,992	2,031	2,112	2,526	2,669	2,858	Cont	Cont
Project 2830, Advanced Life Support	3,431	4,101	4,266	3,024	3,115	3,724	3,938	4,218	Cont	Cont
Project 2868, Crew Escape	2,197	4,724	6,095	6,529	6,552	7,750	8,546	9,152	Cont	Cont
Project 3257, Helmet-Mounted Sensory Technologies	2,153	6,188	6,600	7,497	7,930	5,966	6,308	6,754	Cont	Cont

A. (U) Mission Description and Budget Item Justification: This Advanced Development program develops and demonstrates technologies 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. All efforts in this program element contain the resources necessary, including civilian salaries, to manage, conduct, and document the technical activities.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

#3, Advanced Development

PE NUMBER AND TITLE: **PE 0603231F, Crew Systems and Personnel Protection Technology**

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	12,888	16,600	18,042	18,555	Cont
Appropriated Value	12,960	17,700			
Adjustments to Appropriated Value:					
a. Congressional General Reductions	-72	-368			
b. SBIR	-179				
c. Below Threshold Reprogramming	-100				
Current President's Budget	12,609	17,332	18,953	19,081	Cont

Change Summary Explanation:

Funding: Changes due to budget priorities and increased emphasis on the requirements of women in combat aircraft ejection seats and life support technologies.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary: Not Applicable.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #3, Advanced Development

PE NUMBER AND TITLE: PE 0603231F, Crew Systems and Personnel Protection Technology

PROJECT NO.: 2722

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 2722, Aerospace Chemical, Biological, and Directed Energy Defense	2,499	-0-	-0-	-0-	-0-	-0-	-0-	-0-	Cont	Cont

A. (U) Mission Description and Budget Item Justification: This project develops technology to protect Air Force members performing duty in hazardous environments. The goal is to maintain sortie generation rates and effectively treat casualties in any type of combat environment.

(U) FY 1994:
- (U) Completed and transitioned technologies for facility model, casualty generation model, and execution components of the Threat Related Attrition System to Engineering and Manufacturing Development (EMD). ($855K)
- (U) Completed wartime medical planning technology casualty care models for first/second and third/fourth echelons. Designed a medical theater model. ($1,276K)
- (U) Developed technology to improve survivability of aircrew and ground crew supporting air operations in hazardous environments. ($368K)

(U) FY 1995: Not Applicable.

(U) FY 1996: Not Applicable.

(U) FY 1997: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT NO.
#3, Advanced Development	PE 0603231F, Crew Systems and Personnel Protection Technology	2722

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	2,691	-0-	-0-	-0-	Cont
Current President's Budget	2,499	-0-	-0-	-0-	Cont

Change Summary Explanation:

Funding: OSD has transferred responsibility for this technology to the Army starting in FY1995.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0602202F, Human Systems Technology.
- (U) PE 0604601F, Chemical Defense Equipment.
- (U) PE 0604703F, Aeromedical/Casualty Care Systems Development.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #3, Advanced Development

PE NUMBER AND TITLE: PE 0603231F, Crew Systems and Personnel Protection Technology

PROJECT NO.: 2829

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 2829, Crew-Centered Cockpit Design	2,329	2,319	1,992	2,031	2,112	2,526	2,669	2,858	Cont	Cont

A. (U) Mission Description and Budget Item Justification: This project develops, demonstrates, and transitions technolgy for design and modification of crew stations that will enhance aircrew performance and safety. Using systems engineering, human factors principles, mission requirements, and crew capabilities, the project developes rigorous, traceable, and human-centered ways to design and test cockpits.

(U) FY 1994:

- (U) Demonstrated crew-centered cockpit design process and software tools for crew station modifications for multi-place aircraft, including special operations applications. ($1,597K)
  - -- (U) Completed second of five tests, demonstrating effectiveness of redesigned AC-130H Fire Control Operator (FCO) cockpit in improving crew performance and reducing crew workload for FCO, pilot and navigator stations.
  - -- (U) Upgraded new design process and software suite of design tools based on first test of the AC-130H FCO coclpit.
  - -- (U) Published and presented four papers at a national electronics conference which described advanced cockpit design process, results of first test demonstrating effective application to single-place fighter upgrade, advanced design traceability manager software tool, cockpit simulators.
- (U) Conducted technology demonstration at USAF and USN flight test centers of computer support technology to enhance assessment process of crew station designs. ($732K)
  - -- (U) Demonstrated new test planning, analysis and evaluation computer tool for cockpit evaluation in field demonstrations by numerous test agency users at Air Force and Navy flight test centers.

(U) FY 1995:

- (U) Develop and demonstrate human-centered software tools for design and modification of crew stations. ($1,925K)
  - -- (U) Demonstrate advanced design process and tools applied to redesign of cockpits for enhanced defensive situation awareness in conventional standoff attack mission.
  - -- (U) Plan beta test program and prepare crew-centered cockpit design software tools and user manuals for release to industry/government cockpit specialists for controlled user evaluation.
  - -- (U) Complete version 3.0 of crew-centered cockpit design process and implement on computer design system for additional validation tests.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #3, Advanced Development	PE NUMBER AND TITLE: PE 0603231F, Crew Systems and Personnel Protection Technology 2829 — PROJECT NO.

- (U) Complete demonstration and documentation of a computer work station for use by test engineers in conducting flight evaluations. ($394K)
  - -- (U) Conclude operational test at flight test agencies, document and transition to users.

(U) FY 1996:
- (U) Continue to develop and demonstrate human-centered software tools for design and modification of crew stations. ($1,550K)
  - -- (U) Develop computer data base and software tool for accommodating male and female flying population during system design
  - -- (U) Demonstrate advanced design process and tools, showing ability to accommodate full range of flying population in cockpit design by accounting for ranges of male and female size, strength and performance.
  - -- (U) Perform beta test program of crew-centered cockpit design software tools at multiple user locations.
- (U) Continue to develop crew station design and evaluation technology to support emerging distributed interactive system development process. ($442K)
  - -- (U) Demonstrate adapting the test planning, analysis and evaluation system software and procedures, previously proven for cockpit flight testing, for integrating the human system interface with advanced distributed simulation environment.

(U) FY 1997:
- (U) Continue to develop and demonstrate human-centered software tools for design and modification of crew stations. ($541K)
  - -- (U) Conclude field demonstration program with final test of advanced cockpit design process and software tools, showing ability to improve crew performance for single-place and multi-place aircraft, across a range of operational military missions, accommodating both male and female flying crew populations, and applicability throughout the full weapon system acquisition and operation cycle.
  - -- (U) Make available for transition crew-centered cockpit technology to industry and acquisition centers for use in weapon system developments.
- (U) Continue to develop crew station design and evaluation technology to support emerging distributed interactive system development process. ($1,490K)
  - -- (U) Establish ground-based laboratory extending proven crew-centered cockpit technology to design evaluation of battle management crew systems, including theater missile defense, command and control, and related multi-crew applications.
  - -- (U) Demonstrate ability to extract human performance data from distributed simulation node to support development of enhanced human-systems interfaces.
  - -- (U) Demonstrate crew-centered system node for theater missile defense simulation.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #3, Advanced Development

PE NUMBER AND TITLE: PE 0603231F, Crew Systems and Personnel Protection Technology

PROJECT NO.: 2829

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	2,329	2,221	2,001	2,053	Cont
Current President's Budget	2,329	2,319	1,992	2,031	Cont

Change Summary Explanation:

Funding: Not Applicable.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0602202F, Human Systems Technology.
- (U) PE 0603205F, Aerospace Vehicle Technology.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #3, Advanced Development

PE NUMBER AND TITLE: PE 0603231F, Crew Systems and Personnel Protection Technology

PROJECT NO.: 2830

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 2830, Advanced Life Support	3,431	4,101	4,266	3,024	3,115	3,724	3,938	4,218	Cont	Cont

A. (U) Mission Description and Budget Item Justification: This project develops and demonstrates advanced aircrew life support technologies. The goal is to improve combat performance while protecting aircrews from physiological stresses such as high altitude, high G-forces, thermal burden, nuclear weapons, and directed energy. This project also develops technologies to protect Air Force personnel working in hazardous environments and effectively treat casualties in diverse combat environments.

(U) FY 1994:
- (U) Developed and demonstrated acceleration protection and life support technologies for improved aircrew performance and safety. ($2,920K)
  - -- (U) Developed and integrated survival vest/body armor specifications.
  - -- (U) Developed aircrew respirator specifications for chemical protection in high-G environments.
  - -- (U) Developed aircrew personal environmental control specifications.
- (U) Developed and demonstrated technologies for improved aircrew and support personnel protective equipment. ($511K)

(U) FY 1995:
- (U) Develop and demonstrate technologies for improved protective equipment for aircrew and support personnel. ($1,459K)
  - -- (U) Demonstrate and transition advanced laser eye protection.
  - -- (U) Develop advanced technology for improved positive-pressure breathing oxygen mask for high-G maneuvers and high altitude operations.
  - -- (U) Develop advanced technology for personnel protective equipment specifically designed for female aviators.
- (U) Develop and demonstrate life support technologies for integration into aircraft to improve aircrew safety and reduce logistical burdens. ($1,642K)
  - -- (U) Develop technology for advanced oxygen equipment to replace the requirement for liquid oxygen in air-transportable hospitals thereby reducing logistics burdens during deployment.
  - -- (U) Develop advanced technology for aircrew personal environmental control.
- (U) Develop technology to protect and sustain Air Force personnel operating in hazardous environments. ($1,000K)
  - -- (U) Develop operational analysis capabilities for wartime medical planning, personnel protection, and combat sustainability.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: **#3, Advanced Development**	PE NUMBER AND TITLE: **PE 0603231F, Crew Systems and Personnel Protection Technology** PROJECT NO.: **2830**

(U) FY 1996:
- (U) Continue to develop and demonstrate technologies for improved protective equipment for aircrew and support personnel. ($2,061K)
  -- (U) Develop advanced technology for an improved aircrew oxygen mask for COMBAT EDGE.
  -- (U) Develop personnel protective equipment to provide improved protection in hostile environments for female aviators.
  -- (U) Continue development of aircrew protection against visible wavelength lasers.
- (U) Continue to develop and demonstrate life support technologies for integration into aircraft to improve aircrew safety and reduce logistical burdens. ($1,705K)
  -- (U) Develop advanced hybrid oxygen system technologies to replace current liquid oxygen systems.
  -- (U) Complete laboratory demonstration of personal environmental control technology for aircrew.
- (U) Continue to develop technology to protect and sustain Air Force personnel operating in hazardous environments. ($500K)

(U) FY 1997:
- (U) Continue to develop and demonstrate technologies for improved protective equipment for aircrew and support personnel. ($1,796K)
  -- (U) Develop advanced technology for an improved aircrew oxygen mask.
  -- (U) Develop personnel protective equipment for female aviators.
  -- (U) Develop and demonstrate integration of laser threat analysis into Air Force mission planning models.
- (U) Continue to develop and demonstrate life support technologies for integration into aircraft to improve aircrew safety and reduce logistical burdens. ($728K)
  -- (U) Develop advanced hybrid oxygen system technologies to replace current liquid oxygen systems.
- (U) Continue to develop technology to protect and sustain Air Force personnel operating in hazardous environments. ($500K)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #3, Advanced Development

PE NUMBER AND TITLE: PE 0603231F, Crew Systems and Personnel Protection Technology

PROJECT NO.: 2830

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	3,518	3,928	4,286	3,054	Cont
Current President's Budget	3,431	4,101	4,266	3,024	Cont

Change Summary Explanation:

Funding: Not Applicable

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0602202F, Human Systems Technology.
- (U) PE 0604601F, Chemical Defense Equipment.
- (U) PE 0604703F, Aeromedical/Casualty Care Systems Development.
- (U) PE 0604706F, Life Support Systems.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #3, Advanced Development

PE NUMBER AND TITLE: PE 0603231F, Crew Systems and Personnel Protection Technology

PROJECT NO.: 2868

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 2868, Crew Escape	2,197	4,724	6,095	6,529	6,552	7,750	8,546	9,152	Cont	Cont

A. (U) Mission Description and Budget Item Justification: This project develops and demonstrates advanced crew escape technologies to protect aircrews during ejection. The goal is to reduce aircrew fatalities and major injuries in emergency ejections occurring at up to 700 knots equivalent air speed (KEAS) and at low altitude, adverse attitudes. This project will also improve escape system reliability, maintainability, and logistics supportability.

