

# Ballistic Missile Defense Organization



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## FY 98-99 President's Budget Submission

February 1997

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**- Editorial Note -**

**The numbering system shown on some pages of this book corresponds to the numbering system used within the FY 1998 budget book produced by the OUSD Comptroller during February 1997.**

**- Procurement Editorial Note -**

**PBD 224C3 transferred all procurement funding for FY 1998 and out, to the service departments.**

# **FY 98-99 President's Budget Submission**



## **Letter Of Transmittal**



DEPARTMENT OF DEFENSE  
BALLISTIC MISSILE DEFENSE ORGANIZATION  
7100 DEFENSE PENTAGON  
WASHINGTON, DC 20301-7100

PO

January 15, 1997

MEMORANDUM FOR SECRETARY OF DEFENSE  
DEPUTY SECRETARY OF DEFENSE

THROUGH: UNDER SECRETARY OF DEFENSE FOR ACQUISITION AND  
TECHNOLOGY

SUBJECT: Ballistic Missile Defense Organization FY 1998-1999  
President's Budget (PB)--INFORMATION MEMORANDUM

The Ballistic Missile Defense Organization (BMDO) FY 1998 PB reflects the Department of Defense's current Ballistic Missile Defense plan and is consistent with the Ballistic Missile Defense (BMD) priorities of the Department of Defense. The BMDO's Theater Missile Defense program continues as our highest priority, followed by a National Missile Defense deployment readiness program, and a limited advanced technology program.

I anticipate that Congress may again add resources to selected programs causing outyear program instability. Additionally, I am concerned that the absence of a Medium Extended Air Defense System outyear funding level in the PB will prompt Congressional reductions jeopardizing the schedule for this important international cooperative effort. Finally, the last minute realignment by Program Budget Decision 224C3 of BMDO Procurement Appropriations to the Services causes some management concerns. In this regard, I am continuing to follow the authorities and responsibilities of the BMDO Charter. Accordingly, I have provided the Services with the justification materials for the BMD procurement portions of their budget submissions. The Program Overview and appropriate exhibits are at Tab A.

A handwritten signature in black ink, reading "Lester L. Lyles", is positioned above the typed name and title.

LESTER L. LYLES  
Lieutenant General, USAF  
Director

Attachments:  
As stated

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# Program Overview

BALLISTIC MISSILE DEFENSE ORGANIZATION  
FY 1998 President's Budget Overview

1. OVERVIEW: The Ballistic Missile Defense Program is structured to respond to existing and emerging ballistic missile threats to the United States, its forward deployed forces, allies, and friends around the world. First priority is Theater Missile Defense, (TMD), second priority is National Missile Defense (NMD) and, third priority is an investment in BMD advanced technologies in order to enhance future BMD capabilities for both TMD and NMD.
2. THEATER MISSILE DEFENSE PROGRAM: The TMD key elements include: PATRIOT PAC-3 upgrades, Navy Area Defense program, the Theater High Altitude Area Defense (THAAD) System, and Navy Theater-wide BMD. The TMD program also includes MEADS and appropriate battle management, command, control, and communications for these theater capabilities. The PATRIOT mission is to provide asset and force protection from all types of air and short range tactical missile threats. The THAAD mission is to defeat endo/exo TBMs with multiple shot opportunities. The mission of the Navy Area Defense program is point defense of strategic assets. The Navy Theater-wide BMD complements it by engaging the longer range, high altitude threat. Both are stand off weapon systems used to protect U.S. Forces and our allies.
3. NATIONAL MISSILE DEFENSE PROGRAM (NMD): The NMD program is a deployment readiness program that involves developing the element hardware that will be used in an FY 1999 integrated system test (IFT-5) intended to demonstrate an NMD capability. In addition, contract strategies are being implemented that will allow for fielding and maintaining an initial NMD system by FY 2003. Program risk is being reduced by performing the maximum number of system level tests between FY 2000 and FY 2003. Directly supported the NMD program is the Space Based Infrared System (Low Component) (funded and managed by the Air Force). In April 1996 the USD(A&T) designated NMD as an ACAT 1D program and in July 1996 the program successfully completed its first OIPT review.

U N C L A S S I F I E D

4. ADVANCED TECHNOLOGY: To meet future needs, the Advanced Technology program is investing in high leverage technologies for improved capabilities in kinetic energy interceptors and advanced sensors. Limited directed energy efforts are programmed for developing and validating technologies, and integrating subsystems, which could be part of global boost phase intercept defense. New ideas and technologies for missile defense are being investigated by the Innovative Sciences and Technology program.

5. SUMMARY: When the core TMD systems are deployed, U.S. forces overseas will have defensive capability against a broad spectrum of short and longer-range theater-class ballistic missiles. Meanwhile, BMDO is committed to maintaining a well-focused deployment readiness program for National Missile Defense of the United States. BMDO also will continue to demonstrate advanced technologies as options for enhancing initial BMD systems. The Department of Defense remains committed to ensuring that as new ballistic threats arise, highly effective ballistic missile defenses will be in place to defend our forces.

U N C L A S S I F I E D



# Appropriation Summary

UNCLASSIFIED  
BALLISTIC MISSILE DEFENSE ORGANIZATION  
(\$ in Millions)

Program Element	Budget Activity	FY 1996 Actual	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate
<b>PROCUREMENT: *</b>									
0208861C	THAAD System Procurement	0.000	0.000	0.000	0.000	0.000	34.100	534.400	607.600
0208863C	HAWK Procurement	13.980	14.665	0.000	0.000	0.000	0.000	0.000	0.000
0208864C	TMD-BMC3 Procurement	27.101	19.696	20.200	26.000	0.000	0.000	0.000	0.000
0208865C	PAC3 Procurement	285.989	219.413	350.700	372.000	462.100	448.200	435.300	397.600
0208867C	Navy Area Wide	<u>16.276</u>	<u>9.151</u>	<u>15.500</u>	<u>44.600</u>	<u>130.000</u>	<u>161.000</u>	<u>236.000</u>	<u>225.000</u>
	Total Procurement	343.346	262.925	386.400	442.600	592.100	643.300	1,205.700	1,230.200
<b>RDT&amp;E</b>									
0602173C	Support Tech - Applied Research	96.092	102.510	101.932	95.488	86.025	82.161	78.543	78.411
0603173C	Support Tech - Adv Tech Dev	130.611	251.294	147.557	144.902	147.142	151.398	156.360	159.915
0603861C	THAAD System - DEM/VAL	565.818	341.307	294.647	16.778	0.000	0.000	0.000	0.000
0603863C	HAWK - DEM/VAL	22.819	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0603864C	TMD-BMC3 - DEM/VAL	27.147	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0603867C	Navy Area Wide - DEM/VAL	277.565	59.315	0.000	0.000	0.000	0.000	0.000	0.000
0603868C	Navy Theater Wide - DEM/VAL	200.442	304.171	194.898	192.073	191.229	190.930	145.190	149.444
0603869C	MEADS - DEM/VAL (PD-V)	20.123	56.232	47.956	9.509	0.000	0.000	0.000	0.000
0603870C	Boost Phase Intercept - D/V	0.000	23.276	12.885	0.000	0.000	0.000	0.000	0.000
0603871C	NMD - DEM/VAL	730.656	828.864	504.091	393.085	309.748	309.584	391.858	392.433
0603872C	Joint TMD - DEM/VAL	429.137	506.492	542.619	514.109	544.417	550.196	538.259	520.800
0604861C	THAAD System - EMD	0.000	277.508	261.480	578.467	603.213	584.561	413.884	372.674
0604864C	TMD-BMC3 - EMD	10.118	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0604865C	PAC3 - EMD	352.547	381.092	206.057	101.430	0.000	0.000	0.000	0.000
0604866C	PAC3 Risk - EMD	23.358	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0604867C	Navy Area Wide - EMD	0.000	241.330	267.822	226.748	222.145	158.271	52.433	38.089
0605218C	Management	<u>158.748</u>	<u>0.000</u>	<u>0.000</u>	<u>0.000</u>	<u>0.000</u>	<u>0.000</u>	<u>0.000</u>	<u>0.000</u>
	Total RDT&E	3,045.181	3,373.391	2,581.944	2,272.589	2,103.919	2,027.101	1,776.527	1,711.766
<b>MILCON</b>									
0603871C	National Missile Defense	0.000	0.000	0.540	12.815	0.000	0.000	0.000	0.000
0603872C	Joint Theater Missile Defense	2.991	1.404	1.965	1.885	1.444	0.341	1.643	1.650
0604861C	THAAD System	<u>13.104</u>	<u>0.000</u>	<u>4.565</u>	<u>0.000</u>	<u>0.000</u>	<u>0.000</u>	<u>0.000</u>	<u>4.994</u>
	Total MILCON	16.095	1.404	7.070	14.700	1.444	0.341	1.643	6.644
<b>TOTAL BMDO PROGRAM</b>									
		3,404.622	3,637.720	2,589.014	2,287.289	2,105.363	2,027.442	1,778.170	1,718.410

\* FY98-03 Procurement Funding has been transferred to the services. These figures are displayed here for information only.

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UNCLASSIFIED  
 APPROPRIATION SUMMARY  
 BALLISTIC MISSILE DEFENSE ORGANIZATION  
 (\$ in Millions)

Program	Budget Activity	FY 1996 Actual	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate
<b>RDT&amp;E TOTAL BY BUDGET ACTIVITY</b>									
Applied Research	02	96.092	102.510	101.932	95.488	86.025	82.161	78.543	78.411
Advanced Technology Development	03	130.611	251.294	147.557	144.902	147.142	151.398	156.360	159.915
Demonstration/Validation	04	2,273.707	2,119.657	1,597.096	1,125.554	1,045.394	1,050.710	1,075.307	1,062.677
Eng & Manufacturing Development	05	386.023	899.930	735.359	906.645	825.358	742.832	466.317	410.763
Management Support	06	158.748	0.000	0.000	0.000	0.000	0.000	0.000	0.000
<b>BA TOTAL</b>		<b>3,045.181</b>	<b>3,373.391</b>	<b>2,581.944</b>	<b>2,272.589</b>	<b>2,103.919</b>	<b>2,027.101</b>	<b>1,776.527</b>	<b>1,711.766</b>

**BMDO TOTAL BY CONGRESSIONALLY MANDATED PROGRAM ELEMENT STRUCTURE**

Boost Phase Intercept *	0.000	23.276	12.885	0.000	0.000	0.000	0.000	0.000	0.000
MEADS *	20.123	56.232	47.956	9.509	0.000	0.000	0.000	0.000	0.000
HAWK	36.799	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Management	158.748	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Navy Area Wide *	293.841	309.796	267.822	226.748	222.145	158.271	158.271	52.433	38.089
Navy Theater Wide *	200.442	304.171	194.898	192.073	191.229	190.930	190.930	145.190	149.444
National Missile Defense *	730.656	828.864	504.631	405.900	309.748	309.584	309.584	391.858	392.433
Joint Theater Missile Defense *	430.779	542.257	544.584	515.994	545.861	550.537	550.537	539.902	522.450
PAC3 *	639.885	600.505	206.057	101.430	0.000	0.000	0.000	0.000	0.000
PAC3 Risk	23.358	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Support Tech *	226.703	353.804	249.489	240.390	233.167	233.559	233.559	234.903	238.326
THAAD System *	578.922	618.815	560.692	595.245	603.213	584.561	584.561	413.884	377.668
TMD-BMC3	64.366	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
<b>BMDO TOTAL</b>		<b>3,404.622</b>	<b>3,637.720</b>	<b>2,589.014</b>	<b>2,287.289</b>	<b>2,105.363</b>	<b>2,027.442</b>	<b>1,778.170</b>	<b>1,718.410</b>

\* These PEs (FY97-03) reflect the future Program Element structure of the BMDO Program IAW the FY96 Defense Authorization Act.

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# Applied Research PE 0602173C

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

**BUDGET ACTIVITY**

**PE NUMBER AND TITLE**

**2 - Applied Research**  
**0602173C Support Technologies - Applied Research**

COST (\$ In Thousands)	FY 1996 Actual	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	96,092	102,510	101,932	95,488	86,025	82,161	78,543	78,411	Continuing	Continuing
1651 Innovative Science and Technology (IST)	47,852	56,009	50,923	50,094	43,774	41,411	42,505	43,506	Continuing	Continuing
1660 Statutory and Mandated Programs	48,240	46,501	51,009	45,394	42,251	40,750	36,038	34,905	Continuing	Continuing

**A. Mission Description and Budget Item Justification**

To prepare to meet critical future active defense needs, advanced technology programs invest in an aggressive program of high leverage technologies that yield markedly improved capabilities across a selected range of boost phase and terminal defense interceptors, advanced target sensors, and innovative science. The objectives of these investments are to provide: (1) component technologies that offer improved performance or reduced costs for BMDO acquisition programs; (2) a better understanding of the physical processes to support these acquisition programs; and (3) technical solution options to mitigate unpredicted threats. Unlike other BMDO projects that fund near term technology and testing efforts, this advanced technology initiative invests seed money in high-risk technologies that could significantly change how BMDO develops future systems. The technologies pursued include: next generation sensors, power, information processing, optics, advanced materials, propulsion and communication. This project causes and exploits breakthroughs in science that will keep BMD at the foremost edge of what is possible. A primary project goal is to conduct proof-of-concept demonstrations that transition technology to development programs.

Many of today's baseline technologies on BMDO systems like Theater High Altitude Area Defense (THAAD), Patriot Advanced Capability (PAC3), and Ground Based Radar (GBR) are available due to the wise investment in innovative technologies some 10 years ago. Examples include: indium antimonide and mercury cadmium telluride ultra-sensitive infrared detectors; 32-bit radiation hardened Reduced Instruction Set Computer (RISC) processors for image analysis; composite materials for lightweight satellite structures; interferometric fiber-optic gyroscopes for sophisticated guidance and control; and solid-state gallium arsenide transmitter/receivers for BMDO radars. The IST program is the only R&D program in the Defense Department focused on future BMDO technical requirements.

The Small Business Innovative Research (SBIR) and the Small Business Technology Transfer (STTR) programs for all of BMDO are managed under this budget item. Pursuant to PL 102-564, a two-phased competition for small businesses with innovative technologies is conducted, focusing on BMDO relevant technologies with an emphasis on technologies with potential dual use.

**Acquisition Strategy:** This R&D program receives proposals in response to an annual Broad Agency Announcement of research opportunities. Proposals received are competitively judged according to BMD relevance, cost, and capabilities of the offeror. Strong emphasis is placed on the dual-use nature of the proposed effort. For the SBIR and STTR programs, BMDO conducts the competitions and the executing agents award and manage the contracts.

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

DATE February 1997

BUDGET ACTIVITY

PE NUMBER AND TITLE

**2 - Applied Research**  
**0602173C Support Technologies - Applied Research**

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

	FY 1996	FY 1997	FY 1998	FY 1999	Total Cost
Previous President's Budget Appropriated Value	89,230	94,023	86,459	86,702	356,414
Adjustments to Appropriated Value:					
a. MEADS below threshold reprogramming		-1,109			
b. General Reductions (FFRDC, Inflation etc.)		-404			
Current Budget Submit/President's Budget	96,092	102,510	101,932	95,488	396,022

**Change Summary Explanation:**

Funding: FY97 Congressional Plus-up for wide band-gap semiconductor research initiative.

Schedule:

Technical:

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

See individual project R-2 exhibits

**D. Schedule Profile**

See individual project R-2 exhibits

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

DATE **February 1997**

BUDGET ACTIVITY

**2 - Applied Research**

PE NUMBER AND TITLE

**0602173C Support Technologies - Applied Research**

PROJECT

**1651**

COST (\$ in Thousands)	FY 1996 Actual	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
1651 Innovative Science and Technology (IST)	47,852	56,009	50,923	50,094	43,774	41,411	42,505	43,506	Continuing	Continuing

**A. Mission Description and Budget Item Justification**

To prepare to meet critical future active defense needs, advanced technology programs invest in an aggressive program of high leverage technologies that yield markedly improved capabilities across a selected range of boost phase and terminal defense interceptors, advanced target sensors, and innovative science. The objectives of these investments are to provide: (1) component technologies that offer improved performance or reduced costs for BMDO acquisition programs; (2) a better understanding of the physical processes to support these acquisition programs; and (3) technical solution options to mitigate unpredicted threats. Unlike other BMDO projects that fund near term technology and testing efforts, this advanced technology initiative invests seed money in high-risk technologies that could significantly change how BMD develops future systems. The technologies pursued include: next generation sensors, power, information processing, optics, advanced materials, propulsion and communication. This project causes and exploits breakthroughs in science that will keep BMD at the foremost edge of what is possible. A primary project goal is to conduct proof-of-concept demonstrations that transition technology to development programs.

Many of today's baseline technologies on BMDO systems like Theater High Altitude Area Defense (THAAD), Patriot Advanced Capability (PAC3), and Ground Based Radar (GBR) are available due to the wise investment in innovative technologies some 10 years ago. Examples include: indium antimonide and mercury cadmium telluride ultra-sensitive infrared detectors; 32-bit radiation hardened Reduced Instruction Set Computer (RISC) processors for image analysis; composite materials for lightweight satellite structures; interferometric fiber-optic gyroscopes for sophisticated guidance and control; and solid-state gallium arsenide transmitter/receivers for BMDO radars. The IST program is the only R&D program in the Defense Department focused on future BMDO technical requirements.

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

DATE

February 1997

BUDGET ACTIVITY

2 - Applied Research

PE NUMBER AND TITLE

0602173C Support Technologies - Applied Research

PROJECT

1651

**FY 1996 (\$ in Thousands):**

- \$16,898 Battle Management/Command, Control and Communications (BM/C3): Invested in advanced FPA; Light Detection and Ranging (LIDAR); sensor fusion prototype for target handover and multi-sensor fusion; and missile signatures. Began development of affordable wafer scale associative string processor (WASP) supercomputer capable of 50 GOPS per second. Continued to develop the superconducting terahertz modem for spread-spectrum, code division multiple access communications for BMDO battle management. Invested in laser diodes for communication; laser satellite communication systems; terahertz communication sources; and spread-spectrum CDMA communications modem. Flight tested the laser satellite communication system using an air-to-ground link to demonstrate free-space communications at data rates greater than 1 gigabyte per second. Began development of fast frame seeker (2 kHz) real-time 3-D read-out from a 64x64 focal plane array into a next generation, artificial neural network special purpose computer capable of 1022 interconnects per second in under 2 watts. Invested in neural networks for image recognition, optical image processing, multi-sensor tracking. Supported Navy LEAP FTV-3 and FTV-4 tests. For FTV-4, tracked target vehicle from horizon to horizon in real time images and provided the only enhanced image showing the target, interceptor and carrier vehicles, and established miss distance. Demonstrated real-time sensor data fusion of angle-angle radar data and participate in US-Australian real-time sensor data fusion communication experiment. Provided an Australian test range the imaging and range data and fused them with the Australian radar data for real-time transmission to US.
- \$8,900 Materials: Continued the development of wide band-gap semiconductors for non-volatile memory and advanced ultraviolet sensors. Continued research of all-optical packet switched terabit per second computer networks for BM/C3 and simulation. Integrated the gallium arsenide quantum-well focal-plane array with a monolithic readout and the associated optics into a completed camera system.
- \$7,400 Sensors: Continued the R&D projects on dual-band solar blind detectors and plume spectroscopy and radiometry measurements. Invested in advanced infrared and ultraviolet detectors, including multi-spectral and hyperspectral capabilities. Field demonstrated the associative string processor, linked to a large-format focal plane array. Invested in flying sensor and processing testbed for pre-launch and boost-phase targets (VIGILANTE); advanced 3-D neural coprocessor; software library for high-speed automatic target recognition. Completed Skipper integration and ground testing and deliver spacecraft to Russia for launch on a Molniya launch vehicle. Launched the SKIPPER satellite.
- \$7,062 Propulsion: Continued the R&D program on advanced thermoplastic elastomers for solid rocket propellant. Ground demonstrated integrated RHETT propulsion system for spacecraft with performance of 1600 sec specific impulse and nearly 50% efficiency with an input power of 1.5 kW. The integrated RHETT propulsion system includes the thruster, power processing unit, propellant delivery system, and mechanical structure with a total mass of 23 kg.

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

DATE

February 1997

BUDGET ACTIVITY

PE NUMBER AND TITLE

PROJECT

## 2 - Applied Research

0602173C Support Technologies - Applied Research

1651

- \$7,592 Power: Continued IST advances in wide band-gap materials for high-power electronic devices to reduce the weight and volume of ground-based radar power supplies. Completed flight qualification testing of a SCARLET array designed for operation in high radiation environments. The array was designed, fabricated, qualified, and integrated in the spacecraft, and launched in a total of only 9 months. Initiated design of a 2.6 kW advanced SCARLET array to provide power to NASA's first New Millennium Deep Space spacecraft. Completed design of advanced SCARLET array for the New Millennium flight demonstration with specific power of >50 W/kg using 24% efficient multiple band-gap photovoltaic cells. Delivered the engineering prototype of the photovoltaic flight solar cell. Assessed the conceptual feasibility of a cryogenic ground based radar system using a high temperature superconducting (HTS) generator. Initiated fabrication of the HTS coils for the power system demonstrator.

- \$47,852 Total

## FY 1997 (\$ in Thousands):

- \$19,597 BM/C3: Test the fast framing seeker in a real interceptor scenario to test its ability to do passive discrimination. Invest in neural networks for image recognition, optical image processing, multi-sensor tracking. Invest in ultra-stable laser diodes for optical communication; laser satellite communication systems; terahertz communication sources; and spread-spectrum CDMA communications modem.

- \$13,166 Materials: Advance the development of wide band gap semi-conductors, targeting gallium nitride and silicon carbide, and establishing a facility specifically for material growth and material characterization research. Begin development of advanced optical polymers to be used in 10 wavelength transmitters to achieve 1 terabit/sec transmission rate.

- \$4,160 Sensors: Demonstrate Fast Frame Seeker capability against simulated infrared missile targets in a gimbaled test cell. Invest in flying sensor and processing prototype for pre-launch and boost-phase targets (VIGILANTE); advanced 3-dimensional neural coprocessor; software library for high-speed automatic target recognition.

- \$5,072 Propulsion: Invest in high-impulse solid propellants; electric propulsion thrusters; and propellant manufacturability, for hypervelocity interceptors. Flight test the stationary plasma thrusters in space for satellite orbital transfer and orbit plane adjustment.

- \$14,014 Power: Complete demonstration of a high temperature superconducting (HTS) generator. Complete development of an advanced power design for a Gallium Nitride Microwave amplifier, and conduct a Gallium Nitride field effect transistor (FET) performance test. Complete design of a cryo GBR power conditioning system. Initiate thermal system design for complete cryogenic radar system including TR modules, power conditioning system, power generation system, and staged cryogenic cooling system.

- \$56,009 Total

## FY 1998 (\$ in Thousands):

- \$21,836 BM/C3: Invest in neural networks for image recognition, optical image processing, multi-sensor tracking. Invest in ultra-stable laser diodes for optical communication; laser satellite communication systems; terahertz communication sources; and spread-spectrum CDMA communications modem, as progress warrants.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE	PROJECT
BUDGET ACTIVITY		February 1997	1651
2 - Applied Research		0602173C Support Technologies - Applied Research	
	PE NUMBER AND TITLE		
- \$8,801	Materials: Invest in wide band-gap semiconductors; polymer-based electronics; digital superconducting electronics; non-volatile random access memory; and diamond windows and coatings. Demonstrate prototype GaN-based high microwave power amplifier operated at 300 degrees Centigrade.		
- \$5,116	Sensors: Complete HTS design of integrated cryogenic GBR system prototype. Complete fabrication of 500 kW prototype cryogenic power conditioning system for GBR. Complete thermal system design for prototype system. Demonstrate Fast Frame Seeker capability against simulated infrared missile targets in a gimbaled test cell. Perform integrated demonstration of sensor and processing prototype for pre-launch and boost-phase targets (VIGILANTE); demonstrate against ground and airborne TMD targets using both hyperspectral and multispectral capability.		
- \$5,187	Propulsion: Invest in high-impulse solid propellants; electric propulsion thrusters; and propellant manufacturability.		
- \$9,983	Power: Complete SCARLET ground qualification and acceptance testing. Complete integrated New Millennium spacecraft system ground qualification with SCARLET array wings in launch and initial operation of SCARLET in space. Initial report on flight system performance in space completed. Invest in advanced switching for radar; high-efficiency solar cells and concentrators; and miniature interceptor guidance technology. Demonstrate a GaN-based high microwave power amplifier, operated at 300 degrees C.		
- \$50,923	Total		
<b>FY 1999 (\$ in Thousands):</b>			
- \$21,503	BMC3: Invest in neural networks for image recognition, optical image processing, multi-sensor tracking and miniature interceptor guidance technology. Invest in ultra-stable laser diodes for optical communication; laser satellite communication systems; terahertz communication sources; and spread-spectrum CDMA communications modem, as progress warrants.		
- \$8,614	Materials: Continue to invest in wide band-gap semiconductors; polymer-based electronics; digital superconducting electronics; non-volatile random access memory; and diamond windows and coatings, as technical progress and system technology needs warrant.		
- \$5,040	Sensors: Continue to invest in sensor fusion and advanced neural network image recognition, as technical progress and system technology needs warrant.		
- \$5,602	Propellants: Continue to invest in high-impulse solid propellants; electric propulsion thrusters; and propellant manufacturability, as technical progress and system technology needs warrant.		
- \$9,335	Power: Continue to invest in a power conditioning system for radar, high-efficiency solar cells and concentrators as technical progress and system technology needs warrant.		
- \$50,094	Total		
<b>Acquisition Strategy:</b> This R&D program receives proposals in response to an annual Broad Agency Announcement of research opportunities. Proposals received are competitively judged according to BMD relevance, cost, and capabilities of the offeror. Strong emphasis is placed on the dual-use nature of the proposed effort.			

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

DATE February 1997

BUDGET ACTIVITY  
**2 - Applied Research**  
 PE NUMBER AND TITLE  
**0602173C Support Technologies - Applied Research**  
 PROJECT  
**1651**

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

	FY 1996	FY 1997	FY 1998	FY 1999	Total Cost
Previous President's Budget	47,800	47,449	52,393	51,563	199,205
Appropriated Value		57,449			
Adjustments to Appropriated Value:					
a. MEADS below threshold reprogramming		-1,109			
b. General Reductions (FFRDC, Inflation etc.)		-331			
Current Budget Submit/President's Budget	47,852	56,009	50,923	50,094	204,878

**Change Summary Explanation:**

Funding: FY97 Congressional Plus-up for wide band-gap semiconductor research initiative  
 Schedule: None  
 Technical: None

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

	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To Compl	Total Cost
1651 Innovative Sci & Tech, PE 603173C		2,233							2,233	2,233
The IST program acts as a creator of new technology for BMD. It feeds into all of the other BMDO technology programs and it acts as a catalyst to transition devices and components whose efficacy has been demonstrated under IST sponsorship into other advanced development programs.										

**D. Schedule Profile**

	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 1999		
1	2	3	4	1	2	3	4	1	2	3	4
SKIPPER launch	X										
Deliver Lasercom System for STRV-2			X								
RHEIT II hardware delivery			X								
SWARM reticle seeker tracking demo			X								
Wafer-Scale Associative String Processor Demo			X								

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

DATE

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BUDGET ACTIVITY

PE NUMBER AND TITLE

PROJECT

**2 - Applied Research**

**0602173C Support Technologies - Applied Research**

**1651**

	FY 1996				FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
4 Kbit Nonvolatile Random Access Memory in Silicon Carbide Demo				X												
ISTEF THAAD tests support				X												
Integrate 3D chip stack version					X											
VIGILANTE electronics						X										
ISTEF Red Tigris III data collection							X									
600GHz and 1 THz backward wave oscillator tested								X								
Mass Optical Storage demo								X								
Adv Signal Processor Prototype delivered								X								
Start preliminary VIGILANTE flights								X								
Integrate first VIGILANTE chip set in lab								X								
HTS generator demonstration								X								
Gallium Nitride FET performance test								X								
Deliver sensor package for EFEX 1,2									X							
SCARLET Array wings integrated with										X						
New Millennium spacecraft																
Demonstrate cryo transmit and receive tubes for GBR														X		
RHETT II flight test																
Cryo GBR power conditioning sys dem																
SCARLET solar array flight test																
Non-Linear Optics device demo																
NF2 propellant demo																
Voxel Cruncher delivered																
Cryo GBR 1 MW generator demo																
Load THAAD motor case with energetic elastomers propellant and characterize under operational conditions.																
Laser materials device decision																

UNCLASSIFIED

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE	February 1997		PROJECT	
BUDGET ACTIVITY	PE NUMBER AND TITLE					PROJECT
2 - Applied Research	0602173C Support Technologies - Applied Research					1651
		FY 1996	FY 1997	FY 1998	FY 1999	
		1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	
Advanced HWIL testbed demo at NRL						

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

DATE **February 1997**

BUDGET ACTIVITY

PE NUMBER AND TITLE

PROJECT

**2 - Applied Research**

**0602173C Support Technologies - Applied Research**

**1660**

COST (\$ in Thousands)	FY 1996 Actual	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
1660 Statutory and Mandated Programs	48,240	46,501	51,009	45,394	42,251	40,750	36,038	34,905	Continuing	Continuing

**A. Mission Description and Budget Item Justification**

To prepare for critical future active defense needs, advanced technology programs will invest in a balanced program of high leverage technologies that yield improved capabilities across a selected range of boost phase and terminal missile defense interceptors, advanced target sensors, and innovative science. The objectives of these investments are component technologies with improved performance or reduced costs for acquisition programs, and technical solution options to mitigate advanced and unpredicted threats. Under this project, the SBIR and STTR programs explore innovative concepts pursuant to PL 102-564 which mandates a two phase competition for small businesses that are developing innovative technologies. Emphasis is placed on dual use technologies for future BMDO needs. Dual use means that the technologies will also be judged on their potential for future private sector investment, both as a vehicle for reducing development time and unit cost of new BMDO technologies as a route to national economic growth through new commercial products.

**FY 1996 (\$ in Thousands):**

- \$11,240 125 Phase I SBIR and STTR awards to 90 firms.
- \$37,000 70 Phase II SBIR and STTR awards to 38 firms.
- \$48,240 Total

**FY 1997 (\$ in Thousands):**

- \$11,367 200 Phase I SBIR and STTR awards to 140 firms.
- \$35,134 60 Phase II SBIR and STTR awards to 50 firms.
- \$46,501 Total

**FY 1998 (\$ in Thousands):**

- \$10,558 200 Phase I SBIR and STTR awards to 150 firms.
- \$40,451 55 Phase II SBIR and STTR awards to 70 firms.
- \$51,009 Total

**FY 1999 (\$ in Thousands):**

- \$9,119 160 Phase I SBIR and STTR awards to 130 firms.
- \$36,275 58 Phase II SBIR and STTR awards to 62 firms.

Project 1660

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

DATE February 1997

BUDGET ACTIVITY

PE NUMBER AND TITLE

PROJECT  
1660

**2 - Applied Research**

**0602173C Support Technologies - Applied Research**

- \$45,394 Total

**Acquisition Strategy:** These competitively awarded programs are in response to annual announcement of research opportunities. Proposals received are judged according to technical and commercial potential.

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

	FY 1996	FY 1997	FY 1998	FY 1999	Total Cost
Previous President's Budget	41,430	46,574	34,066	35,139	157,209
Appropriated Value		46,574			
Adjustments to Appropriated Value:					
a. General Reductions (FFRDC, Inflation etc.)		-73			
Current Budget Submit/President's Budget	48,240	46,501	51,009	45,394	191,144

**Change Summary Explanation:**

Funding: Funding changes in Advanced Technology Development (0603173C) and in Applied Research (0602173C) are based on guidance stated in PL102-564.  
Schedule: None  
Technical: None

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

	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To Compl	Total Cost	
1	2	3	4	1	2	3	4	1	2	3	4
X				X			X				

**D. Schedule Profile**

	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To Compl	Total Cost	
1	2	3	4	1	2	3	4	1	2	3	4
X				X			X				

SBIR/STTR



# Advanced Technology Development PE 0603173C

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

BUDGET ACTIVITY	PE NUMBER AND TITLE											Total Cost
	0603173C Support Technologies - ATD											
COST (\$ In Thousands)	FY 1996 Actual	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete			
Total Program Element (PE) Cost	130,611	251,294	147,557	144,902	147,142	151,398	156,360	159,915	Continuing	Continuing		
1155 Phenomenology Program	2,410	18,309	26,740	26,205	20,401	21,204	22,399	22,926	Continuing	Continuing		
1161 Advanced Sensor Technology	19,326	32,797	24,527	22,743	19,723	18,921	16,995	25,566	Continuing	Continuing		
1270 Adv Interceptor Materials and Systems Tech	26,788	68,409	31,492	29,412	42,890	46,133	49,460	42,449	Continuing	Continuing		
1360 Directed Energy Program	76,488	95,930	28,877	28,539	28,222	27,631	28,224	28,886	Continuing	Continuing		
1651 Innovative Science and Technology	0	2,233	0	0	0	0	0	0	TBD	TBD		
1660 Statutory and Mandated Programs	5,399	4,707	4,161	4,113	4,073	4,051	4,293	4,299	Continuing	Continuing		
3352 Modeling & Simulations	0	2,002	1,554	1,898	643	1,512	1,544	1,582	Continuing	Continuing		
4000 Operational Support	200	26,907	30,206	31,992	31,190	31,946	33,445	34,207	Continuing	Continuing		

**A. Mission Description and Budget Item Justification**

The BMD supporting technology program develops concepts and components for next generation and product improved ballistic missile defense systems. The responsibility for BMD unique and high leverage technology development rests solely with BMDO within the Department of Defense. In order to meet long range defense guidance priorities, a focused, robust component and advanced concept technology development program must be maintained to position the Department to be able to respond to a changing environment and an evolving global missile threat. The program advances the state-of-the-art in those critical functions, components, and subsystems necessary to increase system performance, reliability, maintainability and survivability while reducing acquisition and life cycle cost. This program directly supports those critical related technologies for next generation BMD Systems.

The BMD technology program is designed to provide answers to many key R&D issues for developmental and future Theater and National Missile Defense systems. BMDO crafts the program as a component of the overall Department technology area plan. The efforts include:

- Development of prediction tools to generate high-confidence target signatures for BMD, a critical adjunct to the evaluation of BMD system performance across the full spectrum of threats and engagement scenarios (Project 1155).

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

DATE

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BUDGET ACTIVITY

PE NUMBER AND TITLE

## 3 - Advanced Technology Development

## 0603173C Support Technologies - ATD

- Advanced sensor technology development which is needed to detect, track, discriminate, and intercept advanced (post-2000) BMD threats. This includes target object map generation on board interceptors, the detection and tracking of low observable targets, and other high leverage sensor technologies (Project 1161).
- The Advanced Interceptor Materials and Systems Technology (AIMST) program develops and demonstrates the following for interceptor and space surveillance systems: advanced interceptor sensor processing and power components; multifunctional material and structures; low cost interceptor composite manufacturing processes; and low cost flight test demonstrations. These technologies are critical to the deployment of effective, affordable TMD and NMD systems (Project 1270).
- The culmination of advanced chemical laser systems technologies (Project 1360) to demonstrate integration of high power laser beam with large optics and transition to technology based advances with ground integration efforts.
- This program also includes important mandated outreach efforts to encourage Small Business Innovation Research, to transition BMD technology to commercial and industrial sectors, and to affirmatively incorporate historically minority and black colleges and universities in development of BMD technology (Project 1660).
- Provide for the development/modification and validation of modeling and simulation (M&S) techniques and tools that are critical in assessing the projected, alternative, and demonstrated performance capabilities of Theater Missile Defense (TMD) and National Missile Defense (NMD) systems. These large and complex M&S tools require high-performance vector and parallel processing supercomputers, scalar processors, and advanced graphic workstations for operation (Project 3352).
- Includes manpower authorizations and the associated costs specifically identified and measured to the performance of these program (Project 4000).

This project is assigned to the Budget Activity and Program Element codes as identified in this descriptive summary in accordance with existing Department of Defense policy. Further justification of the Budget Activity code assigned to each Program Element is contained within the Brief Description of Element section of each Program Element Summary.

FY 1996 Accomplishments: See individual R-2 project summaries.

FY 1997 Plans: See individual R-2 project summaries.

FY 1998 Plans: See individual R-2 project summaries.

FY 1999 Plans: See individual R-2 project summaries.

Acquisition Strategy: See individual R-2 project summaries.

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

BUDGET ACTIVITY	PE NUMBER AND TITLE		DATE
<b>3 - Advanced Technology Development</b>	<b>0603173C Support Technologies - ATD</b>		
<b>B. Program Change Summary (\$ in Thousands)</b>			
Previous President's Budget	FY 1996	FY 1997	Total
Appropriated Value	125,537	132,319	Cost
Adjustments to Appropriated Value:		262,319	565,830
a. MEADS below threshold reprogramming		-9,999	
b. General Reductions (FFRDC, Inflation etc.)		1,026	
Current Budget Submit/President's Budget	130,611	251,294	674,364
<b>Change Summary Explanation:</b>			
Funding: Over the past few years, in compliance with congressional direction and in consonance with the Bottom-Up Review findings, the Department has significantly restructured the follow-on supporting technology program for ballistic missile defense. Today, BMDO management is highly focused on those technologies that directly support TMD and NMD systems developments, or hold significant promise for advanced missile defense systems. In instances where those programs have significant collateral application to other military missions, technical information is shared with the interested military department. The ongoing advanced technology program supports DoD's long-term commitment to continue, at a stable level, critical research on technologies that build on work to date in order to prepare for more capable and affordable active ballistic missile defense systems. This submission incorporated minor realignments of work effort between sensor and interceptor technologies to take advantage of project synergies. Additionally, the directed energy program continues through the FYDP to provide the technological base advances essential to ready robust responsive threat options.			
Schedule: See individual R-2s.			
Technical: See individual R-2s.			
<b>C. Other Program Funding Summary (\$ in Thousands)</b>			
See Individual Project R-2 Exhibits			
<b>D. Schedule Profile</b>			
See Individual Project R-2 Exhibits			

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

DATE **February 1997**

BUDGET ACTIVITY

**3 - Advanced Technology Development**

PE NUMBER AND TITLE

**0603173C Support Technologies - ATD**

PROJECT  
**1155**

COST (\$ In Thousands)	FY 1996 Actual	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
1155 Phenomenology Program	2,410	18,309	26,740	26,205	20,401	21,204	22,399	22,926	Continuing	Continuing

**A. Mission Description and Budget Item Justification**

To prepare for critical future missile defense needs, advanced technology programs will conduct a balanced program of high leverage technologies that yield improved capabilities across a selected range of boost, midcourse, and terminal phase missile defense interceptors, advanced target sensors, and innovative science. The objectives of these investments are subsystems with improved performance or reduced costs for acquisition programs, and technical solution options to mitigate advanced and unpredicted threats.

This program provides the U.S. with the data and predictive tools to generate high confidence target signatures for ballistic missile defenses (BMD). This is a critical adjunct to the evaluation of BMD system performance across the full spectrum of threats and engagement scenarios. This program provides data collection sensors and instruments for use on live-fire missions and provides analysis of the resulting test data. This program provides predictive models of target signatures in both Radar and Infrared spectrums. This program evaluates and develops algorithms for the critical functions of discrimination, target handover, and aimpoint selection. This program provides for data storage and retrieval of all BMDO sponsored tests per statutory requirements.

Space-based Phenomenology Program Database Development is the work to expand the database for background data through the analysis of Midcourse Space Experiment (MSX) data. This effort will include analysis of the background data for its impact on current and future elements of the NMD program, especially the Space Based Infrared System (SBIRS).

Data Collection is the program to provide effective and robust threat signature collection for ballistic missile defense programs. This program analyzes existing and emerging requirements for signature data collection capabilities. This program provides mission planning for all BMDO signature collection activities. These activities include providing for the maximum use of existing high altitude data collection aircraft to collect ballistic threat signatures in all phases of flight. Signature data dissemination and modeling tie in with higher level simulations will be developed. Evaluation, development, and employment of several types of potential data collection sensors will be conducted per the direction of OSD. This program develops responsive access to stored signature data. This program provides exploitation of new signatures provided by emerging sensing techniques.

DATE February 1997

BUDGET ACTIVITY

PE NUMBER AND TITLE

PROJECT  
1155**RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)****3 - Advanced Technology Development****FY 1996 (\$ in Thousands):**

- \$2,410 Technical Analysis: Provided BMDO with the specialized support required to resolve development and deployment issues, including trade studies of the cost, schedule, and technical risks of alternative deployment readiness options. Provided special studies and reviews involving long-range program planning, technical and programmatic issues such as methods to maximize NMD deployment by leveraging development efforts of the TMD program. Supported BMDO in all aspects of battlespace environment discrimination issues including scientific studies and analysis in optical and radar areas of the spectrum.

- \$2,410 Total

**FY 1997 (\$ in Thousands):**

- \$5,253 Space-based Phenomenology Program Database Development: Collect and analyze background data from the MSX to support SBIRS and other users. Provide for data collection, reduction, and sensor development to collect spectral data on natural backgrounds and signatures of ballistic missiles during boost, mid-course, and terminal phases of flight including the use of existing high altitude aircraft.

- \$13,056 Data Collection: Analyze existing and emerging requirements for signature data collection capabilities. Perform mission planning for all BMDO signature collection activities. Perform signature collection missions using existing high altitude aircraft. Develop approach to tie signature data and modeling to higher level simulations.

- \$18,309 Total

**FY 1998 (\$ in Thousands):**

- \$4,517 Space-based Phenomenology Program Database Development: Analyze background data from the MSX to support Space Based Infrared System (SBIRS) and other users. Provide mission support costs for high altitude background and target spectral measurements. Develop and transfer promising Long Wavelength Infrared (LWIR) sensor/processor technologies for discrimination.

- \$22,223 Data Collection: Continue analysis of existing and emerging requirements for signature data collection capabilities. Demonstrate signature data collection capabilities at the laboratory level. Acquire mission capable signature data collectors to meet requirements. Perform mission planning for all BMDO signature collection activities. Perform signature data collection missions using existing signature data collection aircraft. Implement approach to tie signature data and modeling to higher level simulations.

- \$26,740 Total

**FY 1999 (\$ in Thousands):**

- \$4,503 Space-based Phenomenology Program Database Development: Analyze background data from the MSX to support SBIRS and other users. Provide mission support costs for high altitude background and target spectral measurements. Continue developing and transferring promising (LWIR) sensor/processor technologies for discrimination.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE	February 1997		PROJECT																																																																																	
BUDGET ACTIVITY	PE NUMBER AND TITLE					1155																																																																																
<p><b>3 - Advanced Technology Development</b></p> <p>- \$21,702 Data Collection Platform: Continue analysis of existing and emerging requirements for signature data collection capabilities. Demonstrate signature data collection capabilities at the laboratory level. Acquire mission capable signature data collectors to meet requirements. Perform mission planning for all BMDO signature collection activities. Perform signature collection missions using upgraded signature data collection aircraft. Demonstrate approach to tie signature data and modeling to higher level simulations.</p> <p>- \$26,205 Total</p> <p>Acquisition Strategy: This project funds its efforts through executing agents in the Air Force, Army, Navy and BMDO via existing contracts.</p>																																																																																						
<p><b>B. Program Change Summary (\$ in Thousands)</b></p> <table border="1"> <thead> <tr> <th></th> <th>FY 1996</th> <th>FY 1997</th> <th>FY 1998</th> <th>FY 1999</th> <th>FY 2000</th> <th>FY 2001</th> <th>FY 2002</th> <th>FY 2003</th> <th>Total</th> </tr> </thead> <tbody> <tr> <td>Previous President's Budget</td> <td>1,539</td> <td>13,931</td> <td>27,078</td> <td>26,670</td> <td></td> <td></td> <td></td> <td></td> <td>Cost 69,218</td> </tr> <tr> <td>Appropriated Value</td> <td></td> <td>13,931</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Adjustments to Appropriated Value:</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>    a. MEADS below threshold reprogramming</td> <td></td> <td>-184</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>    b. General Reductions (FFRDC, Inflation etc.)</td> <td></td> <td>-71</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>    c. Internal BMDO Adjustments</td> <td></td> <td>4,633</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Current Budget Submit/President's Budget</td> <td>2,410</td> <td>18,309</td> <td>26,740</td> <td>26,205</td> <td></td> <td></td> <td></td> <td></td> <td>73,664</td> </tr> </tbody> </table>								FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	Total	Previous President's Budget	1,539	13,931	27,078	26,670					Cost 69,218	Appropriated Value		13,931								Adjustments to Appropriated Value:										a. MEADS below threshold reprogramming		-184								b. General Reductions (FFRDC, Inflation etc.)		-71								c. Internal BMDO Adjustments		4,633								Current Budget Submit/President's Budget	2,410	18,309	26,740	26,205					73,664
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<p>Change Summary Explanation:</p> <p>Funding: Increase in funding FY 96 to FY 97. Explanation: 1) MSX data analysis moved into this project beginning in FY 97, 2) Effort to increase quantity and quality of signature data collection and analyses.</p> <p>Funding: Increase in funding FY 97 to FY 98. Explanation: Demonstration and acquisition phase of the effort to increase quantity and quality of signature data collection and analyses.</p> <p>Schedule: None</p> <p>Technical: None</p>																																																																																						
<p><b>C. Other Program Funding Summary (\$ in Thousands)</b></p> <table border="1"> <thead> <tr> <th></th> <th>FY 1996</th> <th>FY 1997</th> <th>FY 1998</th> <th>FY 1999</th> <th>FY 2000</th> <th>FY 2001</th> <th>FY 2002</th> <th>FY 2003</th> <th>To</th> </tr> </thead> <tbody> <tr> <td>2400 NMD, PE 0603871C</td> <td>730,656</td> <td>828,864</td> <td>504,091</td> <td>393,085</td> <td>309,748</td> <td>309,584</td> <td>391,858</td> <td>392,433</td> <td>Compl Cont</td> </tr> <tr> <td>1155 Phenomenology Program, PE 0603872C</td> <td>36,908</td> <td>31,338</td> <td>37,835</td> <td>38,622</td> <td>37,464</td> <td>37,300</td> <td>37,205</td> <td>36,490</td> <td>Cont Cont</td> </tr> </tbody> </table>								FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To	2400 NMD, PE 0603871C	730,656	828,864	504,091	393,085	309,748	309,584	391,858	392,433	Compl Cont	1155 Phenomenology Program, PE 0603872C	36,908	31,338	37,835	38,622	37,464	37,300	37,205	36,490	Cont Cont																																																		
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<p>Project 1155</p> <p>Page 6 of 38 Pages</p> <p>Exhibit R-2 (PE 0603173C)</p>																																																																																						



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

DATE **February 1997**

BUDGET ACTIVITY

PE NUMBER AND TITLE

**3 - Advanced Technology Development**

**0603173C Support Technologies - ATD**

PROJECT  
**1161**

	FY 1996 Actual	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
1161 Advanced Sensor Technology	19,326	32,797	24,527	22,743	19,723	18,921	16,995	25,566	Continuing	Continuing

**A. Mission Description and Budget Item Justification**

To prepare for critical future active defense needs, advanced technology programs will conduct a balanced program of high leverage technologies that yield improved capabilities across a selected range of boost, midcourse, and terminal phase missile defense interceptors, and advanced target sensors, as well as advances in innovative science. The objectives of these investments are subsystems with improved performance, reduced costs for acquisition programs, and technical solution options to counter advanced and unpredicted threats.

The Advanced Sensor Technology Program (ASTP) is BMDO's principal advanced sensor program. ASTP is a joint Army, Navy, Air Force technology development and demonstration program, managed by BMDO. The purpose of ASTP is to provide the sensor technology needed to detect, track, and discriminate advanced (post-2000) BMD threats. The technologies for ASTP were chosen through a technology requirements analysis driven by BMD missions, threats, system requirements, and schedules. Care was taken to avoid duplication with other programs both within and external to BMDO. Starting in FY1996, ASTP realigned interceptor-related technology efforts under Project 1270 to correspond with their discriminating interceptor technology focus.

The three Services and BMDO are developing technologies in their Project Reliance areas of expertise. The Air Force is developing passive sensor technology, the Army - ladar technology, and the Navy - radar technology. These technologies will be infused from ASTP into BMDO core programs as they mature.

In addition to development of critical component technologies, the three Services, in conjunction with BMDO, will combine these critical components in an integrated sensor for demonstrating data fusion by FY2001. Data from the passive, ladar and radar sensors will be combined (fused) in a BMDO-developed fusion processor for tracking and discrimination.

Real-time data fusion is a central focus of ASTP. It is identified by the technical requirements analysis as the best solution to the difficult signal processing problem. High-speed data fusion algorithms are under development by BMDO for this critical need.

Laboratory and field demonstrations of ASTP technologies are being conducted throughout the program, starting with advanced focal plane imaging demonstrations conducted at White Sands Missile Range, NM (WSMR) in FY95. Larger experiments will permit fusion of radar, infrared, and ladar data beginning in FY96 and FY97, when scaled rocket flights will provide initial collocated multi-sensor data for benchmarking of tracking algorithms. The first integrated demonstration of ASTP subsystems will be at the Pacific Missile Range Facility (PMRF), Kauai, Hawaii ground test facility, where radar and optical sensors will detect and track missiles beginning in FY00. Successful performance of the radar-to-system interface and tracking algorithms will signal the transition to the airborne demonstration phase, which begins in FY01.

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**3 - Advanced Technology Development**

BMDO has selected a Government system integration team led by Naval Research Laboratory/Navy Air Systems Team (NRL/NAST). This system integrator (SI) will oversee the installation of ASTP equipment at the test ranges, and will integrate the sensors and other equipment into the P-3 aircraft. Additionally, the SI will operate the ASTP equipment during the airborne demonstrations.

The technologies under development in ASTP are:

- Multiple Quantum Well (MQW) Focal Plane Arrays (FPA). MQW FPAs have made rapid progress in the past three years, and are now available in 256x256 format with quantum efficiency approaching 30%. This technology is important due to its potential for high sensitivity, low noise, high uniformity imaging and low production cost.
  - Simultaneous Multi-Color FPAs. FPAs capable of simultaneously measuring two or more Infrared (IR) wavebands will simplify sensor design for both surveillance and interceptor seekers. The result will be highly sensitive, discriminating sensors which are more reliable, lighter, and less costly than currently available
  - Smart FPAs. Pre-processing sensor data on or near the FPA greatly improves processing throughout. This provides the overall processing speed needed for real-time data fusion for accomplishing multiple target tracking, discrimination, and tracking low-observable targets in clutter.
  - Imaging Ladar. Miniature Laser Radar (ladar) integrated with passive sensors will allow precise tracking and discrimination of BMD targets. Ladar capable of range-doppler and 3-dimensional imaging are under development. Eye safe ladar is being developed for airborne applications. The ladar technology is also consistent with interceptor technology requirements.
  - Radar. Reliable booster detection and tracking through cloud-cover requires radar observations. ASTP is leveraging an existing NRL airborne UHF surveillance radar technology program based on the APS-145 to demonstrate TBM detection and early ascent phase tracking.
  - Transmit/Receive (T/R) Modules. The radar T/R Module program will develop and demonstrate technologies required to increase output power and power added efficiency, and reduce the noise figure of 10 Ghz (X-band) T/R modules for use in radars.
  - Real Time Data Fusion Algorithms. Techniques for combining (fusing) data for tracking multiple targets, discrimination, and sensor optimization are under development. The algorithms are critically needed as principal elements of the fusion processor. They are the central focus of the ASTP data fusion effort.
- Russian American Cooperative Programs:
- The RAMOS program is a cooperative effort with Russian scientists and engineers to exchange IR data acquired through remote sensing systems and to develop plans for future cooperative space experiments. This program investigates options to leverage off existing funded experiments to foster a closer working relationship at the technology level between both nations.

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- The AGRE is an upper atmospheric joint research project with Russian scientist, using Russian launch vehicles and US/Russian on-board sensor packages, Russian ground optical/radar sites, and US MSX satellite to monitor experiments and collect data.

Down Under early Warning Experiment (DUNDEE). DUNDEE is a cooperative advanced BMD sensor and BMC/3 technology research demonstration with the Australian Defense Science Technology Organization (DSTO). Objectives are to perform research, demonstration, and post mission data reduction using the Australian Jindalee Over-the-Horizon Radar to detect TBM and Cruise Missile targets. Specific objectives include: wide area, timely launch detection; target identification using plume doppler signature; and trajectory association with satellite detection reports.

**EY 1996 (\$ in Thousands):**

- \$5,865 Developed sensor integration requirements and begin system integration planning, demonstration planning, and simulation for ground demonstrations; allocated subsystem requirements to achieve performance enhancements beyond current NMD & TMD sensor capabilities, and developed airborne demonstration data and signal architecture.
- \$3,299 Performed sequential 2-color 256x256 MQW imagery demonstration, perform on-FPA processing demonstration. Performed 2-Color sequential MQW lab tests.
- \$1,748 Demonstrated eye-safe laser pump and 6m multiple-folded CO2 ladar.
- \$2,163 Continued testing and integration of radar sensor and began development of ballistic missile defense mode.
- \$1,254 Completed planning, began development and testing of data fusion algorithms with system simulations.
- \$4,997 Defined terms of RAMOS agreement, planned near-term experiments. Began data exchange with Russia.
- \$19,326 Total

**EY 1997 (\$ in Thousands):**

- \$10,233 Begin laboratory, ground, and chamber demonstrations of components, begin planning for flight demonstrations, begin system performance simulations, conduct system level system design review (SDR), conduct system Preliminary Design Review (PDR), and begin system design. Compare different Gallium Arsenide based structures, such as transistors, to determine optimum device structure for T/R modules and components. Develop and improve interceptor communications technologies, including conformal antenna array designs.
- \$5,756 Continue development, integration, and testing of passive IR components that are candidates for multi-sensor flight demonstration; demonstrate simultaneous 256x256 2-color MQW array at Army Missile Optical Range (AMOR), and deliver on-FPA electronics.
- \$1,678 Fabricate and deliver hardened eye-safe aluminum gallium antimonide arsenide detector for eye-safe ladar and demonstrate 2-D imaging.
- \$3,146 Continue integration of radar sensor for multi-sensor flight demonstration.
- \$1,783 Develop and test fusion processing algorithms for tracking and discrimination from an airborne platform.
- \$8,846 Execute RAMOS near-term experiments, data reduction and analysis, and sensor feasibility studies. Execute AGRE-0 and AGRE-1 experiments and post flight data analysis.
- \$1,355 Conduct DUNDEE design trades and execute acquisition and assembly of 3 sounding rocket targets. Provide ground assembly, testing, launcher acquisition, remote site transportation, in-theater launch support, and overall target management for the DUNDEE cooperative demonstration.

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BUDGET ACTIVITY		DATE	PROJECT
3 - Advanced Technology Development		February 1997	1161
PE NUMBER AND TITLE		0603173C Support Technologies - ATD	
-	\$32,797	Total	
<b>FY 1998 (\$ in Thousands):</b>			
-	\$10,806	Perform laboratory, ground, and chamber demonstrations of integrated components; plan for sensor suite integration and flight demonstrations, system performance simulations, complete system Critical Design Review (CDR) and begin demonstration system fabrication and finalize system interfaces.	
-	\$5,841	Continue development, integration, and testing of passive IR components that are candidates for multi-sensor flight demonstration; demonstrate 128x128 high-quantum-efficiency MQW array. Fabricate 128x128 configuration on-FPA processing electronics brassboard for multi-sensor flight demonstration.	
-	\$3,221	Continue development, integration, and airborne testing of wide area search (WAS) APS-145 radar for multi-sensor flight demonstration. Test ASTP system to radar interface.	
-	\$2,691	Continue development and testing of fusion processing algorithms and mapping real-time algorithms onto high performance computer (HPC) processor. Demonstrate passive to active sensor handover at AMOR.	
-	\$1,968	Continue development and testing of eyesafe ladar.	
-	\$24,527	Total	
<b>FY 1999 (\$ in Thousands):</b>			
-	\$10,202	Perform system performance simulations, complete subsystem fabrication and test system interfaces, begin integration of demonstration system for ground tests at PMRF, Kauai, Hawaii, and test user interfaces/soles and command software.	
-	\$5,889	Continue development, integration, and testing of Passive Sensor Subsystem (PSS) for multi-sensor flight demonstration tests, perform laboratory and ground calibrations and performance measures, accept delivery of ladar subsystem for optical integration.	
-	\$1,973	Continue development, integration, and airborne testing of wide area search (WAS) APS-145 radar for multi-sensor flight demonstration. Test ASTP system to radar signal processor interface in preparation for ground testing at PMRF.	
-	\$2,986	Benchmark testing of fusion processing algorithms on wafer-scale signal processor (WSSP) co-processor as part of Intel Paragon (HPC) configuration. Continue refinement of alternative tracking and target discrimination algorithms to support system ground tests.	
-	\$1,693	Final testing and delivery of eye-safe ladar following ground tests at AMOR, integration of ladar into passive/active sensor subsystem (PASS) for later integration into ASTP ground and airborne demonstration equipment.	
-	\$22,743	Total	
<p><b>Acquisition Strategy:</b> ASTP is a Tri-Service/BMDO program. The executing agents will use existing contracts, and in-house resources to perform this program. The Air Force is developing passive IR technology (multi-color FPAs and on-FPA processing) and is responsible for passive sensor technology development, integration, and testing. The Army is responsible for ladar technology development, integration, and testing. The Navy is developing radar technology (bi-static) and is leveraging off of existing airborne radar programs. BMDO is developing fusion processor technology and algorithms and is responsible for performing platform integration and conducting major flight demos. BMDO will initiate contracts to perform these efforts. Cooperation with on-going programs will be maximized to leverage funding.</p>			

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BUDGET ACTIVITY **3 - Advanced Technology Development** PE NUMBER AND TITLE **0603173C Support Technologies - ATD** PROJECT **1161**

ASTP is an on-going program with many contracts in place. A coordinated team of management and technical personnel is now in place in the Army, Navy, and Air Force, managed by BMDO. Essential documentation has been prepared, and mission requirements have been analyzed, and flowed-down to ASTP component designs. Broad Agency Announcements have been published and proposals evaluated to ensure potential attractive technologies and innovative approaches have not been overlooked during the tri-service planning efforts. BMDO contracting efforts are in progress to initiate platform integration and sensor fusion.

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

	FY 1996	FY 1997	FY 1998	FY 1999	Total Cost
Previous President's Budget	20,789	24,611	27,683	24,509	97,592
Appropriated Value		34,611			
Adjustments to Appropriated Value:					
a. MEADS below threshold reprogramming		-1,147			
b. General Reductions (FFRDC, Inflation etc.)		-57			
c. Internal BMDO Adjustments		-610			
Current Budget Submit/President's Budget	19,326	32,797	24,527	22,743	99,393

**Change Summary Explanation:**

Funding: Funding decrease in FY1996 results from refining the separation of technologies and efforts between Project 1161 and Project 1270.

Schedule: None

Technical: Sensor and interceptor technology efforts have been realigned within Projects 1161 and 1270, respectively, to better reflect the technologies' principal applications.

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

	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To Compl	Total Cost
1270 Applied Interceptor Materials and Systems Technology, PE 0603173C	26,788	68,409	31,492	29,412	42,890	46,133	49,460	42,449	Cont	Cont
1270 Applied Interceptor Materials and Systems Technology, PE 0603872C	9,137	0	0	0	0	0	0	0	TBD	TBD
1360 Directed Energy Programs, PE 0603173C	76,488	95,930	28,877	28,539	28,222	27,631	28,224	28,886	Cont	Cont
2400 NMD Program, PE 0603871C	730,656	828,864	504,091	293,085	309,748	309,584	391,858	392,433	Cont	Cont
3360 Test Resources, PE 0603872C	31,139	35,507	30,888	30,201	29,942	29,793	30,312	30,363	Cont	Cont

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**D. Schedule Profile**

	PE NUMBER AND TITLE												
	FY 1996		FY 1997		FY 1998		FY 1999		FY 2000		FY 2001		
	1	2	3	4	1	2	3	4	1	2	3	4	
Sequential 2-color 256x256 MQW													
Imagery Demonstration													
Define Terms of RAMOS Agreement			X										
Eyesafe Ladar Pump Demo			X										
Simultaneous 2-color 256x256 MQW													
Imagery Demonstration													
Demonstrate FED smart windowing													
Eyesafe Ladar 2-D imaging demo													
Hardened Eyesafe Solid-State Ladar													
AlGaSb Detector Delivery													
System-level PDR; interface requirements defined													
On-FPA Electronics Delivery													
Fabricate FED 128x128 on-FPA processing electronics													
Passive-to-active sensor handover demo at AMOR													
Deliver Ladar Sensor Subsystem													
Deliver Passive/Active Sensor Subsystem													
Deliver Fusion Processing Subsystem													
Deliver Radar Sensor Subsystem													

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COST (\$ In Thousands)	FY 1996 Actual	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
	1270 Adv Interceptor Materials and Systems Tech	26,788	68,409	31,492	29,412	42,890	46,133	49,460	42,449	Continuing

**A. Mission Description and Budget Item Justification**

To prepare for critical future defense needs, advanced technology programs will invest in a balanced program of high leverage technologies that yield improved capabilities at affordable cost with lower technical and schedule risks for boost phase and terminal missile defense interceptors, advanced target sensors and future space surveillance and defense systems. The objectives of these investments are component and systems technologies with improved performance and reduced costs for acquisition programs, and technical solution options to mitigate advanced and unpredicted threats.

The Advanced Interceptor Materials and Systems Technology (AIMST) program develops and demonstrates the following for interceptor and space surveillance systems: advanced interceptor sensor processing and power components; multifunctional material and structures; low cost interceptor composite manufacturing processes; and low cost flight test demonstrations. These technologies are critical to the deployment of effective, affordable TMD and NMD systems.

The near-term AIMST projects are planned and executed through direct interchange with System Program Offices (SPOs) and prime contractors responsible for fielding current NMD Technology Readiness and TMD systems hardware. The execution of this comprehensive technology program, however, is slowed by funding limitations. This impedes efforts on near-term technologies that will increase interceptor and sensor performance while lowering deployment costs.

The AIMST program consists of six major task programs: Discriminator Interceptor Technology, Materials and Structures, Power Technology, Endo Atmospheric Flight Experiment (EFEX), the Space Technology Research Vehicle (STRV), and the Atmospheric Interceptor Technology (AIT) programs.

Discriminator Interceptor Technology Program: The Discriminator Interceptor Technology Program (DITP) develops subsystems necessary to achieve long range threat acquisition and tracking, accurate homing guidance, robust discrimination, and aimpoint selection for autonomous hit-to-kill interceptors. Passive infrared sensors, and laser radars (ladars) are being designed, fabricated, and tested. Emphasis is placed on increasing active sensor output power, miniaturization, and lidar waveform generation to support on-board imaging. The primary goal of the DITP program is interceptor flight demonstrations of the integrated sensor suite, with its data fusion processor and associated discrimination/data fusion algorithms, to demonstrate the performance and readiness of the advanced subsystems to support future form-fit-function upgrades to NMD and TMD interceptors.

The Materials and Structures Program: The materials and structures program develops and demonstrates: advanced, low cost to manufacture, multifunctional, composite structural components; adaptive and passive vibration isolation and suppression systems; optical materials and baffle specialty components; and low temperature superconductor LWIR sensor electronics. This program also evaluates new high temperature, composite materials for use in manufacturing propulsion components such as ceramic hot gas lines, combustion chambers, nozzles, and exit cones. Many projects executed under the Materials and Structures Task, which

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includes the EFEX and STRV programs, rely on cofunding from other agencies (AF, USA, DARPA, NASA) or international partners (UK, Japan). In some cases this cooperative funding represents a substantial portion of the total project cost. Reductions in current or future cooperative funding will adversely impact planned goals and schedules.

**Power Technology Program:** The power program develops concentrator solar arrays (SCARLET) ; electric generators, thermal management components, and power conditioning for GBR; and batteries for TMD and NMD interceptors. The technologies will improve system performance in terms of reducing recurring costs, lowering mass and increasing efficiency.

**Endo Atmospheric Flight Experiment (EFEX) Program:** This multiflight test program will use existing sounding rockets to provide the hypersonic flight environment to validate advanced interceptor technologies. Lightweight, ultrastiff, high temperature, multifunctional structures, optical and structural thermal control concepts, super-tough optical windows and erosion resistant coatings, emergent processing and guidance schemes, miniature inertial systems, advanced shroud concepts, propulsion systems, and dual mode seekers and aperture will be tested. The flight test results will be correlated with aerothermal-mechanical test results from ground-based hypersonic and shock tube facilities in the 3 to 4 km/sec velocity and 20 km to 45 km altitude range. Subsequent tests will emphasize high-G maneuverable flight profiles.

**Space Technology Research Vehicle Program (STRV-1c/d, STRV-2 and STRV-3):** The STRV-2 Experiment Module will consist of an advanced composite structure supporting the following 6 primary payloads: 1) a UK provided Mid-Wavelength Infrared (MWIR) experiment; 2) the Vibration Isolation Suppression System (VISS); 3) the Space Active Modular Materials Experiment System (SAMMES); 4) the Electronic Test Bed (ETB); 5) the Laser Communications Experiment (Lasercom); and 6) the micro-meteoroid & debris (MM&D) experiment. The low outgassing, high stiffness and high strength composite structure is part of the overall experiment providing critical validation for incorporation of this technology in future systems. Multiple sensors will be used to measure local contamination from all sources, including the composites used in structures. The primary payloads form an overall integrated payload. MWIR background/clutter data will be obtained using filters specified by the Space and Missile Tracking System (SMTS) SPO. Data on the space environment at SMTS mission altitudes and its effects on materials, components and systems will be obtained. A one year mission is planned. Efforts have been initiated to conduct follow-on cooperative space experiments with the UK using micro satellites based on the recent US/UK STRV 1a/b program. These UK-provided micro satellites (STRV 1c/d) have a nominal launch planned for Fiscal Year 1999. The experiments to be flown on STRV 1c/d include a Quantum Well Infrared Photometer (QWIP) sensor and a multi-functional composite structure. The Space Technology Research Vehicle-3 (STRV-3) will be a US-led multi-agency, multi-national (UK, US allies) cooperative space experiment effort. The program is in the preliminary discussion stage.

**Atmospheric Interceptor Technology (AIT) Program:** The AIT program will develop, integrate and demonstrate the critical technologies for performing hypersonic hit-to-kill intercepts of TBMs within the atmosphere. The demonstrations will validate the solution to critical KKV technologies and will provide: (1) new capabilities with reduced costs/risks compared to current interceptor weapons systems, and enhancements to other interceptors under development; (2) reduction of technical risks and costs in support of acquisition programs through direct technology insertions; and (3) technical solutions to provide theater defense interceptor capabilities for contingencies not currently addressed by the TMD system programs. The program uses existing contracts and technologies currently under development to reduce

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schedule and cost, and will be planned and conducted with BMDO, Air Force, Navy, and Army elements to make maximum use of existing Service infrastructures. The AIT project will participate in the UAV/BPI Studies (PMA 1294) and the Navy Theater Wide requirements studies.

**FY 1996 (\$ in Thousands):**

- \$5,409 Space Surveillance System Support: Completed FY94-FY95 space flight experiments (STRV-1b) data reduction and final reports. Delivered cryocoolers, MWIR filters, and IR calibration source for STRV-2 flight experiment. Launched Advanced Control technology Experiment-1 (ACTEX-1) spaceflight experiment and initiated data reduction. Initiated development of STRV-1c/d space flight experiments. Initiated development of multi-functional structures for spacecraft. Initiated development of an advanced, high efficiency concentrator solar array.
- \$15,571 Interceptor System Support: Demonstrated low frame rate image processing with Ground Based Interceptor (GBI) Long Wave Infra Red (LWIR) Focal Plane Array (FPA) and Low Temperature Superconductor (LTS) Analog to Digital Converter and Multiplexer (ADC/MUX) operating at 10K. Developed test articles of advanced optical baffles and weight reducing advanced composite components for TMD systems. Initiated design of EFEX-1 flight hardware to evaluate aerothermal heating of windows and high temperature interceptor composite structures. Demonstrated 3 meter folded CO2 lidar at AMOR and WSMR. Initiated fabrication of 6-m CO2 Multi-Folded Ladar (MFL). Fabricated breadboard 2-D solid state lidar transmitter and receiver. Fabricated and performed initial evaluation of simultaneous 2-color 64x64 HgCdTe FPA. Collected active and passive sensor data at AMOR. Demonstrated real-time fusion algorithms. Initiated composite component manufacturing programs with Japan. Demonstrated high frame rate low temperature superconducting LWIR sensor signal processing ADC. Completed subscale high temperature propulsion.
- \$5,808 Atmospheric Interceptor Technology: Continued prototype strapdown seeker validations and tests. Completed downselect to single prime contractor. Conducted cooled window and forebody aero-optical shock tunnel tests. Conducted forebody and airframe vibration tests and field joint validation, and initiated development of solid propellant Divert and Attitude Control System (DACS) components. Continued detailed design of KKV vehicle.
- \$26,788 Total

**FY 1997 (\$ in Thousands):**

- \$5,239 Space Surveillance System Support: Complete data reduction of ACTEX-1 space flight experiment. Deliver SAMMES for STRV-2. Complete integration of STRV-2 flight experiments. Continue STRV-1c/d Program. Deliver flight qualified, multi-kilowatt advanced concentrator for FY98 flight demonstration.
- \$20,138 Interceptor System Support: Continue development of weight-reducing structural, thermal and optical components for advanced TMD systems. Continue development of EFEX-1 flight hardware. Perform lab test of 6-m CO2 MFL transmitter. Perform lab test of integrated 2-D solid state lidar and receiver breadboards. Continue joint composites program with Japan. Perform simultaneous 2-color HgCdTe imagery demonstration. Initiate design of 128x128 and 256x256 simultaneous 2-color HgCdTe arrays. Initiate design of DITP data fusion processor. Award DITP System Integration Contract. Fabricate two ceramic hot gas lines. Begin thrust chamber firings. Continue smart patch technology.

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- \$41,012 Atmospheric Interceptor Technology: Complete prototype seeker development and conduct initial hardware-in-the-loop (HWIL) tests. Conduct cooled window and forebody aero-optic shock tunnel tests. Conduct cold-gas jet interaction wind tunnel tests. Complete preliminary design of solid DACS and deliver DACS ground test unit (GTU). Complete integrated avionics unit final design. Fabricate and integrate vehicle structures. Complete preliminary software specifications. Conduct System Requirements Review. Conduct Preliminary Design Review for flight test vehicle. Conduct millimeter Wave (RF) technology development (lightweight Ka-band seeker transmitter).

- \$68,409 Total

## FY 1998 (\$ in Thousands):

- \$3,238 Space Surveillance System Support: Launch STRV-2 flight experiment and initiate data analysis. Launch and operate advanced concentrator solar array demonstration. Deliver STRV 1c/d flight experiments.

- \$23,364 Interceptor System Support: Conduct EFEX 1 flight experiments and initiate development of EFEX-2 flight experiments. Demonstrate 6-m MFL CO2 lidar transmitter integrated with receiver and controls. Fabricate 3-D solid state imaging lidar transmitter. Complete Si-APD lidar receiver. Complete thrust chamber firings. Perform imagery demo of 256x256 simultaneous 2-color HgCdTe FPAs. Host real time DITP algorithms on WSSP (ASTP) processor in lab demo. Complete ceramic hot gas line testing. Evaluate LTS time dependent processing with Japanese provided RAM, and initiate prototype cryogenic GBR development.

- \$4,890 Atmospheric Interceptor Technology: Continue vehicle component development and tests.

- \$31,492 Total

## FY 1999 (\$ in Thousands):

- \$2,964 Space Surveillance System Support: Complete STRV-2 flight experiments. Launch STRV 1c/d. Prepare final reports for STRV-2. Initiate development of multifunctional spacecraft structure flight experiment.

- \$21,458 Interceptor System Support: Continue development of EFEX-2 flight experiments. Test prototype multifunctional structure. Integrate and lab demonstrate 3-D solid state transmitter and receiver. Perform testing at AMOR to support downselect. Design and fabricate simultaneous 3-color HgCdTe arrays. Demonstrate real time discrimination and data fusion algorithms on WSSP. Continue BMDO/Japanese RTM development for complex-shaped composite structures, LTS sensor development, and continue development of prototype cryogenic GBR system.

- \$4,990 Atmospheric Interceptor Technology: Continue vehicle component development and tests.

- \$29,412 Total

**Acquisition Strategy:** The AIMST Project uses U.S. Army Space and Strategic Defense Command, DoD and DOE laboratories to fund contractors supported by relevant in-house expertise to meet the AIMST milestones. Weapons systems prime contractors acquire license agreements to use advanced manufacturing/productibility processes (e.g., composite materials, baffles and nozzles) developed by the AIMST Project. International funding (e.g., UK and Japan) and joint agency coalitions (e.g., NASA, DoE and ARPA) are assembled to obtain critical level of effort (e.g., US/UK STRV-2, BMDO/AF/ARPA Smart Structures, US/Japan Composites and superconducting materials programs). The AIT program plan will consist of development and validation of endoatmospheric kill vehicle

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technologies for potential use in advanced TMD systems, such as advanced NTWD, THAAD, MEADS and UAV/BPI; options for the design, fabrication, and test of the KKV; options for KKV/booster integration and flight tests. USASDC will provide technical and contract management of the AIT prime contract. On-going, competitively-awarded, CPFF contracts for the kill vehicle technologies within the AIT program will continue through the completion of ground testing and potential flight tests. The DITP program uses: USASDC in-house expertise and contractors for radar technology development; AF Philips Lab personnel and contractors to develop infrared detector technology; and BMDO personnel and contractors to lead integration activities, flight demonstrations and fusion processor development.

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

	FY 1996	FY 1997	FY 1998	FY 1999	Total
Previous President's Budget	22,899	30,109	28,519	27,888	Cost 109,415
Appropriated Value		70,109			
Adjustments to Appropriated Value:					
a. MEADS below threshold reprogramming		-3,290			
b. General Reductions (FFRDC, Inflation etc.)		-258			
c. Internal BMDO Adjustments		1,848			
Current Budget Submit/President's Budget	26,788	68,409	31,492	29,412	156,101

**Change Summary Explanation:**

Funding: Changes in funding resulted in realigning of interceptor & sensor technologies within Projects 1270 and 1161 to better reflect the technologies' principal application. The AIT Program was transferred to Project 1270 in FY96 from Project 1265 (BPI), PE 0603870, without funding. Execution of the STRV-2 Program was consolidated under Project 1270 starting in FY97. AIT program funding in FY97 increased in accordance with FY97 Authorization and Appropriations Act. Schedule: Delay in program milestones for DITP and Materials and Structures program due to transfer of AIT Technology development to Project 1270 and other funding reductions. AIT program milestones accelerated due to increased FY97 funding  
Technical: None

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

	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To
2400 NMD Program, PE 0603871C	730,656	828,864	504,091	393,085	309,748	309,9584	391,858	392,433	Cost Cost
1161 Advanced Sensor Technology, PE 0603173C	19,326	32,797	24,527	22,743	19,723	18,921	16,995	25,566	Cost
1161 Advanced Sensor Technology, PE 0603872C	1,270	3,334	3,364	3,208	3,199	3,151	3,148	3,153	Cost

Project 1270

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

BUDGET ACTIVITY	DATE				PROJECT			
	February 1997				1270			
	PE NUMBER AND TITLE							
	0603173C Support Technologies - ATD							
D. Schedule Profile	FY 1996	FY 1997	FY 1998	FY 1999	FY 1996	FY 1997	FY 1998	FY 1999
AIT Aero-Optical shock tunnel tests (window #1)	1	2	3	4	1	2	3	4
AIT Downselect to single prime contractor	X							
Initiate design of Advanced SCARLET	X							
3-m CO2 ladar transmitter demo		X						
Initiate Joint Composites Manufacturing Program with Japan			X					
Test THAAD DACs Bulkhead			X					
SCARLET design complete			X					
Solid state ladar amplifier demo			X					
3-m CO2 ladar receiver demo			X					
Demo superconductor ADC/MUX with GBI FPA				X				
6-m CO2 ladar amplifier test					X			
Solid state ladar 2-D imaging demo					X			
Deliver SAMMES and Sensor Isolation System to STRV-2						X		
AIT Systems Requirement Review						X		
AIT aero-optical shock tunnel tests (window #2)							X	
AIT prototype seeker development and test							X	
AIT jet interaction wind tunnel test						X		
Perform simultaneous 2-color HgCdTe imagery demonstration						X		
Complete Data Reduction of ACTEX-1						X		
AIT seeker initial HWIL tests							X	
AIT PDR for flight test vehicles							X	
Award DITP system integration contract							X	
Interceptor composite structures demo							X	

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

BUDGET ACTIVITY		PE NUMBER AND TITLE										DATE	PROJECT
3 - Advanced Technology Development		0603173C Support Technologies - ATD										February 1997	1270
		FY 1996		FY 1997		FY 1998		FY 1999					
		1	2	3	4	1	2	3	4	1	2	3	4
Deliver Advanced SCARLET Array to Spacecraft Integrator													
Initiate KV ground plane EMI shield demo						X							
Initiate prototype cryo-GBR design													
Host real-time DITP algorithms on ASTP's WSSP processor and perform lab demo							X						
Launch STRV-2								X					
256x256 2-color HgCdTe Array demo at AMOR								X					
Launch and evaluate SCARLET array													X
Launch EFEX-1													X
Demo 6-m MFL CO2 ladar transmitter integrated with receiver and controls at AMOR													X
Demonstrate full-up, real-time discrimination and data-fusion algorithms on WSSP (field test)													X
Complete Cryo-GBR system design													X
Integrate and perform lab demo of 3-D solid-state transmitter and receiver													X
LTS sensor processor demo													X
Complete STRV-2 Data Analysis													X
Test prototype interceptor multifunctional structure													X
Perform AMOR testing (image discrimination) to support ladar downselect													X

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

DATE

February 1997

BUDGET ACTIVITY

PE NUMBER AND TITLE

## 3 - Advanced Technology Development

0603173C Support Technologies - ATD

PROJECT

1360

COST (\$ In Thousands)	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	Total Cost
	Actual	Estimate	Estimate	Estimate	Estimate	Estimate	Estimate	Estimate	
1360 Directed Energy Program	76,488	95,930	28,877	28,539	28,222	27,631	28,224	28,886	Continuing
									Continuing

**A. Mission Description and Budget Item Justification**

BMDO's charter is to provide for defense against current and future missile threats. An effective missile defense against a wide variety of current and near-term projected threats will require boost phase intercept capability. The Space Based Laser (SBL) program was created to provide the nation with a highly effective, continuous, global boost phase intercept option for both theater and national missile defense. While BMDO is pursuing numerous terminal and midcourse intercept concepts, this program element, project number 1360, contains DOD's only boost phase intercept program that can provide national missile defense and operate in all theaters, regardless of size, geometry, or weather conditions. This system also provides many ancillary capabilities, including air defense, global surveillance and target detection and designation for other systems.

Unique features of an SBL missile defense system include global, 24 hour boost phase intercept capability and defense against surprise first strikes. SBLs can destroy missiles whose range is greater than 75 miles, providing a robust first layer for both theater and national missile defenses-in-depth. SBLs do not require prior knowledge of enemy launch site locations. The footprint of one SBL can cover approximately 10% of the earth. Twenty SBLs could provide overlapping full-time coverage of missile threats from theaters anywhere. Each SBL would be capable of destroying approximately 100 missiles with the initial fuel load. Capability for on-orbit refueling would be provided. An SBL system could defend against missiles without putting the lives of US military personnel at risk. With its long range and speed of light defense, it accomplishes boost phase intercept at the earliest possible moment, offering the highest probability that intercepted missile fragments (possibly containing active chemical/biological or nuclear materials) will fall within the attackers territory, not on defended assets.

The directed energy program is structured to address the key critical technical issues: (1) Can a chemical laser be built powerful enough to destroy a missile at militarily useful ranges? (Alpha program); (2) Can mirrors and optics be built large enough and easily enough? (Large Aperture Mirror Program (LAMP) and Large Optical Segment (LOS)); (3) Can the high power beam be controlled adequately? (Large Optics Demonstration Experiment, LODE); (4) Can the high power components of a Space Based Laser be integrated on the ground and operated as a system? (Alpha LAMP Integration (ALI)); (5) Can missile targets be acquired and tracked from space and can a laser be pointed and fired accurately enough? (Acquisition, Tracking, Pointing, and Fire Control, ATP/FC); (6) Can these key components be integrated into a functional unit suitable for space flight and remote operation? (Space Based Laser Readiness Demonstrator (SBLRD) Ground Demonstration); (7) Can the fully integrated system operate adequately on-orbit? (SBLRD).

Progress To Date. The program has demonstrated that the answer to questions 1 through 3 (and partially 5) is "yes," and has built devices that perform the respective functions. (1) The Alpha program's high energy chemical laser achieved weapons-class power for the first time in 1991. (2) LAMP and LOS demonstrated the ability to build optics of the required size with the successful fabrication of a 4-meter segmented mirror in 1989 and a key segment of an 11 meter mirror in 1993. (3) The Large Optics Demonstration Experiment (LODE) demonstrated the ability to control the projected (or outgoing) beam in low power laser experiments in 1987. (5) The

Project 1360

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Exhibit R-2 (PE 0603173C)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE	PROJECT
BUDGET ACTIVITY	PE NUMBER AND TITLE	February 1997	1360
<b>3 - Advanced Technology Development</b>	<b>0603173C Support Technologies - ATD</b>		
<p>basic technology of acquiring and tracking missiles and pointing a high power laser beam from ground and space has been demonstrated by a number of programs. The ATP/FC technologies required (sensors, optics, processors, etc.) have been demonstrated at or near performance levels required for the Space Based Laser. Stable low power laser beam pointing from a space platform was demonstrated at the same precision level required for an operational SBL in 1991 during the flight of the Relay Mirror Experiment (RME).</p> <p>Current Status. The major building blocks have been developed, but key system integrations and tests lie ahead. Remaining tasks are: to integrate the high power laser with the large optics beam director and test (Alpha-LAMP Integration (ALI)); to integrate and test ATP/FC hardware and software (High Altitude Balloon Experiment (HABE)); to integrate the high power laser and the large optics beam director hardware with ATP/FC hardware and test; to integrate the system in a space qualified SBL Readiness Demonstrator (SBLRD) vehicle for ground and flight testing.</p> <p>In FY96, Congress provided additional program funding to continue ALI, accelerate design activities for a space demonstration, produce a concept of operations (CONOPs) and design requirements for an operational SBL system, and revitalize the SBL technology development efforts. The increased funding allowed us to preserve vital infrastructure, restore the ALI program to its original scope, and continue the ATP/FC program.</p> <p><u>PROGRAM ACCOMPLISHMENTS AND PLANS:</u></p> <p>The current plan brings Alpha back to test readiness and, with Congressional added funding, completes ALI high power testing in FY97. The Alpha device and facility have been reactivated and the test team reconstituted. In Sep 96, a high power reactivation test of the Alpha laser device was successfully completed after a down time of over two years. In ALI, all major assemblies were fabricated, integrated, and tested in the test chamber. In Dec 96, an Alpha hot flow test was conducted while performing a low power integration check-out of the ALI beam train.</p> <p>In compliance with Congressional language, design activities for the follow-on space qualified vehicle ground demonstration were restarted, and the Cost Analysis Requirements Document (CARD) was updated with emphasis on the CONOPS, design requirements, satellite design, and launch vehicle design. Design reviews for the demonstrator space vehicle and operational SBL system concepts occurred in Dec 96. The SBLRD test site selection process was restarted. The facility design, site selection, and preliminary environmental assessment for the Space Test Facility (STF) will be completed in FY97. Design activity for the SBLRD is continuing.</p> <p>The ATP/FC program completed fabrication and test of the illuminator laser that will be used in the field experiments. Integration into the High Altitude Balloon Experiment (HABE) platform was completed and testing begun. With the FY97 Congressional added funding, integrated ground testing will be completed in early FY98, and the first flight test will occur in FY99.</p> <p>Work resumed on high payoff advanced technologies. The unique facility (Large Optics Diamond Turning Machine) and capability to build the Alpha resonator optics has been restored, and preliminary fabrication of the new, advanced, lightweight, uncooled resonator optics has begun. Fabrication continues through FY01 and is followed by a high power test of the new uncooled resonator in FY01 (assuming POM funding). Procurement of an uncooled deformable mirror (DM) was initiated. The mirror will be integrated into the high power beam train and tested in FY99.</p>			

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

DATE

February 1997

BUDGET ACTIVITY

PE NUMBER AND TITLE

PROJECT

## 3 - Advanced Technology Development

0603173C Support Technologies - ATD

1360

## FY 1996 (\$ in Thousands):

-	\$35,993	ALI Integration and Test: Completed system integration of major assemblies including the secondary mirror, wavefront sensor, metering structure, and remaining cabling and plumbing. Reestablished metrology lab to preserve industry capability to test coatings of uncooled optics. Fabricated and tested diagnostic wavefront sensor for high power tests. Conducted low power experiments (ALI test plan series 100).
-	\$9,683	Alpha Restart: Maintained Alpha laser with periodic operations of critical systems through first three quarters. Periodic operations included flowing all water systems, operating the pressure recovery system and isolation gate valves, operating all pumps, compressors and valves, inspecting optics and probe laser, and performing alignment checks. Made repairs as required, reconstituted test team and prepared facility for high power operation. Validated diagnostics performance in preparation for IQFY97 revalidation high power tests.
-	\$4,390	Dem/Val Design: Updated designs of space qualified demonstration vehicle taking into account latest accomplishments in spacecraft and directed energy technologies. Restarted planning for space test facility. Reactivated site selection process and updated integration and test facility requirements document. Identified and began work on long-lead issues.
-	\$8,786	EMD Design: Updated requirements and design based on current projected threat and latest accomplishments in spacecraft and directed energy technologies. Provided traceability criteria to Dem/Val design task. Refined and updated CARD.
-	\$4,967	Acquisition, Tracking, and Pointing: Completed fabrication and acceptance testing of illuminator laser. Completed hardware integration and check-out of beam alignment system for High Altitude Balloon Experiment.
-	\$12,669	SBL Support Technologies: Reactivated Large Optics Diamond Turning Machine (LODTM). Began test of the first advanced Hypervelocity Low Temperature (HYLTE) nozzle module at fundamental Hydrogen Fluoride wavelength. Began fabrication of the NACL beam train optics to be used in the phase conjugation experiment. Conducted narrow field of view testing of auto-alignment algorithms on advanced beam control system brassboard. Completed design requirements for 4-meter monolithic primary mirror.
-	\$76,488	Total

## FY 1997 (\$ in Thousands):

-	\$29,031	ALI/Alpha High Power Testing: Complete high power revalidation test of Alpha laser. Complete assembly and system integration (Level 200 and 300) experiments on ALI at low power. Complete open loop and closed loop high power tests to demonstrate and characterize integrated laser and beam control performance at near weapon scale power levels.
-	\$46,497	Space Based Laser Readiness Demonstrator (SBLRD): Complete design updates for the SBL Readiness Demonstrator vehicle and the space test facility. Complete facility site selection and environmental assessment, and initiate construction. Initiate long-lead procurements of primary mirror and uncooled resonator for SBLRD. Continue SBLRD design effort toward a Preliminary Design Review (PDR). Complete reactivation and recertification of the Large Optics Diamond Turning Machine (LODTM) at Lawrence Livermore National Laboratory (LLNL). Maintain the LODTM in operating condition. Complete the test of the first advanced nozzle module and the initial auto-alignment tests.
-	\$5,244	SBL System: Complete design and requirement updates for the operational SBL spacecraft. Complete update of the Cost Analysis Requirements Document.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE	PROJECT
BUDGET ACTIVITY		PE NUMBER AND TITLE	
<b>3 - Advanced Technology Development</b>		<b>0603173C Support Technologies - ATD</b>	<b>February 1997</b> <b>1360</b>
-	\$4,323	Scorpius: Complete design, fabrication and ground test of launch vehicle propulsion and non-propulsion components to flight test a sub-orbital Launch Vehicle Technology Testbed (LVTT). Continue fabrication and development of additional vehicles for flight tests in FY98. Design and begin to fabricate 20,000 lb thrust engines for tests in late FY97.	
-	\$1,942	Advanced Technologies: Complete the fabrication of optics for the phase conjugation experiment.	
-	\$8,893	High Altitude Balloon field Experiment (HABE): Complete passive and active tracking tests against boosting scaled rockets. Deploy to White Sands Missile Range (WSMR), NM, for ground test against boosting missiles (targets of opportunity). Restart balloon segment to prepare for checkout flight in FY98 and flight test in FY99.	
-	\$95,930	Total	
<b>EY 1998 (\$ in Thousands):</b>			
-	\$1,942	ALI Test Final Report: Complete test data reduction and archiving. Complete final test report.	
-	\$21,285	Space Based Laser Readiness Demonstrator (SBLRD): Complete and demonstrate operation of new light-weight uncooled deformable in high power beam train. Maintain operation of the Large Optics Diamond Turning Machine (LODTM) at Lawrence Livermore National Laboratory (LLNL) for production of uncooled laser resonator. Acquire silicon and begin fabrication of uncooled resonator optics. Prepare coating chamber of coating of annular optics.	
-	\$152	SBL System: Continue SSDC modeling and analysis support using EADSIM at modest level.	
-	\$5,498	High Altitude Balloon field Experiment (HABE): Complete WSMR ground test against boosting missiles (targets of opportunity). Perform checkout flight of balloon segment to prepare for flight test of ATP payload in FY99.	
-	\$28,877	Total	
<b>EY 1999 (\$ in Thousands):</b>			
-	\$22,889	Space Based Laser Readiness Demonstrator (SBLRD): Continue fabrication and test of uncooled resonator optics using the LODTM machine at LLNL. Begin coating of first resonator optic. Begin preparation of test facility for test of uncooled resonator in FY00-01	
-	\$152	SBL System: Continue SSDC modeling and analysis support using EADSIM at modest level.	
-	\$5,498	High Altitude Balloon field Experiment (HABE): Complete two flights of the ATP payload and actively track in "near-space" environment boosting missiles. Scale results to SBLRD and operational SBL performance levels. Prepare for final flight test in FY00.	
-	\$28,539	Total	
<b>Acquisition Strategy:</b> BMDO's contract to build an SBL ("Zenith Star") was competed in 1988 and awarded to (then) Martin Marietta. The ALI and SBLRD design efforts are performed under this contract. The Alpha laser is maintained and operated under a BMDO contract to TRW. Existing contract vehicles may be viable to launch the SBLRD with appropriate waivers. In FY97, an acquisition strategy will be formulated which may result in a recompetition of the effort for the SBLRD.			