(U) FY 1994:
- (U) Developed technologies for demonstration of both gel and solid propellant escape propulsion. ($1,901K)
  - (U) Completed initial testing of gel escape propulsion technology.
  - (U) Completed initial testing of solid propellant escape propulsion technology.
- (U) Completed trade studies of escape system flight control and high-speed life protection devices. ($296K)

(U) FY 1995:
- (U) Demonstrate both gel and solid propellant escape propulsion technologies. ($2,050K)
  - (U) Demonstrate solid propellant escape propulsion technology.
  - (U) Demonstrate gel propellant escape propulsion technology.
- (U) Develop and demonstrate escape system flight control, ejection seats, and high-speed life protection devices. ($2,674K)
  - (U) Design flight controller.
  - (U) Design demonstration seat with high-speed life protection devices.
  - (U) Develop advanced catapult technology to control ejection seat accelerations.
  - (U) Demonstrate light-weight, environmentally-sealed parachute and harness technology.
  - (U) Develop light-weight ejection seat parachute and restraint harness technology to reduce aircrew injuries.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #3, Advanced Development	PE NUMBER AND TITLE: PE 0603231F, Crew Systems and Personnel Protection Technology 2868 — PROJECT NO.

(U) FY 1996:
- (U) Continue to develop and demonstrate escape system flight control, ejection seats, and high-speed life protection devices. ($2,650K)
  - -- (U) Code and verify flight control software.
  - -- (U) Fabricate demonstration test ejection seats.
  - -- (U) Fabricate demonstration test flight computers.
  - -- (U) Fabricate high-speed life protection devices.
  - -- (U) Develop independent conceptual design for full aircrew accommodating escape system demonstrator.
- (U) Develop and demonstrate technologies for controlled ejection seat flight from adverse launch attitudes. ($2,187K)
  - -- (U) Fabricate components for propulsion system demonstration tests.
  - -- (U) Conduct demonstration tests at Holloman AFB.
- (U) Develop technologies to address small occupant specifications for current ejection seats. ($1,258K)
  - -- (U) Develop small occupant manikin.
  - -- (U) Develop inertia reel technology for specific applications.

(U) FY 1997:
- (U) Develop technology demonstrator for escape system to accommodate full range of aircrew. ($2,823K)
  - -- (U) Develop configuration for escape system demonstrator.
- (U) Continue demonstration of controlled ejection seat flight from adverse launch attitudes. ($2,806K)
  - -- (U) Complete track testing at Holloman AFB.
  - -- (U) Analyze data from track testing.
  - -- (U) Document fourth generation escape systems technology demonstration program.
- (U) Develop technologies to address small occupant requirements for current ejection seats. ($900K)
  - -- (U) Fabricate two small ejection test manikins.
  - -- (U) Complete demonstration of flight-weight high-speed inertial reel.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #3, Advanced Development	PE NUMBER AND TITLE: PE 0603231F, Crew Systems and Personnel Protection Technology 2868 — PROJECT NO.

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	2,197	4,524	5,124	5,878	Cont
Current President's Budget	2,197	4,724	6,095	6,529	Cont

Change Summary Explanation:

Funding: Increase in FY 1996 and FY 1997 is due to increased emphasis on the requirements of women in combat aircraft ejection seats.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0602202F, Human Systems Technology.
- (U) PE 0603205F, Aerospace Vehicle Technology.
- (U) PE 0603216N, Aircrew Systems Technology.
- (U) PE 0604706F, Life Support Systems.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #3, Advanced Development

PE NUMBER AND TITLE: PE 0603231F, Crew Systems and Personnel Protection Technology

PROJECT NO.: 3257

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 3257, Helmet-Mounted Sensory	2,153	6,188	6,600	7,497	7,930	5,966	6,308	6,754	Cont	Cont

A. (U) Mission Description and Budget Item Justification: This project develops and demonstrates advanced helmet-mounted subsystem technologies to improve mission effectiveness and pilot situational awareness during day and night missions in all weather conditions. Through the development of advanced helmet-mounted tracker and display technologies (HMT/D), pilots will be able to detect, identify, target, and launch weapons faster and more accurately. This project also develops technology for improved night vision goggles (NVG) to enhance combat capabilities at night.

(U) FY 1994:
- (U) Developed and demonstrated miniature display and helmet-vehicle interface technologies for helmet-mounted tracker and displays (HMT/Ds). ($1,154K)
  - -- (U) Defined alternative design requirements for new HMT/D for fighter aircraft.
  - -- (U) Developed miniature cathode ray tube (CRT) technology optimized for use on HMT/Ds.
  - -- (U) Demonstrated standardized helmet-vehicle interface (HVI) for binocular HMT/Ds in ejection seat equipped aircraft.
- (U) Demonstrated the utility of 3-D audio localization and HMT/D technology with high off-boresight angle (HOBA) missile seekers on operational aircraft. ($999K)
  - -- (U) Demonstrated target acquisition with high off-boresight angle (HOBA) missile seekers using an HMT/D on two F-15C aircraft.
  - -- (U) Demonstrated utility of 3-D audio localization on AV8B and OV-10 aircraft.
  - -- (U) Developed improved set of flight qualified display electronics.

(U) FY 1995:
- (U) Continue to develop and demonstrate helmet-vehicle interface and subsystems technologies for HMT/Ds. ($5,715K)
  - -- (U) Conduct test of new advanced HMT/D for fighter aircraft.
  - -- (U) Demonstrate standardized HVI for monocular HMT/Ds.
  - -- (U) Develop new phosphor technology to improve CRT performance for HMT/D applications.
  - -- (U) Evaluate target acquisition with HOBA missile seekers using improved HMT/D on two F-15C aircraft.
- (U) Develop and demonstrate advanced night vision technologies for Air Force-specific aircrew requirements. ($473K)
  - -- (U) Evaluate improved image source technology for NVGs.
  - -- (U) Study anthropometric issues for fit of NVGs and HMT/Ds on full pilot population.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE February 1995
BUDGET ACTIVITY **#3, Advanced Development**	PE NUMBER AND TITLE **PE 0603231F, Crew Systems and Personnel Protection Technology**
	PROJECT NO. **3257**

(U) FY 1996:
- (U) Continue to develop and demonstrate helmet-vehicle interface and subsystems technologies for helmet-mounted tracker and displays (HMT/D). ($5,825K)
  -- (U) Demonstrate advanced HMT/D for tactical air-to-air missions in a simulator.
  -- (U) Develop new image source for HMT/D that will provide color symbology capability.
  -- (U) Evaluate new subsystem technologies for HMT/Ds.
- (U) Continue to develop and demonstrate advanced night vision technologies for Air Force-specific aircrew requirements. ($775K)
  -- (U) Evaluate improved night vision goggles (NVG) technologies.
  -- (U) Study anthropometric issues for fit of NVGs and HMT/Ds on full pilot population.

(U) FY 1997:
- (U) Continue to develop and demonstrate helmet-vehicle interface and subsystems technologies for HMT/Ds. ($5,895K)
  -- (U) Develop design for new HMT/D with color symbology display.
  -- (U) Demonstrate advanced HMT/D on two operational fighters.
  -- (U) Evaluate advanced helmet-vehicle interface designs.
- (U) Continue to develop and demonstrate advanced night vision technologies for Air Force-specific aircrew requirements. ($1,602K)
  -- (U) Evaluate improved NVG technologies.
  -- (U) Develop new image intensifier tube technology for NVGs.
  -- (U) Study anthropometric issues for fit of HMT/Ds on full pilot population.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #3, Advanced Development

PE NUMBER AND TITLE: PE 0603231F, Crew Systems and Personnel Protection Technology

PROJECT NO.: 3257

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	2,153	5,927	6,631	7,570	Cont
Current President's Budget	2,153	6,188	6,600	7,497	Cont

Change Summary Explanation:

Funding: Changes due to increased emphasis on life support technologies.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0602202F, Human Systems Technology.
- (U) PE 0603238F, Global Surveillance and Communications.
- (U) PE 0604706F, Life Support Systems.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #3, Advanced Development

PE NUMBER AND TITLE: PE 0603238F, Global Surveillance and Communications

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Total PE 0603238F Cost	0	1,975	2,483	2,582	2,880	3,100	3,298	3,398	Cont	Cont
Project 4216, Warfighter Information Usage, Management, and Integration Technologies	0	1,975	2,483	2,582	2,880	3,100	3,298	3,398	Cont	Cont
Project 4217, Information Management and Integration Technologies	0	0	0	0	0	0	0	0	0	0

A. (U) Mission Description and Budget Item Justification: This Advanced Development program will develop and demonstrate the technologies required to link national command authorities and sources to deployed Air Force components of a Joint Task Force, regardless of location, and provide a global interactive distributed infrastructure with which commanders, staff, and warfighters can obtain immediate access to critical Command and Control (C2) information associated with all phases of mission planning, execution, and assessment. The global concept calls for use of the evolving worldwide commercial fiber optic communications infrastructure to provide wide-bandwidth DOD communications. This program develops the information transmission, services, and management functions needed to reach the warfighter. This program directly responds to user needs as expressed by the Joint Staff (Command, Control, Communications, Computers, and Intelligence for the Warrior), Air Force (Theater Deployable Communications), Air Mobility Command (Airborne Situational Awareness), and the Defense Information Systems Agency (Far-Term Defense Information Systems Network). All efforts in this program element contain the resources necessary, including civilian salaries, to manage, conduct, and document the technical activities.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #3, Advanced Development

PE NUMBER AND TITLE: PE 0603238F, Global Surveillance and Communications

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	0	14,500	30,569	30,379	Cont
Appropriated Value	0	2,000			
Adjustments to Appropriated Value					
a. Congressional General Reductions		-25			
Current President's Budget	0	1,975	2,483	2,582	Cont

Change Summary Explanation:

Funding: All FY 1994 funds for this program element were zeroed by Congress. Increases from FY 1995 to FY 1996 reflect added emphasis on information technologies for the warfighter. This technology directly supports the Joint Chiefs of Staff Future Joint Warfighting Capability: "To maintain near perfect real-time knowledge of the enemy and communicate that to all forces in near-real-time."

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary: Not Applicable.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #3, Advanced Development

PE NUMBER AND TITLE: PE 0603238F, Global Surveillance and Communications 4216

PROJECT NO.: 4216

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 4216, Warfighter Information Usage, Management, and Integration Technologies	0	1,975	2,483	2,582	2,880	3,100	3,298	3,398	Cont	Cont

A. (U) Mission Description and Budget Item Justification: This project develops, demonstrates, and integrates advanced technologies, including network switches, gateways, and transmission systems, to provide deployed commanders and warfighters with secure, survivable, access to information services from the worldwide information network. It pursues technologies which can ensure military access to and exploitation of the rapidly developing commercial international fiber optic network to provide deployed units with the ability to reach back to national resources. Robust and survivable communications protocols will be developed to maintain network structure and provide uninterrupted flow of vital information while maintaining compatibility with established international standards. Wideband, programmable radio frequency and optical transmission technologies will be integrated to allow a surge to remote and mobile users. Advanced information communication capabilities will be developed to provide commanders with an interactive, common picture of the theater battlefield. Distributed information management concepts will be developed and demonstrated which will provide the ability to optimize and control the entire information system, including deployed resources, operating as a part of a worldwide infrastructure. Work will focus on technologies for improved management of communications, distributed computing, survivability, and system integrity. It will address interoperation across echelon, Service, and multi-national force boundaries, as well as provide support for mobile command and control (C2), and sensor-to-shooter operations.

(U) FY 1994: Not Applicable.

(U) FY 1995:
- (U) Conduct independent cost estimate, feasibility study, technical risk assessment, and rigorous military requirements analysis per Congressional direction. ($1,975K)

(U) FY 1996:
- (U) Demonstrate connectivity of worldwide network through continental U.S. to Tanker Airlift Control Center (TACC). ($1,000K)
  - -- (U) Integrate the TACC at Scott Air Force Base to the joint advanced development environment--the six node continental U.S. asynchronous switching network.
  - -- (U) Integrate the joint advanced development environment with the associated commercially compatible switching technology testbeds in Canada, Australia, and the United Kingdom.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #3, Advanced Development	PE NUMBER AND TITLE: PE 0603238F, Global Surveillance and Communications 4216 — PROJECT NO.: 4216

- (U) Develop distributed information management system. ($400K)
  - -- (U) Develop algorithm for seamless Air Force interpolation of allied coalition international network.
  - -- (U) Conduct initial demonstration of distributed information management technologies in a tri-Service operational network management facility.
- (U) Develop advanced multi-media and interactive technologies for improved Air Force warfighter global and local situational awareness. ($1,083K)
  - -- (U) Design and develop brassboard workstation to process and transmit information to the Air Mobility Command (AMC) aircraft cockpit.
  - -- (U) Design and develop brassboard workstation to display Command and Control (C2) information in the AMC aircraft cockpit.