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

BUDGET ACTIVITY		DATE	PROJECT							
3 - Advanced Technology Development		February 1997	1360							
B. Program Change Summary (\$ in Thousands)		PE NUMBER AND TITLE								
		0603173C Support Technologies - ATD								
Previous President's Budget	FY 1996	FY 1997	FY 1998	FY 1999	Total					
Appropriated Value	75,345	28,449	28,971	28,670	Cost					
Adjustments to Appropriated Value:		108,449			161,435					
a. MEADS below threshold reprogramming		-5,378								
b. General Reductions (FFRDC, Inflation etc.)		-250								
c. Internal BMDO Adjustments		-6,981								
Current Budget Submit/President's Budget	76,488	95,930	28,877	28,539	229,834					
<p><b>Change Summary Explanation:</b>                      Funding: Congress increased the FY97 President's Budget Request to continue development of the Space Based Laser to the point where it is a technically viable option for ballistic missile defense. A portion of the increased funding is used to accelerate completion of the ALI high power test and the HABE active tracking tests so that results can be used for the design of the SBL Readiness Demonstrator (SBLRD). Remaining increased funding is used to begin preparation of the test facility needed to test the SBLRD, continue the design phase, and initiate procurement for long lead items such as the uncooled optics for the laser resonator and the glass for the 4-meter monolithic mirror. This project is responsive in FY97 to the congressional language accompanying the increased funding. This project continues the SBL program in the outyears at a very low level. It preserves the most critical portions of the infrastructure required to maintain an option of deploying highly effective global defenses in the future. A limited technology development effort is preserved while pursuing an advanced uncooled resonator.                      Schedule: Program continues through FYDP.                      Technical: None</p>										
<p><b>C. Other Program Funding Summary (\$ in Thousands)</b></p>										
	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To	Total
									Compl	Cost

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

BUDGET ACTIVITY		DATE		PROJECT	
<b>3 - Advanced Technology Development</b>		February 1997		1360	
PE NUMBER AND TITLE					
0603173C Support Technologies - ATD					

**D. Schedule Profile**

	FY 1996		FY 1997		FY 1998		FY 1999	
	1	2	3	4	1	2	3	4
ALI beam expander integration complete		X						
Preliminary Design Review of new (completely uncooled) Alpha resonator optics				X				
Low power ALI experiments (Series 100) complete				X				
LODTM back on line				X				
ALI Assembly & Integration experiments (Series 200) complete				X				
Alpha high power restart test				X				
ALI system integration experiments (Series 300) complete				X				
First ALI high power diagnostics test				X				
Space test facility site selection				X				
ALI closed loop high power test IIA				X				
ALI closed loop high power test IIB				X				
Passive tracking tests against boosting scaled rockets				X				
Active tracking tests against boosting scaled rocket complete				X				
WSMR active track ground test against full scale boosting target				X				
Integrated test of uncooled deformable mirror				X				
HABE Flight - ATP aimpoint mission								X
Fabrication of uncooled rear and outer cone assemblies complete								X

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

DATE February 1997

BUDGET ACTIVITY

**3 - Advanced Technology Development**

PE NUMBER AND TITLE

**0603173C Support Technologies - ATD**

PROJECT

**1651**

COST (\$ in Thousands)	FY 1996 Actual	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
1651 Innovative Science and Technology	0	2,233	0	0	0	0	0	0	TBD	TBD

**A. Mission Description and Budget Item Justification**

To prepare to meet critical future active defense needs, advanced technology programs invest in an aggressive program of high leverage technologies that yield markedly improved capabilities across a selected range of boost phase and terminal defense interceptors, advanced target sensors, and innovative science. The objectives of these investments are to provide: (1) component technologies that offer improved performance or reduced costs for BMDO acquisition programs; (2) a better understanding of the physical processes to support these acquisition programs; and (3) technical solution options to mitigate unpredicted threats. Unlike other BMDO projects that fund near term technology and testing efforts, this advanced technology initiative invests seed money in high-risk technologies that could significantly change how BMD develops future systems. The technologies pursued include: next generation sensors, power, information processing, optics, advanced materials, propulsion and communication. This project causes and exploits breakthroughs in science that will keep BMD at the foremost edge of what is possible. A primary project goal is to conduct proof-of-concept demonstrations that transition technology to development programs.

Many of today's baseline technologies on BMDO systems like Theater High Altitude Area Defense (THAAD), Patriot Advanced Capability (PAC3), and Ground Based Radar (GBR) are available due to the wise investment in innovative technologies some 10 years ago. Examples include: indium antimonide and mercury cadmium telluride ultra-sensitive infrared detectors; 32-bit radiation hardened Reduced Instruction Set Computer (RISC) processors for image analysis; composite materials for lightweight satellite structures; interferometric fiber-optic gyroscopes for sophisticated guidance and control; and solid-state gallium arsenide transmitter/receivers for BMDO radars. The IST program is the only R&D program in the Defense Department focused on future BMDO technical requirements.

**FY 1996 (\$ in Thousands):**

- \$0  
- \$0 Total

**FY 1997 (\$ in Thousands):**

- \$2,233 Power: Complete integration of SCARLET flight array wings. Deliver SCARLET flight system to JPL for integration onto the New Millennium spacecraft.  
- \$2,233 Total

**FY 1998 (\$ in Thousands):**

- \$0  
- \$0 Total

Project 1651

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE	February 1997						
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT							
<b>3 - Advanced Technology Development</b>	<b>0603173C Support Technologies - ATD</b>	<b>1651</b>							
<p><u>EY 1999 (\$ in Thousands):</u></p> <p>- \$0</p> <p>- \$0</p> <p>Total</p>									
<p><b>B. Program Change Summary (\$ in Thousands)</b></p>									
Previous President's Budget	FY 1996	FY 1997	FY 1998	FY 1999	Total				
Appropriated Value	0	0	0	0	Cost				
Adjustments to Appropriated Value:					0				
a. Internal BMDO Adjustments		2,233							
Current Budget Submit/President's Budget	0	2,233	0	0	1,758				
<p>Change Summary Explanation:</p> <p>Funding: Funding changes in 0603173c are due to changes in BMDO priorities. Funding is for hardware development and commercialization that transitioned from technology developed in 1651 IST, PE0602173c.</p> <p>Schedule:</p> <p>Technical:</p>									
<p><b>C. Other Program Funding Summary (\$ in Thousands)</b></p>									
1651 Innovative Science and Technology, PE 0602173C	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To
	47,852	56,009	50,923	50,094	43,774	41,411	42,505	43,506	Compl
									Cont



RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)										DATE	February 1997
BUDGET ACTIVITY		PE NUMBER AND TITLE								PROJECT	
3 - Advanced Technology Development		0603173C Support Technologies - ATD								1660	
COST (\$ In Thousands)		FY 1996 Actual	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
1660 Statutory and Mandated Programs		5,399	4,707	4,161	4,113	4,073	4,051	4,293	4,299	Continuing	Continuing
<p><b>A. Mission Description and Budget Item Justification</b></p> <p>To prepare for critical future missile defense needs, advanced technology programs will invest in a balanced program of high leverage technologies that yield improved capabilities across a selected range of boost phase and terminal missile defense interceptors, advanced target sensors, and innovative science. The objectives of these investments are component technologies with improved performance or reduced costs for acquisition programs, and technical solution options to mitigate advanced and unpredicted threats.</p> <p>Two specific programs in advanced technology are managed under this project</p> <ol style="list-style-type: none"> <li>1. Technology Applications</li> <li>2. Historically Black Colleges and Universities/Minority Institutions (HBCU/MIs)</li> </ol> <p>The Technology Applications Program, established in 1986, makes technology from all parts of BMDO available to federal agencies, state and local governments, and U.S. business and research interests. The program objective is to develop and support the transfer of BMD derived technology to other Department of Defense applications as well as other federal, state and local government agencies, federal laboratories, universities, and the domestic, commercial, and private sector. Incorporation of these technologies by the private sector and other government agencies can result in reduced unit costs and further improvements to be made available for applications in BMDO systems.</p> <p>The HBCU/MI Program increases and improves the participation of minority colleges and institutions in the BMDO program. It also responds to Section 832 of PL 101-510 which establishes a specific goal for HBCU and MIs within the overall five percent goal for minority business contracts and introduces them to BMDO technologies and the particulars of the BMDO procurement process.</p> <p>Each program will focus, to the maximum extent feasible, on innovative technologies in support of future BMD sensor and interceptor systems. These systems will require processing, sensor, power, propulsion, materials and BMC3 capabilities beyond those currently being developed. An important goal of each program is to identify, develop, and demonstrate innovative technologies which will dramatically improve BMD system performance.</p> <p><b>FY 1996 (\$ in Thousands):</b></p> <ul style="list-style-type: none"> <li>- \$808 Database: Completed enhancement of the database, investigated international access to the BMDO technology, and initiated migration to the national information infrastructure.</li> <li>- \$554 Panel Reviews: Provided assistance to large, medium and small businesses wishing to bring BMD supported technology to the commercial market.</li> </ul>											

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

DATE

February 1997

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PE NUMBER AND TITLE

PROJECT

## 3 - Advanced Technology Development

0603173C Support Technologies - ATD

1660

- \$422 Outreach: Developed publications, brochures, target articles for journals and newspapers, quarterly newsletters, conference exhibits, ads and reports on BMDO technology, etc.

- \$1,203 Networking: Expanded results of technology transfer by working with other federal technology transfer organizations and activities such as the OSD Director, DDR&E Office of Technology Transition, NASA and DOE. Interacted with professional/technical associations and societies involved with technology transfer and commercialization. Initiated new activities to include technology transfer demonstration projects.

- \$2,412 HBCU/MI program awarded 3 contracts and incrementally funded 8 contracts.

- \$5,399 Total

FY 1997 (\$ in Thousands):

- \$850 Database: Maintain up-to-date information on potential BMD programs that have commercial applications; and implement graphics and interactive modes into National information infrastructure on BMD-sponsored technologies.

- \$650 Panel Reviews: Provide assistance to large, medium and small businesses wishing to bring BMD supported technology to the commercial market.

- \$591 Outreach: Develop publications, brochures, target articles for journals and newspapers, quarterly newsletters, conference exhibits, ads and reports on BMDO technology, etc.

- \$1,200 Networking: Expand results of technology transfer by working with other federal technology transfer organizations and activities such as the OSD Director, DDR&E Office of Technology Transition, NASA and DOE. Interact with professional/technical associations and societies involved with technology transfer and commercialization. Initiate new activities to include technology transfer demonstration projects.

- \$1,416 HBCU/MI program will award 10 contracts as a target.

- \$4,707 Total

FY 1998 (\$ in Thousands):

- \$503 Database: Maintain up-to-date information on potential BMD programs that have commercial applications. Update graphics and interactive modes into national information infrastructure on BMD-sponsored technologies.

- \$576 Panel Reviews: Provide assistance to large, medium and small businesses wishing to bring BMD supported technology to the commercial market.

- \$792 Outreach: Develop publications, brochures, target articles for journals and newspapers, quarterly newsletters, conference exhibits, ads and reports on BMDO technology, etc.

- \$879 Networking: Expand results of technology transfer by working with other federal technology transfer organizations and activities such as the OSD Director, DDR&E Office of Technology Transition, NASA and DOE. Interact with professional/technical associations and societies involved with technology transfer and commercialization. Initiate new activities to include technology transfer demonstration projects.

- \$1,411 HBCU/MI program will incrementally fund 10 contracts.

- \$4,161 Total

Project 1660

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Exhibit R-2 (PE 0603173C)

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

DATE

February 1997

BUDGET ACTIVITY

PE NUMBER AND TITLE

PROJECT

**3 - Advanced Technology Development**

**0603173C Support Technologies - ATD**

**1660**

FY 1999 (\$ in Thousands):

- \$503	Database: Maintain up-to-date information on potential BMD programs that have commercial applications. Update graphics and interactive modes into national and global information infrastructure on BMD-sponsored technologies.
- \$576	Panel Reviews: Provide assistance to large, medium and small businesses wishing to bring BMD supported technology to the commercial market.
- \$792	Outreach: Develop electronic media, publications, brochures, target articles for journals and newspapers, quarterly newsletters, conference exhibits, ads and reports on BMDO technology, etc.
- \$845	Networking: Expand results of technology transfer by working with other federal technology transfer organizations and activities such as the OSD Director, DDR&E Office of Technology Transition, NASA and DOE. Interact with professional/technical associations and societies involved with technology transfer and commercialization. Initiate new activities to include technology transfer demonstration projects.
- \$1,397	HBCU/MI program will award 9 contracts as a target.
- \$4,113	Total

**Acquisition Strategy:** These competitively awarded programs are in response to annual announcement of research opportunities. Proposals received are judged according to technical and commercial potential.

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

	<u>FY 1996</u>	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	Total
Previous President's Budget	4,965	6,476	12,258	7,595	Cost 31,294
Appropriated Value		6,476			
Adjustments to Appropriated Value:					
a. General Reductions (FFRDC, Inflation etc.)		-9			
b. Internal BMDO Adjustments		-1,760			
Current Budget Submit/President's Budget	5,399	4,707	4,161	4,113	18,380

**Change Summary Explanation:**

Funding: Funding changes in Advanced Technology Development (0603173C) are due to changes in BMDO priorities.  
 Schedule: None  
 Technical: None

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

DATE

February 1997

BUDGET ACTIVITY

PE NUMBER AND TITLE

PROJECT

**3 - Advanced Technology Development**

**0603173C Support Technologies - ATD**

**1660**

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

The HBCU/MI program feeds novel technologies into all other BMD programs, and the Technology Applications program supports the transfer of technology from all BMD programs

	FY_1996	FY_1997	FY_1998	FY_1999	FY_2000	FY_2001	FY_2002	FY_2003	To Compl	Total Cost
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**D. Schedule Profile**

	FY_1996	FY_1997	FY_1998	FY_1999	FY_2000	FY_2001	FY_2002	FY_2003	FY_1999		
1	2	3	4	1	2	3	4	1	2	3	4
Technology Applications Annual Report	X		X								
Special Tech Applications Report	X		X	X	X	X	X	X	X	X	X
BMDO Update	X		X	X	X	X	X	X	X	X	X
HBCU/MI Solicitation/Review for incremental funding	X			X							

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

DATE **February 1997**

BUDGET ACTIVITY **3 - Advanced Technology Development** PE NUMBER AND TITLE **0603173C Support Technologies - ATD** PROJECT **3352**

COST (\$ In Thousands)	FY 1996 Actual	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
3352 Modeling & Simulations	0	2,002	1,554	1,898	643	1,512	1,544	1,582	Continuing	Continuing

**A. Mission Description and Budget Item Justification**

This project provides for the development/modification and validation of modeling and simulation (M&S) techniques and tools that are critical in assessing the projected, alternative, and demonstrated performance capabilities of Theater Missile Defense (TMD) and National Missile Defense (NMD) systems. These large and complex M&S tools require high-performance vector and parallel processing supercomputers, scalar processors, and advanced graphic workstations for operation. Portions of this processing capability are housed at the Joint National Test Facility (JNTF) in Colorado Springs, CO, and the Advanced Research Center/Simulation Center (ARC/SC) in Huntsville, AL. These facilities operate in a distributed integrated simulation environment and host the modeling and simulation wargames that provide analysis, integration, demonstration, and performance verification of Ballistic Missile Defense (BMD) systems. These facilities and the Joint Missile Defense Network (JMDN), which links BMD contractors, Services, and other DoD government facilities, are utilized by all Services. Procedures are established to ensure efficient utilization of these facilities and to provide verification, validation, and accreditation (VV&A) of the models, simulations, and systems portrayed. This cost effective approach reduces the need for more costly live fire missile test programs and establishes requirements for future technology needs. It promotes enhancements of M&S technologies that support: the acquisition process; the development of fielding of operational capabilities; and the development of common tools, methodologies, and protocols beneficial to data exchange, integration of various models and simulations, and software reusability of M&S applications.

Funding for these facilities is distributed through Project 3352. Three Program Elements (PEs) (NMD, TMD, and Support Technology) provided funding. This cost sharing approach ensures cooperation, contributes to achieving synergy across the efforts, and minimizes duplication of modeling and simulation resources. The total funding profile remains flat on an annual basis, with adjustments for inflation. For example, the decrease in TMD funding for JNTF in FY97 is offset by a corresponding increase in NMD funding. These PEs include the costs for operations and maintenance of these facilities which includes: computer hardware and software; communications networks; security; and other essential capabilities necessary to develop and operate configurable, multiple experiment test bed environments. This document describes the support technology portion of funding for these activities.

**FY 1996 (\$ in Thousands):**

- \$	None
- \$0	Total

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

DATE February 1997

BUDGET ACTIVITY

PE NUMBER AND TITLE

0603173C Support Technologies - ATD PROJECT 3352

**3 - Advanced Technology Development**

FY 1997 (\$ in Thousands):

- \$2,002 This task supports the modernization of the BMDO's computer capabilities throughout the BMDO. The acquisition of equipment to modernize is based on supporting BMDO program priorities. These priorities include BMD wargames, TMD COEA Phase II, TMD Architecture Analysis, CFD Analysis, NMD Architecture Analysis, and C4/ISR. Upgrade of host processing resources to address inadequate user response time; establishment of a wide area network (WAN); upgrade supercomputers to support M&S; implementation of new technology to support multimedia applications; replace obsolete computational resources; and implement nearline and online mass storage to support user software analysis.  
Total - \$2,002

FY 1998 (\$ in Thousands):

- \$1,554 Continue to support the modernization of the BMDO's computer capabilities throughout the BMDO. The acquisition of equipment to modernize is based on supporting BMDO program priorities. Continue upgrade of host processing resources to address inadequate user response time; establishment of a WAN; upgrade supercomputers to support M&S; implementation of new technology to support multimedia applications; replace obsolete computational resources; and implement nearline and online mass storage to support user software analysis.  
Total - \$1,554

FY 1999 (\$ in Thousands):

- \$1,898 Continue to support the modernization of the BMDO's computer capabilities throughout the BMDO. The acquisition of equipment to modernize is based on supporting BMDO program priorities. Continue upgrade of supercomputers to support M&S and implementation of new technology to support multimedia applications and replace obsolete computational resources.  
Total - \$1,898

Acquisition Strategy: The tasks in this project have been met through full and open contractual competition to support Technology Follow-on M&S requirements.

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

Previous President's Budget Appropriated Value	FY 1996	FY 1997	FY 1998	FY 1999	Total Cost
Adjustments to Appropriated Value:					
a. General Reductions (FFRDC, Inflation etc.)	0	1,459	1,559	1,907	4,925
b. Internal BMDO Adjustments		1,459			
Current Budget Submit/President's Budget	0	2,002	1,554	1,898	5,454

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

DATE February 1997

BUDGET ACTIVITY  
**3 - Advanced Technology Development**

PE NUMBER AND TITLE  
**0603173C Support Technologies - ATD**

PROJECT  
**3352**

Change Summary Explanation:  
 Funding: None  
 Schedule: None  
 Technical: None

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

	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To Compl	Total Cost
2400 NMD Program, PE 0603871C	730,656	828,864	504,091	393,085	309,748	309,584	391,858	392,433	Cont	Cont
3352 Modeling and Simulation, PE 0603872C	71,362	64,180	73,173	72,984	74,939	74,961	78,333	75,661	Cont	Cont

**D. Schedule Profile**

	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 1999	FY 2002	FY 1999
1	2	3	4	1	2	3	4	1	2	3	4

None

7.0

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

DATE February 1997

BUDGET ACTIVITY

PE NUMBER AND TITLE

PROJECT

## 3 - Advanced Technology Development

0603173C Support Technologies - ATD

4000

COST (\$ In Thousands)	FY 1996 Actual	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
Operational Support	200	26,907	30,206	31,992	31,190	31,946	33,445	34,207	Continuing	Continuing

**A. Mission Description and Budget Item Justification**

This project provides support in three basic areas: personnel and related support costs; funding to meet cost fluctuations and contract terminations; management overhead required for the Support Technology program.

Personnel and related support costs common to all Support Technology projects include support of the Office of the Director, Ballistic Missile Defense Organization and his staff located within the Washington, DC area, as well as BMDO's Executing Agents within the US Army Space & Strategic Defense Command, U.S. Army PEO Missile Defense, U.S. Navy PEO for Theater Defense, U.S. Air Force PEO office, and the National Test Facility. This project supports funding for overhead/indirect personnel costs, benefits, and infrastructure costs such as rents, utilities, supplies, etc.

The BMDO prioritizes funding within this project to meet operational, contractual, and statutory fiscal requirements for the Support Technology program. Operational requirements include reimbursable services acquired through the Defense Business Operating Fund (DBOF), such as accounting services provided by the Defense Finance and Accounting Service (DFAS). Contractual requirements include reserves for special termination costs on designated contracts and provisions for terminating other programs as required. BMDO has additional requirements to provide for foreign currency fluctuations on its limited number of foreign contracts. Finally, statutory requirements include funding for charges to canceled appropriations in accordance with Public Law 101-510.

Assistance required to support BMDO overhead management functions for the Support Technology program is contained in this project. This assistance ranges from operational contracts to fully support functions such as ADP operations, Access control offices, and graphics support, to supportive efforts required, as well as to supplement the BMDO government personnel. Typical efforts include cost estimating, security management, contracts management, strategic relations management and information management. These efforts include assessment of technical project design, development and testing, test planning, assessment of technology maturity and technology integration across BMDO projects; and support of design reviews and technology interface meetings. Program control tasks include assessment of schedule, cost, and performance, with attendant documentation of the many related programmatic issues. The requirement for this area is based on most economical and efficient utilization of contractors versus government personnel.

The Fiscal Year 1996 Defense Authorization Act eliminates the management program element effective with the Fiscal Year 1997 President's Budget submission. This overhead management and indirect program support funding has been realigned in accordance with Public Law 104-106.

FY 1996 (\$ in Thousands):

- \$200 Provide management and support for overhead/indirect fixed costs such as civilian payroll, travel, rents & utilities and supplies.

Project 4000

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Exhibit R-2 (PE 0603173C)

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

DATE **February 1997**

BUDGET ACTIVITY  
**3 - Advanced Technology Development**  
 PE NUMBER AND TITLE  
**0603173C Support Technologies - ATD**  
 PROJECT  
**4000**

Total

- \$200 Total

**FY 1997 (\$ in Thousands):**  
 - \$26,907 Continue providing management and support for overhead/indirect fixed costs such as civilian payroll, travel, rents & utilities and supplies.  
 - \$26,907 Total

**FY 1998 (\$ in Thousands):**  
 - \$30,206 Continue providing management and support for overhead/indirect fixed costs such as civilian payroll, travel, rents & utilities and supplies.  
 - \$30,206 Total

**FY 1999 (\$ in Thousands):**  
 - \$31,992 Continue providing management and support for overhead/indirect fixed costs such as civilian payroll, travel, rents & utilities and supplies.  
 - \$31,992 Total

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

	FY 1996	FY 1997	FY 1998	FY 1999	Total Cost
Previous President's Budget	0	27,284	31,561	33,106	91,951
Appropriated Value		27,284			
Adjustments to Appropriated Value:					
a. General Reductions (FFRDC, Inflation etc.)		-375			
Current Budget Submit/President's Budget	200	26,907	30,206	31,992	89,305

Change Summary Explanation:  
 Funding: Management costs realigned to technical program elements effective with FY 1997.  
 Schedule: None  
 Technical: None



# THAAD System (Dem / Val) PE 0603861C

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

DATE February 1997

BUDGET ACTIVITY

PE NUMBER AND TITLE

**4 - Demonstration and Validation**

**0603861C Theater High-Altitude Area Defense System - TMD**

PROJECT  
2260

COST (\$ In Thousands)	FY 1996 Actual	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
2260 Theater High Altitude Area Defense	565,818	341,307	294,647	16,778	0	0	0	0	TBD	TBD

**A. Mission Description and Budget Item Justification**

The Theater High Altitude Area Defense (THAAD) System is being designed to negate theater ballistic missiles (TBM) at long ranges and high altitudes. Its long-range intercept capability will make possible the protection of broad areas, dispersed assets, and population centers against TBM attacks. The THAAD System includes missiles, Palletized Loading System (PLS) launchers, Battle Management/Command, Control, Communications, Computers, Intelligence (BM/C4I) units, THAAD Radars, and support equipment. The THAAD Radar (formerly known as Ground Based Radar) provides threat early warning, threat type classification, interceptor fire control, external sensor cueing, and launch and impact point estimates for the THAAD System. The THAAD Radar is based on state-of-the-art, solid-state, X-band radar technology. THAAD will be interoperable with both existing and future air defense systems. This netted and distributed BM/C4I architecture will provide robust protection against the TBM threat spectrum. THAAD is pursuing integration of THAAD BM/C4I with the Project Manager (PM), Air Defense Command and Control Systems (ADCCS) to take advantage of previous Army developments that can be incorporated into the THAAD program.

The Demonstration/Validation (Dem/Val) program will develop a design for the objective THAAD system and demonstrate the capabilities of the system in a series of 11 flight tests. The residual hardware resulting from the THAAD Dem/Val program, including the User Operational Evaluation System (UOES) missile option, will be used for a prototype system called the UOES. The UOES, used primarily for early operational assessment and for soldiers to influence the final design, will also be available for limited use as a contingency capability during a national emergency. The UOES will consist of 40 missiles with 4 launchers, 2 BM/C4I units, 2 THAAD Radars and support equipment. The THAAD system design will be developed and tested in the Engineering, Manufacturing, and Development (EMD) phase leading to low rate initial production and subsequent fielding in FY 04.

During FY95 - FY98 the Dem/Val flight test program will be conducted at White Sands Missile Range (WSMR), New Mexico. The flight test schedule consists of flight and system tests which began on April 21, 1995 with a successful first flight of the THAAD missile. To date, six flight tests have been conducted with the seventh flight planned for February 1997. The targets for the flight test program are being developed under the Tactical Missile Defense Targets contract (Project 3354).

This project is assigned to the Budget Activity and Program Element codes as identified in this descriptive summary in accordance with existing Department of Defense policy.

The THAAD Program continued Dem/Val hardware and software design, development and delivery in support of integration and acceptance testing for flight

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

DATE

February 1997

BUDGET ACTIVITY

## 4 - Demonstration and Validation

PE NUMBER AND TITLE

0603861C Theater High-Altitude Area Defense System - TMD

PROJECT

2260

testing at WSMR. The first Dem/Val THAAD radar was delivered to WSMR on July 17, 1995, and has participated in flights 3, 4, 5, and 6. The THAAD Dem/Val Radar has performed in the shadow mode to the test range radar and will be the primary sensor on flight 7. The first UOES Radar was delivered to WSMR May 3, 1996, and completed range integration and test in September 1996. It will be used for flight testing beginning with flight 8 and for the remainder of the Dem/Val flight tests. The first flight was successfully conducted at WSMR on April 21, 1995, proving the THAAD missile propulsion system booster/kill vehicle separation, seeker shroud cover deployment, seeker data, uplink/downlink communications from the Radar Interface Unit (RIU) to the missile, and pre-planned command destruct. The second flight was conducted on July 31, 1995, as a planned non-intercept, guidance and control test. The missile successfully performed the THAAD Energy Management Steering (TEMS) maneuver which resulted in nominal velocities and accelerations. The kill vehicle successfully maneuvered in response to planned In-Flight Target Updates (IFTUs). The third flight was a non-intercept fly-by test against a Storm target on October 13, 1995. The missile collected critical seeker data and the BM/C4I generated the fire control solution and sent the launch command to the interim launcher. During flight 4, on December 13, 1995, much success was demonstrated even though a planned intercept was not accomplished. The PLS launcher was used successfully for the first time, and the seeker and integrated electronics package demonstrated end game homing. During flights 4, 5, and 6, the THAAD Radar successfully tracked both the THAAD interceptor and the target. During flights 4 and 6, it properly maintained track on the interceptor and seeker shrouds during shroud separation. All radar mission events, times, and durations, went as predicted in pre-mission analysis. Flight 6 was conducted July 15, 1996. Data analysis is being performed to assess the segment performance which all appeared to function as planned, with the exception of a component failure in the missile seeker. An intercept was not achieved, however, critical data was obtained on how the seeker viewed the target.

## FY 1996 (\$ in Thousands):

- \$383,000	Major Contracts: Began THAAD system flight tests with BMC4I, THAAD Radar and PLS launcher. Completed flight tests 3-6 at WSMR. Continued system flight testing analysis. Continued THAAD system ground testing to mitigate flight test risk. Completed fabrication and WSMR integration of the UOES #1 Radar. Completed fabrication of UOES #2 Radar and delivered to WSMR. Continued THAAD Radar characterization tests at WSMR. Conducted System Design Review.
- \$62,900	Support Contracts: Continued software independent verification and validation. Continued nuclear environment survivability analysis. Continued hit assessment, discrimination, and guidance, navigation and control algorithm development. Continued hit to kill lethality analysis. Continued integration and support of THAAD flight testing.
- \$52,333	Integration by Prime Contractor: Continued integration and testing of Joint Tactical Information Distribution System (JTIDS) radios, launch support, BM/C4I, weapon system deck model, and simulation efforts. Continued system threat vulnerability assessment. Maintained integrated logistics and product assurance efforts. Provided system engineering support to THAAD flight tests to validate test results with predicted performance simulations. Continued pursuing integration of THAAD BM/C4I with the PM, ADCCS, to take advantage of previous Army developments of force operations software.
- \$19,700	In-house support: Maintained government salaries and benefits, travel, training.
- \$41,375	Targets: Continued development and delivery of targets to support THAAD flight tests and THAAD Radar system tests. Maintained infrastructure to support TMD targets.

Project 2260

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Exhibit R-2 (PE 0603861C)

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

DATE February 1997

BUDGET ACTIVITY

## 4 - Demonstration and Validation

PE NUMBER AND TITLE

0603861C Theater High-Altitude Area Defense  
System - TMDPROJECT  
2260

- \$3,907 Lethality Analysis - Continued lethality simulation code validation.  
 - \$2,603 Operational Test and Evaluation (OT&E) - Conducted independent assessment of the THAAD System.  
 - \$565,818 Total

## FY 1997 (\$ in Thousands):

- \$212,808 Major Contracts: Continue system flight test program and support. Conduct Radar System Test #1 (RST-1). Complete fabrication and integration of UOES radars. Conduct THAAD Radar characterization tests at United States Army Kwajalein Atoll (USAKA) in conjunction with the Theater Critical Measurements Program (TCMP)-2. Conduct Software Specification Review and SDR update. Exercise the UOES missile option. Begin procurement and fabrication of UOES missile components.  
 - \$42,463 Support Contracts: Continue software independent verification and validation. Continue nuclear environment survivability analysis. Continue hit assessment, discrimination, and guidance, navigation and control algorithm development. Continue hit to kill lethality analysis. Continue integration and support THAAD flight testing.  
 - \$56,629 Government Furnished Equipment (GFE)/Other: Continue integration and testing of Joint Tactical Information Distribution System (JTIDS) radios, launch support, BM/C4I, weapon system deck model, and simulation efforts. Continue system threat vulnerability assessment. Maintain integrated logistics and product assurance efforts. Provide system engineering support to THAAD flight tests to validate test results with predicted performance simulations. Continue pursuing integration of THAAD BM/C4I with PM, ADCCS to take advantage of previous Army developments of force operations software.  
 - \$20,590 In-house support: Maintain government salaries and benefits, travel, training.  
 - \$5,450 Targets: Continue development and delivery of targets to support THAAD flight tests and THAAD Radar system tests. Maintain infrastructure to support TMD targets.  
 - \$1,594 Operational Test and Evaluation (OT&E): Conduct independent assessment of the THAAD System.  
 - \$1,773 Small Business and Innovative Research  
 - \$341,307 Total

## FY 1998 (\$ in Thousands):

- \$194,368 Major Contracts: Continue fabrication and integration of UOES missiles. Complete system flight test program and support.  
 - \$30,500 Support Contracts: Continue software independent verification and validation. Continue nuclear environment survivability analysis. Continue hit assessment, discrimination, and guidance, navigation and control algorithm development. Continue hit to kill lethality analysis. Continue integration and support THAAD flight testing.

DATE February 1997

PROJECT  
0603861C Theater High-Altitude Area Defense  
System - TMD

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

BUDGET ACTIVITY  
4 - Demonstration and Validation

<p>- \$30,100</p> <p>- \$21,500</p> <p>- \$14,234</p> <p>- \$2,367</p> <p>- \$1,578</p> <p>- \$294,647</p>	<p>Integration by Prime Contractor: Continue integration and testing of Joint Tactical Information Distribution System (JTIDS) radios, launch support, BM/C4I, weapon system deck model, and simulation efforts. Continue system threat vulnerability assessment. Maintain integrated logistics and product assurance efforts. Provide system engineering support to THAAD flight tests to validate test results with predicted performance simulations. Continue pursuing integration of THAAD BM/C4I with PM, ADCCS to take advantage of previous Army developments of force operations software.</p> <p>In-house support: Maintain government salaries and benefits, travel, training.</p> <p>Targets: Continue development and delivery of targets to support THAAD Radar system tests. Maintain infrastructure to support TMD targets</p> <p>Lethality Analysis: Continue lethality simulation code validation.</p> <p>Operational Test and Evaluation (OT&amp;E): Conduct independent assessment of the THAAD System.</p> <p>Total</p>
--	--

**FY 1999 (\$ in Thousands):**

- \$16,778	Completes funding of the UOES missiles.
- \$16,778	Total

**Acquisition Strategy** The THAAD Acquisition Strategy approved for the Dem/Val phase specified full and open competition for THAAD system integration, missiles, launchers, and BM/C4I. The TMD Ground Based Radar (GBR) Acquisition Strategy also specified full and open competition for Dem/Val. The Concept Definition phase, completed in 1992, involved three contractor teams and defined concepts and preliminary designs for the THAAD System. The THAAD Dem/Val contract was competitively awarded to Lockheed Missiles and Space Company in September 1992. The Dem/Val program will develop a design for the THAAD System, and the contract contains an option for production of the 40 UOES missiles based on the design demonstrated in the Dem/Val flight test program. The THAAD Radar (formerly known as TMD-GBR) Dem/Val contract was competitively awarded to Raytheon Company in September 1992. The Dem/Val phase includes the development and test of the Dem/Val TMD-GBR and two UOES TMD-GBRs.

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

DATE February 1997

BUDGET ACTIVITY

PE NUMBER AND TITLE

PROJECT

4 - Demonstration and Validation

0603861C Theater High-Altitude Area Defense

2260

System - TMD

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

	FY 1996	FY 1997	FY 1998	FY 1999	Total
Previous President's Budget	554,755	269,000	0	0	Cost 823,755
Appropriated Value		344,000			
Adjustments to Appropriated Value:					
a. General Reductions (FFRDC, Inflation etc.)		-2,693			
FY 1998 President's Budget Request	565,818	*341,307	294,647	16,778	1,218,550

**Change Summary Explanation:**

\*Funding: A request has been submitted to reprogram FY 97 EMD funds to Dem/Val. FY 98 and FY 99 funds were realigned due to the slip in the THAAD flight test schedule.

Schedule: The Milestone II DAB Review milestone has slipped due to longer than expected Flight 6 failure investigation and Flight 7 preparation. The Flight 6 failure investigation caused Flight 7 to move from September to December 1996. An inertial measurement unit software error, found during software verification testing of FTV-07, further delayed the flight test to late February 1997.

Technical: None

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

	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To
THAAD Procurement, SSN C494000*	0	0	0	0	0	33,785	531,715	606,315	Compl Cont
THAAD MILCON, 0604861C	13,104	0	4,565				4,994		Cont
THAAD EMD, 0604861C	0	277,508	261,480	578,467	603,213	584,561	413,884	372,674	Cont

\* IN ARMY TOA

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

DATE February 1997

PROJECT

2260

PE NUMBER AND TITLE

0603861C Theater High-Altitude Area Defense System - TMD

BUDGET ACTIVITY

**4 - Demonstration and Validation**

**D. Schedule Profile**

	FY 1996	FY 1997	FY 1998	FY 1999
Dem/Val Radar Integration and Test (I&T) Complete	1 2 3 4 *	1 2 3 4	1 2 3 4	1 2 3 4
System Design Review				
UOES Radar 1 I&T Complete				
Radar System Test #1				
UOES Option Award		X		
UOES Radar 2 I&T Complete				
Software Specification Review				
Integrated System Tests Complete				
Radar System Test #2		X		
Milestone II				
1st UOES Missile Delivery				X

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

DATE February 1997

PROJECT

2260

PE NUMBER AND TITLE

0603861C Theater High-Altitude Area Defense

System - TMD

**BUDGET ACTIVITY**  
**4 - Demonstration and Validation**

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

	FY 1996	FY 1997	FY 1998	FY 1999
a. Prime Contract	383,000	212,808	194,368	16,778
b. Other Government Activities	52,333	56,629	30,100	0
c. Support Contracts	62,900	42,463	30,500	0
d. Program Management	19,700	20,590	21,500	0
e. Targets	41,375	5,450	14,234	0
f. Lethality	3,907	0	2,367	0
g. OT&E	2,603	1,594	1,578	0
h. Small Business Innovative Research	0	1,773	0	0
<b>Total</b>	<b>565,818</b>	<b>341,307</b>	<b>294,647</b>	<b>16,778</b>

**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 1996	Budget			Total Program
						FY 1996	FY 1997	FY 1998	
<b>Product Development Organizations</b>	LMMS	CPFF	Oct 97		988,344	293,494	181,745	194,368	1,674,729
	RAYTHEON	CPIF/CPAF			430,034	89,506	31,063		550,603
<b>Support and Management Organizations</b>	SETA	C/CPAF	Oct 97		212,338	23,200	16,700	11,050	50,950
	Other Spt Cont	Various	Multiple		131,054	39,700	25,763	19,450	297,251
	OGAS	MIPR	Multiple			53,033	58,219	29,600	271,906

Project 2260

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Exhibit R-3 (PE 0603861C)

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

DATE February 1997

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
4 - Demonstration and Validation	0603861C Theater High-Altitude Area Defense System - TMD	2260

Contractor or Government Performing Activity SBIR	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1996	Budget FY 1996	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Test and Evaluation Organizations											
WSMR	MIPR	OCT 97			27,531	19,000	19,000	22,000	0	0	87,531
OT&E					1,500	1,594	1,594	1,578	0	0	7,275
TARGETS					61,245	5,450	5,450	14,234	0	0	122,304
LETHALITY					7,200	3,907	0	2,367	0	0	13,474

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

Item Description	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Delivery Date	Total Prior to FY 1996	Budget FY 1996	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Product Development Property										
N/A				0	0	0	0	0	0	0
Support and Management Property										
N/A				0	0	0	0	0	0	0
Test and Evaluation Property										
N/A				0	0	0	0	0	0	0
Subtotal Product Development				1,418,378	383,000	212,808	194,368	16,778		2,225,332
Subtotal Support and Management				343,392	115,933	102,455	60,100			621,880
Subtotal Test and Evaluation				97,476	66,885	26,044	40,179			230,584
Total Project				1,859,246	565,818	341,307	294,647	16,778		3,077,796



# Hawk Missile (Dem / Val) PE 0603863C

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

DATE **February 1997**

BUDGET ACTIVITY

**4 - Demonstration and Validation**

PE NUMBER AND TITLE

**0603863C HAWK Upgrades TMD**

PROJECT

**2358**

COST (\$ In Thousands)	FY 1996 Actual	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
2358 HAWK System BM/C3	22,819	0	0	0	0	0	0	0	TBD	TBD

**A. Mission Description and Budget Item Justification**

The program consists of modifying the U.S. Marine Corps AN/TPS-59 long-range air surveillance radar and the HAWK weapon system to allow detection, tracking, and engagement of short-range TBMs and thereby provides a point defense Theater Missile Defense (TMD) capability to the Marine Air Ground Task Force. The program will also provide a communications interface between the AN/TPS-59 and the HAWK system by developing an Air Defense Communications Platform (ADCP). This Marine Corps TMD initiative is jointly funded with BMDO and will yield a low-risk, near-term capability for expeditionary forces against short-range ballistic missiles.

The AN/TPS-59 long-range surveillance radar is the primary sensor for the Marine Air Control Squadron. The (V3) configuration developed under this program was enhanced to provide a TBM tracking and surveillance capability. The radar completed operational test and evaluation in FY 96 and initial modification kit production will begin in FY 97. Installation of the modification kits is scheduled to begin in FY 98 and complete in FY99.

The HAWK weapon system modifications include upgrades to the Battery Command Post (BCP) and improvements to the HAWK missile that resulted in a missile configuration called the "improved lethality missile." The modified HAWK BCP will process cueing data to control the high power illuminator radar. The improved lethality missile will incorporate fuse and warhead improvements to 300 improved lethality missiles that have been transferred from the Army to the Marine Corps. Another 700 improved lethality missile modification kits will be procured and installed by the end of Fiscal Year 1997. Production of the BCP modification kits began in Fiscal Year 1995 and the installation of all BCP modifications was completed by the end of Fiscal Year 1996.

The Air Defense Communications Platform (ADCP) will convert AN/TPS-59 data messages and Tactical Data Information Link-J (TADIL-J) formatted messages into the intra-battery data link formats required by the HAWK weapon system. The ADCP will also transmit TADIL-J formatted messages to other theater sensors. This communications interface has completed operational test and evaluation and initial production will begin in Fiscal Year 1997. Fielding of the ADCP is scheduled to begin in FY98 and complete in FY99.

This project is assigned to the Budget Activity and Program Element codes as identified in this descriptive summary in accordance with existing Department of Defense policy.

**FY 1996 (\$ in Thousands):**

- \$20,074	Complete AN/TPS-59 integration and testing.
- \$2,452	Complete ADCP integration and testing.
- \$293	Provide targets for live flight testing.
- \$22,819	Total

Project 2358

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE	PROJECT																						
BUDGET ACTIVITY	PE NUMBER AND TITLE																								
4 - Demonstration and Validation	0603863C HAWK Upgrades TMD	February 1997	2358																						
<p><b>FY 1997 (\$ in Thousands):</b>                      - \$ BMDO participation in the program is completed in FY1996.                      - \$0 Total</p> <p><b>FY 1998 (\$ in Thousands):</b>                      - \$ BMDO participation in the program is completed in FY1996.                      - \$0 Total</p> <p><b>FY 1999 (\$ in Thousands):</b>                      - \$ BMDO participation in the program is completed in FY1996.                      - \$0 Total</p>																									
<p><b>B. Program Change Summary (\$ in Thousands)</b></p> <table border="0"> <thead> <tr> <th></th> <th>FY 1996</th> <th>FY 1997</th> <th>FY 1998</th> <th>FY 1999</th> <th>Total Cost</th> </tr> </thead> <tbody> <tr> <td>Previous President's Budget</td> <td>22,312</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>Current Budget Submit/President's Budget</td> <td>22,819</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> </tr> </tbody> </table> <p>Change Summary Explanation:                      Funding: Total funding remained unchanged, however adjustments were required to the individual tasks in order to accurately reflect the actuals (AN/TPS-59 integration testing from \$20,102 to \$20,074, ADCP integration and testing from \$2,430 to \$2,452 and targets from \$287 to \$293).                      Schedule: The additional 700 improved lethality missile modification kits were scheduled to be procured and installed by the end of FY96. This date changed to the end of FY97 due to a protest which delayed the award of the modification kit contract. Milestone III dates were changed in FY95 in conjunction with changes to the test schedule which slipped developmental testing to 1st quarter FY96 and operational testing to 4th quarter FY96.                      Technical: None</p>					FY 1996	FY 1997	FY 1998	FY 1999	Total Cost	Previous President's Budget	22,312	0	0	0	0	Current Budget Submit/President's Budget	22,819	0	0	0	0				
	FY 1996	FY 1997	FY 1998	FY 1999	Total Cost																				
Previous President's Budget	22,312	0	0	0	0																				
Current Budget Submit/President's Budget	22,819	0	0	0	0																				
<p><b>C. Other Program Funding Summary (\$ in Thousands)</b></p> <table border="0"> <thead> <tr> <th></th> <th>FY 1996</th> <th>FY 1997</th> <th>FY 1998</th> <th>FY 1999</th> <th>FY 2000</th> <th>FY 2001</th> <th>FY 2002</th> <th>FY 2003</th> <th>To Compl</th> <th>Total Cost</th> </tr> </thead> <tbody> <tr> <td>HAWK Procurement</td> <td>5,046</td> <td>19,379</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>					FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To Compl	Total Cost	HAWK Procurement	5,046	19,379								
	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To Compl	Total Cost															
HAWK Procurement	5,046	19,379																							
Project 2358		Page 2 of 3 Pages		Exhibit R-2 (PE 0603863C)																					

DATE February 1997

PROJECT  
2358

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

PE NUMBER AND TITLE  
0603863C HAWK Upgrades TMD

BUDGET ACTIVITY  
4 - Demonstration and Validation

D. Schedule Profile

	FY 1996		FY 1997		FY 1998		FY 1999	
	1	2	3	4	1	2	3	4
Acquisition Milestone:								
AN/TPS-59 Milestone III				X				
ADCP Milestone III					X			
T&E Milestone:								
AN/TPS-59 Development Tests	X							
AN/TPS-59 Operational Tests	X							
ADCP Development Tests								
ADCP Operational Tests								
Other Program Events:								
AN/TPS-59 Mod Fielding					X	X	X	X
ADCP Fielding					X	X	X	X



**TMD BM/C<sup>3</sup>I (Dem / Val)**  
**PE 0603864C**

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

DATE **February 1997**

BUDGET ACTIVITY **4 - Demonstration and Validation**

PE NUMBER AND TITLE **0603864C Battle Management and C41 for TMD Acquisition**

PROJECT **3261**

	FY 1996 Actual	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
3261 TMD BM/C3I (BM/C3I) Concepts	27,147	0	0	0	0	0	0	0	TBD	TBD

**A. Mission Description and Budget Item Justification**

The primary mission of this project is to provide the warfighter with an integrated and interoperable Theater Missile Defense (TMD) Battle Management/Command, Control, Communications, and Intelligence (BM/C3I) capability having the flexibility to meet a wide range of threats and expected needs. The BM/C3I architecture for TMD is built upon the existing command and control (C2) structure for Theater Air Defense (TAD) and adds the communications linking TMD C2 nodes, weapons, and sensors, and the TMD interfaces to intelligence systems and other supporting capabilities. The BMDO, from its joint perspective, uses this project to oversee independent weapon systems development and to provide guidance, standards, equipment, integration, and analysis to maximize the performance of a multitude of sensors, interceptors, and C2 nodes and to synergize their individual contributions to an integrated Joint theater-wide TMD system. BMDO has three major thrusts to the TMD BM/C3I integration program.

The first thrust establishes the links and means for receipt and in-theater early warning and dissemination of launch warning information from space-based and intelligence systems external to TMD. This project supports the system engineering of their capability and prototype development of items such as improved displays for early in-theater warning information. This project focuses on linking separate external systems into the theater.

The second thrust of the BM/C3I program focuses on communication of, and interoperability among, TMD weapon systems. Interoperability includes both the communications equipment, and protocols as well as the common command and control procedures among different weapons systems to ensure a truly integrated theater-wide ballistic missile defense system. The cornerstone of TMD interoperability is the Joint Data Net (JDN) which uses the Joint Tactical Information Distribution System (JTIDS) and the Tactical Data Information Link-JTIDS (TADIL-J) message format. This project integrates JTIDS terminals into existing Theater Ballistic Missile Defense (TBMD) C2 platforms and provides the necessary software upgrades. This funding is critical for timely inter-Service interoperability.

The third thrust of the BM/C3I program directs attention to upgrades of Service C2 centers. Various command center upgrades are included in this project to reduce decision-making time necessary to effectively engage ballistic missiles. Again, BMDO leverages off several existing Service-funded theater air defense command center upgrades and this project funds only the specific TMD-related aspects of these upgrades. BMDO's central direction and support of hardware and software developments will produce an integrated C2 capability for TMD.

The joint warfighters and BM/C3I developers evaluate the effects of early warning, improved interoperability, integration, and command center upgrades on joint TBMD doctrine through BM/C3I work shops and analysis.

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

DATE **February 1997**

BUDGET ACTIVITY

PE NUMBER AND TITLE

**0603864C Battle Management and C41 for TMD Acquisition**

PROJECT

**4 - Demonstration and Validation**

**3261**

All of the efforts in this project are designed to provide a seamless interoperable architecture to provide timely warning and information necessary to reduce decision times and allow more opportunities to efficiently and effectively engage hostile missiles. The end result will kill more missiles and will reduce casualties to U.S. and other friendly forces.

FY 1996 (\$ in Thousands):

- \$7,120 Army: Complete debris techniques analysis plan and track correlation and flexible firing doctrine analysis; evaluate software maturity for operational tests; develop a data link handbook; establish a software library and re-use database
- \$1,523 Air Force: Start integration of JTIDS on multiple additional USAF platforms; complete initial JTIDS integration on AWACS; produce two additional TMD intelligence support templates; prototype the decision support aids for Joint Force Air Component Commander (JFACC) battle management; complete gateway software development and testing; multi-sensor tracking algorithm development; implement situation targeting algorithms; develop, simulate, and demonstrate prototypes of the recommended Theater Battle Management Core Systems (TBMCS) application for the distributed C2 nodes; update Information Exchange Requirements (IER) and resolve interoperability issues; produce technical baseline for Time-Critical Target Aid (TCTA) and JTIDS gateway.
- \$6,885 Navy: Conduct JTIDS network design analysis; enhance evolution of Joint Maritime Command Information System (JMCIS) TBMD segments; participate in Joint TMD BM/C3I work shops; complete testing of JTIDS C2P modifications; begin development of ICD for AEGIS/Joint Maritime Command Information Services (JMCIS) interface; begin implementation of TBMD modifications necessary for Advanced Combat Direction system (ACDS). The last two efforts are critical to maintain schedule with AEGIS and ACDS.
- \$3,500 USMC: Integrate additional JTIDS terminals into Air Defense Communications Platform (ADCP); commence development of cue acceptance software in the AN/TPS-59 (HA WK) radar; initiate integration efforts for JTIDS (TADIL-J) into the Tactical Air Operations Module (TAOM).
- \$8,119 Joint/Combined: Conduct TMD BM/C3I work shops; conduct command and control (C2) tests to refine C2 procedures; initiate Multifunctional Information Distribution System (MIDS) Army development efforts; complete rapid & contingency deployable prototypes of the Combat Integration Capability (CIC) and the Sector Anti-Air Warfare Facility (SAA WF); conduct modeling and analysis of JTIDS network structure in support of TMD; support inter-Service integration efforts; initiate joint TMD planning capability; develop follow-on TADIL-J messages; test and refine existing messages.

- \$27,147 Total

FY 1997 (\$ in Thousands):

- \$0

- \$0 Total

FY 1998 (\$ in Thousands):

- \$0

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

DATE February 1997

PROJECT

3261

PE NUMBER AND TITLE

0603864C Battle Management and C41 for TMD  
Acquisition

BUDGET ACTIVITY

4 - Demonstration and Validation

- \$0 Total

FY 1999 (\$ in Thousands):

- \$0

- \$0 Total

**Acquisition Strategy:** The 3261 Project acquisition strategy leverages existing system acquisition programs (which are subject to milestone decisions and testing) and accomplishes supporting tasks to satisfy BM/C3I performance requirements. A significant portion of this project entails systems engineering of separately funded and managed service programs so that all systems will interoperate when fielded.

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

	FY 1996	FY 1997	FY 1998	FY 1999	Total Cost
Previous President's Budget	23,160	0	0	0	23,160
Current Budget Submit/President's Budget	27,147	0	0	0	27,147

**Change Summary Explanation:**

Funding: Congressional direction eliminated the TMD BM/C3I program elements 0603864/0604864C and placed this project under the Joint TMD activities program element. Consistent with this direction, a determination was made that this program is more appropriately funded with Dem/Val funds. Navy tasks directly supporting the Navy Area TBMD program were deleted from this project for FY1997 and beyond and funded under the Navy Area TBMD program element (Project 2263) to unify control.

Schedule: None

Technical: None

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

DATE

February 1997

BUDGET ACTIVITY

PE NUMBER AND TITLE

4 - Demonstration and Validation

0603864C Battle Management and C41 for TMD Acquisition

PROJECT

3261

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

While this program is not dependent upon funding from other programs, it supports these programs by providing capstone systems engineering, common BM/C3I guidance, government furnished equipment, interface support, joint network design analysis, and other actions necessary to achieve interoperability among independent systems.

	FY 1996	FY 1997	FY 1998	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To	Total
										Comp	Cost
3261 TMD BM/C3I PE: 0604864C	10,115	0	0	0	0	0	0	0	0	TBD	TBD
3261 TMD BM/C3I PE: 0603872C	0	32,357	34,094	35,864	43,717	44,576	43,210	43,286	43,286	Comp	Comp

**D. Schedule Profile**

	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 1999
1	2	3	4	1	2	3	4	1	2
			X						
			X						
			X						

Data link handbook published (Army)  
 TMD software library & re-use database established (Army)  
 Two CIC/SAA WF prototypes fielded (USAF/USMC)



# **Navy Area Theater Missile Defense (Dem / Val)**

## **PE 0603867C**

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

DATE **February 1997**

BUDGET ACTIVITY **4 - Demonstration and Validation** PE NUMBER AND TITLE **0603867C Navy Area TBMD** PROJECT **2263**

COST (\$ In Thousands)	FY 1996 Actual	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
2263 Navy Area TMD	277,565	59,315	0	0	0	0	0	0	TBD	TBD

To see the other Program Elements and Appropriations associated with Navy Area TMD, see section C of this R2.

**A. Mission Description and Budget Item Justification**

The Navy Area Theater Ballistic Missile Defense (TBMD) project builds on the national investment in AEGIS ships, weapon systems, and Navy Standard Missile II (SM-2) Block IV missiles. Two classes of ships continue to be deployed with the AEGIS combat system: the CG-47 Ticonderoga-class cruisers and the DDG-51 Burke-class destroyers. Navy TBMD will take advantage of the attributes of naval forces including overseas presence, mobility, flexibility, and sustainability in order to provide protection to debarkation ports, coastal airfields, amphibious objective areas, Allied forces ashore, and other high value sites. Navy assets will provide an option for initial TBMD allowing the insertion of additional land-based TBMD assets and other expeditionary forces in a threatening environment.

**FY 1996 (\$ in Thousands):**

- \$266,377 Continue AEGIS Combat System Computer Program design; conduct Tactical Program system concept review (SCR); conduct User Operational Evaluation System (UOES) preliminary design review (PDR); and begin development of system level design specification for Tactical Program. Complete preliminary missile design and PDR. Complete Risk Reduction Flight Demonstration program. Initiate procurement of Engineering Design Model (EDM) test rounds. Continue command and control processor (C2P) development and implementation of TBMD messages in LINK 11 and LINK 16.
- \$5,967 Conduct required lethality analyses, lethality model refinements and testing in support of Live Fire Test and Evaluation (LFT&E).
- \$5,221 Continue building and delivery of targets to support Navy TBMD flight tests. Maintain infrastructure to support TMD targets.
- \$277,565 Total

**FY 1997 (\$ in Thousands):**

- \$59,315 Continue systems engineering and analysis and conduct Milestone II Defense Acquisition Board (DAB). Continue development of UOES and tactical computer programs; initiate development of computer program design specifications for the tactical program. Continue detailed missile design. Continue procurement and fabrication of EDM test rounds. Provide technical support for AEGIS weapons system design activities. Continue test planning. Define interface for TBMD-related upgrades to AEGIS and Joint Maritime Command Information System (JMCIS). Continue C2P development.
- \$59,315 Total

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

DATE

February 1997

BUDGET ACTIVITY

PE NUMBER AND TITLE

0603867C Navy Area TBMD

PROJECT

2263

**4 - Demonstration and Validation**

EY 1998 (\$ in Thousands):

- \$0 No funding in FY 1998  
 - \$0 Total

EY 1999 (\$ in Thousands):

- \$ No funding in FY 1999  
 - \$0 Total

**Acquisition Strategy:** This strategy consists of a Navy Area TBMD Program evolving to a Theater-Wide Defense TBMD program. The Navy Area Program will build on existing force structure by modifying the SM-2 Block IV missile and AEGIS Combat System to achieve TBMD capability.

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

	FY 1996	FY 1997	FY 1998	FY 1999	Total
Previous President's Budget	187,258				187,258
Appropriated Value		60,000			60,000
Adjustments to Appropriated Value			0	0	0
a. PBD 633 Reductions		-685			-685
Current Budget Submit/President's Budget	277,565	59,315			336,880

**Change Summary Explanation:**

**Funding:** Delays in the risk reduction flight tests, SM-2 Blk IVA design immaturity, and cost growth in targets necessitated a program restructure and an FY96 notification reprogramming from P.E. 0604867C to 0603867C. Additional risk reduction flight test delays in early FY1997 necessitated a request to reprogram funds from P.E. 0604867C to 0603867C.

**Schedule:** The January 1996 program restructure included a delay in both UOES and FUE dates. The Navy Area TBMD Program, within the FY97 President's Budget, supported an SM-2 Block IVA UOES capability in FY1999 and FUE in FY2001. However, due to concerns with 1996 flight test delays, and to allow a longer test period to accommodate a more conservative Developmental Testing/Operational Testing schedule, UOES is projected for FY2000 and FUE in FY2002. Following an independent life cycle cost estimate of the rebaselined program and successful completion of the Milestone II DAB, these schedules will be reassessed.

**Technical:** Additional lethality analysis and testing have been included in the program as a result of the January 1996 restructure.

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

DATE February 1997

PROJECT  
2263

PE NUMBER AND TITLE  
0603867C Navy Area TBMD

BUDGET ACTIVITY  
4 - Demonstration and Validation

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

	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To	Total
									Compl.	Cost
									Cont.	Cont.
									*Cont.	*Cont.
Navy Area TMD (EMD) P.E., 0604867C	0	241,330	267,822	227,800	222,145	158,271	52,433	38,089		
Standard Missile WPN 1507, BA2	16,276	9,151	*15,500	*44,600	*130,000	*161,000	*236,000	*225,000		
* Funds transferred to U. S. Navy										

**D. Schedule Profile**

	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To	Total
									Compl.	Cost
									Cont.	Cont.
									*Cont.	*Cont.
Acquisition Milestones:										
- Acquisition Milestone II			X							
Engineering Milestones:										
- AEGIS Combat System (ACS)										
- Preliminary Design Review(PDR)(UOES)										
- SM-2 BLK IVA PDR										
- ACS Systems Design Review (Tactical)										
- SM-2 BLK IVA Critical Design Review										
- ACS PDR (Tactical)										
T&E Milestones										
- White Sands Missile Range NM										
(DT/Operational Assessment)										
- UOES										
- LRIP										
- Navy Area TBMD TECHEVAL (DT)										
- Navy Area TBMD OPEVAL										
- Acquisition Milestone III										
- FUE										

4thQFY00  
2ndQFY01  
2ndQFY01  
4thQFY01  
2ndQFY02  
3rdQFY02

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

DATE February 1997

PROJECT  
2263

PE NUMBER AND TITLE

0603867C Navy Area TBMD

BUDGET ACTIVITY

**4 - Demonstration and Validation**

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

	FY 1996	FY 1997	FY 1998	FY 1999
a. Program Management/Integration	6,085	1,300	0	0
b. System Engineering	40,318	6,700	0	0
c. Program Management	4,933	500	0	0
d. Program Support	25,610	700	0	0
e. Ship System Modifications	4,300	0	0	0
f. Design and Analysis	57,675	5,800	0	0
g. Hardware Fab. and Proc.	71,268	38,015	0	0
h. Test and Evaluation	8,600	0	0	0
i. Test Equipment	5,221	0	0	0
j. Engineering Support	5,500	0	0	0
k. Travel	500	0	0	0
l. Developmental Test and Evaluation	10,800	1,300	0	0
m. Operational Test and Evaluation	239	0	0	0
n. Other/Miscellaneous	1,300	0	0	0
o. Software Development	35,216	5,000	0	0
Total	277,565	59,315	0	0

**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 1996	Budget	Budget	Budget	Total Program
						FY 1996	FY 1997	FY 1998	

**Product Development Organizations**

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

BUDGET ACTIVITY		PE NUMBER AND TITLE		DATE		PROJECT					
4 - Demonstration and Validation		0603867C Navy Area TBMD		February 1997		2263					
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 1996	Budget FY 1996	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Standard Missile Co.	CPAF				0	121,709	19,815	0	0	TBD	141,524
Lockheed Martin	CPAF				39,407	35,091	9,200	0	0	TBD	83,698
NSWC Dahlgren	WR				14,405	19,689	7,515	0	0	TBD	41,609
JHU/APL	PD				30,928	21,456	2,570	0	0	TBD	54,954
Holloman AFB	MIPR				2,140	1,400	0	0	0	TBD	3,540
Motorola	CPFF				6,162	12,728	5,985	0	0	TBD	24,875
SPAWAR	PD				0	633	750	0	0	TBD	1,383
Hughes	CPAF				86,568	8,130	0	0	0	TBD	94,698
Raytheon	CPAF				51,966	4,210	0	0	0	TBD	56,176
Arnold Eng.	CPFF				0	1,400	0	0	0	TBD	1,400
ARC	CPFF				0	3,400	0	0	0	TBD	3,400
Kaman	CPFF				0	1,700	800	0	0	TBD	2,500
Miscellaneous (efforts < \$500K)					9,718	1,810	580	0	0	TBD	12,108
<b>Support and Management Organizations</b>											
NSWC Dahlgren	WR				3,813	8,891	3,115	0	0	TBD	15,819
NSWC Port	WR				220	368	0	0	0	TBD	588
Hueneme	WR				0	2,354	780	0	0	TBD	3,134
NAWC China Lake	RCP				0	1,543	655	0	0	TBD	2,198
NSWC Indian Head	CPFF				3,500	2,400	500	0	0	TBD	6,400
VITRO	CPFF				0	742	500	0	0	TBD	1,242
SPA	CPFF				0	3,973	900	0	0	TBD	4,873
TSC	MIPR				0	1,500	750	0	0	TBD	2,250
Hanscomb AFB (MIT/LL)											

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

DATE February 1997

BUDGET ACTIVITY  
 4 - Demonstration and Validation  
 PE NUMBER AND TITLE  
 0603867C Navy Area TBMD  
 PROJECT  
 2263

Contractor or Government Performing Activity	Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity	Project Office	Total Prior to FY 1996	Budget FY 1996	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Miscellaneous (efforts < \$500K)			EAC	EAC	6,022	2,657	1,500	0	0	TBD	10,179
<b>Test and Evaluation Organizations</b>											
NAWC Point Mugu	WR				5,018	1,391	475	0	0	TBD	6,884
NSWC Port Hueneine	WR				880	250	100	0	0	TBD	1,230
NSWC Dahlgren	WR				5,800	330	200	0	0	TBD	6,330
JHU/APL	WR				0	1,483	500	0	0	TBD	1,983
SSDC Army	MIPR				7,534	5,221	0	0	0	TBD	12,755
WSMR	WR				3,250	5,581	1,525	0	0	TBD	10,356
PMRF	WR				0	2,865	350	0	0	TBD	3,215
NWAD Corona	WR				0	1,000	250	0	0	TBD	1,250
Miscellaneous (efforts < \$500K)					12,628	1,660	0	0	0	TBD	14,288

**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 1996	Budget FY 1996	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<b>Product Development Property</b>										
<b>Support and Management Property</b>										

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

		DATE				February 1997		PROJECT	
BUDGET ACTIVITY		PE NUMBER AND TITLE							
4 - Demonstration and Validation		0603867C Navy Area TBMD							
Item Description	Method/Type or Funding Vehicle	Award or Obligation Date	Delivery Date	Total					Program
				Prior to FY 1996	Budget FY 1996	Budget FY 1997	Budget FY 1998	Budget FY 1999	
<b>Test and Evaluation Property</b>									
				241,294	233,356	47,215			521,865
				13,555	24,428	8,700			46,683
				35,110	19,781	3,400			58,291
				289,959	277,565	59,315			626,839
<b>Total Project</b>									



# **Navy Theater Wide Missile Defense (Dem / Val)**

## **PE 0603868C**

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

DATE **February 1997**

BUDGET ACTIVITY

PE NUMBER AND TITLE

PROJECT

**4 - Demonstration and Validation**

**0603868C Navy Theater Wide TMD**

**1266**

COST (\$ In Thousands)	FY 1996 Actual	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
1266 Navy Theater Wide Missile Defense	200,442	304,171	194,898	192,073	191,229	190,930	145,190	149,444	Continuing	Continuing

**A. Mission Description and Budget Item Justification**

The Navy Theater Wide (NTW) Ballistic Missile Defense (BMD) program builds upon the Navy Area Theater Missile Defense (TMD) program and the national investment in AEGIS ships, weapons systems, and missiles. Two classes of ships are deployed with the AEGIS combat system: the Ticonderoga Class cruisers and the Arleigh Burke Class destroyers. Navy Theater Wide BMD will take advantage key naval forces attributes including overseas presence, mobility, flexibility, and sustainability to provide protection of a theater of operations.

The Navy Theater Wide BMD program will provide an exo-atmospheric naval regional defense capability to counter the TBM threat. In accordance with the BMD Program Review in early 1996, the Navy Theater Wide program is conducting the following activities: an AEGIS LEAP system level intercept demonstration, Kinetic Warhead (KW) technology assessments and concept definition studies, and system engineering efforts to identify key technical risk reduction activities including discrimination and KW lethality. Since the FY97 President's Budget request, the Department has provided additional funds for FY 98-01 to increase testing and conduct more in-depth risk reduction. Ongoing advanced technology studies provide the anticipated objective system improvements required to meet the evolving threat.

This project is assigned to the Budget Activity and Program Element codes as identified in this descriptive summary in accordance with existing Department of Defense policy.

FY 1996 (\$ in Thousands):

- \$158,970 Continued NTW TBMD planning and studies, and continue Navy Cost and Operational Effectiveness Analysis (COEA) Phase II. Conducted system and design engineering to support the guidance-to-hit (GTH) technical demonstration flights including SM-2/LEAP limited integration. Conducted AEGIS Weapon System (AWS) integration for an NTW interceptor and provide limited AWS integration to support the GTH demonstration flights.
- \$15,972 Provided technical support and historical expertise for NTW program.
- \$17,000 Provided follow-on engineering and analysis to conduct system engineering and risk reduction activities.
- \$5,000 Conducted initial concept exploration analysis under the Joint System Engineering interceptor studies.
- \$3,500 Conducted initial lethality tests for momentum/weight effects.
- \$200,442 Total

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

DATE **February 1997**

BUDGET ACTIVITY

**4 - Demonstration and Validation**

PE NUMBER AND TITLE

**0603868C Navy Theater Wide TMD**

PROJECT  
**1266**

**FY 1997 (\$ in Thousands):**

- \$170,200	Continue Vertical Launch System (VLS) integration of the technical demonstration interceptor. Continue engineering for the NTW regional defense program and continue specific concept investigations and technology demonstrations.
- \$80,100	Conduct kill vehicle technology assessments and shipboard system risk reduction activities.
- \$25,450	Continue NTW TBMD planning and studies, and complete Navy COEA Phase II.
- \$24,000	Continue AEGIS Weapon System integration for an NTW interceptor and provide limited AWS integration to support the GTH demonstration flights.
- \$4,421	Continue follow-on engineering and analysis to support NTW.
- \$304,171	Total

**FY 1998 (\$ in Thousands):**

- \$119,000	Continue planning and system engineering in support of the end game GTH demonstration flights. Continue VLS integration of the technical demonstration interceptor.
- \$35,542	Conduct kill vehicle technology assessments and shipboard system risk reduction activities.
- \$19,528	Continue NTW TBMD planning and studies.
- \$19,377	Continue AEGIS Weapon System integration for an NTW interceptor and provide limited AWS integration to support the end game demonstration flights.
- \$1,451	Continue follow-on engineering and analysis to support NTW.
- \$194,898	Total

**FY 1999 (\$ in Thousands):**

- \$113,000	Continue planning and system engineering in support of the end game GTH demonstration flights. Continue VLS integration of the technical demonstration interceptor.
- \$41,375	Conduct kill vehicle technology assessments and shipboard system risk reduction activities.
- \$19,747	Continue NTW TBMD planning and studies.
- \$17,951	Continue AEGIS Weapon System integration for an NTW interceptor and provide limited AWS integration to support the end game GTH demonstration flights.
- \$192,073	Total

**Acquisition Strategy:** The Navy acquisition strategy is to leverage the AEGIS ship anti-air warfare capability development by integrating TBMD capability through the Standard Missile prime contractor.

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

DATE February 1997 PROJECT 1266

PE NUMBER AND TITLE 0603868C Navy Theater Wide TMD

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

	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	Total Cost
Previous President's Budget	194,565	58,171	96,226	143,295					492,257
Appropriated Value		304,171							
Changes to Appropriated Value:									
a. Restoration of Inflation Reduction	5,877								
Current Budget Submit/President's Budget	200,442	304,171	194,898	192,073					891,584

**Change Summary Explanation:**  
 Funding: FY1997 change due to Congressional addition of \$246M and various adjustments to the program. Changes in FY97 - 99 reflect congressional language and DoD increases to the program.  
 Schedule: The Navy SM-2/AEGIS/LEAP program was delayed 3-6 months in FY96 in order to transition the executing agent from the BMDO to the Navy; Completion of Navy TBMD COEA has been delayed approximately one year following program restructure in January 1996. The joint system engineering team (JSET) study will be completed in the third quarter of FY98 with a briefing to be presented in the fourth quarter FY98.  
 Technical: None

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

	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To
2263, Navy Area TBMD, PE 0603867C	277,565	59,315	0	0	0	0	0	0	Compl
2263, Navy Area TBMD, PE 0604867C	0	241,330	267,822	226,748	222,145	158,271	52,433	38,089	TBD
Standard Missile WPN 1507, BA2	16,276	9,151	*15,500	*44,600	*130,000	*161,000	*236,000	*225,000	Cont
* Funds transferred to U. S. Navy									*Cont

**D. Schedule Profile**

	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 1999
Transition to Navy as Executing Agent									
Control Test Vehicle 1									
Complete Navy TBMD COEA									
Third Stage Rocket Motor Test									
Control Test Vehicle 2									
Kinetic Warhead Hover Test									

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

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PE NUMBER AND TITLE

4 - Demonstration and Validation 0603868C Navy Theater Wide TMD

PROJECT 1266

	FY 1996				FY 1997				FY 1998			FY 1999				
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Complete Joint System Engineering Study																
Control Test Vehicle 3																
Control Test Vehicle 4														X		
First Flight Intercept Demo 1 (Guidance Test Vehicle) - 2Q/FY2000																X

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

PROJECT 1266

PE NUMBER AND TITLE 0603868C Navy Theater Wide TMD

BUDGET ACTIVITY

4 - Demonstration and Validation

A. Project Cost Breakdown (\$ in Thousands)

	FY 1996	FY 1997	FY 1998	FY 1999
a. System Engineering	27,099	65,675	37,621	34,727
b. Program Management	3,818	6,250	5,818	5,818
c. Program Support	4,386	5,825	5,386	5,386
d. Ship System Mods	290	8,450	3,875	3,875
e. Design & Analysis	68,701	75,325	45,117	43,117
f. Hardware Fab & Procurement	51,340	96,675	58,430	60,499
g. Test & Evaluation	5,806	9,900	7,806	7,806
h. Test Equipment	544	4,600	3,300	3,300
i. Engineering Support	3,975	7,500	6,975	6,975
j. Travel	300	300	300	300
k. Software Development	13,795	19,250	18,795	18,795
l. Other/Misc/BMDO	20,388	4,421	1,475	1,475
Total	200,442	304,171	194,898	192,073

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 1996	Budget FY 1996	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
						FY 1996	FY 1997	FY 1998	FY 1999		
Product Development Organizations											
Standard Missile Company	CPAF				53,131	84,970	173,750	89,754	89,823	TBD	491,428
Lockheed Martin	CPAF				12,637	16,800	30,575	16,800	16,800	TBD	93,612
NSWC Dalgren	WR				6,109	20,239	30,100	11,777	10,034	TBD	78,259

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BUDGET ACTIVITY		DATE		PROJECT							
4 - Demonstration and Validation		February 1997		1266							
Contractor or Government Performing Activity		PE NUMBER AND TITLE									
4 - Demonstration and Validation		0603868C Navy Theater Wide TMD									
Contractor or Government Performing Activity	Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity	Project Office	Total Prior to FY 1996	Budget FY 1996	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
JHU/APL	RCP		EAC	EAC	3,295	9,673	18,650	7,807	6,656	TBD	46,081
Holloman AFB	MIPR		EAC	EAC	8,794	720	1,350	720	720	TBD	12,304
SSI	CPFF		EAC	EAC	1,576	952	1,500	952	952	TBD	5,932
United Defense	PD		EAC	EAC	0	2,675	4,100	2,675	2,675	TBD	12,125
Rockwell	CPAF		EAC	EAC	0	942	1,450	942	942	TBD	4,276
Arnold Eng	CPFF		EAC	EAC	0	300	400	300	300	TBD	1,300
ARC	CPFF		EAC	EAC	0	435	500	435	435	TBD	1,805
TSC	CPFF		EAC	EAC	0	2,150	2,550	2,150	2,150	TBD	9,000
Misc			EAC	EAC	12,640	2,663	3,750	2,663	2,663	TBD	24,379
BMDO			EAC	EAC	47,990	37,972	4,421	37,972	37,972	TBD	166,327
<b>Support and Management Organizations</b>											
NSWC Dalgren	WR		EAC	EAC	0	2,000	3,100	2,000	2,000	TBD	9,100
NSWC Port	WR		EAC	EAC	0	815	1,250	815	815	TBD	3,695
Hueneke	WR		EAC	EAC	0	1,400	1,675	1,400	1,400	TBD	5,875
NAWC China Lake	WR		EAC	EAC	0	2,370	2,600	2,370	2,370	TBD	9,710
NSWC Indian Head	RCP		EAC	EAC	0	2,370	2,600	2,370	2,370	TBD	9,710
VITRO	CPFF		EAC	EAC	2,132	445	550	445	445	TBD	4,017
SPA	CPFF		EAC	EAC	0	500	1,000	500	500	TBD	2,500
JHU/APL	CPFF		EAC	EAC	0	4,153	5,500	4,153	4,153	TBD	17,959
Misc			EAC	EAC	2,589	1,496	1,900	1,496	1,496	TBD	8,977
<b>Test and Evaluation Organizations</b>											
NSWC Dalgren	WR		EAC	EAC	0	3,800	4,600	3,800	3,800	TBD	16,000
JHU/APL	CPFF		EAC	EAC	0	400	1,500	400	400	TBD	2,700
SSDC Army	MIPR		EAC	EAC	0	1,276	4,600	1,276	1,276	TBD	8,428
WSMR	WR		EAC	EAC	1,198	50	1,500	50	50	TBD	2,848

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)		DATE	February 1997
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT	
4 - Demonstration and Validation	0603868C Navy Theater Wide TMD	1,246	1266
Misc	3,909	1,246	1BD 8,947
<b>B. Budget Acquisition History and Planning Information Continued (\$ in Thousands)</b>			
<b>Government Furnished Property:</b>			
Contract Method/Type or Funding Vehicle	Award or Obligation Date	Delivery Date	Total Prior to FY 1996
			FY 1996
			Budget FY 1996
			Budget FY 1997
			Budget FY 1998
			Budget FY 1999
			Budget to Complete
			Total Program
<b>Product Development Property</b>			
<b>Support and Management Property</b>			
<b>Test and Evaluation Property</b>			
Subtotal Product Development	146,172	180,491	273,096
Subtotal Support and Management	4,721	13,179	17,575
Subtotal Test and Evaluation	5,107	6,772	13,500
Total Project	156,000	200,442	304,171
			174,947
			172,122
			13,179
			6,772
			194,898
			192,073
			946,828
			61,833
			38,923
			1,047,584



**Medium Extended Air Defense System  
(MEADS) (Dem / Val)  
(Corps SAM)  
PE 0603869C**

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

DATE

February 1997

BUDGET ACTIVITY

## 4 - Demonstration and Validation

PE NUMBER AND TITLE

0603869C CORPS SAM/Medium Extended Air  
Defense System - TMD

PROJECT

1262

COST (\$ In Thousands)	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	Cost to Complete	Total Cost
	Actual	Estimate	Estimate	Estimate	Estimate	Estimate	Estimate	Estimate		
1262 CORPS SAM/MEADS Concepts	20,123	56,232	47,956	9,509	0	0	0	0	TBD	TBD

**A. Mission Description and Budget Item Justification**

The CORPS SAM/Medium Extended Air Defense System (MEADS) is an advanced air and missile defense system. CORPS SAM/MEADS is designed to fill a critical void providing highly mobile defense of maneuver forces from ballistic and cruise missiles and unmanned aerial vehicles (UAVs). In May 1996 the Memorandum of Understanding (MOU) among the U.S., Germany, and Italy was signed. Subsequently, in June 1996, the Charter for the North Atlantic Treaty Organization (NATO) MEADS Design and Development, Production, and Logistics Management Organization (NAMEADSMO) was approved. In accordance with these directives, the NATO MEADS Management Agency (NAMEAD SMA) is responsible for the accomplishment of the Project Definition-Validation Phase (PD-V). The objective of the PD-V Phase is 1) to define and validate through engineering analyses, simulations and demonstrations a MEADS which is compliant with the commonly agreed requirements of the Participants while taking maximum advantage of the technology existing in the countries of the Participants and 2) to define a balanced cooperative Program to develop, produce in single source and support MEADS which has acceptable technical and financial risks for the Participants. The CORPS SAM/MEADS National Product Office has also been established and will be responsible for planning, budgeting, and coordinating all U.S. national efforts in support of the MEADS program as well as executing national specific tasks related to satisfying the CORPS SAM requirements.

The CORPS SAM/MEADS mission and consequently its design is a function of the assets that CORPS SAM/MEADS must protect, the threat against these assets, and the depth and nature of the battlefield. CORPS SAM/MEADS will be designed to deal with shorter range Tactical Ballistic Missiles (TBMs), cruise missiles, UAVs, and other air breathing threats. It will be required to protect critical maneuver force assets throughout all phases of tactical operations and it will be operating in the division area of the battlefield outside the umbrella of an upper tier system. CORPS SAM/MEADS will be designed to provide: 1) defense against multiple and simultaneous attacks by Short Range Ballistic Missiles (SRBMs), low cross-section cruise missiles, and other air-breathing threats to the force; 2) immediate deployment for early entry operations with as few as six C-141 sorties; 3) mobility to move rapidly and protect maneuver force assets during offensive operations; 4) a distributed architecture and modular components to increase survivability and flexibility of employment in a number of operational configurations; 5) a significant increase in firepower while greatly reducing manpower and logistics requirements. Given these characteristics, CORPS SAM/MEADS will be able to rapidly respond to a variety of crisis situations and satisfy the needs of the joint operational and tactical commanders.

**FY 1996 (\$ in Thousands):**

- \$9,605	Conducted International Teaming.
- \$5,600	Awarded prime contracts to initiate PD-V Phase.
- \$400	Support contracts to provide technical analysis and tools in specialty areas (e.g. lethality, BM/C4I, system simulations, FAAD/CORPS SAM/MEADS integration)

Project 1262

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Exhibit R-2 (PE 0603869C)

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

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BUDGET ACTIVITY

**4 - Demonstration and Validation**

PE NUMBER AND TITLE

**0603869C CORPS SAM/Medium Extended Air Defense System - TMD**

PROJECT  
1262

- \$1,530 Overall management/support to execute the cooperative program in accordance with the NATO Charter and MOU for PD-V (includes travel and other administrative expenses).

- \$2,988 CORPS SAM/MEADS National Product Office management/support (including contracts) to conduct assigned tasks in support of and directly related to both national and MEADS international efforts (e.g. user coordination, national oversight and review activities, technology transfer, and technology assessment efforts; threat/scenario, modeling/simulation, cost estimating, Cost and Operational Effectiveness Analysis (COEA), etc.). Includes all U.S. personnel salaries and benefits.

- \$20,123 Total

**FY 1997 (\$ in Thousands):**

- \$45,070 Prime contracts for PD- V Phase.

- \$4,920 Support contracts to provide technical analysis and tools in specialty areas (e.g. lethality, BM/C4I, system simulations, FAAD/CORPS SAM/MEADS integration) and support in conducting independent evaluations of contractor trades and analysis.

- \$1,378 Overall management and administrative support to execute the cooperative program in accordance with the NATO Charter and MOU for PD-V (includes travel and other administrative expenses).

- \$4,864 CORPS SAM/MEADS National Product Office management/support (including contracts) to conduct assigned tasks in support of and directly related to both national and MEADS international efforts (e.g. user coordination, national oversight and review activities, technology transfer, and technology assessment efforts; threat/scenario, modeling/simulation, cost estimating, COEA, etc.). Includes all U.S. personnel salaries and benefits.

- \$56,232 Total

**FY 1998 (\$ in Thousands):**

- \$36,660 Prime contracts for PD- V Phase.

- \$6,380 Support contracts to provide technical analysis and tools in specialty areas (e.g. lethality, BM/C4I, system simulations, FAAD/CORPS SAM/MEADS integration), support in conducting independent evaluations of contractor trades and analysis, and provide additional technical analysis of contractor competitive proposals for design and development (D&D).

- \$1,392 Overall management and administrative support to execute the cooperative program in accordance with the NATO Charter and MOU for PD-V (includes travel and other administrative expenses).

- \$3,524 CORPS SAM/MEADS National Product Office management/support (including contracts) to conduct assigned tasks in support of and directly related to both national and MEADS international efforts (e.g. user coordination, national oversight and review activities, technology transfer, and technology assessment efforts; threat/scenario, modeling/simulation, cost estimating, COEA, etc.). Includes all U.S. personnel salaries and benefits.

- \$47,956 Total

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

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BUDGET ACTIVITY

## 4 - Demonstration and Validation

PE NUMBER AND TITLE

0603869C CORPS SAM/Medium Extended Air  
Defense System - TMD

PROJECT

1262

## FY 1999 (\$ in Thousands):

-	\$8,670	Prime contractors complete PD-V Phase.
-	\$300	Support contracts to provide technical analysis and tools in specialty areas (e.g. lethality, BMC4I, system simulations, FAAD/CORPS SAM/MEADS integration), support in conducting independent evaluations of contractor trades and analysis, and provide additional technical analysis of contractors competitive proposals for D&D.
-	\$200	Overall management and administrative support to execute the cooperative program in accordance with the NATO Charter and MOU for PD-V (includes travel and other administrative expenses).
-	\$339	CORPS SAM/MEADS National Product Office management/support (including contracts) to conduct assigned tasks in support of and directly related to both national and MEADS international efforts (e.g. user coordination, national oversight and review activities, technology transfer, and technology assessment efforts; threat/scenario, modeling/simulation, cost estimating, COEA, etc.). Includes all U.S. personnel salaries and benefits.
-	\$9,509	Total

Acquisition Strategy

At this time MEADS is accepted as the acquisition strategy to meet the Army CORPS SAM requirement. The acquisition strategy was developed based on having two competitive transatlantic industrial teams conduct the PD-V phase in which technology among the nations would be leveraged to define the most cost-effective solution to meet the requirements. In Oct 95, following a formal U.S. source selection process, the U.S. Army announced the selection of Lockheed-Martin Integrated Systems, Inc. and H&R Company (joint venture between Hughes Aircraft and Raytheon Company) as U.S. industrial participants. Following a random selection process, each team was paired with a European team with the goal of creating two equal transatlantic industrial entities. Both European teams consist of the following firms: Alenia, DASA, and Siemens. Contracts to conduct a four month international industrial teaming phase were awarded on 1 May 96. Following the teaming phase, the international teams were awarded two contracts on 4 Oct 96 to execute PD-V. During PD-V the contractors will be required to define/develop a total system concept based upon the International Technical Requirements Document; conduct requirements analysis/flowdown; establish baseline system concept; conduct concurrent engineering design trades; perform simulations/modeling; provide life cycle cost estimates; and establish integrated program plans to include a risk assessment/abatement plan. The effort will also include demonstration of critical functions associated with integrated system performance and resolution of key technical issues for the proposed system design concept through use of end-to-end digital simulation. Also, during the PD-V phase the two international entities will compete for selection as the sole contractor to conduct the Design and Development and Production phases. The CORPS SAM/MEADS National Product Office is pursuing integration of CORPS SAM BM/C4I with the Project Manager, Air Defense Command and Control Systems (ADCCS), to take advantage of previous Army developments that can be incorporated into the MEADS program.

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

DATE February 1997

BUDGET ACTIVITY

4 - Demonstration and Validation

PE NUMBER AND TITLE

0603869C CORPS SAM/Medium Extended Air Defense System - TMD

PROJECT 1262

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

	FY 1996	FY 1997	FY 1998	FY 1999	Total Cost
Previous President's Budget Appropriated Value	19,675	56,232	48,113	9,553	133,573
Adjustment to Appropriated Value:		56,232			
a. MEADS below threshold reprogramming		26,232			
Current Budget Submit/President's Budget	20,123	56,232	47,956	9,509	133,820

**Change Summary Explanation:**

Funding: Background: This project was funded under PE 0603216C project 2212 prior to FY 95, PE 0603869C project 2262 in FY 95, and PE 0603869C project 1262 in FY 96 and beyond.

Funding: FY 1996 (-319): Undistributed Defense-Wide Reduction.  
 FY 1998 (-157): Undistributed Defense-Wide Reduction.  
 FY 1999 (-44): Undistributed Defense-Wide Reduction.