(U) FY 1997:

- (U) Demonstrate In-Transit Visibility capability to the AMC aircraft cockpit. ($1,100K)
  - -- (U) Integrate medium-data-rate airborne/ground radio-frequency (RF) brassboard models into asynchronous switching environment.
  - -- (U) Demonstrate autonomous command and control to AMC aircraft cockpit.
- (U) Develop an information management system to integrate/consolidate commercial with military management networks. ($582K)
  - -- (U) Field test wartime survivable functions (automatic reconstitution) of management system.
  - -- (U) Demonstrate joint task force network control.
- (U) Integrate military C2 distributed computer with global communications network. ($900K)
  - -- (U) Interface advanced multi-media, interactive technologies to global network.
  - -- (U) Demonstrate distributed air operations center within global information network.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #3, Advanced Development

PE NUMBER AND TITLE: PE 0603238F, Global Surveillance and Communications

PROJECT NO.: 4216

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	0	14,500	30,569	30,379	Cont
Current President's Budget	0	1,975	2,483	2,582	Cont

Change Summary Explanation:

Funding: Due to budget constraints, Projects 4217 and 4216 have been combined into a single project to provide warfighter information usage, management, and integration technologies. All FY 1994 funds for this program element were zeroed by Congress. Increases from FY 1995 to FY 1996 reflect added emphasis on information technologies for the warfighter. This technology directly supports the Joint Chiefs of Staff Future Joint Warfighting Capability: "To maintain near perfect real-time knowledge of the enemy and communicate that to all forces in near-real-time."

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0602702F, Command, Control, and Communications (C3).
- (U) PE 0603726F, C3 Subsystems Integration.
- (U) PE 0603789F, C3 Advanced Development.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #3, Advanced Development

PE NUMBER AND TITLE: PE 0603238F, Global Surveillance and Communications 4217

PROJECT NO.

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 4217, Information Management and Integration Technologies	0	0	0	0	0	0	0	0	0	0

A. (U) Mission Description and Budget Item Justification: Not Applicable.

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	0	8,300	15,169	14,500	Cont
Current Budget Submit/President's Budget	0	0	0	0	0

Change Summary Explanation:

Funding: Due to budget constraints, Projects 4217 and 4216 have been combined into a single project to provide warfighter information usage, management, and integration technologies. This project has been discontinued.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary: Not Applicable.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #3, Advanced Development

PE NUMBER AND TITLE: PE 0603245F, Flight Vehicle Technology Integration

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Total PE 0603245F Cost	1,278	8,999	12,491	11,710	12,283	12,572	13,007	14,454	Cont	Cont
Project 2568, Flight Vehicle Technology Integration	1,278	8,999	12,491	11,710	12,283	12,572	13,007	14,454	Cont	Cont

A. (U) Mission Description and Budget Item Justification: This Advanced Development program performs the integration and flight demonstration functions necessary to improve the performance and supportability of existing and future aircraft. System level integration brings together the air vehicle technologies with avionics, propulsion, and weapon systems to flight demonstrate them in a realistic operational environment. Integration and flight test reduces the risk and time required to transition technologies into operational aircraft. This program provides demonstrated flight vehicle and dual-role technologies for all-weather, day/night operations, and technologies for affordability. All efforts in this program element contain the resources necessary, including civilian salaries, to manage, conduct, and document the technical activities.

(U) FY 1994:
- (U) Developed and demonstrated advanced aeromechanics and flight control technologies for user evaluation of increased combat effectiveness. ($1,278K)
  -- (U) Flight-demonstrated different forebody shapes on an F-16 to demonstrate improved controllability at high angles-of-attack (AOA).

(U) FY 1995:
- (U) Continue to develop and demonstrate advanced aeromechanics and flight control technologies for user evaluation of increased combat effectiveness. ($4,104K)
  -- (U) Complete initial design of forebody vortex control hardware on an F-16 test aircraft to flight demonstrate, for user pilot evaluation, compatibility with existing radome designs, elimination of "hung-stalls," improved lateral stability at high AOA, and operational utility.
- (U) Continue to develop and demonstrate advanced subsystem technologies and technology integration for increased supportability of air vehicles. ($4,895K)
  -- (U) Complete design and begin fabrication of a robust production-representative integrated flight/propulsion control subsystem for the Variable Stability Inflight Simulation Test Aircraft (VISTA) F-16 so that this unique Air Force asset may be used for long-term high AOA efforts.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #3, Advanced Development	PE NUMBER AND TITLE: PE 0603245F, Flight Vehicle Technology Integration — PROJECT NO.: 2568

(U) FY 1996:
- (U) Continue to develop and demonstrate advanced aeromechanics and flight control technologies for user evaluation of increased combat effectiveness. ($5,981K)
  - -- (U) Complete fabrication/installation of forebody vortex control hardware on an F-16 test aircraft to flight demonstrate, for user pilot evaluation, compatibility with existing radome designs, elimination of "hung-stalls," improved lateral stability at high angles-of attack (AOA), and operational utility.
  - -- (U) Develop and ground test software and hardware designs for increased control authority for the advancement of conventional tail and tailless research configurations.
- (U) Continue to develop and demonstrate advanced subsystem technologies and technology integration for increased supportability of air vehicles. ($6,510K)
  - -- (U) Complete ground testing of a robust production-representative integrated flight/propulsion control subsystem for the Variable Stability Inflight Simulation Test Aircraft (VISTA) F-16 so that this unique Air Force asset may be used for long-term high AOA efforts.
  - -- (U) Complete initial design of an exhaust flow control nozzle that reduces radar cross section and improves aircraft performance yet significantly reduces parts count and simplifies engine removal.

(U) FY 1997:
- (U) Continue to develop and demonstrate advanced aeromechanics and flight control technologies for user evaluation of increased combat effectiveness. ($5,514K)
  - -- (U) Flight test the forebody vortex control hardware to demonstrate for user pilot evaluation the operational utility and maturity of this technology.
  - -- (U) Flight test an increased flight control authority system for takeoff and landing, air/ground weapon delivery, as well as other mission segments.
- (U) Continue to develop and demonstrate advanced subsystem technologies and technology integration for increased supportability of air vehicles. ($6,196K)
  - -- (U) Complete flight qualification of long-term VISTA integrated flight/propulsion control subsystem.
  - -- (U) Perform static and sub-scale testing of three next-generation nozzle concepts to determine fluidic control effectiveness in improving stealthiness and performance while simplifying design.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #3, Advanced Development

PE NUMBER AND TITLE: PE 0603245F, Flight Vehicle Technology Integration

PROJECT NO.: 2568

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	1,296	18,100	14,544	16,763	Cont
Appropriated Value	1,303	9,100			
Adjustments to Appropriated Value:					
a. Congressional General Reductions	-7	-101			
b. SBIR	-18				
Current President's Budget	1,278	8,999	12,491	11,710	Cont

Change Summary Explanation:

Funding: FY 1996 ramp is due to Air Force continued support for this PE despite the Congressional reduction in FY 1994 and FY 1995.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary: Not Applicable.

(U) Related Activities:

- (U) PE 0603106F, Logistics Systems Technology.
- (U) PE 0603205F, Flight Vehicle Subsystem and Component Technology.
- (U) PE 0603211F, Aerospace Structures.
- (U) PE 0603245F, Advanced Flight Vehicle Multidisciplinary Technologies.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #3, Advanced Development

PE NUMBER AND TITLE: PE 0603253F, Advanced Avionics Integration

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Total PE 0603253F Cost	3,421	16,765	20,421	19,763	20,263	22,089	21,761	23,439	Cont	Cont
Project 2735, Avionics Integration Technology	0	8,167	9,152	8,866	8,727	7,521	7,100	7,300	Cont	Cont
Project 3833, Integrated Avionics for Aging Aircraft	0	0	3,080	4,290	4,236	6,212	6,661	7,039	Cont	Cont
Project 666A, Reference and Information Transmission Technology	3,421	8,598	8,189	6,607	7,300	8,356	8,000	9,100	Cont	Cont

A. (U) Mission Description and Budget Item Justification: This Advanced Development program develops and demonstrates technologies and techniques to improve aircraft communications, navigation, identification, and cockpit display integration for improved aircraft performance, reduced pilot workload, and reduced avionics support costs. This program develops and improves advanced technology to include: solid state and stellar inertial guidance units and Global Positioning System (GPS) receivers; low probability of detection airborne communications for shared situation awareness; highly reliable and easily maintainable avionics architectures and advanced processors, to include artificial intelligence processors for air crew workload reduction and situation awareness; and integration techniques to reduce aircraft electronic emissions for improved aircraft hostile airspace penetration capability. All efforts in this program element contain the resources necessary, including civilian salaries, to manage, conduct, and document the technical activities.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #3, Advanced Development

PE NUMBER AND TITLE: PE 0603253F, Advanced Avionics Integration

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	3,474	24,500	24,747	25,080	Cont
Appropriated Value	3,493	17,205			
Adjustments to Appropriated Value:					
a. Congressional General Reductions	-24	-440			
b. SBIR	-48				
Current President's Budget	3,421	16,765	20,421	19,763	Cont

Change Summary Explanation:

Funding: Project 2735 was denied by Congress in FY 1994, but restored in FY 1995. Project 3833 was denied by Congress in FY 1994 and Congress transfered FY 1995 funds to JAST for development of advanced avionics. Project 3833 is now restructured for FY 1996 to address issues of aging aircraft and obsolescence in the avionics inventory.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary: Not Applicable.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #3, Advanced Development

PE NUMBER AND TITLE: PE 0603253F, Advanced Avionics Integration

PROJECT NO.: 2735

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 2735, Avionics Integration Technology	0	8,167	9,152	8,866	8,727	7,521	7,100	7,300	Cont	Cont

A. (U) Mission Description and Budget Item Justification: Develops and demonstrates technologies that provide for a robust implementation and exploitation of offensive and defensive assets, and that provide for reduced avionics support costs, weight, and volume; and improved reliability. These advanced technologies provide the avionics integration capability that enables improved cockpit systems management, information display, and weapons targeting and tracking and includes integrated avionics architectures, information integration involving on-board and off-board assets, and sensor management technologies.

(U) FY 1994: Not Applicable.

(U) FY 1995:

- (U) Develop advanced modular, sharable radio frequency sensor signal processing technologies to provide for avionics cost and weight savings, improved reliability, and increased sensor data fusion opportunities. The modularity will allow for retrofit applications to provide for support cost reducing upgrades. ($4,969K)
  - -- (U) Develop an Integrated Sensor System (ISS) open system design of form, fit, and interface.
  - -- (U) Develop ISS demonstration plan for verifying integrated radio frequency (RF) functions performing resource sharing, simultaneity, and fault tolerance.
- (U) Develop advanced sensor integration technologies and algorithms to provide the capability to augment the performance of individual sensors which will enable improved fault tolerance and situation awareness. ($1,266K)
  - -- (U) Develop and demonstrate techniques to mitigate error contributions to Global Positioning System (GPS) sensors, and solutions for selective denial protection of current and future "friendly" GPS receivers.
- (U) Develop technologies to provide for transition of current generation integrated avionics elements into retrofit applications enabling increased service life with significant support cost savings. ($1,932K)
  - -- (U) Demonstrate modular, portable Ada real-time operating system for the low-level mission processing hardware.
  - -- (U) Design, integrate, and test representative low-level mission threat detection and avoidance algorithms.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT NO.
#3, Advanced Development	PE 0603253F, Advanced Avionics Integration	2735

(U) FY 1996:
- (U) Develop advanced modular, sharable radio frequency (RF) sensor signal processing technologies to provide for avionics cost and weight savings, improved reliability, and increased sensor data fusion opportunities. The modularity will allow for retrofit applications to provide for support cost reducing upgrades. ($4,823K)
  - -- (U) Perform modeling and simulation to validate the Integrated Sensor System (ISS) architecture.
  - -- (U) Perform detailed design of the ISS common RF modules, and initiate design of embedded control and application software.
  - -- (U) Complete ISS demonstration plan, defining signal sources, functionality, control, operational capabilities, fault injection/recording, and post demonstration data capture and analysis.
- (U) Develop advanced sensor integration technologies and algorithms to provide the capability to augment the performance of individual sensors which will enable improved fault tolerance and situation awareness. ($1,855K)
  - -- (U) Continue development of techniques to mitigate error contributions to Global Positioning System (GPS) sensors, and solutions for providing selective denial protection of current and future "friendly" GPS receivers.
  - -- (U) Develop and demonstrate affordable, improved anti-jam filter/adaptive aircraft antennae electronics.
- (U) Develop integrated avionics architecture components which leverage prior technology demonstration developments and incorporate additional user requirements of multi-platform commonality, open system architecture (OSA) compliance, standard high level software language, affordability, and expandability features. ($2,474K)
  - -- (U) Develop laboratory model of advanced terrain following/terrain avoidance/threat avoidance technology for low-level missions.
  - -- (U) Develop and integrate hardware components, port real-time Ada operating system, and low-level algorithms, and demonstrate pilot-in-loop simulation using low-level avionics mission environment.

(U) FY 1997:
- (U) Develop advanced modular, sharable radio frequency sensor signal processing technologies to provide for avionics cost and weight savings, improved reliability, and increased sensor data fusion opportunities. The modularity will allow for retrofit applications to provide for support cost reducing upgrades. ($4,836K)
  - -- (U) Fabricate/emulate and test the ISS common module types, code, and unit test the embedded application and control software.
- (U) Develop advanced sensor integration technologies and algorithms to provide the capability to augment the performance of individual sensors which will enable improved fault tolerance and situation awareness. ($1,727K)
  - -- (U) Continue to develop affordable, improved anti-jam filter/adaptive aircraft antennae electronics.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #3, Advanced Development

PE NUMBER AND TITLE: PE 0603253F, Advanced Avionics Integration

PROJECT NO.: 2735

- (U) Develop integrated avionics architecture components which leverage prior technology demonstration developments and incorporate additional user requirements of multi-platform commonality, open system architecture (OSA) compliance, standard high level software language, affordability, and expandability features. ($2,303K)
  - -- (U) Develop and implement high performance three-dimensional terrain/threat avoidance display generation technology for the low-level avionics mission environment.