Schedule: None  
 Technical: None

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

FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To Compl	Total Cost

N/A

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

DATE February 1997

BUDGET ACTIVITY

PE NUMBER AND TITLE

4 - Demonstration and Validation

0603869C CORPS SAM/Medium Extended Air Defense System - TMD

PROJECT 1262

D. Schedule Profile

	FY 1996		FY 1997		FY 1998		FY 1999	
	1	2	3	4	1	2	3	4
Engineering Milestone: System Requirements Review								
System Design Review				X				
Contract Milestone: Int'l Teaming Contract Award		*						
PD-V Contract Award								
Release RFP for Design and Dev Complete PD-V				*				
Other Program Events: Rqmts Harmonization w/GE/IT	*							
Sign MOU								
Establish NATO Agency								
Conduct SC Review1								
Conduct SC Review2								
Conduct SC Review3								

Engineering Milestone:  
System Requirements Review

System Design Review

Contract Milestone:  
Int'l Teaming Contract Award  
PD-V Contract Award  
Release RFP for Design and Dev  
Complete PD-V

Other Program Events:  
Rqmts Harmonization w/GE/IT  
Sign MOU  
Establish NATO Agency  
Conduct SC Review1  
Conduct SC Review2  
Conduct SC Review3



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

DATE

February 1997

BUDGET ACTIVITY

PE NUMBER AND TITLE

PROJECT

**4 - Demonstration and Validation**

**0603869C CORPS SAM/Medium Extended Air**

**1262**

**Defense System - TMD**

**Government Furnished Property:**

Item Description	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Delivery Date	Total Prior to FY 1996	Budget	Budget	Budget	Budget	Total Program
					FY 1996	FY 1997	FY 1998	FY 1999	
Product Development Property TBD					15,205	45,070	36,660	8,670	105,605
Support and Management Property TBD					4,918	11,162	11,296	839	28,215
Subtotal Product Development									
Subtotal Support and Management									
Subtotal Test and Evaluation									
<b>Total Project</b>					<b>20,123</b>	<b>56,232</b>	<b>47,956</b>	<b>9,509</b>	<b>133,820</b>



# **Boost Phase Interceptor**

## **PE 0603870 C**

BUDGET ACTIVITY		RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)										DATE	PROJECT
4 - Demonstration and Validation		PE NUMBER AND TITLE										February 1997	1294
		0603870C Boost Phase Intercept Theater Missile Defense Concept Development											
	COST (\$ in Thousands)	FY 1996 Actual	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost		
1294	UAV Boost Phase Intercept	0	23,276	12,885	0	0	0	0	0	0	TBD	TBD	TBD
<p><b>A. Mission Description and Budget Item Justification</b></p> <p>The UAV-Based Boost Phase Intercept (BPI) project covers two tasks; Task 1: Israeli Boost Phase Intercept System (IBIS) Risk Mitigation, and Task 2: Cooperative UAV-Based BPI Concepts. Task 1 is a cooperative U.S./Government of Israel (GOI) BPI program which involves further development and refinement (risk mitigation) of the UAV-based BPI concept which destroys tactical ballistic missiles in the boost phase of flight, before engine cutoff, preferably while in enemy territory. This project is based on the use of Unmanned Aerial Vehicles (UAV) armed with on-board interceptors to provide the means of destroying enemy missiles in their boosting phase of flight. Task 1 efforts will be performed in Israel and will focus on key elements of the IBIS concept. Task 2 of this cooperative effort will be performed in the U.S. and will support and expand key elements of the IBIS concept. It will include developing the UAV-based BPI system requirements for scenarios of operation and employment in support of U.S. expeditionary forces. The requirements will address kinetic energy interceptors, UAVs, search and track sensors, Battle Management, Command, Control, Communications, Computers and Intelligence (BMC4I), and the concept of operations (CONOPS) based on readily available U.S. technologies.</p> <p>Along with attack operations, the BPI concept is a means of destroying hostile ballistic missiles in enemy territory. UAVs armed with interceptors show significant near term promise. Previous cooperative investigations of the UAV-based BPI concept and a recent Air Force Airborne Laser (ABL) Analysis of Alternatives (AoA) study concluded that such a BPI system could be very cost effective and complementary to terminal missile defense systems.</p> <p><b>FY 1996 (\$ in Thousands):</b></p> <ul style="list-style-type: none"> <li>- \$0 Covered under PE0603872C.</li> <li>- \$0 Total</li> </ul> <p><b>FY 1997 (\$ in Thousands):</b></p> <ul style="list-style-type: none"> <li>- \$16,000 Initiate risk mitigation activities with the GOI. Emphasize development of key lightweight interceptor seeker and control system technologies, search and track algorithms, fire control algorithms, and simulation of BMC4I technologies.</li> <li>- \$2,000 Validate UAV-based BPI system performance parameters through simulations and wargaming.</li> <li>- \$5,276 Analyze technical issues including survivability, interceptor effectiveness, and lethality.</li> <li>- \$23,276 Total</li> </ul>													

<b>RDT&amp;E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)</b>		DATE	February 1997
BUDGET ACTIVITY	PE NUMBER AND TITLE		PROJECT
<b>4 - Demonstration and Validation</b>	<b>0603870C Boost Phase Intercept Theater Missile Defense Concept Development</b>		<b>1294</b>
<b>FY 1998 (\$ in Thousands):</b>			
-	\$4,000	Demonstrate a prototype search, launch detection, tracking and discrimination capability.	
-	\$3,885	Demonstrate, via simulation, key UAV performance and command and control parameters. Further refine interceptor design.	
-	\$5,000	Develop a proof-of-concept demonstration plan.	
-	\$12,885	Total	
<b>FY 1999 (\$ in Thousands):</b>			
-	\$0	Project continuation decision expected in Fiscal Year 1998.	
-	\$0	Total	
<p><b>Acquisition Strategy:</b> This program is a "hedge" for the ABL program. Conduct cooperative activities in the U.S. and Israel to mitigate risk of developing UAV-based BPI systems. The GOI will take the lead on risk mitigation of the interceptor while the U.S. will lead for the Infrared Search and Track (IRST) sensor activities in other system elements, such as BMC4I and system integration will be shared. The US and GOI will share costs. Task 1 is being done under a firm fixed price contract with Israeli industry. Task 2 is being accomplished by BMDO Tri-Service Integrated Product Teams (IPT) with additional support provided by industry.</p>			
<b>B. Program Change Summary (\$ in Thousands)</b>			
Previous President's Budget	FY 1996	FY 1997	FY 1998
Appropriated Value	0	0	0
Adjustments to Appropriated Value:		24,300	
a. MEADS below threshold reprogramming		-999	
b. General Reductions (FFRDC, Inflation etc.)		-25	
Current Budget Submit/President's Budget	0	23,276	12,885
			0
			36,161
<b>Change Summary Explanation:</b>			
Funding: Project funding, structure, and objective directed by Congress.			
Schedule: None			
Technical: None			
Total Cost 28,438			

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

DATE February 1997

BUDGET ACTIVITY PE NUMBER AND TITLE PROJECT

4 - Demonstration and Validation 0603870C Boost Phase Intercept Theater Missile Defense Concept Development 1294

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

	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To Compl	Total Cost
1294 UAV BPI, PE0603872C	5,705	930							TBD	TBD

**D. Schedule Profile**

	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 1999	FY 2002	FY 2003	FY 1999	FY 2002	FY 2003	Total
1	2	3	4	1	2	3	4	1	2	3	4	2	3	4	4

Complete IBIS Follow-On Report  
 Preliminary US UAV BPI Requirements  
 Contract Milestone (Israeli) Risk  
 Mitigation  
 IBIS Risk Mitigation Final Report

X X

X

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

DATE February 1997

PROJECT

1294

PE NUMBER AND TITLE

**0603870C Boost Phase Intercept Theater Missile  
Defense Concept Development**

BUDGET ACTIVITY

**4 - Demonstration and Validation**

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

	FY 1996	FY 1997	FY 1998	FY 1999
Task 1 - IBIS Risk Mitigation	See PE0603872C	17,976	7,615	0
Task 2 - Cooperative UAV-based BPI Concepts	See PE0603872C	5,300	5,270	0
Total		23,276	12,885	

**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 1996	Budget				Total Program	
						FY 1996	FY 1997	FY 1998	FY 1999		
<b>Product Development Organizations</b>											
Israeli MOD	FFP	Jun 97	FY97/98	FY97/98	7,527	0	17,976	7,615	0	TBD	33,118
SMC	MIPR	FY96	0	0	N/A	1,350	0	0	0	TBD	1,350
Navy PEO TAD	MIPR	FY97	300	300	N/A	2,025	800	720	0	TBD	3,545
NAWC-CL	MIPR	FY97	2,750	2,750	N/A	466	2,750	3,050	0	TBD	6,266
DARPA	MIPR	FY96	0	0	N/A	650	0	0	0	TBD	650
<b>Support and Management Organizations</b>											
WJ Schaefer Assoc	CPFF	FY97	0	0	N/A	1,171	1,250	1,000	0	TBD	3,421
SSDC	MIPR	FY96	0	0	N/A	25	0	0	0	TBD	25
SMC	MIPR	FY97	250	250	N/A	0	250	250	0	0	500
Navy PEO TAD	MIPR	FY97	250	250	N/A	0	250	250	0	0	500
<b>Test and Evaluation Organizations</b>											
None											

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

DATE February 1997

BUDGET ACTIVITY

PE NUMBER AND TITLE

4 - Demonstration and Validation

0603870C Boost Phase Intercept Theater Missile

PROJECT

1294

Defense Concept Development

**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 1996	Budget FY 1996	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Product Development Property										
Support and Management Property										
BMDO	PR	FY96		18						18
Test and Evaluation Property										
Subtotal Product Development				7,527	4,491	21,526	11,385			44,929
Subtotal Support and Management					1,214	1,750	1,500			4,464
Subtotal Test and Evaluation										
<b>Total Project</b>				<b>7,527</b>	<b>5,705</b>	<b>23,276</b>	<b>12,885</b>			<b>49,393</b>



# **National Missile Defense (NMD) (Dem / Val)**

## **PE 0603871C**

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE								
BUDGET ACTIVITY		PROJECT								
4 - Demonstration and Validation		2400								
PE NUMBER AND TITLE		DATE								
0603871C National Missile Defense		February 1997								
COST (\$ In Thousands)	FY 1996 Actual	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
2400 National Missile Defense	730,656	828,864	504,091	393,085	309,748	309,584	391,858	392,433	Continuing	Continuing

**A. Mission Description and Budget Item Justification**

The objective of the National Missile Defense (NMD) program is to develop and maintain the option to deploy a cost effective, operationally effective, and Anti-Ballistic Missile (ABM) Treaty compliant system that will protect the United States against limited ballistic missile threats, including accidental or unauthorized launches or Third World threats. In mid 1993, the Department of Defense (DoD) conducted a Bottom-Up Review (BUR) to select the strategy, force structure, and modernization programs for America's defense in the post-Cold War era. With the dissolution of the Soviet Union, the threat to the U.S. homeland from a deliberate or accidental ballistic missile attack by states of the former Soviet Union (FSU) or the Peoples Republic of China (PRC) was judged to be highly unlikely. In addition, the ability of Third World countries to acquire or develop a long range ballistic missile capability in the near future was considered uncertain. As a prudent approach for responding to this uncertain threat, the Department pursued a technology readiness strategy for National Missile Defense (NMD) to develop and maintain the ability to deploy ballistic missile defenses for the United States should a threat emerge.

In February 1996, the Department completed a comprehensive Ballistic Missile Defense Program Review that addressed changes that have occurred in the ballistic missile defense environment since the 1993 BUR. For the NMD program, the findings of this review resulted in an adjustment to the goal of the NMD program and a corresponding adjustment to the Future Years Defense Program which now includes additional resources in FY96-FY98 for NMD. The revised goal of the NMD program is to develop, within three years, elements of an initial NMD system that could be deployed within three additional years after a deployment decision. This approach is commonly referred to as the NMD "3+3" program. The path towards accomplishing this goal includes: providing a near-term focus to reduce program risk; providing a hedge against the potential of more sophisticated emerging threats; and conducting an integrated NMD system test not later than FY99. All development efforts will be broadly based to preserve deployment option flexibility for a future decision on deployment of an ABM treaty compliant NMD system.

To achieve this goal, BMDO has initiated an NMD Deployment Readiness Program. In April 1996 the USD(A&T) initiated steps to designate NMD as an Acquisition Category (ACAT) 1D program and in July 1996 the program successfully completed its first Overarching Integrated Product Team (OIPT) review. The intent of the NMD Deployment Readiness Program is to position the U.S. to respond to a strategic missile threat as it emerges by shifting emphasis from technology readiness to deployment readiness. This approach focuses on demonstrating an NMD system level capability by FY99, and being able to deploy that capability within an additional three years, if required to do so by the threat. If no threat materializes at the end of the three year development period, evolutionary development will continue on a path towards an objective system capability and the program will continue to maintain the ability to deploy within three years after a decision is made to do so. With this approach, no commitment to deploy is made until the threat emerges.

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

DATE February 1997

BUDGET ACTIVITY

PE NUMBER AND TITLE

4 - Demonstration and Validation

0603871C National Missile Defense

PROJECT

2400

The NMD system is composed of several elements which are required to perform the key functions involved in a ballistic missile defense engagement. The Ground Based Radar (GBR) and the Space Based Infrared System (SBIRS) Low component (previously known as the Space and Missile Tracking System) provide the dual sensor phenomenology required to address the full spectrum of potential threats. In addition, Upgraded Early Warning Radars (UEWR) are candidate sensors in the event of an early NMD deployment within three years of the FY99 NMD integrated system test. SBIRS, which will provide midcourse tracking of targets, is currently managed and funded by the Air Force. The Ground Based Interceptor (GBI) is the weapon element that engages and destroys the threat. The Battle Management/Command, Control, and Communications (BM/C3) element provides engagement planning and human-in-control management of the engagement.

Concurrent with the development of these elements, technology development efforts focused on achieving an early NMD capability and providing a path to future enhanced capabilities are being prioritized and funded to the extent possible. In addition, several related activities are being performed in support of the development of the NMD system. System Engineering develops the NMD system-level performance and integration requirements and flows these requirements down to the individual elements. NMD Integration activities integrate the individual elements into a unified and coordinated NMD system. Deployment Planning activities focus on the planning required to field the NMD system. Test and Evaluation activities provide management of the NMD T&E program. And Program Support provides overall program management and analysis support. All NMD activity areas are described in more detail below.

GBR is the primary fire control sensor, providing surveillance, acquisition, tracking, discrimination, fire control support and kill assessment for the NMD system. Prior to commitment of interceptors, the radar performs surveillance autonomously or as cued by SBIRS Low or other sensors, and will acquire, track, classify/identify and estimate trajectory parameters for targets. In post-commit, the radar will discriminate and track the target(s), and provide via the In-Flight Interceptor Communications System (IFICS) an In-Flight Target Update (IFTU) and a Target Object Map (TOM) to the interceptor(s). The GBR is an incremental development program derived from the former NMD-GBR program and will leverage the Theater Missile Defense GBR program to resolve the critical radar issues applicable to NMD. A GBR prototype, designated as GBR-P, will be installed at USAKA in FY98 and will be available as part of the FY99 NMD integrated system test (IFT-5).

UPGRADED EARLY WARNING RADARS incorporate the software upgrades and modest hardware changes required by the existing Early Warning Radars to support the NMD mission. The UEWRs will detect, track and count the individual objects in a ballistic missile attack early in their trajectory. The UEWR data can be used for interceptor commit and GBR cueing in the event of an early deployment. Depending on the anticipated threat (East Coast or West Coast) at the time of a defense deployment decision, the appropriate BMEWS and/or PAVE PAWS radars will be upgraded for inclusion in the NMD architecture. If needed, other existing forward based radars (such as Cobra Dane or HAVE STARE) could also be used to support NMD.

The GROUND BASED INTERCEPTOR is using an evolutionary acquisition strategy to develop and demonstrate the NMD interceptor capability, with an emphasis on accomplishing the NMD integrated system test in FY99. The initial focus of GBI development is the exo-atmospheric kill vehicle (EKV) which is the most critical and technically challenging part of the GBI. Development of an EKV booster and the associated launch control equipment will begin in FY98. Until booster development is complete, EKV flight tests will be flown on the Payload Launch Vehicle (PLV), which is a booster consisting of a Minuteman II second and third stage. EKV sensor flight tests are scheduled for FY97 and EKV interceptor flight tests are scheduled for FY98 and FY99. The two current EKV contractors will be downselected to one in FY98.

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

DATE

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BUDGET ACTIVITY

## 4 - Demonstration and Validation

PE NUMBER AND TITLE

0603871C National Missile Defense

PROJECT

2400

The **BATTLE MANAGEMENT, COMMAND, CONTROL AND COMMUNICATIONS** activity uses an evolutionary approach to incrementally prototype the BM/C3 functionality required for the NMD mission, and integrate and demonstrate an NMD system in step with evolving NMD sensors and interceptor element capabilities. BM/C3 prototypes will be integrated and demonstrated at the Joint National Test Facility (JNTF) with USSPACECOM/NORAD user participation to refine and focus the BM/C3 development and system behavior. NMD BM/C3 supports the NMD command and control process required to provide human-in-control; develop, assess, and select missile defense strategies and tactics; fuse and correlate available sensor information for discrimination; integrate and plan the complimentary coordination of NMD sensors and interceptors for maximum system performance and kill assessment; provide interface with existing and planned C3 systems; prototype an In-flight Interceptor Communications System (IFICS) for BM/C3-GBI communication.

**SYSTEM ENGINEERING** translates user requirements into NMD system-level performance and integration requirements and flows them down to the individual program elements. This results in a balanced system capability, and readiness through incremental element development on a path to an objective system deployment capability. Throughout this process, systems engineering interacts with and ultimately defines the architecture required to meet and defeat whatever the prescribed threat may be. System engineering is an integral part of the components performance verification, test planning and analysis, deployment planning, user concept of operations (CONOPS) development and evaluation, and command and control (C2) simulation analysis activities. This effort includes interaction with the user with respect to operational requirements, CONOPS, integration of multi-sensor systems, and operational evaluation of R&D activities in support of command and control (C2) simulations. Analyses, simulations, and tests are performed to address the system effectiveness and concept of operations of proposed NMD system architectures against near- and far-term ballistic missile threats. These results support activities required for strategic C2 simulations where the CINCs identify roles, missions and requirements for an effective NMD system.

**NMD INTEGRATION** activities focus on integrating the individual NMD elements into a cohesive NMD system. The Lead System Integrator (LSI) will have responsibility for integrating the GBI; developing, integrating and demonstrating the NMD system; and developing NMD deployment options. Parallel concept definition study contracts will be awarded in FY97, with downselect and contract award to a single LSI contractor in FY98.

**DEPLOYMENT PLANNING** activities focus on planning and logistics activities which support a decision to deploy, and the deployment of the NMD system if a deployment decision is made. The deployment planning effort will be captured in the NMD Integrated deployment Plan. Deployment planning activities also include the identification of critical actions and timelines for fielding the NMD system, the identification of actions that would mitigate the risks to deployment, and initial planning for life cycle logistics support. Other efforts include environmental analyses and documentation, site activation planning, human systems integration, site analyses, industrial base assessments and operational suitability assessments.

**TEST AND EVALUATION** activities involve providing the planning and management to support the NMD test and evaluation program. Some test infrastructure is provided including the Integrated System Test Capability (ISTC) for NMD HWIL testing and simulation activities, and development and validation of targets for NMD sensor and EKV intercept tests. Planning includes overseeing the development and coordination of documentation essential to the conduct of testing -- the overall test strategy, the Cost Analysis Requirements Document (CARD), detailed test plans, interface control documents, lethality plans, post-test data analysis plans, and simulation validation, verification and accreditation (VV&A). Management activities include development of the NMD Test and Evaluation Master Plan (TEMP), review and analysis of test results, and coordination of test assets.

Project 2400

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Exhibit R-2 (PE 0603871C)

UNCLASSIFIED

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

DATE

February 1997

BUDGET ACTIVITY

**4 - Demonstration and Validation**

PE NUMBER AND TITLE

**0603871C National Missile Defense**

PROJECT

**2400**

SENSOR TECHNOLOGY focuses on the development of advanced technologies in infrared focal planes, cryogenics, radiation hardened electronics and signal processing, and optics hardware for the objective SBIRS Low satellite system. Research and development of components, devices and sub-systems required for the SBIRS Low system will continue, supportive technologies in infrared focal plane testing, cryocooler development and radiation testing of electronics and optics hardware will be pursued.

PROGRAM SUPPORT provides management and analysis support to the NMD programs in areas such as cost/schedule/performance assessments, cost estimating and analysis, budget analysis and formulation, program planning and control, and contract management.

OTHER NMD INITIATIVES addresses the USAF NMD initiative to fully explore the USAF NMD concept, including utilizing test facilities which provide a realistic and representative test scenario. Specific activities remain under review but may include performing sensor track/data fusion, transmitting in-flight target updates and target object maps to an interceptor, acquiring targets with a sensor package, and demonstrating that the launch control system meets or exceeds NMD timeline requirements.

PHENOMENOLOGY provides the U.S. with the capability to generate high confidence target signatures for ballistic missile defenses. This is a critical adjunct to the design and evaluation of NMD system performance across the full spectrum of threats and engagement scenarios. This program provides signature collection sensors for live-fire missions and storage of the resulting test data. This program provides predictive models of target signatures and develops algorithms for the critical functions of discrimination, target handover and aimpoint selection.

ARCHITECTURE ANALYSIS/BMC3 INITIATIVES supports an initiative to ensure that system architecture and BM/C3 are addressed in a coordinated and synergistic manner across all NMD and TMD efforts. Systems analysis work is done to determine the expected operational effectiveness and life cycle cost impacts of the NMD system based on changing threats, mission requirements, acquisition reform initiatives and advances in technology. It includes implementation within BMDO of DoD initiatives in C4ISR architectures, technical architecture and open systems.

THREAT AND COUNTERMEASURES defines potential adversary missile forces which the NMD system could confront. This includes 1) Intelligence threat description in the form of an annual report, the NMD System Threat Assessment (NMDSTA); 2) Threat scenario generation; and 3) Countermeasure integration, which integrates countermeasures (CM) technology into NMD elements.

MODELING AND SIMULATION provides for the development and validation of modeling and simulation (M/S) tools and techniques. This project provides supercomputing resources at the Joint National Test Facility (JNTF) and the Advanced Research Center/Simulation Center (ARC/SC), and the engineering expertise and integration support to operate these facilities.

TEST RESOURCES provides the infrastructure to support the NMD test and evaluation program. Test infrastructure includes common test ranges and instrumentation, and common test beds for NMD HWIL testing and simulation activities. Common ground test facilities include: Kinetic Kill Vehicle Hardware-in-

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

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## PROJECT

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the-Loop Simulator (KHILS) at Eglin AFB, FL; Hypervelocity Wind Tunnel Number 9 at the Naval Surface Warfare Center, White Oak, MD; National Hover Test Facility (NHTF) at Edwards AFB, CA; Kinetic Energy Weapon Digital Emulation Center at Huntsville, AL; Aero optic Evaluation Center (AOEC) at Calspan Corp, Buffalo, NY; Center for Research Support (CERES) at Falcon AFB, CO; Army Missile Optical Range (AMOR) at Huntsville, AL; 7V and 10V chambers at Arnold Engineering Development Center (AEDC) in Tullahoma, TN; Portable Optical Sensor Tester (POST) and Characterization of Low Background Mosiacs (CALM) at Rockwell International in Anaheim, CA; Naval Research and Development (NRA) at the Naval Command, Control and Ocean Surveillance Center in San Diego, CA; and infrared and blackbody standards at the National Institute of Standards and Technology (NIST) in Gaithersburg, MD. Common range facilities include Kwajalein Missile Range (KMR) in the Marshall Islands; Western test Range (WRT) at Vandenberg AFB, CA; and the Pacific Missile Range Facility (PMRF) at Kauai, HI. Common range instrumentation includes special test equipment, data collection assets and range instrumentation upgrades including: High Altitude Observatory (HALO) with the Infrared Imaging System (IRIS) based at Aeromet, Inc. in Tulsa, OK; the Remote Area Safety Aircraft (RASA) based at Point Mugu, CA; the SeaLite Beam Director (SLBD) at White Sands Missile Range, NM; KMR improvements and modernization; and the Kwajalein Mobile Range Safety System (KMRSS).

OPERATIONAL SUPPORT provides personnel and related support costs common to all NMD projects including support to the Office of the Director, Ballistic Missile Defense Organization (BMDO) and his staff located in Washington, DC, as well as BMDO's Executing Agents within the U.S. Army Space and Strategic Defense Command, U.S. Army PEO Missile Defense, U.S. Navy PEO for Theater Defense, U.S. Air Force PEO office and the Joint National Test Facility. This project supports funding for overhead/indirect personnel costs, benefits and infrastructure costs such as rents, utilities and supplies.

This project is assigned to the Budget Activity and Program Element codes as identified in this descriptive summary in accordance with existing Department of Defense policy.

## FY 1996 (\$ in Thousands):

-	\$87,000	GBR: Complete contract modification to incorporate a growable antenna design into the NMD prototype radar. Complete fabrication of transmit/receive modules. Conduct environmental, facility, and site analysis at USAKA; develop facility requirements documentation and Electromagnetic Radiation/Electromagnetic Interference (EMR/EMI) analysis. Award facility construction contract and begin construction at USAKA. Continue development of software Realtime Digital Simulation (RDS) and Hardware In the Loop (HWIL) simulation. Fabricate, integrate and begin near-field verification testing of pilot antenna array. Procure remaining piece parts for the GBR-P antenna. Conduct Preliminary Design Review (PDR).
-	\$8,490	UEWR: Conduct realtime missile tracking experiments using EWR. Define, develop and demonstrate the feasibility and utility of modifying EWR and other existing sensors for NMD mission support. Award UEWR Demonstrator contract.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE	PROJECT
BUDGET ACTIVITY		PE NUMBER AND TITLE	PROJECT
<b>4 - Demonstration and Validation</b>		<b>0603871C National Missile Defense</b>	<b>2400</b>
- \$259,764	GBI: Integrate EKV sensors with PLV boosters and interface the missile with the test range. Acquire long-lead PLV booster hardware for FY98 kill vehicle flight tests and fabricate upper stage. Interface with BM/C3 element for FY98 flight tests. Fabricate EKV seeker, avionics processor, structure, and propulsion subsystems for the competitive FY98 kill vehicle flight test. Conduct software CDR. Integrate hardware and software, and conduct HWIL and simulations on the EKV flight test vehicle. Reactivate U.S. Army Kwajalein Atoll (USAKA) GBI facilities and supporting activities. Resume SHIELD silicon FPA readout electronics and hardening design work. Continue PET HgCdTe FPA development, focusing on reduced size readout electronics. Conduct 20/44 GHz transceiver preliminary brass board demonstration, including ground-to-ground test range demo. Continue development of a lightweight, low cost vectorable nozzle. Execute simulated high altitude booster nozzle static firing.		
- \$72,160	BM/C3: Conduct BM/C3 engineering and integration activities to support BM/C3 Prototype development, BM/C3 communications component prototype development and NMD system integration activities. Develop and demonstrate the BM/C3 Legacy Plus capability. Start development of the first increment of the BM/C3 Prototype. Support NMD tests by providing integrated BM/C3 products as test articles. Use Minuteman III FO&E flights as targets of opportunity for BM/C3 development. Support IGT-2. Develop contract requirements package for the In-Flight Interceptor Communications System (IFICS).		
- \$56,038	System Engineering: Assess and translate user requirements into system requirements documents based on the updated Capstone ORD/CRD and CONOPS. Baseline interface and configuration control requirements in support of the NMD Deployment Readiness Program. Analyze and update contingency deployment options. Provide system level requirements to test execution of ISTC-1 and -2 and IFT-1. Analyze and validate results of IGT-2. Support preparations for IFT-1, IFT-2, and ISTC-1 and -2. Update technical documentation baseline (NMD Capability Assessment, NMM, and NSEN/IDN) and JNTF system simulations based upon test results to date. Conduct NMD System Requirements Review (SRR) to define the NMD Capability 2 (C2) architecture.		
- \$11,475	Deployment Planning: Modify NMD deployment plans based on NMD deployment readiness program developments for early options. Conduct critical path analysis of NMD deployment options and determine pre-deployment timeline reduction activities. Integrate systems operational suitability planning activities into NMD engineering integration and test programs. Support NMD integrated systems tests by providing analytical and planning support. Conduct deployment logistics and sustainment support analysis for the deployment options. Conduct site, facility and environmental tasks to preserve three year deployment timeline.		
- \$70,385	Test and Evaluation: Supported ISTC integration testing and integration of BM/C3 Legacy Plus configuration into the ISTC. Began the production of the NMD TEMP and CARD with the support of the NMD System T&E Program Integrated Product Team (PIPT). Coordinated test range infrastructure and upgrades to support IFT-1 and IFT-2 scheduled for launch from KMR in FY97. Completed integration and launch of MSX targets on STARS/ODES and participated in MSLS demonstration launch. Completed target builds for IFT-1 and IFT-2.		

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE	PROJECT
BUDGET ACTIVITY	PE NUMBER AND TITLE		
4 - Demonstration and Validation	0603871C National Missile Defense	February 1997	2400
- \$87,806	Sensor Technology: Delivered two lots of HgCdTe LWIR FPA hybrids from each contractor for performance testing and verification. Initiated/continued endurance testing on 150K PSC and 35/60K pulse tube and Stirling coolers. Delivered three 60K PSC units for characterization and endurance testing. Initiated advanced optical coating development. Completed fabrication and testing of ultra high performance 12 bit analog-to-digital converter. Completed radiation hardened 1Mbit static random access memory development. Completed board-level demonstration of rad-hard, fault tolerant 32-bit microprocessor and associated support circuits to verify function and performance. Initiated cryocooler thermal bus effort to support thermal integration and heat removal. Launched the MSX satellite and began data collection experiments. Delivered cryocoolers, MWIR filters and IR calibration source for STRV-2 flight experiment.		
- \$20,902	Program Support: Continue to provide management and analysis support to the NMD program in areas such as cost/schedule/performance assessment, cost estimating and analysis, budget analysis and formulation, program planning and control, contract management.		
- \$18,741	Phenomenology: Provided Airborne Surveillance Testbed (AST) core support for MSX Dedicated Targets (MDT-1, MDT-2) and Red Tigris III missions to collect optical data. Populated NMD target database. Developed five discrimination algorithms for GBR-P. Archived and distributed MSX data.		
- \$3,051	Architecture Analysis/BMC3 Initiatives: Evaluated the capability of an evolving NMD architecture, the SMTS sensors under development, RV/decoy discrimination techniques, and the application of advances in TMD component technology to NMD systems. Defined BM/C3 architectural and development process requirements to facilitate the translation of operational requirements to interoperable, affordable, evolvable, and supportable systems. Provided mission area capability to address emerging BM/C3 requirements issues and facilitate their resolution in a synergistic manner.		
- \$7,945	Threat and Countermeasures: Provided NMDSTA and operational threat environment intelligence estimates, continued development of threat system scenario descriptions, upgraded threat modeling capability and digital media threat products. Performed counter-countermeasure parametric studies, supported teams conducting CM concept, design, and flight tests, and began design work on dedicated countermeasures flight experiment.		
- \$16,041	Modeling and Simulation: Provided supercomputing resources and staff capability at the JNTF, continued to plan and conduct wargames, conducted command and control simulations (C2sims), developed and operated the NMDSim tool and BMD Simulation Support Center (SSC). Provided supercomputing resources at the ARC/SC to develop and operate a multiple experiment test bed for ISTC testing, and other modeling and simulation support.		

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE	PROJECT
BUDGET ACTIVITY		PE NUMBER AND TITLE	
<b>4 - Demonstration and Validation</b>		<b>0603871C National Missile Defense</b>	<b>2400</b>
-	\$10,858	Test Resources: Achieved IOC for the 10V space chamber. Provided ground test facility infrastructure and upgrades; digital emulation and analytic support at KDEC, IR seeker HWIL testing at KHILS, wind tunnel testing at Tunnel 9, shock-tunnel testing at AOEC, hover test and NMD safety net integration and flight support capability at NHTF, command/control technology experiments at CERES, sensor testing at POST, CALM, NRaD, and AEDC 7V/10V, phenomenology characterization at AMOR and KHILS, and primary IR standards at the NIST.	
-	\$730,656	Total	
<b>FY 1997 (\$ in Thousands):</b>			
-	\$66,129	GBR: Conduct CDR and baseline the NMD-GBR-P Design. Begin assembly and testing of antenna subarrays. Continue facility construction with a Joint Occupancy Date in 3QFY97. Begin integration and installation of the GBR-P at USAKA. Begin modifications to the TMD-GBR DemVal radar for NMD uses. Deliver RDS and HWILS to support software validation and Integrated Ground Tests (IGTs). Deliver Software Block 1 and 2.	
-	\$12,122	UEWR: Initiate UEWR upgrade development. Recommended EWR upgrade solution will be determined by evaluating the feasibility, effectiveness and cost of hardware and software options for modifying EWRs to support NMD. Targets of opportunity will be supported in coordination with NMD test and evaluation, system engineering and BMC3 efforts. Potential ISTC use of existing EWR HWIL assets will be assessed. Potential use of Forward Based X-Band Radar will be assessed.	
-	\$236,319	GBI: Conduct two EKV sensor flight tests (IFT-1 and IFT-2), complete data analysis, and incorporate any required changes in preparation for the FY98 and FY99 intercept flight tests. Complete fabrication, assembly, and testing of EKV hardware for the FY98 flight test. Continue EKV/PLV booster hardware and software integration, flight qualification, and acceptance testing. Acquire long-lead PLV booster hardware for FY99 EKV flight tests. Update and validate EKV sensor, kill vehicle models and simulations based on seeker flight data. Continue SHIELD program to develop 256X256 silicon FPAs. Complete phase I transceiver package development and transfer effort to EKV prime contractors. Initiate development/fabrication/testing of EKV transceivers and IFICS modem suitable for use in the FY99 NMD integrated system test. Continue PET program to develop HgCdTe FPAs.	
-	\$50,576	BM/C3: Conduct BM/C3 engineering and integration activities to support BM/C3 prototype development, BM/C3 communications component prototype development and NMD system integration activities. Complete development of the first and second increment of the BM/C3 prototype, fully integrated with current increments of other BM/C3 components and with applicable external systems. Start development of BM/C3 prototype third increment. Support NMD tests by providing integrated BM/C3 products as test articles. Support IFT-1, IFT-2, ISTC Integration Tests-1 and -2, and IGT-1A. Deliver IFICS test assembly to support NMD tests.	

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**2400**

**4 - Demonstration and Validation**

- \$42,542 System Engineering: Evaluate and refine user requirements into system requirements documents (SRDs), Element Requirement Documents (ERDs), and Interface Requirement Documents (IRDs) based on updated Capstone ORD/CRD and CONOPS. Refine interface and configuration control requirements. Analyze and update contingency deployment options and continue to provide systems analysis in support of objective contingency deployment. Analyze and validate results of IFT-1, IFT-2, ISTC-1, and ISTC-2. Support preparations for IFT-3, IFT-4 and the NMD integrated system test (IFT-5). Update technical documentation baseline (NMD Capability Assessment, NMM and NSEN/IDN) and JNTF system simulations based upon test results to date.

- \$58,046 NMD Integration: Issue Request for Proposal for system integrator concept definition contracts. Make multiple contract awards and initiate parallel concept definition studies with up to three contractors.

- \$17,139 Deployment Planning: Complete the initial NMD Integrated Deployment Plan and initial Site Activation Plan. Continue preliminary site activation planning. Assess the operational suitability requirements and the compliance of the NMD system and elements. Develop NMD Master Integrated Program Schedule for the development and deployment of the NMD system. Develop environmental compliance plan for the NMD system. Conduct deployment and logistics assessments in support of the NMD PDR.

- \$101,599 Test and Evaluation: Support ISTC Integration Tests 1 and 2, and integration of the following functions into the ISTC: BM/C3 Capability Increment 1 and 2; EKV realtime simulation for both contractors; GBR-P testbed; UEWR and X-band radars. Complete and maintain currency of TEMP, CARD and Test Strategy with the support of the NMD System T&E PIPT. Implement V&V plan for ISTC. Complete program documentation, pre-launch preparations and oversee execution of IFT-1 and IFT-2. Evaluate post-test results. Coordinate test range infrastructure and upgrades to support EKV flight tests from KMR. Coordinate range instrumentation upgrades and provide data collection and analysis for NMD testing. Conduct target launch for two EKV sensor flight tests (IFT-1 and IFT-2).

- \$54,134 Sensor Technology: Initiate advanced optical coating development. Initiate follow-on program for LWIR HgCdTe FPAs and deliver 2 lots of hybrid arrays for testing. Deliver 35/60K PSC for characterization testing. Initiate/continue endurance testing on 150K PSC, 60K PSC, 35/60K PSC, 35K turbo cryocooler and 35/60K pulse tube cryocoolers. Complete prototype rad-hard 4Mbit SRAM. Complete prototype high speed, 14-bit analog-digital converter. Complete prototype rad-hard, fault-tolerant 32 bit processor. Continue non-cryogenic FPA signal processor. Initiate rad-hard visible star tracker effort. Deliver additional 60K PSC cooler. Complete thermal bus effort. Continue the collection and analysis of background and target data from the MSX satellite.

- \$31,100 Program Support: Continue to provide management and analysis support to the NMD program in areas such as cost/schedule/performance assessment, cost estimating and analysis, budget analysis and formulation, program planning and control, contract management.

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BUDGET ACTIVITY		PE NUMBER AND TITLE	
<b>4 - Demonstration and Validation</b>		<b>0603871C National Missile Defense</b>	<b>2400</b>
-	\$52,945	Other NMD Initiatives: The USAF NMD initiative will fully explore the USAF NMD concept, including utilizing test facilities which provide a realistic and representative test scenario. Specific FY97 activities remain under review but may include performing sensor track/data fusion, transmitting in-flight target updates and target object maps to an interceptor, acquiring targets with a sensor package, and demonstrating that the launch control system meets or exceeds NMD timeline requirements.	
-	\$19,587	Phenomenology: Provide AST core support for IFT-1, IFT-2, MDT-3 and MDT-4 missions to collect optical data. Receive, archive and distribute test data. Perform optical and radar data analysis of IFT-1, IFT-2, MDT-3 and MDT-4 for NMD system design and test. Develop and analyze higher order discrimination algorithms. Upgrade modeling of radar and IR target signatures.	
-	\$1,989	Architecture Analysis and BM/C3 Initiatives: Continue systems analysis work on NMD issues. Provide system-level capability to address emerging BM/C3 architectures and requirements in a synergistic manner across all NMD/TMD efforts and facilitate the translation of operational requirements to interoperable, affordable, evolvable, and supportable systems.	
-	\$7,168	Threat and Countermeasures: Provide NMDSTA and operational threat environment intelligence estimates, continue development of threat system scenario descriptions, and upgrade threat modeling capability and digital media threat products. Perform CM concept design and flight tests, continue work on dedicated countermeasures flight experiment.	
-	\$32,803	Modeling and Simulation: Provide infrastructure and core capability funding for the JNTF for hardware, software, and systems engineering, and other capabilities for system support, and supercomputing and wargaming resources. Provide maintenance of the SSC, and M/S support in the five primary areas of standardization, assessments, development/modification, computer architecture/ networks, and program management for M/S programs. Provide supercomputing resources at the ARC/SC and validate simulators. Upgrade all computer capabilities and establish a WAN.	
-	\$11,554	Test Resources: Provide ground test facility infrastructure and upgrades including: HWIL testing at KHILS, wind tunnel testing at Tunnel 9, shock-tunnel testing at AOEC, hover test and NMD safety net integration and flight support capability at NHTF, command/control technology experiments at CERES, lethality tests at AEDC Range C, sensor testing at POST, CALM, NRaD, and 7V/10V phenomenology characterization and target signatures at AMOR and KHILS, and primary IR and black body calibration standards at the NIST. Provide test range infrastructure and upgrades to support EKV testing. Provide range instrumentation, upgrades, data collection and analysis for BMDO testing. Provide data collection and processing.	
-	\$33,112	Operational Support: Continue providing management and support for overhead/indirect fixed costs.	
-	\$828,864	Total	
Project 2400		Exhibit R-2 (PE 0603871C)	

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BUDGET ACTIVITY

PE NUMBER AND TITLE

## 4 - Demonstration and Validation

0603871C National Missile Defense

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2400

## FY 1998 (\$ in Thousands):

- \$19,536 GBR: Conduct CONUS Readiness Review. Complete facility construction with a Beneficial Occupancy Date in 1QFY98. Complete integration and installation of the GBR-P at USAKA. Conduct USAKA Readiness Review. Deliver Software Block 3. Conduct on-line system verification test in 3QFY98.
- \$16,745 UEWR: Continue the conduct of real-time missile tracking experiments using EWR and other applicable existing sensors. Provide UEWR Demonstrator for participation in NMD integrated system tests. Continue system development and program risk definition and risk reduction. Manage UEWR portion of the LSI contract.
- \$127,551 GBI: Conduct one EKV intercept flight experiment (IFT-3). Reduce flight test data and incorporate results into HWIL simulations to prepare for IFT-4. Following EKV downselect, complete the winning contractor's EKV fabrication for IFT-4 and for the NMD integrated system test (IFT-5). Acquire PLV hardware to support FY99 flight testing. Fabricate EKV components for FY00 flight testing. Begin Lead System Integrator booster development. Terminate either the PET or SHIELD FPA development effort, preserving the program which corresponds to the FPA material of the winning EKV contractor.
- \$43,730 BM/C3: Conduct BM/C3 engineering and integration activities to support BM/C3 Prototype development, BM/C3 communications component prototype development and NMD system integration activities. Complete development of the third increment of the BM/C3 Prototype, fully integrated with current increments of other BM/C3 components and with applicable external systems. Start development of the BM/C3 prototype fourth increment. Support NMD tests by providing integrated BM/C3 products as test articles. Support IFT-3, IGT-1A, and ISTC Integration Test-3.
- \$41,941 System Engineering: Assess and refine user requirements based on updated Capstone ORD/CRD and CONOPS against system requirements. Finalize interface and configuration control requirements in support of deployment options. Continue to analyze and update contingency deployment planning. Analyze and validate results of IFT-3. Support preparations for IFT-4, IFT-5 and IGT-2A. Update technical documentation (NMD Capability Assessment, NMM, NSEN/IDN) and JNTF system simulations based on test results to date.
- \$7,085 NMD Integration: Complete parallel system integrator concept definition studies. Downselect to one LSI contractor. Initiate LSI base contract.
- \$16,613 Deployment Planning: Update the NMD Integrated Deployment Plan and the NMD Site Activation Plan to reflect programmatic changes and refinements in the NMD architecture. Support development of the NMD System Training Plan and System Safety Plan. Efforts will continue in the areas of program and deployment schedule integration, critical path analysis and identification of deployment risk mitigation actions. Continue environmental analyses of candidate deployment sites and required documentation.

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Exhibit R-2 (PE 0603871C)

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

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PE NUMBER AND TITLE

**0603871C National Missile Defense**

BUDGET ACTIVITY

**4 - Demonstration and Validation**

- \$83,705 Test and Evaluation: Support ISTC Integration Test 3 and IG1-1A, and integration of the following into the ISTC: BM/C3 Capability Increment 3; GBI HWIL upgrade, and realtime simulations. Maintain currency of TEMP, CARD and Test Strategy with the support of the NMD System T&E PIPT. Complete program documentation, pre-launch preparations and oversee execution of IFT-3. Evaluate post-test results. Complete VV&A of IFT-3 target and implement accreditation plan for ISTC. Complete lethality and live fire testing plan. Coordinate test range infrastructure and upgrades to support EKV flight tests from KMR. Coordinate range instrumentation upgrades and provide data collection and analysis for NMD testing. Conduct target launch for IFT-3.

- \$30,278 Sensor Technology: Deliver initial samples of advanced optical coatings for testing. Initiate/continue endurance testing of the 35/60K, 60K, and 150K coolers. Extend cutoff wavelength of LWIR HgCdTe FPAs from current technology. Initiate optics development in contamination control technology. Continue development, fabrication, and test of advanced, radiation-hardened electronic components and packaging technologies for processors, memory, and analog-digital converters. Continue rad-hard visible star tracker development.

- \$33,465 Program Support: Continue to provide management and analysis support to the NMD program in areas such as cost/schedule/performance assessment, cost estimating and analysis, budget analysis and formulation, program planning and control, contract management.

- \$13,975 Phenomenology: Provide AST core operating costs for IFT-3 and core support to collect optical data to support NMD. Receive, archive and distribute test data. Continue optical and radar data analysis for NMD system design and test. Provide discrimination algorithms and architectures to GBR, SMTS and GBI programs to handle advanced threats and pendants. Validate modeling capabilities in the NMD scenario.

- \$3,008 Architecture Analysis and BM/C3 Initiatives: Continue systems analysis work on NMD issues. Provide system-level capability to address emerging BM/C3 architectures and requirements in a synergistic manner across all NMD/TMD efforts and facilitate the translation of operational requirements to interoperable, affordable, evolvable, and supportable systems.

- \$688 Threat and Countermeasures: Provide NMDSTA and operational threat environment intelligence estimates, continue development of threat system scenario descriptions, and upgrade threat modeling capability and digital media threat products.

- \$22,308 Modeling and Simulations: Provide infrastructure and core capability funding for the JNTF for hardware, software, and systems engineering, and other capabilities for system support, and supercomputing and wargaming resources. Provide supercomputing resources at the ARC/SC, validate simulators, and upgrade all computer capabilities. Provide M/S support in the five primary areas.

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

DATE **February 1997**

BUDGET ACTIVITY

**4 - Demonstration and Validation**

PE NUMBER AND TITLE

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- \$11,244 Test Resources: Provide ground test facility infrastructure and upgrades for BMDO testing including: IR sensor HWIL testing at KHILS, wind tunnel testing at Tunnel 9, shock-tunnel testing at AOEC, hover test capability at NHTF, command/control technology experiments at CERES, lethality tests at AEDC Range G, sensor testing at POST, CALM NRAd, and 7V/10V phenomenon characterization and target signatures at AMOR and KHILS, and primary IR and blackbody calibration standards at the NIST. Provide test range infrastructure and upgrades to support EKV testing. Provide range instrumentation, upgrades, data collection, and analysis for BMDO testing. Provide data collection and processing.

- \$32,219 Operational Support: Continue providing management and support for overhead/indirect fixed costs.

- \$504,091 Total

FY 1999 (\$ in Thousands):

- \$12,141

GBR: Participate in IFT-4 and the NMD integrated system test (IFT-5) with GBR-P in-line. Continue algorithm development. Develop P3I program.

- \$8,983

UEWR: Continue the conduct of real-time missile tracking experiments using EWR and other applicable existing sensors. Provide UEWR Demonstrator for participation in NMD integrated system tests. Continue Upgraded EWR PDRR phase development and LSI contract management activities.

- \$77,685

GBI: Participate in IFT-4 and the NMD integrated system test (IFT-5) using EKV. Fabricate EKV for fourth intercept flight (IFT-6), incorporating technology improvements and lessons learned from IFTs 1-4. Acquire PLV hardware to support IFT-6. Continue dedicated booster development and prepare for two propulsion verification tests in FY00. Deliver flight ready SHIELD and PET FPAs and readout electronics. Continue radiation hardened microprocessor, low power analog-to-digital converter, and memory development. Demonstrate 100% operability in center 32x32 detectors of SHIELD focal plane array. Fabricate and test full-scale advanced composite structure with integral ground plane for EKV.

- \$35,920

BM/C3: Conduct BM/C3 engineering and integration activities to support BM/C3 Prototype development, BM/C3 communications component prototype development and NMD system integration activities. Complete development of the fourth increment of the BM/C3 Prototype, fully integrated with current increments of other BM/C3 components and with applicable external systems. Start and complete development of the fifth BM/C3 Prototype Capability Increment. Support NMD tests by providing integrated BM/C3 products as test articles. Support IGT-2A, IFT-4 and IFT-5.

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BUDGET ACTIVITY		February 1997	2400
4 - Demonstration and Validation		0603871C National Missile Defense	
PE NUMBER AND TITLE			
- \$35,559	System Engineering: Assess and refine user requirements based on updated Capstone ORD/CRD and CONOPS against system requirements. Finalize interface and configuration control requirements in support of deployment. Continue to analyze and update contingency deployment planning. Analyze and validate results of IFT-5 and IGT-2A. Support preparations for IFT-6 and IGT-3. Support the NMD Early Deployment Readiness Review in 4th quarter. Update technical documentation (NMD Capability Assessment, NMM, NSEN/IDN) and JNITF system simulations based on test results to date.		
- \$22,336	NMD Integration: Conduct FY99 NMD integrated system test (IFT-5) and support the NMD Early Deployment Readiness Review.		
- \$7,758	Deployment Planning: Refine the NMD Integrated Deployment Plan and the NMD Site Activation Plan to reflect programmatic changes and refinements to the NMD architecture. Prepare deployment assessment for the NMD Early Deployment Readiness Review. Assessment will include all aspects of deployment (industrial base assessment, operational suitability assessment, deployment risk analysis and site activation summary). Complete tactical site design to support deployment review and meet deployment timelines. Update program and deployment schedule information and refine critical path analysis of the NMD system.		
- \$52,538	Test and Evaluation: Support five month long IGT-2A campaign. Maintain currency of TEMP, CARD and Test Strategy with support of the NMD System T&E PIPT. Complete program documentation, pre-launch preparations and oversee execution of IFT-4 and IFT-5. Evaluate post-test results. Complete VV&A of IFT-4 and IFT-5 targets and fully accredit the ISTC. Implement lethality and live fire testing plan. Coordinate test range infrastructure and upgrades to support EKV flight tests from KMR. Coordinate test range instrumentation upgrades and provide data collection and analysis for NMD testing. Conduct target launches for IFT-4 and IFT-5.		
- \$32,316	Sensor Technology: Deliver final samples of advanced optical coatings for testing. Deliver 2 lots of LWIR HgCdTe FPAs with extended wavelength cutoff. Initiate silicon FPA development to very long wavelength regime. Initiate continuous 10K sorption cooler effort. Continue endurance testing on 150K, 60K, and 35/60K FSC cryocoolers. Deliver prototype contamination control device. Initiate silicon carbide telescope effort. Continue development, fabrication, and test of advanced, radiation-hardened electronic components and packaging technologies for processors, memory and analog-digital converters. Deliver prototype non-cryogenic FPA signal processor. Continue rad-hard visible star tracker effort. Deliver rad-hard electrically erasable programmable read-only memory (EEPROM). Provide predicted and exploited signature data for test planning and systems effectiveness tasks.		
- \$24,704	Program Support: Continue to provide management and analysis support to the NMD program in areas such as cost/schedule/performance assessment, cost estimating and analysis, budget analysis and formulation, program planning and control, contract management.		

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

DATE

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BUDGET ACTIVITY

**4 - Demonstration and Validation**

PE NUMBER AND TITLE

**0603871C National Missile Defense**

PROJECT

**2400**

- \$13,529 Phenomenology: Provide ASI core operating costs for IFT-4 and IFT-5 missions to collect optical data. Receive, archive and distribute test data. Continue optical and radar data analysis for NMD system design and test. Provide discrimination algorithms and architectures to GBR, SMTS and GBI programs to handle advanced threats and penails. Continue delivering validated signature models for high priority engagement scenarios.

- \$2,973 Architecture Analysis and BM/C3 Initiatives: Continue systems analysis work on NMD issues. Provide system-level capability to address emerging BM/C3 architectures and requirements in a synergistic manner across all NMD/TMD efforts and facilitate the translation of operational requirements to interoperable, affordable, evolvable, and supportable systems.

- \$657 Threat and Countermeasures: Provide NMDSTA and operational threat environment intelligence estimates, continue development of threat system scenario descriptions, and upgrade threat modeling capability and digital media threat products.

- \$22,535 Modeling and Simulations: Provide infrastructure and core capability funding for the JNTF for hardware, software, and systems engineering, and other capabilities for system support, and supercomputing and wargaming resources. Provide supercomputing resources at the ARC/SC, validate simulators, and upgrade all computer capabilities. Provide M/S support in the five primary areas.

- \$11,108 Test Resources: Provide ground test facility infrastructure and upgrades for BMDO testing including: IR sensor HWIL testing at KHILS, wind tunnel testing at Tunnel 9, shock-tunnel testing at AOEC, hover test capability at NHTF, command/control technology experiments at CERES, lethality tests at AEDC Range G, sensor testing at POST CALM, NRaD, and 7V/10/V, phenomenology characterization and target signatures at AMOR and KHILS, and primary IR and blackbody calibration standards at the NIST. Provide test range infrastructure and upgrades to support EKV testing. Provide core support for KMRSS. Provide range instrumentation, upgrades, data collection, and analysis for BMDO testing. Provide data collection and processing by the HALO with the IRIS sensor.

- \$32,343 Operational Support: Continue providing management and support for overhead/indirect fixed costs.

- \$393,085 Total

**Acquisition Strategy:** The NMD program is in a deployment readiness posture that involves developing hardware that will be used in a FY99 integrated system test (IFT-5) intended to demonstrate a National Missile Defense capability. The acquisition strategy is to use current NMD element contractors to complete the development of NMD elements necessary to accomplish this FY99 test, and to award a lead system integrator (LSI) contract in FY98. In addition, contract strategies are being implemented that will allow for fielding and maintaining an initial NMD system by FY03. Program risk is being reduced by performing the maximum number of system level tests between FY00 and FY03. NMD system performance beyond FY03 will be improved through technology upgrades and the addition of SBIRS Low.

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

Project 2400

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

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**BUDGET ACTIVITY**  
**4 - Demonstration and Validation**

	FY 1996	FY 1997	FY 1998	FY 1999	Total Cost
Previous President's Budget Appropriated Value	720,750	508,437	511,495	413,061	2,153,743
Adjustments to Appropriated Value:					
a. General Reductions (FFRDC, Inflation etc.)		-4,573			
Current Budget Submit/President's Budget	730,656	828,864	504,091	393,085	2,456,696

**Change Summary Explanation:**

Funding: Additional resources have been allocated to the NMD program as a result of the FY97 Congressional appropriation.  
 Schedule: N/A  
 Technical: N/A

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

PE 0603871C NMD MILCON Design	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To Compl	Total Cost
	0	0	540	12,815	0	0	0	0		13,355

**D. Schedule Profile**

	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 1998	FY 1999	FY 2002	FY 2003	To Compl
1	3	4	1	2	4	1	2	3	4	1	FY 1999 2 . 3 4
Engineering Milestones											
a. GBR-P PDR	X										
b. NMD SRR											
c. GBR-P CDR											
d. NMD PDR											
e. NMD IPR											
f. NMD Early Deployment Readiness Review							X				X

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BUDGET ACTIVITY	PE NUMBER AND TITLE												DATE	PROJECT			
	0603871C National Missile Defense																
	FY 1996			FY 1997			FY 1998			FY 1999							
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	
Test and Evaluation Milestones																	
g. IGT-2	X																
h. IFT-1					X												
i. ISTC-1						X											
j. BM/C3 Legacy+				X													
k. BM/C3 Capability Increment 1					X												
l. IFT-2							X										
m. ISTC-2						X											
n. IGT-1A								X									
o. BM/C3 Capability Increment 2									X								
p. IFT-3										X							
q. BM/C3 Capability Increment 3											X						
r. IFT-4														X			
s. ISTC-3																	
t. IGT-2A													X				
u. BM/C3 Capability Increment 4																	X
v. NMD Integrated System Test (IFT-5)																	X
w. BM/C3 Capability Increment 5																	X
Contract Milestones																	
x. GBR-P Contract Mod Implemented																	
y. UEWR Demonstrator Contract Award																	
z. NMD Lead System Integrator Concept Definition RFP Release																	
aa. NMD Lead System Integrator Concept Definition Contract Awards																	
bb. NMD Lead System Integrator Downselect to one contractor																	
cc. EKV Contractor Downselect																	

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

DATE **February 1997**

BUDGET ACTIVITY  
 PE NUMBER AND TITLE  
**4 - Demonstration and Validation**  
**0603871C National Missile Defense**  
 PROJECT  
**2400**

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

	<u>FY 1996</u>	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>
NMD Integration	0	58,046	7,085	22,336
Ground Based Interceptor	259,764	236,319	127,551	77,685
Battle Management, Command, Control and Communications	72,160	50,576	43,730	35,920
Ground Based Radar	87,000	66,129	19,536	12,141
Upgraded Early Warning Radars	8,490	12,122	16,745	8,983
Systems Engineering	56,038	42,542	41,941	35,559
Deployment Planning	11,475	17,139	16,613	7,758
Program Support	20,902	31,100	33,465	24,704
Test and Evaluation	70,385	101,599	83,705	52,538
Sensor Technology	87,806	54,134	30,278	32,316
Other NMD Initiatives	0	52,945	0	0
Phenomenology	18,741	19,587	13,975	13,529
Architecture Analysis/BMC3 Initiatives	3,051	1,989	3,008	2,973
Threat and Countermeasures	7,945	7,168	688	657
Modeling and Simulation	16,041	32,803	22,308	22,535
Test Resources	10,858	11,554	11,244	11,108
Operational Support	0	33,112	32,219	32,343
<b>Total</b>	<b>730,656</b>	<b>828,864</b>	<b>504,091</b>	<b>393,085</b>

**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 1996	Budget FY 1996	Budget FY 1997	Budget FY 1998	Budget FY 1999	Total Budget to Complete Program

Project 2400

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Exhibit R-3 (PE 0603871C)

UNCLASSIFIED

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

BUDGET ACTIVITY		DATE		PROJECT							
4 - Demonstration and Validation		February 1997		2400							
Contractor or Government Performing Activity		PE NUMBER AND TITLE		PROJECT							
4 - Demonstration and Validation		0603871C National Missile Defense		2400							
Contractor or Government Performing Activity	Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1996	Budget FY 1996	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<b>Product Development Organizations</b>											
TBD	TBD	FY97	250,000	250,000	0	58,046	7,085	22,336	continues	87,467	
<b>GBI</b>											
Hughes	CPFF	9/90			75,916	82,974	0	0	continues	158,890	
Rockwell	CPFF	9/90			75,056	85,150	0	0	continues	160,206	
TBD (EKV)	CPFF	FY98			0	0	20,310	6,064		26,374	
Lockheed	CPIF	1/86			59,792	37,000	35,000	25,000	continues	156,792	
NRC	CPAF	3/92			6,487	6,685	0	0		13,172	
Sparta	CPFF	8/92			1,790	1,667	0	0		3,457	
ASGI	CPFF	6/89			1,307	0	0	0		1,307	
Mevatec	CPFF	11/93			1,045	0	0	0		1,045	
SY Technology	CPFF	10/96			0	2,290	2,620	2,101	continues	7,011	
TBD (GBI prime)	TBD	TBD			0	0	45,000	28,373	continues	73,373	
Hughes (PET)	CPFF	9/90	26,625	26,625	2,300	0	0	0		2,300	
Liris (PET)	CPFF	9/90	25,425	25,425	2,300	0	0	0		2,300	
TBD (PET)	CPFF	1/97			0	3,000	3,000	3,000	continues	9,000	
Rockwell (SHLD)	CPFF	11/92	6,580	6,580	1,920	2,310	0	0	continues	4,230	
TRW	CPFF	9/95	1,787	1,787	1,457	0	0	0		1,457	
Harris	CPFF	9/95	1,315	1,315	1,102	0	0	0		1,102	
Misc contracts	N/A	N/A			15,814	5,356	9,473	1,162	continues	31,805	
SFAE-MD	N/A	N/A			13,478	9,887	12,148	11,985	continues	47,498	

UNCLASSIFIED

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)										DATE	PROJECT
BUDGET ACTIVITY										0603871C	2400
4 - Demonstration and Validation										National Missile Defense	
Contractor or Government Performing Activity										PE NUMBER AND TITLE	
Contractor or Government Performing Activity	Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1996	Budget FY 1996	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
BM/C3											
TRW	CPFF	8/24/95	90,550	90,550		42,049	18,759	18,790	16,057	continues	95,655
BDM	CPAF	12/27/94	27,350	27,350		6,250	3,900	5,200	4,000	continues	19,350
SFAE-MD	N/A	N/A				2,521	2,691	2,600	1,900	continues	9,712
USA Corp of Eng	N/A	N/A				1,701	5,000	0	0		6,701
TBE	CPFF	4/24/97	4,100	4,100		0	1,000	1,100	900	continues	3,000
Mitre	FFRDC	Annual	11,724	11,724		2,529	2,800	2,880	2,110	continues	10,319
SENCOM	CPAF	10/1/94	3,975	3,975		1,345	800	825	604	continues	3,574
TRW	CPAF	2/1/95	13,500	13,500		2,395	3,500	2,272	1,736	continues	9,903
Loral	CPAF	2/1/95	7,900	7,900		1,290	1,660	1,113	824	continues	4,887
NSWC	N/A	N/A				300	300	300	150	continues	1,050
Misc Contracts	N/A	N/A				11,780	10,166	8,650	7,639	continues	38,235
GBR											
Raytheon	CPAF	11/94	148,922	148,922		62,022	58,598	15,100	9,697	continues	145,417
TBE	CPAF	3/92				2,476	1,000	0	0		3,476
Colsa	CPFF	6/89				3,430	0	0	0		3,430
GRA	CPFF	7/96				1,100	0	0	0		1,100
Misc contracts	N/A	N/A				2,235	1,831	1,936	944	continues	6,946
SFAE-MD	N/A	N/A				15,737	4,700	2,500	1,500	continues	24,437
UEWR											
Xontech	CPAF	1/3/95	12,600	12,600		4,367	6,429	0	0		10,796
TBD		12/1/97				0	0	11,735	4,583	continues	16,318
USAF/ESC	N/A	N/A				1,300	1,300	1,300	1,300	continues	5,200
Project 2400											

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)										DATE	February 1997	PROJECT
BUDGET ACTIVITY										PE NUMBER AND TITLE		2400
4 - Demonstration and Validation										0603871C National Missile Defense		
Contractor or	Method/Type	Award or	Performing	Project	Total	Budget	Budget	Budget	Budget	Budget	Budget	Total
Government	or Funding	Obligation	Activity	Office	Prior to	FY 1996	FY 1996	FY 1997	FY 1998	FY 1999	Complete	Program
Performing	Vehicle	Date	EAC	EAC	FY 1996	FY 1996	FY 1997	FY 1998	FY 1998	FY 1999	continues	Program
Activity	FFRDC											
Mitre						1,900	1,900	3,000	3,360	3,100	continues	11,360
Misc Contracts						923	923	1,393	350	0		2,666
SENSOR TECH												
Hughes	CPFF	1/90	8,770	8,770		1,950	1,600	1,600	0	0		3,550
Analog Devices	CPFF	1/91	9,710	9,710		1,300	1,160	1,160	1,100	718	continues	4,278
TBD	CPFF	TBD	8,500	8,500		0	1,000	1,000	2,890	3,590	continues	7,480
TBD	CPFF	TBD	17,700	17,700		0	5,000	5,000	11,582	8,285	continues	24,867
TBD	CPFF	TBD	8,100	8,100		0	1,000	1,000	2,890	2,761	continues	6,651
Phillips Lab	N/A	N/A				1,140	260	1,500	1,500	1,000	continues	3,900
Crane	CPAF	3/30/90	1,490	1,490		1,290	0	0	0	0		1,290
Lockheed Martin	CPAF	1/10/96	1,830	1,830		407	1,000	175	0	0		1,582
TRW	CPAF	1/90	6,620	6,620		2,210	925	800	800	800	continues	4,735
Honeywell	CPAF	1/90	6,670	6,670		1,120	925	800	800	800	continues	3,645
Hughes	CPAF	2/93	6,620	6,620		1,470	0	0	0	0		1,470
Rockwell	CPAF	2/93	6,670	6,670		2,030	0	0	0	0		2,030
Xontech						1,400	0	0	0	0		1,400
WPAFB	N/A	N/A				1,600	0	0	0	0		1,600
JHU/APL	CPFF	10/1/91	165,841	165,841		11,644	0	0	0	0		11,644
JHU/APL(B)	CPFF	4/1/95	39,894	39,894		7,000	9,938	0	0	0		16,938
MDA	CPFF	1/2/92	53,169	53,169		1,350	0	0	0	0		1,350
USU(SP)	CPFF	6/15/88	90,586	90,586		6,852	1,635	0	0	0		8,487
USU(DPC)	CPFF	8/7/92	20,800	20,800		4,403	3,596	0	0	0		7,999
NRC	CPFF	12/1/93				5,257	1,627	0	0	0		6,884
Misc NASA	MIPR	N/A				233	598	0	0	0		831
USASSDC	N/A	N/A				4,241	580	0	0	0		4,821
AFSMC	N/A	N/A				10,831	8,509	0	0	0		19,340
NRL	N/A	N/A				2,309	2,300	0	0	0		4,609
USASSDC	N/A	N/A				1,556	1,161	1,223	1,223	1,223	continues	5,163
JHU/APL	CPAF	6/96	17,000	17,000		5,230	950	0	0	0		6,180

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

DATE

February 1997

BUDGET ACTIVITY

PE NUMBER AND TITLE

**4 - Demonstration and Validation**  
**0603871C National Missile Defense**

PROJECT

**2400**

Contractor or Government Performing Activity Misc Contracts OTHER NMD INITIATIVES	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1996	Budget				Budget to Complete	Program	Total
						FY 1996	FY 1997	FY 1998	FY 1999			
TBD	TBD	TBD			10,983	10,370	7,318	13,139				41,810
					0	52,945	0	0				52,945
<b>Support and Management Organizations</b>												
<b>SYSTEM ENGINEERING</b>												
TRW	CPFF	8/95			38,833	25,605	25,004	25,568		continues		115,010
BDM	CPAF	12/27/94			7,855	7,107	7,107	7,107		continues		29,176
USSPACECOM	N/A	N/A			1,200	1,200	1,200	636		continues		4,236
JNTP	N/A	N/A			3,100	3,300	3,300	1,212		continues		10,912
DNA	MIPR	N/A			1,750	1,750	1,750	0		continues		5,250
ARSPACE	N/A	N/A			800	580	580	318		continues		2,278
AFSPACE	N/A	N/A			500	500	500	189		continues		1,689
USAF/SMC	N/A	N/A			1,500	2,000	2,000	450		continues		5,950
NAVSPACE	N/A	N/A			500	500	500	79		continues		1,579
<b>DEPLOYMENT PLANNING</b>												
TRW	CPFF	8/23/95			2,458	5,000	6,500	4,157		continues		18,115
NIST	MIPR	N/A			492	450	450	875		continues		2,267
SFAE-MD	N/A	N/A			3,130	762	0	0		continues		3,892
USAF/SMC	N/A	N/A			500	230	510	520		continues		1,760
USSPACECOM	N/A	N/A			971	1,500	1,289	543		continues		4,303

Project 2400

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Exhibit R-3 (PE 0603871C)

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

DATE February 1997

BUDGET ACTIVITY		PE NUMBER AND TITLE										PROJECT	
4 - Demonstration and Validation		0603871C National Missile Defense										2400	
Contractor or Government	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity	Project Office	Total Prior to FY 1996	Budget FY 1996	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program		
TBD	CPFF	FY97	EAC	EAC	0	0	2,110	2,610	1,500	continues	6,220		
USA Corp of Eng	N/A	N/A	EAC	EAC	0	0	4,100	1,750	0	0	5,850		
TBD	CPFF	FY97	EAC	EAC	0	990	990	1,000	0	0	1,990		
Misc contracts	N/A	N/A	EAC	EAC	3,924	1,997	2,504	2,504	163	continues	8,588		
<b>PROGRAM SUPPORT</b>													
BDM	CPAF	12/27/94	EAC	EAC	20,902	19,103	11,770	11,770	5,699	continues	57,474		
SFAE-MD	N/A	N/A	EAC	EAC	0	8,684	18,390	18,390	15,704	continues	42,778		
USASSDC	N/A	N/A	EAC	EAC	0	3,313	3,305	3,305	3,301	continues	9,919		
<b>PHENOMENOLOGY</b>													
Boeing	CPFF	9/95	EAC	EAC	3,049	3,238	3,406	3,406	3,418	continues	13,111		
MIT/LL	FFRDC	10/95	EAC	EAC	5,443	5,410	1,902	1,902	1,658	continues	14,413		
Xontech	CPFF	10/96	EAC	EAC	1,666	1,667	0	0	0	0	3,333		
USASSDC	N/A	N/A	EAC	EAC	512	658	590	590	590	continues	2,350		
Misc contracts	N/A	N/A	EAC	EAC	8,071	8,614	8,077	8,077	7,863	continues	32,625		
<b>ARCH ANALYSIS</b>													
BDM	CPAF	12/27/94	EAC	EAC	1,070	600	1,070	1,070	1,040	continues	3,780		
Misc contracts	N/A	N/A	EAC	EAC	1,981	1,389	1,938	1,938	1,933	continues	7,241		
<b>THREAT &amp; CM</b>													
Sandia	N/A	N/A	EAC	EAC	1,300	1,200	0	0	0	0	2,500		

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

DATE **February 1997**

BUDGET ACTIVITY		PE NUMBER AND TITLE										PROJECT	
4 - Demonstration and Validation		0603871C National Missile Defense										2400	
Contractor or Government	Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity	Project Office	Total Prior to FY 1996	Budget FY 1996	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program		
Contract													
Government	Contract												
Performing Activity	MIT/LL	N/A	EAC	EAC	2,500	1,300	0	0	0	Complete	3,800		
	OGAs	N/A			949	1,046	390	373	278	continues	2,758		
	Misc contracts	N/A			3,196	3,622	298	284		continues	7,400		
<b>OPERATIONAL SUPPORT</b>													
Misc operational accounts					0	33,112	32,219	32,343		continues	97,674		
<b>Test and Evaluation Organizations</b>													
T&E													
TBE	CPAF	3/92			7,047	4,000	2,000	2,000	0	continues	13,047		
Colsa	CPFF	6/89			1,200	2,200	1,200	1,200	1,200	continues	5,800		
Colsa	CPFF	6/89			4,100	13,700	13,300	5,659		continues	36,759		
Rockwell	CPFF	9/90			2,200	2,200	2,000	0			6,400		
Hughes	CPFF	9/90			2,000	2,200	2,200	0			6,400		
SMC	N/A	N/A			1,800	3,400	2,600	2,700		continues	10,500		
SFAE-MD	N/A	N/A			5,900	5,560	2,609	1,720		continues	15,789		
USASSDC	N/A	N/A			455	14,121	15,664	9,764		continues	40,004		
JNTF	N/A	N/A			0	600	1,580	0			2,180		
NRL	N/A	N/A			0	100	100	120		continues	320		
Misc contracts	N/A	N/A			4,303	13,412	15,949	6,553		continues	40,217		
GBI Targets:													
USASSDC	N/A	N/A			339	640	535	1,460		continues	2,974		
Sandia	N/A	N/A			10,062	10,118	10,093	10,002		continues	40,275		
SMC	N/A	N/A			7,152	1,398	1,750	1,700		continues	12,000		
Lockheed	N/A	N/A			6,988	18,214	10,315	9,115		continues	44,632		
Project 2400													

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

BUDGET ACTIVITY		DATE		PROJECT							
4 - Demonstration and Validation		February 1997		2400							
PE NUMBER AND TITLE		National Missile Defense									
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 1996	Budget FY 1996	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Sy Technology						0	625	750	625	625 continues	2,000
TBE						722	455	720	620	continues	2,517
TRW						0	1,300	340	1,300	continues	2,940
MSX Targets:											
USASSDC	N/A	N/A				6,975	1,246	0	0		8,221
Sandia	N/A	N/A				6,777	4,894	0	0		11,671
TBE						1,773	177	0	0		1,950
MICOM	N/A	N/A				592	680	0	0		1,272
SMC	N/A	N/A				0	359	0	0		359
Modeling & Sim											
Colsa						2,054	2,073	2,137	2,114	continues	8,378
MRC						720	715	712	705	continues	2,852
USASSDC						1,018	1,107	0	0		2,125
NRL						243	784	242	239	continues	1,508
AFSPACE						148	303	0	0		451
TRW						491	1,445	2,332	2,305	continues	6,573
Loral						5,950	9,450	3,914	3,860	continues	23,174
Mitre						2,110	5,700	1,614	1,622	continues	11,046
JNTF						2,309	10,756	7,339	7,378	continues	27,782
BMDO						998	470	4,018	4,312	continues	9,798
TEST RESOURCES											
USASSDC	N/A	N/A				3,555	1,875	2,908	3,266	continues	11,604
Phillips Lab	N/A	N/A				699	950	1,000	1,000	continues	3,649
Wright Lab	N/A	N/A				1,159	931	1,000	1,000	continues	4,090
Det2-SMC	N/A	N/A				300	300	300	300	continues	1,200

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

DATE February 1997

BUDGET ACTIVITY PROJECT  
 4 - Demonstration and Validation 2400  
 PE NUMBER AND TITLE  
 0603871C National Missile Defense

Contractor or Government	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1996	Budget FY 1996	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
NIST	N/A	N/A	EAC	EAC	100	100	100	100	100	continues	400
Arnold Engin.	N/A	N/A	EAC	EAC	100	2,250	1,525	1,525	1,525	continues	5,400
NSWC	N/A	N/A	EAC	EAC	735	727	725	716	716	continues	2,903
SPAWAR	N/A	N/A	EAC	EAC	388	412	410	406	406	continues	1,616
Misc contracts	N/A	N/A	EAC	EAC	3,822	4,009	3,276	2,795	2,795	continues	13,902

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

**Government Furnished Property:**

**Contract**

Item Description	Method/Type or Funding Vehicle	Award or Obligation Date	Delivery Date	Total Prior to FY 1996	Budget FY 1996	Budget FY 1997	Budget FY 1998	Budget FY 1999	Total Program
Product Development Property									
Support and Management Property									
Test and Evaluation Property									
Subtotal Product Development				515,220	530,271	244,925	189,381	1,479,797	
Subtotal Support and Management				118,152	152,637	141,909	117,523	530,221	
Subtotal Test and Evaluation				97,284	145,956	117,257	86,181	446,678	
Total Project				730,656	828,864	504,091	393,085	2,456,696	



**Joint Theater Missile Defense Activities  
(Dem / Val)  
PE 0603872C**

16/1/00

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

DATE

February 1997

## BUDGET ACTIVITY

## PE NUMBER AND TITLE

## 4 - Demonstration and Validation

## 0603872C Joint Theater Missile Defense

COST (\$ In Thousands)	FY 1996 Actual	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	429,137	506,492	542,619	514,109	544,417	550,196	538,259	520,800	Continuing	Continuing
1155 Phenomonology Program	36,908	31,338	37,835	38,622	37,464	37,300	37,205	36,490	Continuing	Continuing
1161 Advanced Sensor Technology	1,270	3,334	3,364	3,208	3,199	3,151	3,148	3,153	Continuing	Continuing
1170 TMD Risk Reduction	41,521	23,184	35,267	25,045	24,920	24,803	24,773	24,817	Continuing	Continuing
1270 Applied Inert Mats and System Tech Program	9,137	0	0	0	0	0	0	0	TBD	TBD
1294 UAVBoost Phase Intercept	5,705	930	0	0	0	0	0	0	TBD	TBD
2160 TMD Existing System Mods	20,401	22,421	12,328	12,957	0	0	0	0	TBD	TBD
2259 Israeli Cooperative Project	59,352	43,892	38,715	38,662	38,624	38,591	0	0	TBD	TBD
3153 Architecture Analysis / BMC31 Initiatives	9,738	6,799	8,273	8,099	8,058	8,020	8,011	8,026	Continuing	Continuing
3157 Environmental, Siting, and Facilities	4,369	5,972	3,600	3,640	3,631	3,609	3,606	3,612	Continuing	Continuing
3160 TMD Readiness	1,112	1,709	1,730	1,692	1,687	1,676	1,674	1,677	Continuing	Continuing
3251 Systems Engineering and Technical Support	45,358	50,909	65,260	62,031	66,972	69,350	90,554	76,498	Continuing	Continuing
3261 TMD BM/C31 (BM/C31 Concepts)	0	32,357	34,094	35,864	43,717	44,576	43,210	43,286	Continuing	Continuing
3265 User Interface	15,286	14,031	14,680	21,976	22,060	22,113	22,048	22,118	Continuing	Continuing
3270 Threat and Countermeasures Program	19,865	21,419	27,986	29,154	27,981	27,891	28,779	27,898	Continuing	Continuing
3352 Modeling and Simulations	71,362	64,180	73,173	72,984	74,959	74,961	78,333	75,661	Continuing	Continuing

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

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BUDGET ACTIVITY

PE NUMBER AND TITLE

**4 - Demonstration and Validation**      **0603872C Joint Theater Missile Defense**

COST (\$ In Thousands)	FY 1996 Actual	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
3354 Targets Support	23,046	22,842	27,603	18,721	42,755	42,226	42,463	42,578	Continuing	Continuing
3359 System Test and Evaluation	33,568	42,792	40,307	26,444	30,263	32,250	31,590	31,636	Continuing	Continuing
3360 Test Resources	31,139	35,507	30,888	30,201	29,942	29,793	30,312	30,363	Continuing	Continuing
4000 Operational Support	0	82,876	87,516	84,809	88,185	89,886	92,553	92,987	Continuing	Continuing

**ARCHITECTURE**

**A. Mission Description and Budget Item Justification**

The Theater Missile Defense (TMD) program's goal is to develop, maintain and deploy a cost-effective, Anti-Ballistic Missile (ABM) Treaty compliant system designed to protect the United States and its Allies against the immediate and growing threat from shorter range theater ballistic missiles. The TMD core programs are PATRIOT Advanced Capability (PAC)-3, Theater High Altitude Area Defense (THAAD) System, and Navy Area Theater Ballistic Missile Defense (TBMD) formerly (Lower Tier) and Navy Theater-Wide TBMD formerly(Upper Tier).

Theater Missile Defense programs, projects, and activities in Advanced Development that have as a primary objective the development of technologies capable of supporting systems, components, and architectures that could produce highly effective defenses against theater missile threats. Includes manpower authorizations and the associated costs specifically identified and measured to the performance of these programs.

This project is assigned to the Budget Activity and Program Element codes as identified in this descriptive summary in accordance with existing Department of Defense policy. Further justification of the Budget Activity code assigned to each Program Element is contained within the Brief Description of Element section of each Program Element Summary.

**Acquisition Strategy:** See Individual R2 summaries.

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4 - Demonstration and Validation

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

	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	Total Cost
Previous President's Budget	421,185	520,111	557,046	515,855					2,014,197
Appropriated Value									
Adjustments to Appropriated Value:		525,511							
a. MEADS below threshold reprogramming		-14,125							
b. General Reductions (FFRDC, Inflation etc.)		-4,872							
Current Budget Submit/President's Budget	429,137	506,492	542,619	514,109					1,992,357

Change Summary Explanation: See Individual R2 summaries.

Funding:

Schedule:

Technical:

**C. Other Program Funding Summary (\$ in Thousands) See Individual R2 summaries.**

	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To Compl	Total Cost

**D. Schedule Profile See Individual R2 summaries.**

	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 1999
1	2	3	4	1	2	3	4	1	2
2	3	4	1	2	3	4	1	2	3
3	4	1	2	3	4	1	2	3	4

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

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BUDGET ACTIVITY

PE NUMBER AND TITLE

**0603872C Joint Theater Missile Defense**

PROJECT

1155

**4 - Demonstration and Validation**

COST (\$ In Thousands)	FY 1996 Actual	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
1155 Phenomonology Program	36,908	31,338	37,835	38,622	37,464	37,300	37,205	36,490	Continuing	Continuing

**A. Mission Description and Budget Item Justification**

This project provides the U.S. with the data and predictive tools to generate high confidence target signatures for ballistic missile defenses (BMD). This is a critical adjunct to the evaluation of BMD system performance across the full spectrum of threats and engagement scenarios. This program provides data collection sensors and instruments for use on live-fire missions and analysis of the resulting test data. This program provides predictive models of target signatures in both Radar and Infrared spectrums. This program evaluates and develops algorithms for the critical functions of discrimination, target handover, and aimpoint selection. This program provides for data storage and retrieval of all ballistic missile defense office (BMDO) sponsored tests per statutory requirements.

Data Centers and Management. Storage, archival and retrieval of signature related data is provided by the BMDO-funded Missile Defense Data Center (MDDC) and Advanced Missile Signature Center (AMSC). The MDDC is the primary repository of THAAD data. Both the MDDC and AMSC meet the statutory requirements for program data archiving.

Data Collection Platforms. This project provides core operating costs for Airborne Surveillance Testbed (AST) target signature collection sensor and platform. Mission costs for AST are provided by using acquisition programs. This project provided FY 96 termination costs for the COBRA EYE sensor. This project monitors other BMDO signature data collection programs to ensure complete coverage and avoid duplication.

Analysis, Algorithms, and Modeling. This project performs analysis of radar and optical data on ballistic missile threat signatures and intercept events for the THAAD Radar, THAAD interceptor, and Navy TMD programs. This project develops and evaluates discrimination and kill assessment algorithms for THAAD Radar. This project develops signature models and modeling tools applicable to TMD threat profiles and flight regimes leveraging off investments made in TMD modeling and modeling tools.

For analysis this project provides accurate, objective, and timely flight data analysis in support of target signature phenomenology characterization and sensor algorithm development and evaluation. This includes TMD optical sensor data from THAAD, project 1170, project 3270, and others. This project provides post-flight characterizations of expected and unexpected target features. Under the guidance of the Target Signatures Working Group (TSWG) develop target models and provide high fidelity signature sets of THAAD Dem/Val and User Operational Evaluation System UOES targets. Evaluate THAAD software aimpoint selection, discrimination, and handover algorithms against Dem/Val targets and UOES threats. Provide analysis and recommendations for TMD aimpoint selection, discrimination, and sensor handover.

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

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## 4 - Demonstration and Validation

PE NUMBER AND TITLE

0603872C Joint Theater Missile Defense

PROJECT

1155

For THAAD Radar algorithms this project develops and analyzes algorithms that have the highest payoff potential for the critical functions of detection, tracking, bulk classification, typing, discrimination, target object map generation, aimpoint selection, and kill assessment. Maintenance and upgrades to the simulation facilities required to develop and evaluate these algorithms against real and simulated data is provided for. The Lexington Discrimination System (LDS) will be used to merge radar and optical data analysis on a real-time basis for algorithm development and assessment. Specific tasks include: (1) Use LDS to support development and evaluation of objective system algorithms to be installed on the THAAD Radar, THAAD Interceptor, and Navy TMD programs; (2) Use signature data to identify robust discriminants using field measurements; (3) Develop and deliver individual radar discrimination algorithms based on identified discriminants; (4) Develop, deliver, and exercise on the LDS, algorithms which utilize radar and optical data to facilitate seeker Target Object Map and aim-point selection for THAAD and other TMD systems; and (5) Complete the LDS real-time multiple-sensor, multiple-target handling capability and test TMD algorithms/architectures using this capability.

For modeling this project provides high confidence, target and background scene predictions for sensors and BMD systems. These generated scenes are the foundation for high confidence simulations of engagements that cannot or will not be flight tested. The high-fidelity, physics-based models, predicted composite scenes, and associated analytic output developed in this task are evaluated against measured data to ensure confidence in simulation results and provide a reliable route to systems verification and validation. To facilitate this objective, this task also provides crucial data-driven software tools for exploiting measured data and integrating measurements with simulations in support of technology development, test and evaluation, and acquisition efforts.

This project also provides for participation in international technical exchange programs in the areas of optical and radar discrimination, reentry, and background and plume phenomenology include: U.S./U.K. Scientific Cooperation Research Exchange (SCORE); use of the UK MESAR Radar; NATO Extended Air Defense (EAD)/TMD Ad Hoc Working Group - Plume Phenomenology Expert Group (U.S., U.K., France, Canada); U.S./French Bilateral Group - Plumes, Backgrounds, and Reentry Signatures; U.S./Israeli TBM Signature and Phenomenology Research; and the U.S./German Phenomenology Research committee.

EX 1996 (\$ in Thousands):

-	\$6,513	Data Centers and Management: MDDC and AMSC received, archived, and distributed hardbody and plume target signature test data. Provided for required maintenance of hardware for MDDC and AMSC.
-	\$16,255	Data Collection Platform: Provided AST core operating costs to continue optical data collection in support of THAAD flight tests, the TMD Critical Measurements Program (TCMP) campaign, Navy SM-2 Block IVA tests, Combined Experiment Program (CEP/CPX) and Hera target flights. Provided for COBRA JUDY mission planning to support THAAD intercept events, the TCMP campaign, WD, CEP/CPX, and Hera target flights. Provided for termination of COBRA EYE sensor system.

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DATE **February 1997**

BUDGET ACTIVITY

PE NUMBER AND TITLE

**0603872C Joint Theater Missile Defense**

PROJECT  
**1155**

**4 - Demonstration and Validation**

- \$14,140 Analysis, Algorithms, and Modeling: Developed, refined, and demonstrated active and passive algorithm architectures of multiple targets and single sensors on LDS prototype. Developed multi-sensor data fusion algorithms which perform efficient data resource allocation. Updated integrated background and weather code to include cloud, terrain and UV to RF coverage for modeling and simulation of radar propagation, IR, visible, and laser models. Used LDS to develop and evaluate real-time algorithms for tumbling targets and high resolution imaging in support of THAAD Radar. Performed statistical evaluation of radar/optical discrimination algorithms using field test data. Continued simulation/analysis of TMD Dem/Val optical discrimination and aimpoint algorithms, and finalize prototype algorithms (target selection, aimpoint selection, and kill assessment). Continued to analyze Dem/Val data to support TMD algorithm development. Completed and distribute atmospheric clutter models to TMD system designers. Upgraded signature modeling to incorporate additional TMD threats, modeling of re-entry hardbody break-up, correlated radar-IR ground clutter and capability to merge data with simulations. Developed integrated handover/discrimination information for aimpoint selection using interceptor seeker and integrated radar hardbody and plume signatures for early detection of theater ballistic missiles (TBMIs). Developed and provide new release of optical signature modeling with improvements to support optical discrimination algorithms for NMD and TMD intercept capability. Continued participation in international technical exchange programs (U.S./U.K. Scientific Cooperative Research Exchange (SCORE) Program - Target Signatures & Backgrounds Panel and Trials Group, NATO Extended Air Defense (EAD)/TMD Ad Hoc Working Group - Plume Phenomenology Expert Group (U.S., U.K., France, Canada), U.S./French Bilateral Group - Plumes, Backgrounds, and Reentry Signatures, U.S./Israeli TBM Signature and Phenomenology Research, U.S./German Phenomenology Research) in the areas of optical and radar discrimination, reentry, and signature phenomenology.

- \$36,908 Total

**FY 1997 (\$ in Thousands):**

- \$5,310 Data Centers and Management: MDDC and AMSC will receive, archive, and distribute missile signature test data. Provide required upgrades to data storage and handling tools.

- \$9,857 Data Collection Platform: Provide AST core operating costs for continued optical data acquisition of THAAD flight tests, Navy TMD tests, PAC-3 tests, and Willow Dune, TCMP tests.

- \$16,171 Analysis, Algorithms, and Modeling: Continue radar and optical data analysis support for developmental TMD systems. Increase the capabilities of the LDS to include a scenario visualization tool, an interceptor engagement simulation, and incorporate data into the LDS Field Mission Data Base. Upgrade the LDS physical plant to include upgraded memory and rapid prototyping environments. Complete the LDS real-time multiple target handling capability. Develop and analyze higher order discrimination algorithms using LDS. Upgrade modeling of radar target signatures. Integrate laser signature modeling into the composite modeling framework for radar and infrared signature representations. Deliver validated signature models for high priority engagement scenarios. Continue participation in international technical exchange programs in the areas of optical and radar discrimination, reentry, and background and plume battlespace environment.