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	0	8,187	9,152	9,866	Cont
Current President's Budget	0	8,167	9,152	8,866	Cont

Change Summary Explanation:

Funding: Project 2735 was zeroed by Congress in FY 1994, but restored in FY 1995 for work on avionics integration.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0602204F, Aerospace Avionics.
- (U) PE 0603203F, Advanced Avionics for Aerospace Vehicles.
- (U) PE 0602602F, Conventional Munitions.
- (U) PE 0603270F, Electronic Warfare Technology.
- (U) PE 0305164F, Global Positioning System (GPS) User Equipment.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #3, Advanced Development

PE NUMBER AND TITLE: PE 0603253F, Integrated Avionics for Aging Aircraft

PROJECT NO.: 3833

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 3833, Integrated Avionics for Aging Aircraft	0	0	3,080	4,290	4,236	6,212	6,661	7,039	Cont	Cont

A. (U) Mission Description and Budget Item Justification: Develops and demonstrates affordable avionics technology to extend the useful life of Air Force aging aircraft and provide the flexibility/supportability needed to support world wide operations with reduced force structure. This project focuses on technologies to support transition of modular avionics, commercially available products, and commercial open system standards for cost-effective retrofit of user required upgrades to existing avionics systems, with specific emphasis on supporting the cooperative identification (IFF) upgrade thrust.

(U) FY 1994: Not Applicable.

(U) FY 1995: Not Applicable.

(U) FY 1996:
- (U) Develop and demonstrate programmable integrated communications, navigation, and identification (CNI) hardware/software modules for currently fielded aircraft IFF upgraded capability, and Real Time Information in the Cockpit. Emphasis to provide a baseline for fleet wide logistics commonality and attendant economy of scale, and increase platform availability. ($3,080K)
  - (U) Design and develop brassboard technology required to integrate modular CNI components with existing platform specific interfaces, hardware and software, and backplanes, and maintain data security.

(U) FY 1997:
- (U) Develop and demonstrate programmable integrated CNI hardware/software modules for currently fielded aircraft applications to provide fleet wide commonality and attendant economy of scale, and increase platform availability. ($2,673K)
  - (U) Develop and evaluate technology required to integrate modular CNI components with platform specific interfaces, hardware and software, and backplanes, and maintain data security.
- (U) Develop hardware and software technologies to support re-use of existing avionics software with newly developed Ada software in a common, real-time embedded core avionics environment to provide a cost-effective incremental upgrade capability. ($813K)
  - (U) Develop hardware/software technology necessary for simultaneous execution of existing 16-bit, multi-lingual avionics software with new 32-bit Ada application and control software to reduce the life cycle cost of upgrading and adding software to existing weapon systems.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT NO.
#3, Advanced Development	PE 0603253F, Advanced Avionics Integration	3833

- (U) Develop low-cost network interfaces and modular avionics integration technology to enable advanced avionics architectures and modules to be integrated with existing systems for greater reliability, maintainability and availability of aging aircraft. ($804K)
  - -- (U) Develop technology required to integrate advanced common electronics modules with existing "black box" aircraft electronics to create an open system architecture for aging aircraft, eliminating parts obsolescence and reducing the cost of future avionics upgrades.

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	0	7,629	7,406	7,607	Cont
Current President's Budget	0	0	3,080	4,290	Cont

Change Summary Explanation:

Funding: Congress zeroed in FY 1994 for perceived prematurity. Congress transfered FY 1995 funds to the Joint Advanced Strike Technology (JAST) program for development of advanced avionics. For FY 1996, Project 3833 is now refocused on upgrading and maintaining the current avionics inventory rather than providing advanced technology integration for new developmental aircraft. This new focus will provide benefits in affordability through life extension of rapidly obsolescing aircraft avionics.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(U) Related Activities:
- (U) PE 0602204F, Aerospace Avionics.
- (U) PE 0602301E, Intelligence System Program.
- (U) PE 0602232N, Navy Command, Control, and Communications (C3) Technology.
- (U) PE 0603203F, Advanced Avionics for Aerospace Vehicles.
- (U) PE 0603217N, Maritime Avionics Subsystems Technologies.
- (U) PE 0604201F, Common Avionics.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY: #3, Advanced Development

PE NUMBER AND TITLE: PE 0603253F, Advanced Avionics Integration

PROJECT NO.: 666A

COST ($ in Thousands)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Project 666A, Reference and Information Transmission Technology	3,421	8,598	8,189	6,607	7,300	8,356	8,000	9,100	Cont	Cont

A. (U) Mission Description and Budget Item Justification: Develops and demonstrates advanced reference and information transmission technologies and techniques to provide for a capability to improve the accuracy and availability of navigation and situation awareness information to the weapon system, to reduce recconaissance/intelligence data dissemination times commeasurate with real-time operations, and to increase weapon systems survivability by reducing navigation and communication electromagnetic signatures. The focus is on jam resistant, low probability of detection (LPD) transceivers, inertial components and navigation systems technology, and techniques for exploiting the capabilities of the Global Positioning System (GPS) to provide high accuracy reference information. Technologies demonstrated under this project are needed for stealth operations, real-time information in the cockpit, precision targeting and strike, timely bomb damage assessment, force multiplication achievable through multi-platform shared resources, and affordable, supportable weapon systems.

(U) FY 1994:

- (U) Developed advanced inertial reference technology and architecture to improve robustness of reference functions and weapon/sensor boresight accuracy. ($2,400K)
  - -- (U) Evaluated techniques for dynamic airframe flexure compensation and navigation fault detection and isolation for precision targeting and weapon delivery.
- (U) Developed enhancements to GPS user equipment and system integration techniques to maximize position accuracy and jam resistance, and exploit the benefits of GPS to improve offensive and defensive combat capabilities at reduced costs. ($325K)
  - -- (U) Evaluated GPS-based precision emitter location techniques for enhanced suppression of enemy air defenses (SEAD) capability.
- (U) Developed advanced very-high-reliability all-solid state navigation and reference systems technologies to provide for reduced life cycle costs and increased navigation system availability in both new system and retrofit applications. ($346K)
  - -- (U) Completed fabrication of solid state strapped down stellar inertial system for three times improvement in cost and reliability over current astro trackers.
- (U) Demonstrated a low-observable, wideband, multifunction antenna. ($350K)
  - -- (U) Demonstrated integrated communication, navigation, and identification functions.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #3, Advanced Development	PE NUMBER AND TITLE: PE 0603253F, Advanced Avionics Integration — PROJECT NO.: 666A

(U) FY 1995:

- (U) Develop advanced inertial reference technology and architectures to improve robustness of reference functions and weapon/sensor boresight accuracy. ($1,798K)
  - -- (U) Complete evaluation and design of techniques for dynamic airframe flexure compensation and navigation fault detection and isolation for precision targeting and weapon delivery.
- (U) Develop short-range voice and low data rate jam resistant transmission capability to provide for cooperative low probability of detection (LPD) operations. ($1,700K)
  - -- (U) Complete system design of integrated avionics and discrete system brassboards for a real-time adaptive, highly covert, jam resistant, 96 thousand bits per second voice and data transfer capability.
- (U) Develop enhancements to Global Positioning System (GPS) user equipment and system integration techniques to maximize position accuracy and jam resistance, and exploit the benefits of GPS to improve offensive and defensive combat capabilities at reduced costs. ($1,650K)
  - -- (U) Complete evaluation and preliminary design of a GPS-based precision emitter location technique for enhanced suppression of enemy air defenses (SEAD) capability.
- (U) Develop multi-user, medium to high capacity jam resistant airborne network to provide for LPD exchange between aircraft of time-critical threat, sensor, and cooperative operations information. ($2,500K)
  - -- (U) Complete preliminary design of technology for 1.544 million bits per second data transfer capability for secondary dissemination of recconaissance/intelligence data and imagery to support real-time precision targeting and strike.
- (U) Develop advanced very-high-reliability all-solid state navigation and reference technologies to provide for reduced life cycle costs and increased navigation system availability in both new system and retrofit applications. ($950K)
  - -- (U) Complete ground test of solid-state strapped down stellar inertial system for three times improvement in cost and reliability over current astro trackers.

(U) FY 1996:

- (U) Develop advanced inertial reference technology and architectures to improve robustness of reference functions and weapon/sensor boresight accuracy. ($910K)
  - -- (U) Develop and evaluate techniques for dynamic airframe flexure compensation and navigation system fault detection and isolation to meet precision targeting and weapon delivery requirements.
- (U) Develop short-range voice and low data rate jam resistant transmission capability to provide for cooperative LPD operations. ($2,925K)
  - -- (U) Complete system design of integrated avionics and discrete system brassboards for a low-cost, real-time adaptive, highly covert, jam resistant, 96 thousand bits per second voice and data transfer capability.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE: February 1995
BUDGET ACTIVITY: #3, Advanced Development	PE NUMBER AND TITLE: PE 0603253F, Advanced Avionics Integration — PROJECT NO.: 666A

- (U) Develop enhancements to Global Positioning System (GPS) user equipment and system integration techniques to maximize position accuracy and jam resistance, and exploit the benefits of GPS to improve offensive and defensive combat capabilities at reduced costs. ($1,040K)
  - -- (U) Develop and demonstrate GPS-based precision emitter location techniques for an enhanced, low-cost suppression of enemy air defenses capability for tactical fighters.
- (U) Develop multi-user, medium to high capacity jam resistant airborne network to provide for low probability of detection (LPD) exchange between aircraft of time-critical threat, sensor, and cooperative operations information. ($3,250K)
  - -- (U) Complete design and initiate fabrication of technology for 1.544 million bits per second data transfer capability for secondary dissemination of recconaissance/intelligence data and imagery to support real-time precision targeting and strike.
- (U) Develop advanced very-high-reliability all-solid state navigation and reference technologies to provide for reduced life cycle costs and increased navigation system availability in both new system and retrofit applications. ($64K)
  - -- (U) Develop architectural models of a totally solid state inertial measurement unit with a mean time between critical failure of 40,000 hours.

(U) FY 1997:

- (U) Develop advanced inertial reference technology and architectures to improve robustness of reference functions and weapon/sensor boresight accuracy. ($974K)
  - -- (U) Integrate techniques and plan flight experiments for dynamic airframe flexure compensation and navigation fault detection and isolation to meet precision targeting and weapon delivery requirements.
- (U) Develop short-range voice and low data rate jam resistant transmission capability to provide for cooperative LPD operations. ($2,503K)
  - -- (U) Complete detailed design and initiate fabrication of integrated avionics and discrete system brassboards for a low-cost, real-time adaptive, highly covert, jam resistant, 96 thousand bits per second voice and data transfer capability.
  - -- (U) Develop low-cost, universal, aircraft to weapon wireless data bus for improved weapon reliability and probability of kill.
- (U) Develop enhancements to GPS user equipment and system integration techniques to maximize position accuracy and jam resistance and exploit the benefits of GPS to improve offensive and defensive combat capabilities at reduced costs. ($1,113K)
  - -- (U) Complete development and initiate ground/flight experiments of GPS-based precision emitter location techniques for an enhanced, low-cost suppression of enemy air defenses capability for tactical fighters.
- (U) Develop multi-user, medium to high capacity jam resistant airborne network to provide for LPD exchange between aircraft of time-critical threat, sensor, and cooperative operations information. ($1,947K)
  - -- (U) Complete fabrication and test of technology for 1.544 million bits per second data transfer capability for secondary dissemination of recconaissance/intelligence data and imagery to support real-time precision targeting and strike.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)

DATE: February 1995

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT NO.
#3, Advanced Development	PE 0603253F, Advanced Avionics Integration	666A

- (U) Develop advanced very-high-reliability all-solid state navigation and reference technologies to provide for reduced life cycle costs and increased navigation system availability in both new system and retrofit applications. ($70K)
  - -- (U) Evaluate component technologies and system architecture for a totally solid state inertial measurement unit with a mean time between critical failure of 40,000 hours.

B. (U) Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
Previous President's Budget	3,474	8,684	8,189	7,607	Cont
Current President's Budget	3,421	8,598	8,189	6,607	Cont

Change Summary Explanation:

Funding: Content from PE 0603203F, Project 2345, was transfered to Project 666A effective FY 1995.

Schedule: Not Applicable.

Technical: Not Applicable.

C. (U) Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0602204F, Aerospace Avionics.
- (U) PE 0602782A, Command, Control, and Communications (C3) Technology.
- (U) PE 0602232N, Navy C3 Technology.
- (U) PE 0603203F, Advanced Avionics for Aerospace Vehicles.
- (U) PE 0603363F, Armament Technology Integration.
- (U) PE 0603270F, Electronic Warfare Technology.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

D. (U) Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February, 1995

BUDGET ACTIVITY: 4 - Demonstration And Validation

PE NUMBER AND TITLE: 0603260F Intelligence Advanced Development

COST (*In Thousands*)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	5,917	4,982	5,109	5,109	5,109	5,091	5,108	5,106	Continuing	TBD
3479 Adv Sensor Exploitation	693	847	886	886	886	886	885	885	Continuing	TBD
3480 Automated Imagery Exploitation	1,996	1,403	1,430	1,430	1,430	1,430	1,430	1,429	Continuing	TBD
3481 Knowledge Based Tech For Intell	1,792	1,534	1,567	1,567	1,567	1,567	1,567	1,567	Continuing	TBD
3482 Science & Tech Intel Methodology	1,436	1,198	1,226	1,226	1,226	1,208	1,226	1,225	Continuing	TBD

(U) A. Mission Description and Budget Item Justification

(U) Demonstrates and validates advanced technology intelligence systems capabilities and techniques to support tactical and strategic commanders and National Command Authority needs for timely and all source intelligence information. IAD is composed of software projects developed for the Air Force at Rome Lab (RL). IAD is in research category Demonstration and Validation, because these projects expand and improve data storage, retrieval and handling capabilities; satisfy needs for near-real-time data processing, exploitation and dissemination from present and future sensors. RL works directly with users, employing a rapid prototyping evolutionary approach, integrating finished modules directly into the field. The programs are oriented toward specific shortfalls and deficiencies as documented by the major commands (MAJCOMS), unified commands, and intelligence organizations in their mission and function area plans. The goal of this PE is to expedite technology transition from the laboratory to operational use via rapid prototyping and simulation.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY 4 - Demonstration And Validation	PE NUMBER AND TITLE 0603260F Intelligence Advanced Development

(U) B. **Program Change Summary ($ in Thousands)**

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
(U) Previous President's Budget	6,022	5,134	5,697	5,665	TBD
(U) Appropriated Value	6,134	5,134			
(U) Adjustments to Appropriated Value					
a. General Congressional Reductions	-133	-65			
b. SBIR	-84	-87			
(U) Adjustments to Budget Years Since FY95 PB			-588	-556	
(U) Current Budget Submit/President's Budget	5,917	4,982	5,109	5,109	TBD

(U) Change Summary Explanation:

Funding: FY94 and FY95 reductions reflect distribution of Congressional adjustments, such as SBIR, travel, consulting services and Federally Funded Research Centers.

Schedule: Not Applicable.

Technical: Not applicable, still will apply mature technology from the Science & Technology technology base to operational requirements.

(U) C. **Other Program Funding Summary ($ in Thousands)**

(U) Not Applicable

(U) Related RDT&E:

62720F C3I Exploratory Development: optical storage, speech processing, signals exploitation, data handling, sensor exploitation
63789F C3 Advanced Technology Development: correlation, fusion, signal processing
63726F C3 Subsystem Integration: mass storage, hypermedia database, voice translation, mapping and charting
64750F Intelligence Equipment: modeling and simulation

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY 4 - Demonstration And Validation	PE NUMBER AND TITLE 0603260F Intelligence Advanced Development

(U) D. **Schedule Profile**

	FY 1994				FY 1995				FY 1996				FY 1997			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
(U) EW Flagging Awarded	X*															
(U) Intelligence Event Builder Awarded			X*													
(U) Open System Message Processor Awarded			X*													
(U)AI Data Representation Awarded			X*													
(U) Analytical Tools for Targeting Awarded				X												
(U) Secondary Imagery Dissemination Demonstrated				X												
(U) Imagery Exploitation 2000 Awarded				X												
(U) Image Aim Point Graphic Awarded				X												
(U) Mass Storage Awarded				X												
(U) Correlation Fusion Algorithms Delivered					X											
(U) Video Digital Image Exploitation Awarded						X										
(U) Advanced Intelligence System Delivered								X								
(U) Document Analysis System Delivered									X							
(U) Dynamic Modeling Awarded										X						
(U) Analytical Tools for Targeting Delivered											X					
(U) Consistent Operational Picture Awarded												X				
(U) Image Aim Point Graphic Completed												X				
(U) Video Digital Exploitation Completed														X		

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February, 1995

BUDGET ACTIVITY: 4 - Demonstration And Validation

PE NUMBER AND TITLE: 0603260F Intelligence Advanced Development

PROJECT: 3479

COST (*In Thousands*)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
3479 Adv Sensor Exploitation	693	847	886	886	886	886	885	885	Continuing	TBD

(U) A. **Mission Description and Budget Item Justification**

(U) There is an Air Force and Army need to correlate various sources of intelligence reports (Communications Intelligence - COMINT, Electronic Intelligence - ELINT, Image Intelligence - IMINT) within seconds as opposed to hours with current manual methods. Project includes development data correlation and predictive intelligence algorithms, target analysis and prioritization, air order of battle updates and tactical analysis techniques. This computerized approach will speed up the correlation of data from diverse sources of intelligence information, including COMINT, ELINT, and IMINT; providing faster situational awareness and threat assessment and replace manual systems with automated capabilities.

(U) FY 1994
- (U) Completed effort to expand the development of advanced correlation/fusion capabilities. ($401)
- (U) Initiated the Analytical Tools for Targeting effort. This tool kit will include measures of effectiveness and damage criteria specification. ($196)
- (U) Enhanced correlation and fusion tools based on user feedback at demonstration. ($96)

(U) FY 1995
- (U) Continue Analytical Tools for Targeting. ($400)
- (U) Initiate Consistent Operational Picture via Distributed Fusion. ($350)
- (U) Enhance correlation and fusion based on user feedback at Initial Operational Capability. ($97)

(U) FY 1996
- (U) Deliver Analytical Tools for Targeting. ($207)
- (U) Continue Consistent Operational Picture via Distributed Fusion. ($382)
- (U) Document enhancements of analytical tools based on user feedback demonstration. ($297)

(U) FY 1997
- (U) Complete Consistent Operational Picture via Distributed Fusion. ($382)
- (U) Specify documented enhancements of analytical tools. ($252)
- (U) Code enhancements to analytical tools. ($252)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY 4 - Demonstration And Validation	PE NUMBER AND TITLE 0603260F Intelligence Advanced Development
	PROJECT 3479

(U) **B. Program Change Summary ($ in Thousands)**

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
(U) Previous President's Budget	693	890	1,063	1,113	TBD
(U) Appropriated Value	705				
(U) Adjustments to Appropriated Value					
a. General Congressional Reductions	12	-22			
b. SBIR		-21			
(U) Adjustments to Budget Years Since FY95 PB			-177	-227	
(U) Current Budget Submit/President's Budget	693	847	886	886	TBD

(U) Change Summary Explanation:

Funding: FY94 and FY95 reductions reflect distribution of Congressional adjustments, such as SBIR, travel, consulting services and Federally Funded Research Centers.

Schedule: Not applicable

Technical: Not Applicable

(U) **C. Other Program Funding Summary ($ in Thousands)**

(U) Not Applicable

(U) Related RDT&E:

62720F C3I Exploratory Development: optical storage, speech processing, signals exploitation, data handling, sensor exploitation
63789F C3 Advanced Technology Development: correlation, fusion, signal processing
63726F C3 Subsystem Integration: mass storage, hypermedia database, voice translation, mapping and charting
64750F Intelligence Equipment: modeling and simulation

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE
	February, 1995

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
4 - Demonstration And Validation	0603260F Intelligence Advanced Development	3479

(U) D. Schedule Profile

	FY 1994				FY 1995				FY 1996				FY 1997			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
(U) Correlation Fusion Algorithms Delivered					X											
(U) Correlation Fusion Algorithms Demonstrated						X										
(U) Analytical Tools for Targeting Awarded				X												
(U) Analytical Tools for Targeting Delivered											X					
(U) Analytical Tools for Targeting Demonstrated												X				
(U) Consistent Operational Picture Awarded								X								
(U) Consistent Operational Picture Delivered																X

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February, 1995
BUDGET ACTIVITY 4 - Demonstration And Validation	PE NUMBER AND TITLE 0603260F Intelligence Advanced Development PROJECT 3479

(U) A. **Project Cost Breakdown ($ in Thousands)**

	FY 1994	FY 1995	FY 1996	FY 1997
(U) Development and Test Advanced Correlation & Fusion Algorithms	401			
(U) Develop Analytical Tools	196	400	207	
(U) Improve Correlation & Fusion	96	97	297	
(U) Develop Consistent Operational Picture Software		350	382	382
(U) Test Analytical Tools				252
(U) Improve Analytical Tools Following user evaluation.				252
(U) Total	693	847	886	886

(U) B. **Budget Acquisition History and Planning Information ($ in Thousands)**

(U) Not Applicable

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February, 1995

BUDGET ACTIVITY: 4 - Demonstration And Validation

PE NUMBER AND TITLE: 0603260F Intelligence Advanced Development

PROJECT: 3480

COST (*In Thousands*)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
3480 Automated Imagery Exploitation	1,996	1,403	1,430	1,430	1,430	1,430	1,430	1,429	Continuing	TBD

(U) A. **Mission Description and Budget Item Justification**

(U) This project demonstrates and validates the capability to more accurately and quickly interpret digital imagery by evaluating computer assisted techniques to manipulate and overly imagery, cartographic data, signal intelligence (SIGINT), and on line intelligence data. The result of this effort will be more precise target locations and identifications, precise target reference scenes, and more accurate damage assessments; all development for easily supportable, low cost commercially available computer workstations. This project will also develop data links which can be used to provide digital imagery and imagery to theater and tactical units.

(U) FY 1994
- (U) Completed development of a receive/transmit capability for secondary imagery dissemination. ($500)
- (U) Initiated Imagery Exploitation (IE) 2000 Configuration Management and Application effort in support of Air Combat Command (ACC) requirements. ($365)
- (U) Initiated Image Aim Point Graphic in support of producing high quality Initiate Image Aim Point Graphic in support of producing high quality target materials. ($465)
- (U) Initiated Mass Storage System and Lab effort in support of ACC requirements. ($666)

(U) FY 1995
- (U) Continue IE 2000 Configuration Management and Application in support of imagery exploitation. ($368)
- (U) Continue Image Aim Point Graphic in support of producing high quality target materials. ($405)
- (U) Continue Mass Storage in support of ACC's Mass Digital Storage Concept. ($287)
- (U) Initiate Video Digital Exploitation. ($343)

(U) FY 1996
- (U) Continue IE 2000 Configuration Management and Application. ($304)
- (U) Complete Image Aim Point Graphic. ($201)
- (U) Continue Mass Storage effort. ($108)
- (U) Continue Video Digital Exploitation. ($817)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY: 4 - Demonstration And Validation	PE NUMBER AND TITLE: 0603260F Intelligence Advanced Development — PROJECT: 3480

(U) FY 1997
- (U) Deliver Image Exploitation (IE) 2000 Application. ($480)
- (U) Deliver Mass Storage Effort. ($480)
- (U) Complete Video Digital Image Exploitation. ($470)

(U) B. Program Change Summary ($ in Thousands)

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
(U) Previous President's Budget	2,101	1,437	1,747	1,710	TBD
(U) Appropriated Value	2,133				
(U) Adjustments to Appropriated Value					
a. General Congressional Reductions	-53	-12			
b. SBIR	-84	-22			
(U) Adjustments to Budget Years Since FY95 PB			-317	-280	
(U) Current Budget Submit/President's Budget	1996	1,403	1,430	1,430	TBD

(U) Change Summary Explanation:

Funding: FY94 and FY95 reductions reflect distribution of Congressional adjustments, such as SBIR, travel, consulting services and Federally Funded Research Centers.

Schedule: Not Applicable.

Technical: Not Applicable.