- \$31,338 Total

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

DATE

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BUDGET ACTIVITY

PE NUMBER AND TITLE

PROJECT

## 4 - Demonstration and Validation

0603872C Joint Theater Missile Defense

1155

## FY 1998 (\$ in Thousands):

-	\$4,695	Data Centers & Management: MDDC and AMSC will receive, archive, and distribute missile signature test data. Provide required upgrades to data storage and handling tools.
-	\$16,585	Data Collection Platform: Provide AST core operating costs to collect optical data of TMD target development flights and intercepts.
-	\$16,555	Analysis, Algorithms, and Modeling: Continue data analysis support for TMD systems in Dem/Val and EMD. Provide support for TMD radar/optical discrimination algorithms and architectures for advanced TMD threats and penails. Develop real-time algorithms for battlefield learning using neural networks, field data, and simulations on LDS. Develop algorithms for real-time sensor resource allocation to support threat-adaptive algorithm architectures. Deliver validated signature models for high priority engagement scenarios. Continue participation in international technical exchange programs in the areas of optical and radar discrimination, reentry, and signature phenomenology.
-	\$37,835	Total

## FY 1999 (\$ in Thousands):

-	\$6,256	Data Centers & Management: MDDC and AMSC will receive, archive, and distribute missile signature test data. Provide required upgrades to data storage and handling tools.
-	\$16,557	Data Collection Platform: Provide AST core operating costs to collect optical data of TMD target development flights and intercepts (i.e., THAAD DT, PAC-3 test, etc.)
-	\$15,809	Analysis, Algorithms, and Modeling : Continue data analysis support for TMD systems in Dem/Val and EMD. Continue demonstration of TMD radar/optical discrimination algorithms to finalize EMD algorithms. Demonstrate real-time algorithms for battlefield learning using neural networks, field data, and simulations on LDS. Continue development of real-time sensor algorithms for resource allocation and multi-sensor fusion. Incorporate new field data sets from the transportable radar into the TMD bulk classifiers to adjust parameters for objective system. Maintain and refine signature modeling to run with higher resolution at enhanced computational speed. Deliver validated signature models for high priority engagement scenarios. Continue participation in international technical exchange programs in the areas of optical and radar discrimination, TBM reentry, MESSAR tactical trials and signature phenomenology.
-	\$38,622	Total

**Acquisition Strategy:** This project funds data centers, data collection platforms, and algorithm and model development through executing agents in the Air Force (Phillips Laboratory and Arnold Engineering Development Center), Army (Space and Strategic Defense Command), Navy (Naval Research Laboratory) and OSD (Institute for Defense Analysis) via existing contracts. With the executing agents, free and open competitive contracts will be used to the maximum extent possible.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE	PROJECT							
BUDGET ACTIVITY		DATE	PROJECT							
4 - Demonstration and Validation		February 1997	1155							
PE NUMBER AND TITLE		0603872C Joint Theater Missile Defense								
<b>B. Program Change Summary (\$ in Thousands)</b>										
Previous President's Budget	FY 1996	FY 1997	FY 1998	FY 1999	Total Cost					
Current Budget Submit/President's Budget	36,984	41,524	38,988	39,940	157,436					
	36,908	31,338	37,835	38,622	144,703					
<b>Change Summary Explanation:</b>										
Funding: Decrease in FY97 funds was due to reduction of the AST program to offset part of the higher priority Department unfunded requirement.										
Schedule: None										
Technical: None										
<b>C. Other Program Funding Summary (\$ in Thousands)</b>										
2400 NMD Program, PE 0603871C	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To Compl	Total Cost
1155 Phenomenology Program, PE 0603173C	730,718	828,864	504,091	393,085	309,748	309,584	391,858	392,433	Cont	Cont
	2,410	18,309	26,740	26,205	20,401	21,204	22,399	22,926	Cont	Cont
<b>D. Schedule Profile</b>										
Navy Area TBMD (formerly Lower Tier)	1	2	3	4	1	2	3	4		
Deliver software releases (optical/radar discrimination)	X									
CORPS SAM, Sea-based Theater-wide (Upper Tier) - Deliver software releases (algorithms, plumes, backgrounds, optical/radar discrimination algorithms)	X									
Deliver new software releases ( OSC)	X									
Support BMDO test flight programs	X									

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

BUDGET ACTIVITY		PE NUMBER AND TITLE										DATE	PROJECT
4 - Demonstration and Validation		0603872C Joint Theater Missile Defense										February 1997	1155
		FY 1996		FY 1997		FY 1998		FY 1999					
		1	2	3	4	1	2	3	4	1	2	3	4
TMD-GBR - Deliver software releases (radar discrimination algorithms)				X									
THAAD - Deliver software releases (backgrounds, optical discrimination algorithms)					X								
TMD GBR - Deliver software releases (radar discrimination algorithms)								X					
Deliver new software releases (SSGM)						X							X
THAAD - Deliver software releases (background, optical discrimination algorithms)							X						
Upgrade MDDC and AMSC data retrieval and data analysis tools										X			
Initiate BMDO sponsorship of Cobra Gemini system											X		
Cobra Gemini - provide mission planning and data analysis costs												X	

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

DATE February 1997

BUDGET ACTIVITY PE NUMBER AND TITLE PROJECT  
**4 - Demonstration and Validation** 0603872C Joint Theater Missile Defense 1155

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

	FY 1996	FY 1997	FY 1998	FY 1999	Total
Prime Contracts	28,329	21,352	27,069	28,631	105,381
OGA	2,109	2,109	2,109	2,109	8,436
Support Contracts	4,505	5,887	6,763	5,990	23,155
Program Management	1,965	1,990	1,894	1,892	7,741
Total	36,908	31,338	37,835	38,622	144,703

**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		Budget to Complete	Total Program
					Prior to FY 1996	FY 1996		
Sverdrop			800	910	800	910	910	3,510
Teledyne Brown			11,231	7,645	11,231	7,598	9,272	35,746
Colsa			923	1,503	923	1,565	1,560	5,551
Boeing			13,452	6,826	13,452	13,932	14,057	48,267
MIT/Lincoln Lab			2,581	2,791	2,581	2,343	2,253	9,968
Xontech			1,291	1,596	1,291	1,171	1,126	5,184
Nichols Research			711	1,596	711	1,171	1,126	4,604
Photon Research			2,211	2,810	2,211	2,671	2,626	10,318
Soarta			701	1,294	701	1,211	1,202	4,408

**Product Development Organizations**

**Support and Management Organizations**

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total	Budget to Complete	Total Program
Sverdrop			800	910	800	910	3,510
Teledyne Brown			11,231	7,645	11,231	7,598	35,746
Colsa			923	1,503	923	1,565	5,551
Boeing			13,452	6,826	13,452	13,932	48,267
MIT/Lincoln Lab			2,581	2,791	2,581	2,343	9,968
Xontech			1,291	1,596	1,291	1,171	5,184
Nichols Research			711	1,596	711	1,171	4,604
Photon Research			2,211	2,810	2,211	2,671	10,318
Soarta			701	1,294	701	1,211	4,408

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)		DATE	PROJECT						
BUDGET ACTIVITY		DATE	PROJECT						
4 - Demonstration and Validation		0603872C	Joint Theater Missile Defense						
Contractor or Government Performing Activity Miscellaneous		PE NUMBER AND TITLE	PROJECT						
Contract		0603872C	Joint Theater Missile Defense						
Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1996					
Budget FY 1996	Budget FY 1997	Budget FY 1998	Budget FY 1999	Total Program					
		3,007	4,387	5,263	4,490	17,147			
<b>Test and Evaluation Organizations</b>									
<b>B. Budget Acquisition History and Planning Information Continued (\$ in Thousands)</b>									
<b>Government Furnished Property:</b>									
Item Description	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Delivery Date	Total Prior to FY 1996	Budget FY 1996	Budget FY 1997	Budget FY 1998	Budget FY 1999	Total Program
<b>Product Development Property</b>									
<b>Support and Management Property</b>									
<b>Test and Evaluation Property</b>									
<b>Subtotal Product Development</b>									
<b>Subtotal Support and Management</b>									
<b>Subtotal Test and Evaluation</b>									
<b>Total Project</b>									
Project 1155									

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

DATE

February 1997

BUDGET ACTIVITY

**4 - Demonstration and Validation**

PE NUMBER AND TITLE

**0603872C Joint Theater Missile Defense**

PROJECT

**1161**

COST (\$ In Thousands)	FY 1996 Actual	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
1161 Advanced Sensor Technology	1,270	3,334	3,364	3,208	3,199	3,151	3,148	3,153	Continuing	Continuing

**A. Mission Description and Budget Item Justification**

The goal of this program is to develop and demonstrate survivability technologies to insure that Theater Ballistic Missile Defense (TMD) systems can perform their mission in all required environments. Ballistic missile defenses must be able to operate in nuclear environments and against countermeasure threats. The requirements for the Survivability program are: define, develop and demonstrate Survivability Enhancement Options (SEO) for TMD systems; develop and transfer SEO technology base to research and development centers and laboratories; provide risk reductions to support THAAD Radar Milestone II.

This program develops and demonstrates survivability technologies to ensure that TMD elements can perform their mission in all expected hostile threats. Approaches include: studies/analyses; defense suppression threat mitigation technologies development; developing enhanced shelters applying camouflage, concealment and deception (CCD), SEO development; Electromagnetic Environmental Effects (E3) engineering support, survivability/operability demonstrations, development of issue resolution approaches; development of Anti-Radiation Missile (ARM) Countermeasure Evaluator (ACE); and hardened technology integration. ACE combines the desirable effects of low-cost digital simulations and hardware testing of actual ARM hardware in open- and closed-loop simulations. ACE will be used to develop initial ARM Electronic Counter-Countermeasure (ECCM) techniques for THAAD/GBR and PAC-3. The multi-spectral signature of the deployed THAAD Radar system requires application of extensive CCD technologies which have been developed by the Army Labs. Technologies will be available for incorporation into core missile defense systems at Engineering Manufacturing Development (EMD), will provide near-term improvements to existing systems, and will provide necessary risk reduction evidence to support THAAD Radar, and Medium Extended Air Defense System (MEADS) system milestone decisions.

This program has developed tools to evaluate THAAD Radar performance under defense suppression threats and in hostile environments. These evaluations support the THAAD Radar Milestone II decisions. The ACE operational capability was demonstrated. Countermeasures for precision guided missiles and cruise missiles continued to be developed. CCD techniques applied to the THAAD Radar were evaluated for effectiveness in battlefield conditions. Requirements for the THAAD Radar to be protected against electromagnetic environmental effects were reviewed and design guidelines were identified.

**FY 1996 (\$ in Thousands):**

- \$1,270	This program has developed tools to evaluate THAAD Radar performance under defense suppression threats and in hostile environments. These evaluations support the THAAD Radar Milestone II decisions. The ACE operational capability was demonstrated. Countermeasures for precision guided missiles and cruise missiles continued to be developed. CCD techniques applied to the THAAD Radar were evaluated for effectiveness in battlefield conditions. Requirements for the THAAD Radar to be protected against electromagnetic environmental effects were reviewed and design guidelines were identified.
- \$1,270	Total

Project 1161

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Exhibit R-2 (PE 0603872C)

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

DATE February 1997

PROJECT  
1161

PE NUMBER AND TITLE

0603872C Joint Theater Missile Defense

BUDGET ACTIVITY

**4 - Demonstration and Validation**

FY 1997 (\$ in Thousands):

- \$3,334 Conduct ACE evaluation of PATRIOT and MEADS TMD radars against countermeasures. Repaired ACE to allow testing of THAAD radar waveforms. Implement E(3) program and develop NBC guidelines to optimize protection to TMD systems while minimizing cost and weight. Conduct analysis of vulnerability to Precision Guided Munitions (PGM), and analysis of PGM SEO designs. Continued development of TMD survivability technologies in CCD.  
Total - \$3,334

FY 1998 (\$ in Thousands):

- \$3,364 Develop CCD/technologies for THAAD Radar and THAAD Systems signature management. Utilize ACE for integrated ARM/ECCM evaluation for THAAD Radar. Support THAAD Radar EMD testing. Evaluate THAAD Radar software for survivability. Conduct SEO proof of principle test. Continue environmental model development and enhancements.  
Total - \$3,364

FY 1999 (\$ in Thousands):

- \$3,208 Demonstrate and validate Pre-Planned Product Improvement SEOs for THAAD radar. Utilize ACE for THAAD/GBR radar evaluation. Multi-spectral decoys for TMD systems. Continue E3 programs.  
Total - \$3,208

**Acquisition Strategy:** The survivability technology program supports the tailored and streamlined acquisition strategy employed by the TMD acquisition managers. Survivability technologies chosen for evaluation/development will be based on requirements. Within the executing agents, free and open competitive contracts will be used to the maximum extent possible to accomplish specific work packages in accordance with field laboratory acquisition procedures. Contract proposals will be evaluated according to innovative technology approaches, responsiveness to program requirements, quality of proposed deliverables, and cost.

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

	FY 1996	FY 1997	FY 1998	FY 1999	Total
Previous President's Budget	921	3,531	3,498	3,553	11,303
Current Budget Submit/President's Budget	1,270	3,334	3,364	3,208	11,176



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

DATE February 1997

BUDGET ACTIVITY PROJECT  
 4 - Demonstration and Validation PE NUMBER AND TITLE  
 0603872C Joint Theater Missile Defense 1161

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

	FY 1996	FY 1997	FY 1998	FY 1999	Total
Demonstration & Validation	1270	3334	3364	3208	
Total	1,270	3,334	3,364	3,208	

**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 1996	Budget FY 1996	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<b>Product Development Organizations</b>											
BDM	CPFF	21 Dec 90			431	431	1000	1000	1000	Cont	3,431
BDM	CPFF				0	0	1127	1159	1003	Cont	3,289
NRC	CPFF	14 Feb 92			216	216	0	0	0	0	216
BAH	CPFF	10 Jul 92			175	175	0	0	0	0	175
TBE	CPAF	6 Mar 92			50	50	0	0	0	0	50
MICOM	MIPR	Multiple			0	0	1000	1000	1000	Cont	3,000
<b>Support and Management Organizations</b>											
SSDC	PMA	Multiple			392	392	200	200	200	Cont	992
Misc	Multiple	Multiple			6	6	7	5	5	Cont	23
<b>Test and Evaluation Organizations</b>											

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

Project 1161

UNCLASSIFIED

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)		DATE	PROJECT							
BUDGET ACTIVITY										
4 - Demonstration and Validation		0603872C	Joint Theater Missile Defense							
PE NUMBER AND TITLE		1161								
<b>Government Furnished Property:</b>										
Item Description	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Delivery Date	Total Prior to FY 1996	Budget FY 1996	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
	Product Development Property									
<b>Support and Management Property</b>										
<b>Test and Evaluation Property</b>										
Subtotal Product Development				872	3,127	3,159	3,003			10,161
Subtotal Support and Management				398	207	205	205			1,015
Subtotal Test and Evaluation										
Total Project				1,270	3,334	3,364	3,208			11,176

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

DATE February 1997

BUDGET ACTIVITY

## 4 - Demonstration and Validation

PE NUMBER AND TITLE

0603872C Joint Theater Missile Defense

PROJECT

1170

COST (\$ In Thousands)	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	Total Cost
	Actual	Estimate	Estimate	Estimate	Estimate	Estimate	Estimate	Estimate	
1170 TMD Risk Reduction	41,521	23,184	35,267	25,045	24,920	24,803	24,773	24,817	Continuing

**A. Mission Description and Budget Item Justification**

This project is the primary BMDO risk mitigation program addressing TMD target/threat signature and the sensor-to-system interface issues for all TMD systems. How potential targets appear to radar and infrared seekers is an important issue which allows TMD acquisition programs to limit costs by concentrating designs on narrow bands of key threat signature characteristics. This project consists of five elements: TMD Critical Measurements Program (TCMP) which builds, flies, observes, and analyzes targets with signature characteristics similar to those anticipated on foreign threats; the Target Signature Measurements Program which observes and directs the analysis of signatures from BMDO test targets (STORM, HERA, etc.) to obtain target signature insights, and which exploits other similar threat signature opportunities; the TMD Seeker Test/Measurements Program which uses an experimental seeker test bed to evaluate emerging missile seeker technologies and to support resolution of unexpected critical problems that emerge during their engineering and testing phases; Kill Assessment Program which investigates the signatures and results of a target intercept; and the Sapphire Statistical Characterization and Risk Reduction (SSCARR) program which determines window/dome reliability and fabrication techniques. In all cases, the target signature data and the analyses address specific questions relating to how a radar first identifies a missile (discrimination), how the radar passes the missile location to a seeker (sensor to seeker handover), how the seeker determines the best place to hit the target (aim point selection), and how the defender can tell if a missile is destroyed (kill assessment). The core sensor costs used in this project to collect target signature data will be provided under projects 1155 and 3360. This project funds the specific sensor tasks for each mission.

TMD Critical Measurements Program. This program supports the risk mitigation efforts in TMD signatures. TCMP is a flight test program where threat representative targets are flown at the Kwajalein Missile Range (KMR) or other facilities to observe typical threat-like objects in flight with a sophisticated suite of sensors. These sensors give both target data and representative signature data as seen by TMD system sensors. The TCMP program performs the analysis on the data obtained in these flights. In all cases, the target and threat data and the analysis address the specific areas of discrimination, target object map handover and aim point selection. The hardware, flight instrumentation and data analysis of the TCMP flights are all included in the TCMP budget. TCMP 2 will consist of three medium range flights, in the fourth quarter of Fiscal Year96 and two in the second quarter Fiscal Year97.

Kill Assessment. This program is developing the technical basis for the TMD architecture battle management decision kill assessment capability. This capability will enable the battle manager to respond nearly "real-time" following a target intercept engagement to cease-fire, to order a second shot, or to cue the lower tier for appropriate action. This kill assessment capability will also help measure defense system effectiveness and identify threat warhead type. In support of this shoot-look-shoot doctrine, the program is conducting a series of specialized sensor data collections of TMD interceptor tests, follow-on data analysis, and algorithm development. The most challenging aspect is gathering enough pertinent data from various types of intercept scenes to identify and evaluate those observable characteristics serving this decision process. Since opportunities to observe actual TMD missile intercepts are rare, this program will emphasize ground test measurements and construction of analytical models and tools for developing and validating algorithms for the TMD acquisition program.

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

DATE

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BUDGET ACTIVITY

**4 - Demonstration and Validation**

PE NUMBER AND TITLE

**0603872C Joint Theater Missile Defense**

PROJECT

1170

**I**MD Seeker Test/Measurements: This program provides for the application, integration, and testing of the latest available seeker technologies into on-going IMD seeker designs. The program is divided into two parts; the first supports the Seeker Experimental System (SES) which is used to evaluate missile seeker performance functions and the second is a seeker window sapphire material characterization effort designed to provide a critical database for designers to evaluate seeker window performance in the high temperature, low altitude flight regime. The SES provides BMDO with independent evaluation of emerging seeker technologies in a realistic system context, allowing for risk assessment prior to acquisition commitment. In supporting the solution of technical problems arising in seeker acquisition programs, the SES can address a wide range of design and implementation issues such as hardware/software integration and evaluation of seeker functional algorithms. The sapphire material test activities serve as risk mitigation for Theater High Altitude Area Defense (THAAD), Navy Standard Block IVA Missile and the ARROW Programs for improved survivability confidence of the seeker window.

**T**arget Signature Measurements. This program funds the per mission costs to acquire data using sophisticated sensor platforms (Airborne Surveillance Testbed, HALO, Sealite Beam Director, etc.) on BMDO interceptor target flights (LANCE, STORM, HERA, etc.). This program also provides the tasking through the Target Signatures Working Group (TSWG) and the funding for each mission to the sensor platforms for each flight. The data collected is utilized by the acquisition programs, the TSWG, and the Targets Program to establish target in-flight signature characteristics for use in hardware development and interceptor algorithm assessment.

**S**SCARR is a joint effort involving the THAAD, Navy SM Block IVA, and ARROW programs. Due to its mechanical strength, high thermal conductivity, and high transparency in the mid-wave infrared, sapphire has become the material of choice for TMD seeker windows and domes. SSCARR employs statistical procedures to determine window/dome reliability for the participating programs. This probability of failure data will allow designers and battle planners to more fully exploit the interceptors' available battle-space. In addition, diagnostic techniques are being used in an attempt to demonstrate correlation's between sapphire surface and volume features and "weak" sapphire, thus providing a sapphire screening technique. Potential follow-on activities to SSCARR include a computational fluid dynamics validation effort with emphasis on problems relating to predicting jet interaction effects, an assessment of advanced seeker window technology to remove blur where extreme accuracy in angle-rate measures are required, and an investigation of the utility of reactive materials on hit-to-kill interceptors.

**EY 1996 (\$ in Thousands):**

-	\$30,223	Fiscal Year 1996 accomplishments included fabrication and testing of TCMP 2 payload and FASP hardware. Planning for TCMP 3 continued throughout Fiscal Year 1996. A successful July launch of TCMP 2B allowed for extensive data collection and analysis. Preparation and planning for TCMP 3 continued.
-	\$6,145	Upgraded sensor assets to optimize data collections on intercept events, collected intercept data on Marine Corps HAWK-Lance mission.
-	\$2,195	Enhanced and tested Seeker System performance in support of THAAD; continued to support TMD seeker related improvements and used the seeker experimental system for seeker functional testing, initiated sapphire window material tests to improve seeker performance reliability.
-	\$2,958	Collected data to characterize STORM and HERA targets; collect static Radar Cross Section (RCS) data on items, observe Navy flight tests.
-	\$41,521	Total

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

DATE February 1997

BUDGET ACTIVITY

PE NUMBER AND TITLE

0603872C Joint Theater Missile Defense

PROJECT  
1170

**4 - Demonstration and Validation**

**EY 1997 (\$ in Thousands):**

- \$15,144 Conduct TCMP 2A and 2C experimental flight test; analyze, and report test results. Continue TCMP 3 experimental flight test planning for long and mid-range flights to support THAAD EMD and Navy Upper Tier, and to evaluate potential countermeasures and tactics. Purchase and integrate TCMP 3 payload hardware. Expected launch during first quarter Fiscal Year 1999.
- \$3,353 Continue to collect and analyze sensor data of intercept tests and transfer kill assessment technology to TMD Major Defense Acquisition Programs (MDAPS); evaluate and upgrade, as required, kill assessment algorithm performance.
- \$2,510 Continue electro-optical infrared support testing of missile seekers with Seeker Experimental System (SES) and complete the sapphire material test program. Continue SSCARR joint effort.
- \$2,177 Continue target measurements and observe and characterize interceptor targets and flight tests.
- \$23,184 Total

**EY 1998 (\$ in Thousands):**

- \$26,131 Purchase boosters and remaining payload hardware for TCMP 3 flights, focusing on countermeasures and longer range threats. Conduct final preparations for TCMP launches.
- \$6,904 Continue to collect intercept data and to develop the primary kill assessment algorithms for Engineering Manufacturing and Development (EMD) in support of the THAAD Radar system and Navy Theater Wide.
- \$2,232 Continue target measurements and observe and characterize interceptor targets.
- \$35,267 Total

**EY 1999 (\$ in Thousands):**

- \$21,495 Conduct TCMP 3 flight tests, data collection and analysis. Plan and prepare for TCMP 4 experiments.
- \$3,550 Continue to collect intercept data and test the primary kill assessment algorithms for EMD in support of Navy Upper Tier.
- \$25,045 Total

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

	EY 1996	EY 1997	EY 1998	EY 1999	Total
Previous President's Budget	41,521	22,954	35,267	25,045	Cost
Current Budget Submit/President's Budget	41,521	23,184	35,267	25,045	125,017

**Change Summary Explanation:**

Funding: The FY97 and FY98 funding was reduced by \$13.5M to fund higher priority projects.

Project 1170

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

DATE February 1997

BUDGET ACTIVITY  
 4 - Demonstration and Validation  
 PE NUMBER AND TITLE  
 0603872C Joint Theater Missile Defense  
 PROJECT  
 1170

Schedule: None

Technical: None

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

	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To Compl	Total Cost
1266, Navy Theater Wide TBMD 0603868C	200,442	304,171	194,898	192,073	191,229	190,930	145,190	149,444		

**D. Schedule Profile**

	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 1999
1	2	3	4	1	2	3	4	1	2
TCMP Campaign 2B			X						
TCMP Campaign 2A, 2C									
TCMP Campaign 3 Planning			X						
Conduct TCMP Campaign 3									
Provide Kill Assessment Algorithms							X		X

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

DATE February 1997

BUDGET ACTIVITY

PE NUMBER AND TITLE

4 - Demonstration and Validation

0603872C Joint Theater Missile Defense

PROJECT

1170

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

	FY 1996	FY 1997	FY 1998	FY 1999	Total
Engineering	36,938	21,920	31,170	22,692	112,720
Studies	3,013	1,264	4,097	2,353	10,727
Support	1,570	0	0	0	1,570
Total	41,521	23,184	35,267	25,045	123,434

**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			Budget to Complete	Total Program	
					FY 1996	FY 1997	FY 1998			
Product Development Organizations	Multiple	Multiple			39,938	23,184	35,267	25,045	Cont	123,434
Support and Management Organizations	Alloc				1,583	0	0	0	Cont	1,583

**Test and Evaluation Organizations**

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

**Government Furnished Property:**

UNCLASSIFIED

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)		DATE	February 1997		PROJECT					
BUDGET ACTIVITY		PE NUMBER AND TITLE				PROJECT				
4 - Demonstration and Validation		0603872C Joint Theater Missile Defense				1170				
Contract										
Item Description	Method/Type or Funding Vehicle	Award or Obligation Date	Delivery Date	Total Prior to FY 1996	Budget FY 1996	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Product Development Property										
Support and Management Property										
Test and Evaluation Property										
Subtotal Product Development				39,938	23,184	35,267	25,045			123,434
Subtotal Support and Management				1,583						1,583
Subtotal Test and Evaluation										
Total Project				41,521	23,184	35,267	25,045			125,017

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

DATE **February 1997**

BUDGET ACTIVITY		PE NUMBER AND TITLE										PROJECT	
		<b>0603872C Joint Theater Missile Defense</b>										<b>1270</b>	
<b>4 - Demonstration and Validation</b>		COST (\$ In Thousands)	FY 1996 Actual	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost	
1270	Applied Inert Mats and System Tech Program		9,137	0	0	0	0	0	0	0	TBD	TBD	

**A. Mission Description and Budget Item Justification**

**Atmospheric Interceptor Technology (AIT) Program:** The AIT program will develop, integrate and demonstrate the critical technologies for performing hypersonic hit-to-kill intercepts of TBMs within the atmosphere. The demonstrations will validate the solution to critical KKV technologies and will provide: (1) new capabilities with reduced costs/risks compared to current interceptor weapons systems, and enhancements to other interceptors under development; (2) reduction of technical risks and costs in support of acquisition programs through direct technology insertions; and (3) technical solutions to provide theater defense interceptor capabilities for contingencies not currently addressed by the TMD system programs. The program uses existing contracts and technologies currently under development to reduce schedule and cost, and will be planned and conducted with BMDO, Air Force, Navy, and Army elements to make maximum use of existing Service infrastructures. The AIT project will participate in the UAV/BPI Studies (PMA 2259) and the Navy Theater Wide requirements studies.

The AIT program has successfully developed and demonstrated critical technologies for hypersonic endoatmospheric kill vehicles that perform hit-to-kill intercepts of TBMs in the atmosphere. A number of cooled window concepts have been developed and demonstrated, prototype strap-down seeker hardware has been developed and tested, and kill vehicle design concepts have been completed. The program will complete prototype seeker hardware and testing, develop a solid propellant divert and attitude control system (DACS), and integrate complete ground and potential flight test hardware. Aero-optical shock tunnel tests were completed on an externally cooled window concept. A downselect to a single prime contractor was conducted in first quarter Fiscal Year 1996.

**FY 1996 (\$ in Thousands):**

- \$9,137 Atmospheric Advanced Interceptor Technology: Continue prototype strapdown seeker validations and tests. Complete downselect to single prime contractor. Conduct cooled window and forebody aero-optical shock tunnel tests. Conduct forebody and airframe vibration tests and field joint validation, and initiate development of solid propellant divert and attitude control system (DACS) components. Continue detailed design of KKV vehicle.

- \$  
- \$  
- \$9,137 Total

**FY 1997 (\$ in Thousands):**

- \$0  
- \$

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE	PROJECT
BUDGET ACTIVITY		February 1997	1270
4 - Demonstration and Validation		0603872C Joint Theater Missile Defense	
<p>PE NUMBER AND TITLE</p>			
\$			
- \$0	Total		
<p>FY 1998 (\$ in Thousands):</p>			
- \$0			
- \$			
- \$			
- \$0	Total		
<p>FY 1999 (\$ in Thousands):</p>			
- \$0			
- \$			
- \$			
- \$0	Total		
<p><b>Acquisition Strategy:</b> The AIMST Project uses U.S. Army Space and Strategic Defense Command (USASSDC), DoD and DoE laboratories to fund contractors supported by relevant in-house expertise to meet the AIMST milestones. Weapons systems prime contractors acquire license agreements to use advanced manufacturing/productibility processes (e.g., composite materials, baffles and nozzles) developed by the AIMST Project. International funding (e.g., UK and Japan) and joint agency coalitions (e.g., NASA, DoE and ARPA) are assembled to obtain critical level of effort (e.g., US/UK STRV-2, BMDO/AF/ARPA Smart Structures, US/Japan Composites and superconducting materials programs). The AIT program plan will consist of development and validation of endoatmospheric kill vehicle technologies for potential use in advanced TMD systems, such as advanced NTWD THAAD, MEADS and UAV/BPI; and options for the design, fabrication, and test of the KKV's; options for KKV/booster integration and flight tests. USASSDC will provide technical and contract management of the AIT prime contract. On-going, competitively-awarded, CPFF contracts for the kill vehicle technologies within the AIT program will continue through the completion of ground testing and potential flight tests.</p>			
<p><b>B. Program Change Summary (\$ in Thousands)</b></p>			
			Total
	FY 1996	FY 1997	FY 1998
Previous President's Budget	9,708	0	0
Current Budget Submit/President's Budget	9,137	0	0
	Cost		9,708
			9,137

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

DATE February 1997

BUDGET ACTIVITY

PE NUMBER AND TITLE

**4 - Demonstration and Validation**

**0603872C Joint Theater Missile Defense**

PROJECT  
1270

**Change Summary Explanation:**

Funding: Changes in funding resulted in realigning of interceptor & sensor technologies within Projects 1270 and 1161 to better reflect the technologies principle application. The AIT Program was transferred to Project 1270 in FY96 from Project 1265 (BPI), PE 0603870, without funding. Execution of the STRV-2 Program was transferred to Project 1270 starting in FY97.

Schedule: Delay in program milestones due to cancellation of BPI program and transfer of AIT Technology development to Project 1270 and other funding reductions.

Technical: None

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

	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To Compl	Total Cost
2400 NMD Program PE 0603871C	730,656	828,864	504,091	393,085	309,748	309,584	391,585	392,433	Cont	Cont

**D. Schedule Profile**

	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 1999	FY 1999
1	2	3	4	1	2	3	4	1	2	3
*										

AIT Downselect to single prime contractor.

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

DATE **February 1997**

BUDGET ACTIVITY

PE NUMBER AND TITLE

**4 - Demonstration and Validation**

**0603872C Joint Theater Missile Defense**

PROJECT  
**1294**

	FY 1996 Actual	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
1294 UAV Boost Phase Intercept	5,705	930	0	0	0	0	0	0	TBD	TBD

**A. Mission Description and Budget Item Justification**

The Unmanned Aerial Vehicle (UAV)-Based Boost Phase Intercept (BPI) project covers two tasks; Task 1: Cooperative UAV-Based BPI project with Israel, and Task 2: Development of a US UAV-Based BPI Concept. Task 1 is a cooperative U.S./Government of Israel (GOI) BPI program which involves future development and refinement (risk mitigation) of the Israeli Boost Phases Intercept System (IBIS) concept which is planned to destroy tactical ballistic missiles in the boost phase of flight, before engine cutoff, preferably while in enemy territory. This project is based on the use of UAVs armed with on-board interceptors to provide the means of destroying enemy missiles in their boosting phase of flight. The first task of this two-part project will provide risk mitigation in the development of the GOI's UAV BPI. Task 2 of this effort develops a U.S. UAV-based BPI system concept. It will develop the system requirements, to include: kinetic energy interceptors, UAVs, search and track sensors, Battle Management, Command, Control, Communications, Computers and Intelligence (BMC4I), and the concept of operations (CONOPS) based on readily available U.S. technologies.

FY 1996 (\$ in Thousands):

- \$5,705 UAV-based BPI: Developed U.S. requirements and concept for UAV-based kinetic energy BPI. Generated and evaluated U.S. technologies available for a UAV platform, interceptor, and search and track systems. Developed related BMC4I Technologies. Analyzed available UAVs and develop requirements. Developed preliminary CONOPS for a US UAV concept. Worked with the Israelis to develop a cooperative risk mitigation effort in the areas of interceptors, sensors, and BMC4I.
- \$5,705 Total

FY 1997 (\$ in Thousands):

- \$930 See PE0603870C: Continue the risk mitigation effort with the GOI and initiate interoperability efforts.
- \$930 Total

FY 1998 (\$ in Thousands):

- \$0 See PE0603870C
- \$0 Total

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE	February 1997		PROJECT					
BUDGET ACTIVITY		PE NUMBER AND TITLE		1294						
<b>4 - Demonstration and Validation</b>		<b>0603872C Joint Theater Missile Defense</b>								
<p><u>FY 1999 (\$ in Thousands):</u></p> <p>- \$ Project continuation decision expected in FY98.</p> <p>- \$ Total</p>										
<p><b>Acquisition Strategy:</b> This project is risk integration for the ABL program. Task 1 of this PMA is a cooperative US/Government of Israel (GOI) risk mitigation effort addressing further MOAB interceptor development, BMC3I, along with intraconstellation communications. The effort is being done under a firm fixed price contract. The US and GOI share costs. Task 2 is being accomplished by BMDO tri-service Integrated Product Teams (IPT). Additional support is provided by industry.</p>										
<b>B. Program Change Summary (\$ in Thousands)</b>										
		<u>FY 1996</u>	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	Total				
Previous President's Budget		9,706	9,296	9,436	0	Cost				
Current Budget Submit/President's Budget		5,705	930	0	0	28,438				
						6,635				
<p><b>Change Summary Explanation:</b>                  See PE 0603870C for FY97/98 Funding                  Funding: Project funding, structure, and objective directed by Congress</p>										
Schedule: None										
Technical: None										
<b>C. Other Program Funding Summary (\$ in Thousands)</b>										
		<u>FY 1996</u>	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	To
3359 System Test and Evaluation, PE 0603872C		33,355	42,792	40,307	26,444	25,763	29,793	30,312	30,363	Compl
										Total
										Cost

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

DATE

February 1997

BUDGET ACTIVITY

PE NUMBER AND TITLE

0603872C Joint Theater Missile Defense

PROJECT

1294

D. Schedule Profile

	FY 1996		FY 1997		FY 1998		FY 1999	
1	2	3	2	3	2	3	2	3
	X							
Complete IBIS Follow-On Report								
Contract Milestone (Israeli) Risk Mitigation				X				
Preliminary US UAV BPI Concept			X					
Israeli Risk Mitigation Final Report							X	

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

DATE **February 1997**

BUDGET ACTIVITY  
**4 - Demonstration and Validation**  
 PE NUMBER AND TITLE  
**0603872C Joint Theater Missile Defense**  
 PROJECT  
**1294**

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

	<u>FY 1996</u>	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>
IBIS Systems Engineering	5,705	930		
US Systems Engineering	5,705	930		
Total				

**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 1996	Budget				Total Program	
						<u>FY 1996</u>	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>		
SMC	MIPR	Jan 97	157	157	1,350	157	0	0	0	TBD	1,507
Navy PEO TADB	MIPR	Jan 97	250	250	2,025	250	0	0	0	TBD	2,025
NAWC	MIPR				466	250	0	0	0	TBD	716
DARPA	MIPR				650	0	0	0	0	TBD	650
<b>Support and Management Organizations</b>											
WJSA	CPFF	Apr 96			1,171	523	0	0	0	TBD	1,694
SSDC	MIPR	Sep 96			25	0	0	0	0	TBD	25

**Test and Evaluation Organizations**

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

DATE **February 1997**

BUDGET ACTIVITY  
**4 - Demonstration and Validation** PE NUMBER AND TITLE **0603872C Joint Theater Missile Defense** PROJECT **1294**

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 1996	Budget	Budget	Budget	Budget	Total Program
					FY 1996	FY 1997	FY 1998	FY 1999 Complete	
Product Development Property	FP	Jul		18	0	0	0	TBD	18

Support and Management Property

Test and Evaluation Property

Subtotal Product Development				4,509	407				4,916
Subtotal Support and Management				1,196	523				1,719
Subtotal Test and Evaluation									
<b>Total Project</b>				<b>5,705</b>	<b>930</b>				<b>6,635</b>

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

DATE **February 1997**

BUDGET ACTIVITY

PE NUMBER AND TITLE

**0603872C Joint Theater Missile Defense**

PROJECT  
**2160**

**4 - Demonstration and Validation**

COST (\$ In Thousands)	FY 1996 Actual	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
2160 TMD Existing System Mods	20,401	22,421	12,328	12,957	0	0	0	0	TBD	TBD

**A. Mission Description and Budget Item Justification**

This project implements non-major defense acquisition program modifications to current and existing warning and surveillance systems that result in fielded improvements to TMD capabilities. This project consists of three programs: Cueing and Netting, SHIELD, and the Extended Airborne Global Launch Evaluator (EAGLE).

**CUEING AND NETTING.** The overarching objective of the cueing and netting task is to enable the US Marine Corps AN/TPS-59 long-range surveillance radar to accept external cues from, and pass cues to, different theater sensors in order to facilitate theater ballistic missile (TBM) identification, location, and tracking. The effort will consist of the development, testing, and operational demonstration of hardware and software improvements to the radar and other supporting systems.

**SHIELD (Formerly Talon Shield).** The SHIELD program is developing a system that receives and fuses Defense Support Program (DSP) assets, other national intelligence data and SIGINT data on theater ballistic missile (TBM) events to provide more timely warning of worldwide TBM launch point, time, azimuth and impact point prediction to tactical units. As processing improvements and additional sources are integrated and fused, these upgraded capabilities are passed to the Air Force Attack and Launch Early Reporting to Theater (ALERT) and the Army Joint Tactical Ground Station (JTAGS) programs for incorporation in the operational systems. The system is co-located at the Joint National Test Facility, Falcon Air Force Base, CO with ALERT.

**Extended Airborne Global Launch Evaluator (EAGLE).** The EAGLE is a Commercial Off The Shelf (COTS) and Non-Developmental Item (NDI) program that will field a detection, tracking, and cueing system against TBM. EAGLE will be compatible with any Boeing 707 type or larger class aircraft. The prototype is currently planned for installation in the Air Force E-3 Airborne Warning and Control System (AWACS) aircraft. EAGLE represents the integration of several existing technologies into a new sensor suite that will add significant leverage to the overall TBM defense architecture as well as provide significant complementary support to the US and NATO AWACS missions. The principal components of EAGLE are a Wide Area Surveillance Sensor (WASS) from the B-1B program, a High Accuracy Reacquisition Sensor (HARS) from the F-117A Nighthawk program, and a laser range finder from the Navy's Radiant Mist/Outlaw projects. The overall integrator and prime contractor is Boeing in Seattle, Washington. The major sub-contractors are Texas Instruments in Dallas, Texas and Rockwell International of California. International participation is at the second tier sub-contractors. Operationally, the EAGLE system will acquire a boosting TBM and track it until shortly after burnout to establish very precise trajectory, launch point, and impact point estimates. This information will be broadcast as a Joint Tactical Information Distribution System (JTIDS) message which will be used to cue active defense radar, support attack operations against the launchers, and provide improved warning for passive defense. The trajectory cue will enable fire control radar from a variety of interceptor systems to efficiently focus their energy into a single beam allowing acquisition much sooner than normally achievable with autonomous operations. This capability maximizes the defended area footprint as required by the Joint Requirements Oversight Council (JROC). EAGLE can greatly improve the defended area against long range theater ballistic missiles versus autonomous operation. In addition, the improved

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situational awareness provided through BMC31 to the Joint Force Air Component Commander greatly enhances the coordination of the theater air battle and ballistic missile defenses.

FY97 Congressional Language mandated that funding be moved from "TMD Existing Systems - EAGLE" to "Airborne Sensor for Ballistic Missile Tracking". The language also directed the Under Secretary of Defense for Acquisition and Technology {USD (A&T)} provide a plan to congressional defense committees for developing an airborne sensor capability for ballistic missile tracking not later than 19 Jan 97. The language directed that operational user requirements and perspectives and total program cost be given priority consideration in selecting a system to provide this capability. To meet this mandate, the FY97 funds for Task 3 - EAGLE was moved to Task 4 - Airborne Sensor for Ballistic Missile Tracking, the report to Congress written, and program plan developed for the chosen airborne sensor. The EAGLE program will be allowed to proceed at a slower pace due to the funding limitation while the study is conducted and the report written. The Rivet Joint Technology Transfer program will be given initially \$400,000 to participate in the study. Depending on the USD (A&T) decision, an airborne sensor may be chosen to proceed through engineering, manufacturing, and development (EMD) and production.

FY 1996 (\$ in Thousands):

- \$4,704 SHIELD. Complete SHIELD processor and calibration upgrades; continue to incrementally develop, test and demonstrate added capability of fusing DSP data with other classified sensor data.
- \$15,600 EAGLE. Finalize the design, commence sensor rapid prototyping; complete modifications to sensor components and integrate sensor subsystems; conduct tests in contractor laboratories to characterize components and subsystems.
- \$097 EAGLE. Update Air Force Theater Air Command and Control Facility (TACCSEF) EAGLE simulation and demonstrate modeling.
- \$20,401 EAGLE cost analysis of procurement options and studies from simulations in Europe.  
Total

FY 1997 (\$ in Thousands):

- \$1,393 CUEING AND NETTING. Develop AN/TPS-59 hardware and software modifications to accept and pass an external cue and conduct developmental testing of cueing and netting capability.
- \$3,808 SHIELD. Continue SHIELD development test and evaluation activities; continue to incrementally develop, test and demonstrate improved processing capabilities and fusion of other intelligence and sensor data sources with DSP.
- \$93 EAGLE. Complete efforts initiated in FY 1996. Characterize sensor performance under conditions more characteristic of the operational environment against TBM targets of opportunity and surrogate targets prior to prototype integration on the AWACS TS-3 test aircraft.
- \$17,127 Airborne Sensor for Ballistic Missile Tracking
- \$22,421 Total

FY 1998 (\$ in Thousands):

- \$1,361 CUEING AND NETTING. Conduct an operational demonstration of the TPS-59 capability to accept and pass an external cue.

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- \$1,815	SHIELD. Continue SHIELD development, test and evaluation activities; continue to incrementally develop test and demonstrate improved processing capabilities and fusion of other intelligence and sensor data sources with DSP.											
- \$9,152	EAGLE. Continue FY 1997 activities; install and integrate the EAGLE prototype sensor aboard the TS-3 aircraft; conduct EAGLE prototype flight testing.											
- \$12,328	Total											
<u>FY 1999 (\$ in Thousands):</u>												
- \$12,957	EAGLE. Complete prototype testing and pre-EMD activities initiated in FY98.											
- \$12,957	Total											
<b>B. Program Change Summary (\$ in Thousands)</b>												
		FY 1996	FY 1997	FY 1998	FY 1999	Total Cost						
Previous President's Budget		20,006	24,166	12,860	13,593	70,625						
Current Budget Submit/President's Budget		20,401	22,421	12,328	12,957	68,107						
Change Summary Explanation:												
Funding: Funding adjustments made to support higher priority projects.												
Schedule: None												
Technical: None												
<b>C. Other Program Funding Summary (\$ in Thousands)</b>												
		FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To Compl	Total Cost	
1		2	3	4	1	2	3	4	1	2	3	4
<b>D. Schedule Profile</b>												
Project 2160												
										Exhibit R-2 (PE 0603872C)		

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BUDGET ACTIVITY		PE NUMBER AND TITLE																
4 - Demonstration and Validation		FY 1996				FY 1997				FY 1998				FY 1999				
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	
CUEING AND NETTING																		
Acquisitions milestones							X											
Engineering milestones								X										
Test and Demos									X									
EAGLE																		
Acquisition Milestone																		
Design Review Technical Interchanges		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Engineering Milestone																		
Component Ground Lab Test		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Lab and Field Ground Test										X	X							
Prototype Flight Test														X	X			
Contract Milestone																		
Other Program Events																		
International Participation Negotiations		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
TALON SHIELD																		
Acquisition Milestones																		
Engineering Milestones																		
Upgrade Reviews		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
T&E Milestone																		
Test and Demos		X	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)**

BUDGET ACTIVITY		DATE				PROJECT
4 - Demonstration and Validation		0603872C Joint Theater Missile Defense				2160
PE NUMBER AND TITLE		FY 1996	FY 1997	FY 1998	FY 1999	
<b>A. Project Cost Breakdown (\$ in Thousands)</b>						
Engineering		18,156	21,223	11,328	12,097	
Studies		2,245	1,198	1,000	860	
Total		20,401	22,421	12,328	12,957	
<b>B. Budget Acquisition History and Planning Information (\$ in Thousands)</b>						
<b>Performing Organizations:</b>						
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 1996	Budget FY 1996
						Budget FY 1997
						Budget FY 1998
						Budget FY 1999
						Budget to Complete
						Total Program
<b>Product Development Organizations</b>						
ESC/XR	MIPR		15,487	16,680	9,547	12,957
SMC/XR	MIPR		4,815	5,648	2,781	0
<b>Support and Management Organizations</b>						
ESC/XR	MIPR		99	93	0	0
<b>Test and Evaluation Organizations</b>						
<b>B. Budget Acquisition History and Planning Information Continued (\$ in Thousands)</b>						
<b>Government Furnished Property:</b>						

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Contract

Item Description Method/Type or Funding Vehicle Award or Obligation Date Delivery Date

Total Prior to FY 1996

Budget FY 1996

Budget FY 1997

Budget FY 1998

Budget FY 1999

Budget to Complete

Total Program

Product Development Property

Support and Management Property

Test and Evaluation Property

Subtotal Product Development  
Subtotal Support and Management  
Subtotal Test and Evaluation

Total Project

20,302	22,328	12,328	12,957	67,915
99	93			192
20,401	22,421	12,328	12,957	68,107

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COST (\$ In Thousands)	FY 1996 Actual	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
Israeli Cooperative Project	59,352	43,892	38,715	38,662	38,624	38,591	0	0	TBD	TBD

**A. Mission Description and Budget Item Justification**

This project includes the Arrow Continuation Experiments (ACES) Project, the Arrow Deployability Project (ADP), the Israeli Test Bed (ITB), Israeli Cooperative Research & Development (R&D), and the Israeli System Architecture and Integration (ISA&I) Project. The U.S. derives considerable benefits from its participation in these projects. The primary benefits are in U.S. gains in technology and technical information that will reduce risks in U.S. TMD development programs. The U.S. also benefits from the eventual presence of an anti-ballistic missile defense system in Israel, which provides deterrence of future tactical ballistic missile (TBM) conflicts in that region. This defensive system also contributes to a more robust defensive response should deterrence fail.

The Israeli / Arrow program consists of efforts to develop a ballistic missile defense system. It includes the U.S.-Government of Israel (GOI) initiative to assist the GOI development of an anti-tactical ballistic missile (ATBM) interceptor and launcher. The program also includes development of the fire control radar, fire control center and launch control center by the Israelis without U.S. participation. Comprised of three phases, this initiative began with the Arrow Experiments project (Phase I) that developed the prototype Arrow I interceptor. The ACES project (Phase II) is a continuation of Phase I, and consists of critical lethality tests using the Arrow II interceptor upgraded development and test of the Arrow II interceptor. Arrow provides the basis for an informed GOI engineering and manufacturing decision for an ATBM defense capability. If successful, the Arrow II will satisfy the Israeli requirement for an interceptor for defense of military assets and population centers and will support U.S. technology base requirements for new advanced anti-tactical ballistic missile technologies that could be incorporated into the U.S. theater missile defense (TMD) systems.

The third phase is the ADP which began in Fiscal Year 1996. This phase of the project will pursue the research and development of technologies associated with the deployment of the Arrow Weapon System (AWS) and will permit the GOI to make a decision regarding deployment (without financial participation by the U.S. beyond the R&D stage). This effort will include system-level flight tests of the U.S.-Israeli cooperatively developed Arrow II interceptor supported by the Israeli-developed fire control radar, fire control center and launcher control center (LCC). An interface will be developed for AWS interoperability with U.S. TMD systems. Lethality, kill assessment and producibility will continue to be assessed. Subsequent U.S.-Israeli cooperative R&D on other ballistic missile defense concepts may occur in the future.