(U) C. Other Program Funding Summary ($ in Thousands)

(U) Not Applicable

(U) Related RDT&E:

62720F C3I Exploratory Development: optical storage, speech processing, signals exploitation, data handling, sensor exploitation
63789F C3 Advanced Technology Development: correlation, fusion, signal processing
63726F C3 Subsystem Integration: mass storage, hypermedia database, voice translation, mapping and charting
64750F Intelligence Equipment: modeling and simulation

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY 4 - Demonstration And Validation	PE NUMBER AND TITLE 0603260F Intelligence Advanced Development
	PROJECT 3480

(U) D. **Schedule Profile**

	FY 1994				FY 1995				FY 1996				FY 1997			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
(U) Secondary Imagery Dissemination Demonstrated				X												
(U) Image Aim Point Graphic Awarded				X												
(U) Image Aim Point Graphic Demonstrated												X				
(U) Imagery Exploitation (IE) 2000 Awarded	X															
(U) Imagery Exploitation (IE) 2000 Delivered																X
(U) Mass Storage Awarded				X												
(U) Mass Storage Delivered																X
(U) Video Digital Image Exploitation Awarded						X										
(U) Image Aim Point Graphic Completed												X				
(U) Video Digital Image Exploitation Completed														X		

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)		DATE February, 1995
BUDGET ACTIVITY 4 - Demonstration And Validation	PE NUMBER AND TITLE 0603260F Intelligence Advanced Development	PROJECT 3480

(U) A. **Project Cost Breakdown ($ in Thousands)**

	FY 1994	FY 1995	FY 1996	FY 1997
(U) Demonstrated Secondary Imagery Dissemination	500			
(U) Develop, Support, Test $ Evaluate Imagery Exploitation 2000	365	368	304	480
(U) Develop, Support, Test $ Evaluate Image Aim Point Graphic	465	405	201	
(U) Develop, Support, Test $ Evaluate Mass Storage	666	287	108	480
(U) Develop the video Video Digital Image Exploitation		343	817	470
(U) Total	1,996	1,403	1,430	1,430

(U) B. **Budget Acquisition History and Planning Information ($ in Thousands)**

(U) Not Applicable

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February, 1995

BUDGET ACTIVITY: 4 - Demonstration And Validation

PE NUMBER AND TITLE: 0603260F Intelligence Advanced Development

PROJECT: 3481

COST (*In Thousands*)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
3481 Knowledge Based Tech For Intell	1,792	1,534	1,567	1,567	1,567	1,567	1,567	1,567	Continuing	TBD

(U) A. **Mission Description and Budget Item Justification**

(U) This project will reduce manpower and warning times for respective Strategic Command (STRATCOM), Air Combat Command (ACC), Space Command (SPACECOM), Air Intelligence Agency (AIA), and 497th Intelligence data handling systems. The development of the analytical aids is based on artificial intelligence techniques. The increase timeliness, efficiency and effectiveness derived will provide warning time and accuracy, allowing national/military authorities a greater range of options to avert, diminish or control a crisis.

(U) FY 1994
- (U) Continued Selectively Improved Flagging Techniques (SIFT) Expert System in support of the Air Force Electronic Warfare Center Electronic (AFEWC) Warfare Flagging mission. ($600)
- (U) Initiated Prototype Intelligence Event Builder which represents message as icons on a timeline in support to multiple commands. ($580)
- (U) Initiated Information Process effort to transmit hardcoded "stovepipe" message processing subsystems into open system, client/server environment. ($612)

(U) FY 1995
- (U) Continue EW Flagging Expert System - SIFT. ($410)
- (U) Continue Prototype Intelligence Event Builder. ($340)
- (U) Continue open system architecture on support of massage handling. ($784)

(U) FY 1996
- (U) Continue EW Flagging Expert System. ($520)
- (U) Continue Timeline Event Builder. ($522)
- (U) Continue Open System Message Processor. ($525)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY: 4 - Demonstration And Validation	PE NUMBER AND TITLE: 0603260F Intelligence Advanced Development — PROJECT: 3481

(U) FY 1997
- (U) Continue EW Flagging Expert System. ($520)
- (U) Complete Timeline Event Builder. ($522)
- (U) Complete Open System Architecture. ($525)

(U) B. Program Change Summary ($ in Thousands)

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
(U) Previous President's Budget	1,792	1,575	1,671	1,635	TBD
(U) Appropriated Value	1,832				
(U) Adjustments to Appropriated Value					
a. General Congressional Reduction	-40	-19			
b. SBIR		-22			
(U) Adjustments to Budget Years Since FY95 PB			-104	-68	
(U) Current Budget Submit/President's Budget	1,792	1,534	1,567	1,567	TBD

(U) Change Summary Explanation:

Funding: FY94 and FY95 reductions reflect distribution of Congressional adjustments, such as SBIR, travel, consulting services and Federally Funded Research Centers.

Schedule: Not Applicable.

Technical: Not Applicable.

(U) C. Other Program Funding Summary ($ in Thousands)

(U) Not Applicable

(U) Related RDT&E:

62720F C3I Exploratory Development: optical storage, speech processing, signals exploitation, data handling, sensor exploitation
63789F C3 Advanced Technology Development: correlation, fusion, signal processing
63726F C3 Subsystem Integration: mass storage, hypermedia database, voice translation, mapping and charting
64750F Intelligence Equipment: modeling and simulation

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY 4 - Demonstration And Validation	PE NUMBER AND TITLE 0603260F Intelligence Advanced Development
	PROJECT 3481

(U) D. Schedule Profile

	FY 1994				FY 1995				FY 1996				FY 1997			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
(U) Electronic Warfare Flagging Awarded	X															
(U) Intelligence Event Builder Awarded			X													
(U) Intelligence Event Builder Completed																X
(U) Open System Message Processor Awarded			X													
(U) Open System Message Processor Completed																X
(U) Electronic Warfare Flagging Completed													X			

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February, 1995
BUDGET ACTIVITY 4 - Demonstration And Validation	PE NUMBER AND TITLE 0603260F Intelligence Advanced Development PROJECT 3481

(U) A. **Project Cost Breakdown ($ in Thousands)**

	FY 1994	FY 1995	FY 1996	FY 1997
(U) Develop, Support, Test & Evaluate EW Flagging Expert System	600	410	520	520
(U) Develop, Support, Test & Evaluate Prototype Event Builder	580	340	522	522
(U) Develop, Support, Test & Evaluate Message Handling Open System	612	784	525	525
(U) Total	1,792	1,534	1,567	1,567

(U) B. **Budget Acquisition History and Planning Information ($ in Thousands)**

(U) Not Applicable

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)			DATE February, 1995
BUDGET ACTIVITY 4 - Demonstration And Validation	PE NUMBER AND TITLE 0603260F Intelligence Advanced Development		PROJECT 3482

COST (*In Thousands*)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
3482 Science & Tech Intel Methodology	1,436	1,198	1,226	1,226	1,226	1,208	1,226	1,225	Continuing	TBD

(U) A. **Mission Description and Budget Item Justification**

(U) Demonstrates and Validates intelligence methodologies and techniques for operational employment of simulation models in support of Air Force Intelligence Agency (AIA) requirements. The methods and techniques will help AIA improve their analysis of current and future foreign weapon systems, and prevent technological surprises with regard to the capabilities of these systems.

(U) FY 1994
- (U) Continued to develop techniques to process open source unformatted text. ($301)
- (U) Completed Document Content Analysis and Retrieval System development. ($499)
- (U) Continued to develop Advanced Intelligence (AI) Information System to support AIA analysts. ($416)
- (U) Initiated Advanced Intelligence (AI) Data Representation efforts to develop an analyst workstation/inference engine. ($220)

(U) FY 1995
- (U) Complete AI Information System. ($490)
- (U) Continue to develop AI Data Representation effort to develop an intelligent system to model foreign threats. ($50)
- (U) Continue Document Content Analysis & Retrieval System based on user feedback at Initial Operational Capability (IOC). ($480)
- (U) Complete Intelligence Analyst Associate Expert System. ($178)

(U) FY 1996
- (U) Continue to develop AI Data Presentation to model foreign threats. ($300)
- (U) Initiate dynamic Modeling integration techniques. ($300)
- (U) Enhanced AI Information based on user feedback at IOC. ($300)
- (U) Complete Document Content Analysis & Retrieval System. ($326)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY: 4 - Demonstration And Validation	PE NUMBER AND TITLE: 0603260F Intelligence Advanced Development — PROJECT: 3482

(U) FY 1997
- (U) Deliver Advanced Intelligence (AI) Data Presentation to model foreign threats. ($400)
- (U) Deliver dynamic modeling, integration techniques. ($400)
- (U) Continue to enhance Document Content Analysis & Retrieval System based on user feedback at IOC. ($426)

(U) B. Program Change Summary ($ in Thousands)

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
(U) Previous President's Budget	1,436	1,232	1,216	1,207	TBD
(U) Appropriated Value	1,464				
(U) Adjustments to Appropriated Value					
a. General Congressional Reductions	-28	-12			
b. SBIR		-22			
(U) Adjustments to Budget Years Since FY95 PB			10	19	
(U) Current Budget Submit/President's Budget	1,436	1,198	1,226	1,226	TBD

(U) Change Summary Explanation:
Funding: Not Applicable.

Schedule: Not Applicable.

Technical: Not Applicable.

(U) C. Other Program Funding Summary ($ in Thousands)
(U) Not Applicable

(U) Related RDT&E:
62720F C3I Exploratory Development: optical storage, speech processing, signals exploitation, data handling, sensor exploitation
63789F C3 Advanced Technology Development: correlation, fusion, signal processing
63726F C3 Subsystem Integration: mass storage, hypermedia database, voice translation, mapping and charting
64750F Intelligence Equipment: modeling and simulation

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February, 1995
BUDGET ACTIVITY 4 - Demonstration And Validation	PE NUMBER AND TITLE 0603260F Intelligence Advanced Development PROJECT 3482

(U) D. **Schedule Profile**

	FY 1994				FY 1995				FY 1996				FY 1997			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
(U) Advanced Intelligence (AI) Representation Awarded			X													
(U) Advanced Intelligence (AI) Representation Delivered																X
(U) Document Analysis Systems Delivered									X							
(U) AI Information System Delivered								X								
(U) Dynamic Modeling Awarded										X						
(U) Dynamic Modeling Delivered																X
(U) Enhanced Document Content Analysis & Retrieval System Awarded													X			

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE February, 1995
BUDGET ACTIVITY: 4 - Demonstration And Validation	PE NUMBER AND TITLE: 0603260F Intelligence Advanced Development — PROJECT: 3482

(U) A. **Project Cost Breakdown ($ in Thousands)**

	FY 1994	FY 1995	FY 1996	FY 1997
(U) Develop, Support, Test & Evaluate Intelligence Analyst Associate System	301	178		
(U) Develop, Support, Test & Evaluate Document Content Analysis & Retrieval System	499	480	326	426
(U) Develop, Support, Test & Evaluate Advanced Intelligence Information System	416	490	300	
(U) Develop, Support, Test & Evaluate Advanced Intelligence Data Representation	220	50	300	400
(U) Develop, Support, Test & Evaluate Dynamic Modeling			300	400
(U) Total	1,436	1,198	1,226	1,226

(U) B. **Budget Acquisition History and Planning Information ($ in Thousands)**

(U) Not Applicable

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February 1995

BUDGET ACTIVITY: 3 - Advanced Development

PE NUMBER AND TITLE: 0603270F Electronic Combat (EC) Technology

COST (*In Thousands*)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	22,819	17,845	25,079	25,091	28,140	28,973	28,982	29,846	Continuing	Continuing
2222 Expendable Countermeasures	4,295	3,806	2,262	3,043	3,832	4,286	7,256	4,198	Continuing	Continuing
2432 Defensive System Fusion	2,435	6,618	13,340	7,692	3,962	1,124	30	30	Continuing	Continuing
2754 Suppression Of Enemy Defenses	2,925	2,356	3,990	5,115	8,961	10,123	6,738	2,392	Continuing	Continuing
431G Threat Alert	5,983	4,048	2,276	400	1,599	1,466	4,550	7,512	Continuing	Continuing
691X On-board Countermeasures	7,181	1,017	3,211	8,841	9,786	11,974	10,408	15,714	Continuing	Continuing

(U) A. Mission Description and Budget Item Justification: This Advanced Development program expands the EC technology base by proving design concepts and demonstrating technologies to support critical Air Force EC requirements. The projects are categorized by the development of components, subsystems, and technologies that have potential application to satisfy combat, special operations, and airlift EC requirements and to reduce acquisition and life cycle costs of EC systems. The program develops and demonstrates: radio frequency (RF); infrared (IR); electro-optical (EO); and command, control, and communications (C3) countermeasure technologies. Technology demonstrations include flyable brassboards against validated threat simulators. In addition, the program develops and demonstrates technologies and concepts for signature reduction, advanced electronic warfare (EW) transmitters, receivers, and power management. This program ensures a strong EC technology base to provide demonstrated counters to current and future threat capabilities. All efforts in this program element contain the resources necessary, including civilian salaries, to manage, conduct, and document the technical activities.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1995
BUDGET ACTIVITY 3 - Advanced Development	PE NUMBER AND TITLE 0603270F Electronic Combat (EC) Technology

(U) B. **Program Change Summary ($ in Thousands):**

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
(U) Previous President's Budget	23,451	27,700	26,060	25,924	Cont
(U) Appropriated Value	23,689	18,299			
(U) Adjustments to Appropriated Value					
a. Congressional General Reductions	-238	-454			
b. SBIR	-326				
c. Below Threshold Reprogramming	-306				
(U) Current President's Budget	22,819	17,845	25,079	25,091	Cont

(U) Change Summary Explanation:

Funding: Congress significantly decreased the FY 1995 request. The FY 1996 request is the required funding for this program element.

Schedule: Not Applicable.

Technical: Not Applicable.

(U) C. **Other Program Funding Summary ($ in Thousands):** Not Applicable.

(U) D. **Schedule Profile:** Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1995
BUDGET ACTIVITY: 3 - Advanced Development	PE NUMBER AND TITLE: 0603270F Electronic Combat (EC) Technology / PROJECT: 2222

COST (*In Thousands*)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
2222 Expendable Countermeasures	4,295	3,806	2,262	3,043	3,832	4,286	7,256	4,198	Continuing	Continuing

(U) A. Mission Description and Budget Item Justification: This project develops and demonstrates systems and components for infrared (IR), electro-optical (EO), laser, radio frequency (RF), and multi-spectral expendable countermeasure technologies. Improved antenna, transmitter, and multi-spectral and multi-technique off-board countermeasure technologies are developed and demonstrated.

(U) FY 1994:
- (U) Developed an IR, multi-spectral expendable to address Air Mobility Command (AMC) decoy requirements. ($500K)
  - (U) Completed development of model to evaluate intensity and burn time of multi-spectral expendable material samples.
- (U) Developed future generation expendables to counter rapidly advancing threat environment. ($1,514K)
  - (U) Completed field demonstration of infrared imaging missile simulator against realistic threats for development of countermeasures.
  - (U) Completed technology assessment for combined EO and IR countermeasures.
  - (U) Completed joint (Army, Navy) assessment of millimeter wave threats.
- (U) Developed communication, navigation, identification (CNI) growth algorithms/testbed. ($2,281K)
  - (U) Completed development of software for off-board intelligence links.
  - (U) Demonstrated processing of live intelligence data in laboratory environment

(U) FY 1995:
- (U) Develop an IR, multi-spectral expendable to address AMC decoy requirements. ($234K)
  - (U) Develop shielding for spectral matching to aircraft signature.
  - (U) Complete development of an EO/IR jammer for large aircraft.
- (U) Develop future generation expendable to counter rapidly advancing threat environment. ($242K)
  - (U) Conduct field demonstrations and characterize EO/IR jammer for large aircraft.
- (U) Complete development of CNI growth algorithms/testbed. ($3,330K)
  - (U) Complete software development of Tactical Information Broadcast System (TIBS) waveform and demonstrate in laboratory.
  - (U) Complete software to fuse and integrate four simultaneous off-board intelligence data.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1995
BUDGET ACTIVITY 3 - Advanced Development	PE NUMBER AND TITLE 0603270F Electronic Combat (EC) Technology
	PROJECT 2222

(U) FY 1996:
- (U) Develop an infrared (IR), multi-spectral expendable to address Air Mobility Command (AMC) decoy requirements. ($55K)
  - (U) Conduct laboratory evaluations of expendable source materials to determine burn duration and spectrum of operation to address aircraft decoy requirements.
  - (U) Complete mechanical design and fabrication of multi-spectral expandable samples for characterization.
- (U) Develop future generation expendables to counter rapidly advancing threat environment. ($41K)
  - (U) Complete field demonstrations and characterize electro-optical (EO)/IR jammer for large aircraft.
- (U) Develop an integrated multi-spectral countermeasure (CM) expendable for IR and dual mode IR/radio frequency (IR/RF) seeker threats. ($2,166K)
  - (U) Complete design and fabricate test samples of expendables designed to defeat non-imaging threat missiles.
  - (U) Conduct joint test with United Kingdom of flares against internationally operational missiles.

(U) FY 1997:
- (U) Develop an IR, multi-spectral expendable to address Air Mobility Command (AMC) decoy requirements. ($833K)
  - (U) Conduct environmental testing (vibration, temperature, and safety) of multi-spectral expendables to ensure sustained performance in real world conditions.
  - (U) Demonstrate dynamic stabilization of multi-spectral expendable performance through sled testing.
- (U) Develop an integrated multi-spectral CM expendable for IR and dual mode (IR/RF) seeker threats ($2,210K)
  - (U) Fabricate and field test breadboard IR expendable technologies to defeat non-imaging threat missiles.
  - (U) Design and analyze dual mode (IR/RF) technologies to counter enemy dual mode missile seeker.
  - (U) Develop an integrated multi-spectral CM expendable for IR and dual mode (IR/RF) seeker threats.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1995
BUDGET ACTIVITY 3 - Advanced Development	PE NUMBER AND TITLE 0603270F Electronic Combat (EC) Technology
	PROJECT 2222

(U) B. **Program Change Summary ($ in Thousands):**

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
(U) Previous President's Budget	4,413	4,634	3,662	4,326	Cont
(U) Current President's Budget	4,295	3,806	2,262	3,043	Cont

(U) Change Summary Explanation:

Funding: FY 1996 request for Project 2222 is reduced $1.6 million due to increased emphasis in Project 2432.

Schedule: Not Applicable.

Technical: Not Applicable.

(U) C. **Other Program Funding Summary:**

(U) Related Activities:

- (U) PE 0602204F, Aerospace Avionics.
- (U) PE 0604270F, Electronic Warfare (EW) Development.
- (U) PE 0604270N, EW Development.
- (U) The Joint Director of Laboratories/Technical Panel on Electronic Warfare coordinates this effort with other Services.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) D. **Schedule Profile:** Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1995
BUDGET ACTIVITY: 3 - Advanced Development	PE NUMBER AND TITLE: 0603270F Electronic Combat (EC) Technology — PROJECT: 2432

COST (*In Thousands*)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
2432 Defensive System Fusion	2,435	6,618	13,340	7,692	3,962	1,124	30	30	Continuing	Continuing

(U) **A. Mission Description and Budget Item Justification:** This project develops and demonstrates techniques and hardware technologies for sensor and system fusion and integration. It also develops architecture, algorithm, and assessment techniques. These technologies will cope with the projected multi-spectral threat and countermeasure environments for combat aircraft. This project develops advanced EC algorithms and expert software for application on existing and future EC systems. This project also conducts real-time person-in-the-loop and hardware-in-the-loop integrated defensive avionics demonstrations.

(U) FY 1994:
- (U) Developed techniques/algorithms for mutli-sensor integration, threat assessment, sensor management, and response strategy. ($1,103K)
  - (U) Conducted an interim demonstration, utilizing a digital simulation, of advanced algorithms performing critical threat assessment, sensor management, and response strategy functions in real-time.
  - (U) Optimize algorithms and prepare for a final demonstration.
- (U) Conducted continuing Integrated Defensive Avionics Laboratory (IDAL) risk reduction experiments demonstrating the benefits of electronic warfare sensor suite integration for situation awareness and electronic attack response strategy for Air Force aircraft. ($1,332K)
  - (U) Completed multi-spectral electronic combat testbed requirements definition for the development/demonstration of radio frequency countermeasures and situation awareness technology.
  - (U) Completed preliminary design of multi-spectral electronic combat hardware-in-the-loop evaluation tool for radio frequency (RF) countermeasures designed to increase warfighter situation awareness.

(U) FY 1995:
- (U) Develop techniques/algorithms for multi-sensor integration, threat assessment, sensor management, and response strategy. ($248K)
  - (U) Conduct final demonstration, stressing operational issues through person-in-the-loop demonstrations involving mission planning, on-the-fly reconfiguration, and simulated flight using advanced defensive avionics response strategy algorithms which meet user situation awareness needs.
- (U) Conduct demonstrations using the IDAL showing benefit of integrating electronic warfare (EW) sensor suites for situation awareness and Electronic Attack (EA) response strategy. This effort is transferred to Project 691X in FY 1996. ($1,128K)
  - (U) Complete feasibility demonstration of multi-spectral electronic combat evaluation tool.
  - (U) Complete installation of situation awareness, EA response strategy, and RF countermeasures processing capability into IDAL.
- (U) Develop technology to demonstrate low-cost (based on commercial processors and open architecture) off-board and on-board threat sensor fusion technology for situation awareness for both new and existing aircraft. ($3,478K)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1995
BUDGET ACTIVITY: 3 - Advanced Development	PE NUMBER AND TITLE: 0603270F Electronic Combat (EC) Technology — PROJECT: 2432

- (U) Develop hardware and software requirements for the sensor fusion technology design.
- (U) Design the technology demonstration model.

- (U) Develop technology to demonstrate a single aperture precision location and identification of both ground and airborne radion frequency (RF) emitters for low-cost insertion into existing fielded equipment. ($1,764K)
  - (U) Develop requirements for the technology design.
  - (U) Design the hardware/software for a technology demonstration.

(U) FY 1996:

- (U) Develop technology to demonstrate low-cost (based on commercial processors and open architecture) off-board and on-board threat sensor fusion technology for situation awareness that meets needs for both new and existing aircraft upgrades. ($9,594K)
  - (U) Complete the development of software requirements and design of the technology demonstration mode.
  - (U) Complete fabrication of hardware and development of software and begin in-laboratory technology demonstrations.
  - (U) Prepare plans and begin hardware integration for interim flight demonstration of the technology model.
- (U) Develop technology to demonstrate a single aperture precision location and identification of both ground and airborne RF emitters. ($3,746K).
  - (U) Conduct preliminary and critical design reviews of the technology demonstration model.
  - (U) Conduct a laboratory demonstration to prove hardware and software technology approaches.
  - (U) Fabricate/integrate hardware and develop algorithms/software for the technology demonstration.

(U) FY 1997:

- (U) Develop technology to demonstrate low-cost (based on commercial processors and open architecture) off-board and on-board threat sensor fusion technology for situation awareness that meets needs for both new and existing aircraft upgrades. ($5,646K)
  - (U) Conduct interim flight demonstrations for hardware and software optimization of off-board and on-board threat sensor fusion technology for situation awareness for both new and existing aircraft upgrades.
  - (U) Optimize hardware and algorithms/software in preparation for final demonstration of technology model.
- (U) Develop technology to demonstrate a single aperture precision location and identification of both ground and airborne RF emitters. ($2,046K)
  - (U) Develop demonstration plans and integrate hardware into the technology demonstration aircraft.
  - (U) Conduct a flight demonstration of technology for single aperture precision location and identification of ground RF emitters.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1995
BUDGET ACTIVITY 3 - Advanced Development	PE NUMBER AND TITLE 0603270F Electronic Combat (EC) Technology
	PROJECT 2432

(U) **B. Program Change Summary ($ in Thousands):**

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
(U) Previous President's Budget	2,502	6,973	6,234	6,330	Cont
(U) Current President's Budget	2,435	6,618	13,340	7,692	Cont

(U) Change Summary Explanation:

Funding: Changes due to increased program emphasis on expanded situational awareness and precision emitter location and identification techniques.

Schedule: Not Applicable.

Technical: Not Applicable.

(U) **C. Other Program Funding Summary:**

(U) Related Activities:

- (U) PE 0602204F, Aerospace Avionics.
- (U) PE 0604270F, Electronic Warfare (EW) Development.
- (U) Joint Director of Laboratories, Technology Panel on Electronic Warfare, coordinates this program with the other Services.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) **D. Schedule Profile:** Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)			DATE February 1995
BUDGET ACTIVITY 3 - Advanced Development	PE NUMBER AND TITLE 0603270F Electronic Combat (EC) Technology		PROJECT 2754

COST (*In Thousands*)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
2754 Suppression Of Enemy Defenses	2,925	2,356	3,990	5,115	8,961	10,123	6,738	2,392	Continuing	Continuing

(U) A. **Mission Description and Budget Item Justification:** This project develops and demonstrates technologies and techniques for command and control warfare (C2W) (formerly called command, control, communications, and intelligence (C3I) warfare, or C3I countermeasures (CM)), standoff, and support CMs which deny, disrupt, and suppress adversary air defense operations. The project includes: 1) simulation efforts for evaluating new concepts and techniques; 2) components and techniques needed to jam enemy radar; 3) electronic collection systems to inform the field commander of changes in the electronic environment; and 4) advanced standoff jammer technology.

(U) FY 1994:
- (U) Developed technology developments and technique investigations to suppress adversary defense command and control networks. ($2,925K)
  - (U) Conducted exploitation of foreign materials to counter specific types of communications signals.
  - (U) Developed receiver and transmitter for technique generation to counter communication signals.
  - (U) Completed design and fabrication of system specific components to counter airborne navigation aids.

(U) FY 1995:
- (U) Develop technology developments and technique investigations to suppress adversary defense command and control networks. ($2,060K)
  - (U) Integrate developed hardware and conduct laboratory and field tests of techniques an software algorithms to counter specific types of C2W signals to meet critical user suppression needs.
  - (U) Integrate off-the-shelf components (some fabrication required) of equipment and develop software to counter threat airborne navigation systems.
- (U) Complete an X-KU band linear power amplifier investigation for electronic warfare expendables and higher power radio frequency (RF) countermeasure applications. ($296K)

(U) FY 1996:
- (U) Develop and investigate technique to suppress adversary defense command and control networks. ($3,990K)
  - (U) Flight demonstrate hardware and software techniques/algorithms to counter specific types of C2W signals.
  - (U) Develop and flight demonstrate an approach to counter airborne navigation aids.
  - (U) Develop techniques to counter modern threat command and control processing nets/nodes.
  - (U) Develop/design candidate, using new commercial technologies, affordable, modular, efficient, wide-band high-power amplifier for use in existing and new C2W systems.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1995
BUDGET ACTIVITY 3 - Advanced Development	PE NUMBER AND TITLE 0603270F Electronic Combat (EC) Technology
	PROJECT 2754

(U) FY 1997:

- (U) Develop and investigate techniques to suppress adversary defense command and control networks. ($5,115K)
  - (U) Complete demonstrations of techniques and software algorithms to counter specific types of command and control warfare (C2W) signals.
  - (U) Complete development and demonstration of an approach to counter airborne navigation aids.
  - (U) Fabricate and integrate components (based on new commercial technology) to demonstrate techniques to counter threat command and control processing nets/nodes.
  - (U) Trade off designs and begin fabrication, using new commercial technologies, of a modular, efficient, wide-band, high-power amplifier for use in existing and new C2W systems.
  - (U) Select and demonstrate new technology for a high-speed, frequency agile coupler between a wide band, frequency agile amplifier and an aircraft antenna (joint program with Army).
  - (U) Develop advanced algorithms/techniques to counter airborne command and control signals.
  - (U) Design and analyze approaches/techniques to demonstrate advanced expanded approaches to counter airborne navigation systems.
  - (U) Develop design concepts of competing technology approaches to counter command and control processing nodes.
  - (U) Study competing techniques to counter wide-band, high-speed data transfer systems.
  - (U) Analyze antennas and integration designs to take advantage of new technologies to develop more affordably installed, highly efficient, fast tuning airborne high frequency antennas.

(U) **B. Program Change Summary ($ in Thousands):**

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
(U) Previous President's Budget	3,006	1,970	2,174	3,881	Cont
(U) Current President's Budget	2,925	2,356	3,990	5,115	Cont

(U) Change Summary Explanation:

Funding: Changes due to increased program emphasis on defeating the rapidly advancing threat command and control networks.

Schedule: Not Applicable.

Technical: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1995
BUDGET ACTIVITY 3 - Advanced Development	PE NUMBER AND TITLE 0603270F Electronic Combat (EC) Technology
	PROJECT 2754

(U) C. **Other Program Funding Summary:**

(U) Related Activities:
- (U) PE 0602204F, Aerospace Avionics.
- (U) Joint Director of Laboratories, Technology Panel on Electronic Warfare, coordinates this program with the other Services.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) D. **Schedule Profile:** Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February 1995

BUDGET ACTIVITY: 3 - Advanced Development

PE NUMBER AND TITLE: 0603270F Electronic Combat (EC) Technology

PROJECT: 431G

COST (*In Thousands*)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
431G Threat Alert	5,983	4,048	2,276	400	1,599	1,466	4,550	7,512	Continuing	Continuing

(U) A. **Mission Description and Budget Item Justification:** This project develops and demonstrates advanced technologies for threat warning to enhance aircraft survivability and provide air crew situation awareness. Missile/aircraft warning, laser warning, and radio frequency (RF) receiver technologies are developed and demonstrated under this project. The project also develops and demonstrates advanced electronic combat (EC) preprocessor technologies, advanced sorting and preprocessing algorithms, and expert software for applications on existing and future EC systems.

(U) FY 1994:

- (U) Developed equipment and approaches to reduce risk for infrared (IR) warning systems development. ($3,416K)
  - (U) Conducted tests of an approach to provide time-to-intercept information for optimized use of countermeasures.
  - (U) Completed evaluation of missile signature measurements for validation of current Air Force signature models.
  - (U) Conducted design of test hardware system to develop and test approaches to implement the Advanced Research Projects Agency (ARPA) newly developed IR sensor array technology which does not require cryogenic cooling leading to the development of significantly more affordable missile warning sensors.
  - (U) Developed techniques to enhance the detection of threat missiles in a variety of high background clutter environments.
- (U) Developed a single aperture antenna to measure angle-of-arrival of radar emitters. ($1,011K)
  - (U) Completed demonstration of the single aperture antenna.
- (U) Develop advanced preprocessing radar warning hardware and algorithms. ($1,086K)
  - (U) Completed technology demonstration of preprocessing software and hardware.
- (U) Conducted risk reduction for advanced radar warning concepts and techniques. ($470K)
  - (U) Completed technology demonstration of digital receiver concept.
  - (U) Completed analysis of advanced techniques to identify threat radar types.

(U) FY 1995:

- (U) Develop IR missile warning technology for product improvement of existing and new aircraft-installed equipment through lowering life cycle costs and improving performance to meet the critical needs of detecting advanced, lower signature threats. ($3,369K)
  - (U) Complete development and a field technology demonstration of an approach to determine time-to-intercept for a threat incoming missile to enhance countermeasure effectiveness.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1995
BUDGET ACTIVITY: 3 - Advanced Development	PE NUMBER AND TITLE: 0603270F Electronic Combat (EC) Technology — PROJECT: 431G

- (U) Develop technology approaches to implement Advanced Research Projects Agency (ARPA) newly developed infrared (IR) sensor array technology which will not require cryogenic cooling for the development of significantly more affordable missile warning sensors.
- (U) Develop techniques to enhance the detection of threat missiles in a variety of high background clutter environments.

– (U) Complete development and demonstration of technology for detecting threat laser beam rider missiles for warning and countermeasure responses--a rapidly emerging need for all aircraft survivability. ($606K)

– (U) Conduct risk reduction for low-cost advanced radar (and other radio frequency (RF) emitters) warning concepts and techniques (forming joint program with Army and Navy) which address future, complex and low probability of intercept, RF environment. ($73K)
- (U) Analyze projected threat information to determine requirements for future IR/RF receiver technology development.

(U) FY 1996:

– (U) Develop IR missile warning technology for product improvement of existing and new aircraft-installed equipment through lowering life cycle costs and improving performance to meet the critical needs of detecting advanced, lower signature threats. ($2,213K)
- (U) Develop approaches to implement ARPA newly developed infrared sensor array technology which will not require cryogenic cooling for the development of significantly more affordable missile warning sensors.
- (U) Complete development of techniques to enhance the detection of threat missiles in a variety of high background clutter environments.

– (U) Conduct risk reduction for low-cost advanced radar (and other RF emitters) and IR warning concepts and techniques. ($63K)
- (U) Establish technology requirements for further IR/RF technology development.

(U) FY 1997:

– (U) Develop IR missile warning technology for product improvement of existing and new aircraft-installed equipment through lowering life cycle costs and improving performance to meet the critical needs of detecting advanced, lower signature threats. ($250K)
- (U) Complete development of approaches to use ARPA newly developed IR sensor array technology which will not require cryogenic cooling for the development of significantly more affordable missile warning sensors.
- (U) Define technology and demonstration requirements for low-cost airborne, threat missile warning.

– (U) Conduct risk reduction for low-cost advanced radar (and other radio frequency (RF) emitters) and infrared warning concepts and techniques. ($150K)
- (U) Develop design concept$ for a digital RF receiver (cooperative effort with Navy).

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1995
BUDGET ACTIVITY: 3 - Advanced Development	PE NUMBER AND TITLE: 0603270F Electronic Combat (EC) Technology — PROJECT: 431G

(U) B. Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
(U) Previous President's Budget	6,149	4,172	4,200	3,744	Cont
(U) Current President's Budget	5,983	4,048	2,276	400	Cont

(U) Change Summary Explanation:

Funding: Changes due to the necessity to complete low-cost risk reduction efforts prior to demonstration of an affordable and high performance missile warning system in FY 1998.

Schedule: Not Applicable.

Technical: Not Applicable.

(U) C. Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0602204F, Aerospace Avionics.
- (U) PE 0604270F, Electronic Warfare (EW) Development.
- (U) PE 0604270N, EW Development.
- (U) Joint Director of Laboratories, Technology Panel on Electronic Warfare, coordinates this program with the other Services.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) D. Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February 1995

BUDGET ACTIVITY: 3 - Advanced Development

PE NUMBER AND TITLE: 0603270F Electronic Combat (EC) Technology

PROJECT: 691X

COST (*In Thousands*)	FY 1994 Actual	FY 1995 Estimate	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	Cost to Complete	Total Cost
691X On-board Countermeasures	7,181	1,017	3,211	8,841	9,786	11,974	10,408	15,714	Continuing	Continuing

(U) A. Mission Description and Budget Item Justification: This project develops and demonstrates infrared (IR), electro-optical (EO), laser, and radio frequency (RF) countermeasure (CM) technologies for on-board application to combat aircraft.

(U) FY 1994:
- (U) Developed infrared countermeasure (IRCM) acquisition techniques, for risk reduction of a laser-based CM system to defeat threat IR missiles for large aircraft. ($6,465K)
  - (U) Completed test equipment integration and checkout.
  - (U) Performed tests on a number of IR missile seekers to evaluate advanced laser-based CM technology techniques.
  - (U) Conducted experiments to aid in the definition of techniques for IR acquisition and tracking of threat missiles.
- (U) Completed live fire testing of new techniques to counter advanced threat missiles. ($255K)
- (U) Developed and tested techniques to counter threat laser beam-riders and laser-aided weapon systems. ($461K)

(U) FY 1995:
- (U) Complete testing and reporting of new techniques to counter advanced RF threat missiles. ($1,007K)
  - (U) Complete technology demonstration of an advanced digital RF memory on a single chip.
  - (U) Complete the defensive airborne missile countermeasure flight demonstration program.
- (U) Develop joint-Service technology demonstration plan for application to large aircraft. ($10K)

(U) FY 1996:
- (U) Develop laser-based IRCM technology which will defeat all current and future IR missiles, known or unknown, in multiple threat scenarios, for large aircraft. ($2,451K)
  - (U) Complete joint-Service technology demonstration plan for application to large aircraft.
  - (U) Conduct experiments at the Wright Laboratory Laser IRCM Development range to test and evaluate laser-based IRCM jamming techniques to defeat potential, threat IR missile seekers.
  - (U) Develop and demonstrate IRCM technologies under laboratory and field conditions necessary to provide risk reduction for transition.
  - (U) Conduct experiments in the Dynamic Infrared Missile Evaluator (DIME) hardware-in-the-loop simulator to develop techniques and assist in developing models of potential threat seekers.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1995
BUDGET ACTIVITY: 3 - Advanced Development	PE NUMBER AND TITLE: 0603270F Electronic Combat (EC) Technology / PROJECT: 691X

- (U) Conduct continuing demonstrations using the Integrated Defense Avionics Laboratory (IDAL) showing benefit of integrating electronic warfare (EW) sensor suites for situation awareness and electronic attack (EA) response strategy. ($760K)
  - (U) Complete integration of multi-spectral electronic combat testbed and situation awareness/attack response strategy/radio frequency (RF) countermeasure (CM) processing capability.
  - (U) Complete implementation and integration of testbeds for Expanded Situation Awareness Insertion and Precision Location and Identification technology developments.

(U) FY 1997:

- (U) Develop laser-based Infrared Countermeasure (IRCM) technology which will defeat all current and future infrared (IR) missiles, known or unknown, in multiple threat scenarios, for large aircraft. ($7,829K)
  - (U) Conduct experiments at the Wright Laboratory Laser IRCM Development range to test and evaluate laser-based IRCM jamming techniques to defeat potential, threat IR missile seekers, in accordance with the joint-Service demonstration plan.
  - (U) Develop and demonstrate IRCM technologies under laboratory and field conditions necessary to provide risk reduction for transition to a 6.4 program.
  - (U) Conduct experiments in the Dynamic Infrared Missile Evaluator (DIME) hardware-in-the-loop simulator to develop techniques and assist in developing models of potential threat seekers.
- (U) Conduct continuing demonstrations using the IDAL showing benefit of integrating EW sensor suites for situation awareness and EA response strategy. ($1,011K)
  - (U) Conduct reduction demonstrations of Expanded Situation Awareness Insertion Technology.
  - (U) Conduct risk reduction demonstrations of Precision Location and Identification technology.
- (U) Develop technology for insertion into existing aircraft RF CM subsystems that will jam the advanced/projected complex threat air defense weapon system radars sufficiently to prevent the threat missiles from being fired at high value asset aircraft. ($1K)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1995
BUDGET ACTIVITY 3 - Advanced Development	PE NUMBER AND TITLE 0603270F Electronic Combat (EC) Technology
	PROJECT 691X

(U) B. Program Change Summary ($ in Thousands):

	FY 1994	FY 1995	FY 1996	FY 1997	Total Cost
(U) Previous President's Budget	7,381	9,951	9,790	7,643	Cont
(U) Current President's Budget	7,181	1,017	3,211	8,841	Cont

(U) Change Summary Explanation:

Funding: In FY 1995, Congress reduced funding for laser-based, Infrared Countermeasures (IRCM) jamming techniques for countering IR (heat-seeking) missiles. The FY 1996 and FY 1997 funding increases over FY 1995 reflects partial restoration of funding for the IRCM program.

Schedule: Not Applicable.

Technical: Not Applicable.

(U) C. Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0602204F, Aerospace Avionics.
- (U) PE 0604270F, Electronic Warfare (EW) Development.
- (U) PE 0604270N, EW Development.
- (U) PE 0603203F, Avionics for Aerospace Vehicles.
- (U) Joint Director of Laboratories, Technology Panel on Electronic Warfare, coordinates this program with the other Services.
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

(U) D. Schedule Profile: Not Applicable.