The ITB Program is a medium-to-high fidelity theater missile defense simulation that provides the capability to evaluate potential Israeli missile defenses, aids the Israeli Ministry of Defense (IMOD) in the decision of which defense systems to field, provides insights into command and control in TMD, and trains personnel to function in a TMD environment. A structured set of joint U.S./Israeli experiments is being executed to evaluate the role of missile defenses in both mature and contingency Middle East theater operations. This funding also provides for a portion of the operation and maintenance of the ITB and for planned enhancements. Completed experiments identified additional enhancements needed to improve the ITB as an analysis tool. The enhancements incorporated in the ITB to date include

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radar and weapons models, and a BPI simulation capability. The BPI enhancement benefited the Israeli BPI study completed in January 1996. The planned Adaptive Battle Management Center (ABMC) enhancement will benefit the U.S. by enabling the ITB to simulate a wide variety of command and control and interoperability issues.

The Israeli Cooperative R&D program supports the advancement of emerging TMD technologies. This support will advance the technology demonstration phase which will provide for the defense of the State of Israel. It further supports the U.S. technology base needs for these technologies, and furthers the pursuit of interoperability with U.S. TBMD systems. This task supports efforts in developing an interface to allow for interoperability between Israeli TMD systems and U.S. TBMD systems and the implementation of such a system.

The ISA&I tasks provide ongoing analysis and assessment of the baseline, evolutionary, and responsive threats to support the definition and evaluation of an initial Israeli Reference Missile Architecture (IRMA), a baseline missile configuration. Evolutionary growth paths to enhance the IRMA robustness against future threats will be identified. Critical TMD system architecture issues and technologies will be analyzed, and the conformance to established requirements of various Israeli anti-tactical ballistic missile (ATBM) programs, including the Arrow missile development activity, the ADP, and the ITB will be conducted. Finally, previously developed simulations and models will be used selectively to address significant TMD issues. Collectively, the tasks conducted under this cooperatively sponsored ISA&I project will provide critical insights and technical data to both the U.S. and Israeli governments for improving near-term and evolutionary defenses against ballistic missile threats.

Since program initiation in 1988, Israel successfully improved the performance of its pre-prototype Arrow I interceptor to the point that it achieved a successful intercept and target destruction in June 1994. Arrow II design and component testing progressed to the successful demonstration of the new warhead, electro-optical seeker, radar fuse, first stage booster, sustainer booster, launcher canister, and launcher. The ADP International Agreement was signed in March 1996 and Presidential certification was completed in May 1996.

The ITB became operational in the second quarter of FY 1992. The ITB experiments validated the performance of the prospective near-term Israel Theater Missile Defense System. It provided valuable insight into the potential role of Human-In-The-Loop (HIL) for a TMD system. Also, the Test bed Product Office at the Space and Strategic Defense Command benefited from the application of ITB Project experience to the U.S. and United Kingdom Extended Air Defense Test Bed (EADTB) Projects.

The ISA&I Project activities demonstrated that defense of the State of Israel from tactical ballistic missile (TBM) attacks is feasible and cost-effective. The ISA&I effort analyzed and addressed numerous TMD system issues including HIL, resource allocation, and threat analysis. The U.S. benefited from the architecture analysis work, including identification and progress toward resolution of critical TMD system issues such as kill assessment and the lethality study of a novel interceptor warhead.

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## 4 - Demonstration and Validation

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FY 1996 (\$ in Thousands):

- \$31,493 Completed Arrow Continuation Experiments (ACES) and Support. Completed Arrow II interceptor design, development and fabrication. Initiate Arrow II interceptor flight tests. Continued to transfer Arrow data for risk reduction in the THAAD and SM-2 Block IVA programs. Developed and used high fidelity seeker models to analyze seeker performance.

- \$24,075 Arrow Deployability Project and Support. Program implementation of procurement of long lead items. Conducted interoperability studies. ITB. Awarded contract for continuation of ITB effort. Initiated Adaptive Battle Management Center enhancements.

- \$1,911 ISA&I. Analyzed technical issues associated with TMD system performance including Kill Assessment and Lethality. Evaluated the performance of the near-term TMD against near-term and evolutionary threats. Awarded follow-on contract modification. Continued architecture analysis work for near term and future threats.

- \$207 Cooperative R&D. Identified and assessed key technologies. Assessed technologies and interoperability.

- \$59,352 Total

FY 1997 (\$ in Thousands):

- \$1,701 ACES Support. Complete lethality analysis of Arrow II. Evaluate Arrow II performance against surrogate threat High Explosive and bulk chemical warhead targets. Complete analysis of Arrow II flight test data. Provide Arrow II flight data to U.S. TMD interceptor developers. Arrow Deployability Project and Support. Begin production of Arrow II UOES and targets. Evaluate Arrow interoperability with other TMD systems. Evaluate expected Arrow Weapon System (AWS) test performance. Provide AWS test plans and flight data to U.S. TMD developers. ITB. Complete Adaptive Battle Management Center enhancements. Conduct experiments on near-term improvements to the TMD system. Continue HIL experiments

- \$1,498 ISA&I. Provide independent oversight and assessment of near-term TMD system to include capability conformance with operational requirements and test plan traceability with operational specifications. Conduct architecture effectiveness/cost/risk trade study to examine evolution from near-term TMD system.

- \$142 Gov Project Personnel & Support. Provide project support for USASDC personnel.

- \$43,892 Total

FY 1998 (\$ in Thousands):

- \$35,184 Arrow Deployability Project and Support. Continue AWS integrated flight tests. Evaluate U.S. and Arrow components for electro-magnetic interference. Transfer the results of the AWS tests to U.S. TMD interceptor developers. Continue interoperability, lethality, kill assessment and producibility studies. Develop an US/Israeli Interoperability Capability.

- \$1,894 Continue experiments on near-term improvements to the TMD system and on deployability. Provide improved threat model and Arrow II update enhancements.

- \$1,495 ISA&I. Analyze results of ITB Interoperability experiments. Continue evaluations of the performance of the near-term TMD system based on ADP system engineering flight tests. Continue analysis of TMD refinements for future threats.

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Exhibit R-2 (PE 0603872C)

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BUDGET ACTIVITY

**4 - Demonstration and Validation**

- \$142 Gov Project Personnel & Support. Provide project support for USASSDC personnel.  
 - \$38,715 Total

FY 1999 (\$ in Thousands):

- \$35,137 Arrow Deployability Project and Support. Conduct Benefits Review to determine future ADP plans. Continue AWS integrated flight tests. Continue transfer of the AWS test results to U.S. TMD systems. Continue interoperability, lethality, kill assessment and producibility studies. Complete experiments on near-term improvements to the TMD system and on deployability. Provide improved threat model and Arrow II update enhancements. Conduct joint US/IS experiments.
- \$1,891
- \$1,493 Continue to analyze results of ITB Interoperability experiments. Continue performance evaluations of the near-term TMD system based on ADP system engineering flight tests. Continue analysis of TMD refinements for future threats.
- \$141 Gov Project Personnel & Support. Provide project support for USASSDC personnel.
- \$38,662 Total

Acquisition Strategy: This is a cooperative U.S./GOI development program. By completing the Arrow Deployability Project, U.S. TMD programs will be afforded state-of-the-art technical data for program risk reduction and the GOI will have developed information to make a sound Arrow Weapon System deployment decision. The planned ISA&I and ITB efforts will continue to refine the operational tactics and techniques of the fielded near-term TMD system. The IBIS will provide requirements and concept of operations needed for further acquisition strategy development. The U.S. and the GOI, under the umbrella of the various Memoranda of Agreements, share project costs. The U.S. share of total funding is based upon the maturity of the development. Each contract associated with the individual projects is a firm-fixed price (FFP) contract.

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

	FY 1996	FY 1997	FY 1998	FY 1999	Total
Previous President's Budget	52,906	37,180	37,874	37,402	165,362
Current Budget Submit/President's Budget	59,352	43,892	38,715	38,662	180,621

Change Summary Explanation:

Funding: The FY1997 Congressional Appropriation contained an additional \$2.7M for the Israeli Cooperative Programs. The program was reduced by \$46K in Department of Defense-Wide RDT&E reductions. Negotiations for an extended ADP reduced the Cooperative R&D budget after the U.S.-GOI agreement to cap Israeli Cooperative programs at \$40M per year starting in FY1998. Inflation reductions impacted FY1998 and beyond to levels below the \$40M per year specified in the US/Israel Memorandum of Agreement (Kaminski-Eilam).

Schedule: Out of six flight tests planned in FY96, three occurred in FY96, and three will occur in FY97.

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**4 - Demonstration and Validation**

Technical: None

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

	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To	Total
									Compl	Cost
									Cont	Cont
3359 - System Test & Evaluation, PE 603872C	33,568	42,792	40,307	26,444	25,763	27,750	27,090	27,136		

**D. Schedule Profile**

	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 1999		
1	2	3	4	1	2	3	4	1	2	3	4
U.S./Israel ADP Agreement signed	X										
Complete Arrow Interceptor Development				X							
Complete ITB Enhancements	X		X	X							
Complete six Arrow II Flight Tests (ACES)				X							
Initiate Arrow Weapon System Flight Tests											
Initiate Interoperability Requirements Interoperability Tests										X	X
U.S. Benefits Review										X	X

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**4 - Demonstration and Validation**

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

	<u>FY 1996</u>	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>
Prime Contract (Israel Ministry of Defense)	19950	33,000	33,000	33,000
Other U.S. Government Activities	3975	5,647	2,173	2,121
US Government Flight Test	31493	1,703	0	0
Software Development	1911	1,900	1,900	1,900
Systems Engineering	1666	1,500	1,500	1,500
Miscellaneous	357	142	142	141
<b>Total</b>	<b>59,352</b>	<b>43,892</b>	<b>38,715</b>	<b>38,662</b>

**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 1996	Budget FY 1996	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<b>Product Development Organizations</b>											
<b>Support and Management Organizations</b>											
<b>Test and Evaluation Organizations</b>											

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

**Government Furnished Property:**

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

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BUDGET ACTIVITY

**4 - Demonstration and Validation**

Item Description	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Delivery Date	Total Prior to FY 1996	Budget	Budget	Budget	Budget	Total Program
					FY 1996	FY 1997	FY 1998	FY 1999	
<u>Product Development Property</u>									
<u>Support and Management Property</u>									
<u>Test and Evaluation Property</u>									
Subtotal Product Development									
Subtotal Support and Management									
Subtotal Test and Evaluation									
Total Project									

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**0603872C Joint Theater Missile Defense**

PROJECT  
**3153**

**4 - Demonstration and Validation**

COST (\$ In Thousands)	FY 1996 Actual	FY 1996 Estimate	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
3153 Architecture Analysis / BMC3I Initiatives	9,738	6,799	8,273	8,099	8,058	8,020	8,011	8,026	Continuing	Continuing	

**A. Mission Description and Budget Item Justification**

This project, which began in FY95, supports two offices within BMDO to ensure that appropriate issues relating to system architecture and Battle Management/Command, Control, and Communications (BM/C3) are addressed in a coordinated and synergistic manner across all BMDO National Missile Defense (NMD) and Theater Missile Defense (TMD) efforts. The offices of Architecture Integrator and the BM/C3 Office report directly and independently to the BMDO Director to provide the necessary mission-area oversight of critical BMDO technical issues.

In this project, BMDO supports systems analysis work to determine the expected operational performance and effectiveness of missile defense systems under development. Computer simulation models are developed and used to investigate architecture and system level capability and to resolve critical technical issues related to the development of specific elements of the architecture. Tradeoffs in alternative elements, specific designs, inventory and integration of systems are conducted in detail to determine the most cost effective approach for a particular missile defense mission. The work is performed on a continuing basis in order to determine the impact of changing threats, mission requirements, and advances in technology. The project provides BMDO with an independent assessment of the expected effectiveness of major programs under development and requirements for supporting technology. The work is separated into two program elements, one for TMD and the other for NMD.

In this program element the focus is on TMD systems and technology. The primary thrust of the work is to show, through analysis, the need for and the expected performance of different defense systems under development to handle current and projected missile threats, both ballistic and cruise. Issues such as warhead lethality, system degradation in a severe countermeasure environment, target handover from tracking sensor to missile seeker, effects of netting sensors, etc. are some of the technical issues addressed in this project.

Future BM/C3 activities in this project will provide for the mission-area oversight and coordination of all BMDO BM/C3 development and acquisition activities. This effort will provide for the synergistic evaluation of relevant BM/C3 technical issues; the formulation of appropriate plans, programs, and policies to facilitate the coordination of all BMD Advanced Development BM/C3 research, development, and acquisition activities across TMD and NMD program activities; promote appropriate reuse strategies to maximize BMD reuse capabilities; and minimize the duplication of BM/C3 research and development efforts across all NMD and TMD development efforts.

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## 4 - Demonstration and Validation

FY 1996 (\$ in Thousands):

- \$5,707 Architecture Analysis: Performed analyses of architectures and systems using new (validated) simulation tools. Conducted 3 month study (PROGRUS III) to determine impact of any change in threat, requirements, or development programs on the TMD architecture. Analyzed unresolved technical issues identified in the TMD COEA Study. Determined the ability of TMD systems to respond to proposed countermeasures. Studied active defense in the context of overall defenses including passive and counterforce options. Evaluate the capability of potential Russian and Allied missile defense systems with TMD systems.

- \$4,031 BM/C3 Initiatives: Provided the mission-area capability to address emerging BM/C3 system requirements and concerns and facilitate their resolution in a synergistic manner across all TMD and NMD development efforts. Defined TMD and NMD BM/C3 development process requirements to facilitate the translation of operational BM/C3 requirements to joint and combined interoperable systems. Coordinated BMDO participation in the analysis, development, and implementation of various BMDO, DoD, Allied, and other Government and commercial initiatives relating to BMDO TMD/NMD BM/C3 development. Developed a concise definition of BM/C3 and a simple description of its components, relative to TMD/NMD/Theater Air Defense (TAD) architectures. Developed a Cost Analysis Requirements Document (CARD) type document to support cost and investment analysis.

- \$9,738 Total

FY 1997 (\$ in Thousands):

- \$4,591 Architecture Analysis: Conduct annual program update study (PROGRUS IV). Continue systems analysis of architecture/system performance and related technical issues as directed by the BMDO Architecture Integrator and the Deputy for Acquisition/TMD.

- \$2,208 BM/C3 Initiatives: Provide BMDO system-level capability to address emerging BM/C3 system requirements and concerns in a synergistic manner across all NMD and TMD development efforts and facilitate the translation of operational BM/C3 requirements to joint and combined interoperable systems. Coordinate BMDO participation in the analysis, development, and implementation of various BMDO, DoD, Allied, and other Government and commercial initiatives relating to BMDO NMD/TMD BM/C3 development.

- \$6,799 Total

FY 1998 (\$ in Thousands):

- \$5,295 Architecture Analysis: Conduct annual program update study (PROGRUS IV). Continue systems analysis of architecture/system performance and related technical issues as directed by the BMDO Architecture Integrator and the Deputy for Acquisition/TMD

- \$2,978 BM/C3 Initiatives: Provide BMDO system-level capability to address emerging BM/C3 system requirements and concerns in a synergistic manner across all NMD and TMD development efforts and facilitate the translation of operational BM/C3 requirements to joint and combined interoperable systems. Coordinate BMDO participation in the analysis, development, and implementation of various BMDO, DoD, Allied, and other Government and commercial initiatives relating to BMDO NMD/TMD BM/C3 development.

- \$8,273 Total

Project 3153

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Exhibit R-2 (PE 0603872C)

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

DATE **February 1997**

PROJECT  
**3153**

PE NUMBER AND TITLE  
**0603872C Joint Theater Missile Defense**

**4 - Demonstration and Validation**

FY 1999 (\$ in Thousands):

- \$5,182	Architecture Analysis: Conduct annual program update study (PROGRUS IV). Continue systems analysis of architecture/system performance and related technical issues as directed by the BMDO Architecture Integrator and the Deputy for Acquisition/TMD.
- \$2,917	BM/C3 Initiatives: Provide BMDO system-level capability to address emerging BM/C3 system requirements and concerns in a synergistic manner across all NMD and TMD development efforts and facilitate the translation of operational BM/C3 requirements to joint and combined interoperable systems. Coordinate BMDO participation in the analysis, development, and implementation of various BMDO, DoD, Allied, and other Government and commercial initiatives relating to BMDO NMD/TMD BM/C3 development.
- \$8,099	Total

Acquisition Strategy: Systems analysis work in this project is contracted. In November 1995, a two year competitive contract for this work (with two, one year extension options) was awarded to a ten-member corporate team led by SPARTA, Inc., Laguna Hills, Calif. For BM/C3 Initiatives efforts, expertise of Government, Federally Funded Research & Development Center (FFRDC), System Engineering and Integration Contractor (SEIC), and Scientific, Engineering and Technical Assistance (SETA) personnel are leveraged in the execution of project activities, using existing contracts to the maximum extent possible. Specifically, U.S. Army Space and Strategic Defense Command (USASSDC) and USAF/Electronic Systems Center (ESC) Government and contractor personnel lead Information Architecture and development efforts; SETA and SEIC contracts provide the core of technical expertise for a variety of BM/C3 activities; and Institute for Defense Analysis (IDA) contract vehicles provide state-of-the-art technical expertise in Software Engineering and related technical areas. Additional contractor services will be procured if needed to meet emerging program requirements.

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

	<u>FY 1996</u>	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	Total
Previous President's Budget	8,876	8,062	8,629	8,496	Cost
Current Budget Submit/President's Budget	9,738	6,799	8,273	8,099	Continuing

Change Summary Explanation:

Funding: None

Schedule: None

Technical: None

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

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BUDGET ACTIVITY  
 PE NUMBER AND TITLE  
**4 - Demonstration and Validation**  
**0603872C Joint Theater Missile Defense**

PROJECT  
 3153

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

BUDGET ACTIVITY	FUNDING												To Compl Cont	Total Cost Cont		
	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	FY 2006	FY 2007				
2400 NMD Program, PE 0603871C	730,656	828,864	504,091	393,085	309,748	309,584	391,858	392,433								
<b>D. Schedule Profile</b>																
Define BM/C3 elements																
Assess TMD/NMD/TAD Architectures																
Assess Global Command and Control System (GCCS) Interoperability in support of the Technical Architecture																
Develop Commander-in-Chief (CINC)/User BM/C3 Feedback Plan in support of the Technical Architecture																
Establish BMD BM/C3 CARD like document																
Establish Technical Architecture BM/C3 Policy Update																
Quarterly Program Review																
Annual Contract Program Review																

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

DATE February 1997

BUDGET ACTIVITY PE NUMBER AND TITLE PROJECT  
**4 - Demonstration and Validation** 0603872C Joint Theater Missile Defense 3153

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

	FY 1996	FY 1997	FY 1998	FY 1999
Support Contracts	9,738	6,799	8,273	8,099
Total	9,738	6,799	8,273	8,099

**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 1996	Budget FY 1996	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Product Development Organizations											
Support and Management Organizations											
SETA	CPFF/CPAF	27 Dec 94	BMDO		2,916	1,750	2,500	2,500	2,500	continuing	9,666
Other Support Cont	Multiple				6,822	5,049	5,773	5,599	5,599	continuing	23,243

**Test and Evaluation Organizations**

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

**Government Furnished Property:**

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

DATE February 1997

BUDGET ACTIVITY		PE NUMBER AND TITLE		PROJECT					
4 - Demonstration and Validation		0603872C Joint Theater Missile Defense		3153					
Item Description	Method/Type or Funding Vehicle	Award or Obligation Date	Delivery Date	Total					
				Budget FY 1996	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Contract</u>									
<u>Product Development Property</u>									
<u>Support and Management Property</u>									
<u>Test and Evaluation Property</u>									
Subtotal Product Development									
Subtotal Support and Management									
Subtotal Test and Evaluation									
Total Project									
				9,738	6,799	8,273	8,099		32,909
				9,738	6,799	8,273	8,099		32,909

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

DATE **February 1997**

BUDGET ACTIVITY

PE NUMBER AND TITLE

**0603872C Joint Theater Missile Defense**

PROJECT

**3157**

**4 - Demonstration and Validation**

COST (\$ In Thousands)	FY 1996 Actual	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
3157 Environmental, Siting, and Facilities	4,369	5,972	3,600	3,640	3,631	3,609	3,606	3,612	Continuing	Continuing

**A. Mission Description and Budget Item Justification**

Provides environmental program guidance, environmental impact analyses and documentation, real property facility siting, acquisition, and facility operational support for the Ballistic Missile Defense Organization (BMDO) Theater Missile Defense (TMD) system. Plans, programs, budgets, and oversees facility acquisition through the Military Construction (MILCON) and RDT&E construction programs. Provides guidance and supports BMDO TMD Environmental Assessment and Environmental Impact Statement process, environmental compliance, pollution prevention, and other environmental efforts for TMD activities. Develops guidance for Executing Agents on facilities, siting, acquisition, and environmental matters.

**FY 1996 (\$ in Thousands):**

- \$3,378 Supported TMD programs with siting analyses, basing deployment plans, environmental analyses and documentation, environmental compliance and pollution prevention programs, and test range studies. TMD systems being emphasized are the PATRIOT Advance Capability Level 3 (PAC-3), Theater High Altitude Area Defense (THAAD), Navy Lower Tier (Area) systems and Family of Systems System Integration Tests.
- \$77 Conducted facility planning and developed preliminary facility design concepts for TMD test and evaluation facilities, and for deployment locations.
- \$914 Executed and managed TMD's FY 96-98 MILCON, Minor MILCON, and RDT&E facility design, construction projects, and related activities. The emphasis is on the PAC-3 and THAAD EMD test and deployment facilities, such as THAAD Test Facilities at USAKA, TMD Target Launch Facilities at Wake Island and Fort Wingate, and THAAD 1st Objective Battalion Facilities at Fort Bliss.
- \$4,369 Total

**FY 1997 (\$ in Thousands):**

- \$1,878 Support TMD programs with siting analyses, basing deployment plans, environmental analyses and documentation, environmental compliance and pollution prevention programs, and test range studies. The project covers costs associated with maturing acquisition programs, fielding of systems, integrated system testing, and test and evaluation programs.
- \$144 Continues facility planning for fielding the PAC-3 and THAAD systems. It also continues facility planning support for test and evaluation programs.

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

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BUDGET ACTIVITY

## 4 - Demonstration and Validation

PE NUMBER AND TITLE

0603872C Joint Theater Missile Defense

PROJECT

3157

- \$3,915 Provides funds to execute and manage TMD's FY 97-99 MILCON, Minor MILCON, and RDT&E facility design, construction projects and other related activities providing program support. Design projects include: the THAAD Test Facilities at USAKA, Facility Upgrades at Pacific Missile Range Facility (PMRF), Utilities Repairs at Wake Island, Extended Range Target Launch Complex facilities, and possible Air Launch facilities in the Pacific. Construction projects include PAC-3, THAAD, and Navy Lower Tier (Area) facility projects, such as: TMD Target Launch Facilities at Wake Island and Fort Wingate, and construction of THAAD 1st Objective Battalion Facilities at Fort Bliss.

- \$35 OSD and SBIR Reductions  
- \$5,972 Total

FY 1998 (\$ in Thousands):

- \$1,784 Support TMD programs with siting analyses, basing deployment plans, environmental analyses and documentation, environmental compliance and pollution prevention programs, and test range studies. Begin work on the System Integrated Tests requirements development and continue on the Navy Lower Tier (Area), THAAD and PAC-3 systems. The program manages activities associated with maturing acquisition programs, fielding of systems, integrated system tests, and test and evaluation programs.

- \$62 Complete facility planning for PAC-3 and THAAD facilities. Begin planning and development of unique range test facilities for both Atlantic and Pacific requirements. Complete planning for the FY00 and FY01 System Integration Tests.

- \$1,754 Provides funds to execute overall FY98-00 MILCON, Minor MILCON, and RDT&E facility design, construction projects and related activities. Construction projects include: THAAD Test Facilities at USAKA, Utilities Repairs at Wake Island, and Facility Upgrades at PMRF. Continual improvements to TMD's test and evaluation facilities are required to support the ever increasing complexity of test scenarios. Initial requirements to meet improvements to PAC-3, THAAD and Navy Lower Tier (Area) system will enter the design phase.

- \$3,600 Total

FY 1999 (\$ in Thousands):

- \$1,800 Support TMD programs with siting analyses, basing deployment plans, environmental analyses and documentation, environmental compliance and pollution prevention programs, and test range studies. Work continues on new TMD requirements as well as on Navy Lower Tier (Area), Navy Upper Tier (Theater Wide), THAAD, and PAC-3 systems to meet their requirements. The program manages activities associated with maturing acquisition programs, fielding of systems, integrated system tests, and test and evaluation programs.

- \$63 Complete facility planning for PAC-3 and THAAD basic system facilities. Continue planning and development of unique range test facilities for both Atlantic and Pacific requirements as well as follow-on improvements to THAAD and the Navy Upper Tier (Theater Wide) systems.

- \$1,777 Complete planning for the FY00 and FY02 System Integration Tests.

- \$3,640 Provides funds to execute overall FY98-00 MILCON, Minor MILCON, and RDT&E design and construction. The design emphasis will be on completing facility requirements for PAC-3. Provides for TMD test and evaluation facilities improvements to support increasingly complex test scenarios. Final requirements to meet improvements to PAC-3, THAAD and Navy Lower Tier (Area) system will enter the design phase. The construction emphasis will be on the Facility Upgrades at PMRF.

- \$3,640 Total

Project 3157

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Exhibit R-2 (PE 0603872C)

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

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PE NUMBER AND TITLE

**4 - Demonstration and Validation**

**0603872C Joint Theater Missile Defense**

PROJECT

**3157**

Acquisition Strategy: BMDO is assisted by executing agents in the Army, Navy, Air Force and contractor support. They provide technical assistance of facilities, siting, and environmental activities. The U.S. Army Space and Strategic Defense Command, U.S. Army Corps of Engineers, the U.S. Army Program Executive Office-Missile Defense and Navy PEO Theater Air Defense provide specific additional technical assistance in delivering the Facilities, Siting, and Environmental documentation products needed for program execution. BMDO tasks the Services through Program Management Agreements to perform the required tasks in support of the TMD program. BMDO performs quarterly on-site reviews to verify and validate completed tasks.

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

	<u>FY 1996</u>	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	Total Cost
Previous President's Budget	3,399	3,768	3,754	3,818	14,739
Current Budget Submit/President's Budget	4,369	5,972	3,600	3,640	17,581

Change Summary Explanation:

Funding: Funding adjustments in FY97 made to support additional environmental analysis requirements.

Schedule: None

Technical: None

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

	<u>FY 1996</u>	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	To Compl	Total Cost
3157 Minor MILCON & Design, Joint TMD Dem/Val, PE 0603872C	1,642	1,404	1,965	1,885	1,444	341	1,643	1,650	Cont.	Cont

**D. Schedule Profile**

	<u>FY 1996</u>	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	To Compl
PAC-3 and THAAD Target Launch Facilities, Ft Wingate and Wake Island	1	2	3	4	1	2	4	1	Cont
	X	X	X	X	X	X	X	X	Cont

Project 3157

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BUDGET ACTIVITY

PE NUMBER AND TITLE

**4 - Demonstration and Validation**

**0603872C Joint Theater Missile Defense**

PROJECT

**3157**

	FY 1996				FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
PAC-3 Missile Assembly Bldg, White Sands Missile Range		X		X	X			X	X			X	X			X
THAAD Test Facilities, Kwajalein Atoll				X	X			X	X			X	X			X
THAAD 1st Objective Battalion, Ft Bliss				X	X			X	X			X	X			X
Manage Environmental Analysis for Eglin Gulf Test Range			X		X			X	X			X	X			X
Manage Environmental Analysis for Pacific Missile Range Facility				X	X			X	X			X	X			X
Manage Environmental Analysis for Alternate Air Launch				X	X			X	X			X	X			X

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

DATE **February 1997**

BUDGET ACTIVITY	PE NUMBER AND TITLE	DATE	PROJECT
<b>4 - Demonstration and Validation</b>	<b>0603872C Joint Theater Missile Defense</b>		<b>3157</b>

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

	FY 1996	FY 1997	FY 1998	FY 1999	
Environmental, Siting & Facilities	4,369	5,972	3,600	3,640	
Total	4,369	5,972	3,600	3,640	

**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 1996	Budget			Budget to Complete	Total Program
						FY 1996	FY 1997	FY 1998		
<b>Product Development Organizations</b>										
AF/SMC	PMA	FY96			25	10	10	10	0	55
Huntsville Corps of Engr	MIPR	FY95			167	130	130	130	0	557
Navy Civil Engr/Environ Staff	CPFF	FY94			27	50	50	50	0	177
Pac Ocean Div Corp of Engr	MIPR	FY97			0	1,600	0	0	0	1,600
USASSDC	CPFF	FY96			125	0	279	588	0	992
Fish & Wildlife Service	MIPR	FY92			6	30	0	0	0	36
WSMR Environ Staff	MIPR	FY96			225	175	0	0	0	400
MICOM-RDEC	MIPR	FY96			25	25	25	25	0	100
PEO-AMD-TSD-Civil	PMA	FY96			30	30	30	30	0	120

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

BUDGET ACTIVITY		DATE				PROJECT					
4 - Demonstration and Validation		February 1997				3157					
PE NUMBER AND TITLE		0603872C Joint Theater Missile Defense									
Contract or Government Performing Activity	Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1996	Budget FY 1996	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<b>Support and Management Organizations</b>											
SETA (SSDC)	CPFF	FY97			488	450	445	445	445	Cont.	1,828
PEO-AMD-TSD	CPFF	FY95			167	130	130	130	130	Cont.	557
<b>Support</b>											
MEVATEC	CPFF	FY96			100	100	100	100	100	Cont.	400
USASSDC	CPFF	FY94			983	1,929	1,078	757	757	Cont.	4,747
<b>Environ. Support</b>											
Navy Environ.	CPFF	FY97			0	275	274	280	280	Cont.	829
Support SETA (BMDO)	CPFF	FY95			2,001	1,038	1,049	1,095	1,095	Cont.	5,183
<b>Test and Evaluation Organizations</b>											
<b>B. Budget Acquisition History and Planning Information Continued (\$ in Thousands)</b>											
<b>Government Furnished Property:</b>											
Item Description	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Delivery Date	Total Prior to FY 1996	Budget FY 1996	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program	
<b>Product Development Property</b>											
<b>Support and Management Property</b>											
<b>Test and Evaluation Property</b>											

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

DATE February 1997

BUDGET ACTIVITY  
 PE NUMBER AND TITLE  
**0603872C Joint Theater Missile Defense** PROJECT  
**3157**

**4 - Demonstration and Validation**

Subtotal Product Development	630	2,050	524	833	4,037
Subtotal Support and Management	3,739	3,922	3,076	2,807	13,544
Subtotal Test and Evaluation					
Total Project	4,369	5,972	3,600	3,640	17,581

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BUDGET ACTIVITY

PE NUMBER AND TITLE

**0603872C Joint Theater Missile Defense**

PROJECT

**3160**

**4 - Demonstration and Validation**

COST (\$ In Thousands)	FY 1996 Actual	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
3160 TMD Readiness	1,112	1,709	1,730	1,692	1,687	1,676	1,674	1,677	Continuing	Continuing

**A. Mission Description and Budget Item Justification**

This project supports Theater Missile Defense projects in the functional areas of manufacturing, logistics supportability and metrology design and support. These diverse functions map directly into meeting operational suitability and affordability goals. By focusing on all TMD (BMD) activities and coordinating these efforts between the Services and projects, common cost avoidance is realized. TMD readiness activities include producibility and planning for manufacturing, acquisition logistics, metrology, and training. The efforts will concentrate on identifying and analyzing critical TMD systems level deployment, support, producibility and manufacturing (P&M) risks, industrial base capability issues and developing mitigation plans for these areas to ensure operational requirements and BMDO affordability objectives are met. In addition, TMD operational suitability and availability advances and lessons learned are applied to NMD projects. This effort will also focus on the identification of critical TMD metrology requirements; and the development of national/DOD measurement standards and calibration support for TMD technology and acquisition programs.

FY 1996 (\$ in Thousands):

- \$723 Completed development of Long Wave Infrared (LWIR) transfer standard detectors. Continued National Institute of Standards & Technology (NIST) support of THAAD Radar antenna calibration and field diagnostics. Continued development of IR standards for detectors, sources, optical materials characterization, and focal plane arrays (FPA). Continued to support the TMD program offices, their contractors, Government laboratories and test centers with Infrared (IR) calibration and measurement services.
- \$349 Integrated producibility issues. Resolved TMD system common support and producibility problems. Developed mitigation strategies (both element specific and TMD wide). Reviewed manufacturing planning.
- \$40 Updated operational suitability planning, to address issues related to TMD concepts of operations, BM/C3, inter-Service operations, and systems readiness and functional requirements.
- \$1,112 Total

FY 1997 (\$ in Thousands):

- \$808 Complete the NIST medium background IR calibration facility. Continue development of IR standards for MWIR detectors, focal plane array testing, and IR filter measurements. Continue NIST support of THAAD Radar antenna field diagnostics and calibration. Continue to support the TMD program offices, their contractors, Government laboratories and test centers with IR calibration and measurement services.
- \$485 Support completion and insertion of producibility and manufacturing mitigation programs developed in FY95 and 96, including non-BMDO programs. Support element program offices in risk mitigation development and assessment.

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

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PROJECT  
**3160**

PE NUMBER AND TITLE

**0603872C Joint Theater Missile Defense**

BUDGET ACTIVITY

**4 - Demonstration and Validation**

- \$416 Update operational suitability planning, to address issues related to TMD concepts of operations, BM/C3, inter-Service operations, and systems readiness and functional requirements.

- \$1,709 Total

FY 1998 (\$ in Thousands):

- \$820 Complete Medium Wave Infrared (MWIR) detector transfer standard and standards for IR filter spectral measurements. Continue development of standards for testing IR focal plane arrays and IR scene projections. Continue NIST support of THAAD. Continue to support the TMD program offices, their contractors, Government laboratories and test centers with IR calibration and measurement services.

- \$490 Continue insertion of producibility and manufacturing mitigation programs from FY97, including non-BMDO programs; support producibility and manufacturing aspects of PATRIOT Advanced Capability Level 3 (PAC-3) and Sea-based Area TBMD milestones. Support element program offices in development of exit criteria resolution and assessment.

- \$420 Update operational suitability planning, to address issues related to TMD concepts of operations, BM/C3, inter-Service operations, and systems readiness and functional requirements. Complete plans for the transition of system management of current TMD acquisition programs from BMDO to the Services.

- \$1,730 Total

FY 1999 (\$ in Thousands):

- \$811 Continue MWIR/LWIR detector transfer standard and standards for IR filter spectral measurements. Continue development of standards for testing IR focal plane arrays and IR scene projections. Continue NIST support of THAAD. Continue to support the TMD program offices, their contractors, Government laboratories and test centers with IR calibration and measurement services.

- \$461 Continue insertion of producibility and manufacturing mitigation programs from FY97, including non-BMDO programs; support producibility and manufacturing aspects of PAC-3 and Sea-based Area TBMD milestones. Support element program offices in development of exit criteria resolution and assessment.

- \$420 Update operational suitability planning, to address issues related to TMD concepts of operations, BM/C3, inter-Service operations, and systems readiness and functional requirements. Complete plans for the transition of system management of current TMD acquisition programs from BMDO to the Services.

- \$1,692 Total

Acquisition Strategy: a. Efforts to develop and implement metrology standards will be executed by the NIST. BMDO funding will be administered by the AF Metrology Center in Newark OH. The AF Metrology Center staff also have the responsibility of helping BMDO identify metrology needs and implementing and distributing developed standards through-out US industry.

b. Efforts in producibility and manufacturing , industrial base analyses, and operational suitability will be worked through a series of government managed working groups and IPTs. Efforts may be executed by BMDO SETAs, Service Industrial base Analyses organizations, Service training and planning organizations. Unless a significant,

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PE NUMBER AND TITLE

**4 - Demonstration and Validation**

**0603872C Joint Theater Missile Defense**

PROJECT

**3160**

multi-year effort is required on a particular issue, these areas will be worked via MIPRs to services and by funding tasks with existing BMDO and service SETAs. These limited funds will go to the organization with the expertise on a topic -by-topic basis.

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

	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	Total Cost
Previous President's Budget	1,106	1,822	1,805	1,776	1,805	1,776	1,692		6,509
Current Budget Submit/President's Budget	1,112	1,709	1,730						6,243

Change Summary Explanation:

Funding: None

Schedule: None

Technical: None

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

	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To Compl	Total Cost

**D. Schedule Profile**

	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 1999
1	2	3	4	1	2	3	4	1	2

IR and improved IR dynamic range spectral calibration services are provided throughout other milestones (TBD)

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BUDGET ACTIVITY

PE NUMBER AND TITLE

4 - Demonstration and Validation 0603872C Joint Theater Missile Defense

PROJECT 3251

COST (\$ In Thousands)	FY 1996 Actual	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
3251 Systems Engineering and Technical Support	45,358	50,909	65,260	62,031	66,972	69,350	90,554	76,498	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project provides system engineering and technical support for the integration of Service-supplied weapon systems to facilitate the identification and resolution of inter-Service integration and interoperability issues; technical and engineering assessments and trade-off studies of Theater Missile Defense (TMD) system architectures and concepts; support for UK developed sensor data fusion methodology; Ballistic Missile Defense (BMD) system survivability oversight and assessment; risk reduction and acquisition streamlining support; modeling, simulation, experiment, and flight test support; development and maintenance of technical and programmatic databases; and preparation of technical reports, briefings, and programmatic documentation associated with TMD studies and critical issues.

FY 1996 (\$ in Thousands):

- \$2,470 Supported completion of a UK developed concept of operations test bed. Support continued in the testing and fielding of the UK developed Target Oriented Tracking System (TOTS).
- \$9,775 Provided scientific, engineering, and technical support for the acquisition, integration, and fielding of TMD systems including: reviewed products in comparison to standards, specifications, and requirements; provided modeling and simulation support of architecture analyses and trade-off studies; installed and completed operational configuration of the BMDO node of the Extended Air Defense Test Bed (EADTB); continued analytic and programmatic support of the TMD Capstone Cost and Operational Effectiveness Analysis (COEA); provided risk reduction and acquisition streamlining support; provided engineering and technical support for international programs and BM/C3 efforts; developed and maintained technical and programmatic databases; and prepared technical reports, briefings, and programmatic documentation.
- \$814 Provided support to WALEX, THAAD, HAWK, and TMD Conference
- \$13,856 Using Federally Funded Research and Development Center (FFRDC) resources, performed independent technical and engineering assessments of TMD system architectures including: system concept development and assessment; COEA support; critical element technical and programmatic assessments including trade-off analyses; reviews of mandated documents, international cooperative programs, and treaty implications; multi-Service and allied BM/C3 integration; modeling, simulation, experiment and flight test support; integration of fielded components into operational units; specific studies and analyses of critical issues.
- \$3,728 Provided technical support to the TMD COEA, individual system COEAs, and congressionally-directed studies.
- \$9,596 Provided minimum-level system engineering and integration support at the TMD system level to include the following efforts: continued to identify inter-Service integration interfaces; prepared engineering documents that identify changes required in theater air defense C3I systems to incorporate TBMD; updated TMD Integrated Test Plan; updated system description documents; completed TMD integration trade studies; and planned, coordinated, and analyzed C2 wargames for CINC CONOPS development.

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<b>RDT&amp;E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)</b>		DATE	PROJECT
BUDGET ACTIVITY		PE NUMBER AND TITLE	
<b>4 - Demonstration and Validation</b>		<b>0603872C Joint Theater Missile Defense</b>	<b>February 1997 3251</b>
-	\$1,794	Provided continued support to intra-Service integration, interoperability, and resolution of interface issues; supported review of SEI contractor integration and assessment documentation; evaluated threat-generated requirements; initiated environmental modeling and simulation tool improvements; continued refinement of Survivability Enhancement Options (SEOs) for BM/C3; supported the EADTB effort and supported the Joint Surveillance and Target Attack Radar System (JSTARS) effort.	
-	\$1,500	Provided technical support to Combat Developments Directorate-Ft Bliss, TX.	
-	\$100	Supported BMDO services (e.g., security, contracting, supplies).	
-	\$1,374	Supported BMDO operations and personnel management.	
-	\$351	Provided personnel management support to Program Executive Officer, Missile Defense, Huntsville, AL.	
-	\$45,358	Total	
<b>FY 1997 (\$ in Thousands):</b>			
-	\$1,107	Continue UK sensor data fusion efforts including Target Oriented Tracking System (TOTS) integration testing and development and testing of TOTS applications. Begin use of TOTS in test analysis at various BMD test ranges.	
-	\$442	Provide support to TMD conference, HAWK and Marine Corps combat development support.	
-	\$8,953	Provide scientific, engineering, and technical support for the acquisition, integration, and fielding of TMD systems including: review of products in comparison to standards, specifications, and requirements; modeling and simulation support of architecture analyses and trade-off studies; risk reduction and acquisition streamlining support; engineering and technical support for international programs and BM/C3 efforts; conduct EADTB distributed analyses and operations; development and maintenance of technical and programmatic databases; and preparation of technical reports, briefings, and programmatic documentation.	
-	\$13,781	Using FFRDC resources, perform independent technical and engineering assessments of TMD system architectures including: system concept development and assessment; critical element technical and programmatic assessments including trade-off analyses; reviews of mandated documents, international cooperative programs, and treaty implications; multi-Service and allied BM/C3 integration; modeling, simulation, experiment and flight test support; integration of fielded components into operational units; and specific studies and analyses of critical issues.	
-	\$1,879	Provide technical support to the TMD Joint Effectiveness Analysis (JEA), individual system JEAs, and congressionally directed studies.	
-	\$11,695	Increase system engineering and integration support at the TMD system level. Continue to identify inter-Service integration interfaces; prepare engineering documents to identify changes required in theater air defense C3I systems to support TBMD; update TMD Integrated Test Plan; update system description documents; and plan, coordinate, and analyze C2 wargames for CINC CONOPS development.	
-	\$4,608	Provide support to Service integration, interoperability, and resolution of interface issues; determine adequacy of threshold/objective hardness specifications for C4I support equipment; identify SEOs for C4I/support equipment to meet/exceed identified exposure levels to ensure critical operational effectiveness; continue environmental modeling and simulation tool improvements; assist in coordinating technology infusion to support pre-planned product improvements; continue support to TMD program offices in refining software development practices and mitigating technical, cost, and schedule risks across BMD/TMD software development, integration, testing, and maintenance efforts.	
-	\$300	Support for BMDO services (e.g., security, contracting, supplies).	
-	\$466	Support for Blue Team Analysis to study counter-countermeasures to TMD system.	
Project 3251		Page 61 of 120 Pages	Exhibit R-2 (PE 0603872C)

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

DATE

February 1997

BUDGET ACTIVITY

**4 - Demonstration and Validation**

PE NUMBER AND TITLE

**0603872C Joint Theater Missile Defense**

PROJECT

3251

- \$1,999 Provide technical support to Combat Developments Directorate-Ft Bliss, TX.  
 - \$5,458 Support BMDO operations and personnel management.  
 - \$221 Provided personnel management support to Program Executive Officer, Missile Defense, Huntsville, AL.  
 - \$50,909 Total

**FY 1998 (\$ in Thousands):**

- \$1,134 Continue utilization of TOTS at US BMD test ranges.  
 - \$13,915 Provide scientific, engineering, and technical support for the acquisition, integration, and fielding of TMD systems including: review of products in comparison to standards, specifications, and requirements; modeling and simulation support of architecture analyses and trade-off studies; risk reduction and acquisition streamlining support; engineering and technical support for international programs and BM/C3 efforts; conduct Extended Air Defense Testbed (EADTB) distributed analyses and operations; development and maintenance of technical and programmatic databases; and preparation of technical reports, briefings, and programmatic documentation.  
 - \$14,030 Using FFRDC resources, perform independent technical and engineering assessments of TMD system architectures including: system concept development and assessment; critical element technical and programmatic assessments including trade-off analyses; reviews of mandated documents, international cooperative programs, and treaty implications; multi-Service and allied BM/C3 integration; modeling, simulation, experiment and flight test support; integration of fielded components into operational units; and specific studies and analyses of critical issues.  
 - \$3,986 Provide technical support to the TMD JEA, individual system JEAs, and congressionally-directed studies.  
 - \$19,038 Increase system engineering and integration support at the TMD system level. Continue to identify inter-Service integration interfaces; prepare engineering documents to identify changes required in theater air defense C31 systems to support TBMD; update TMD Integrated Test Plan; update system description documents; and plan, coordinate, and analyze C2 wargames for CINC CONOPS development.  
 - \$5,575 Provide support to Service integration, interoperability, and resolution of interface issues; determine adequacy of threshold/objective hardness specifications for C4I support equipment; identify SEOs for C4I/support equipment to meet/exceed identified exposure levels to ensure critical support pre-planned product improvements; continue environmental modeling and simulation tool improvements; assist in coordinating technology infusion to technical, cost, and schedule risks across BMD/TMD software development, integration, testing, and maintenance efforts.  
 - \$409 Support for BMDO services (e.g., security, contracting, supplies).  
 - \$1,000 Support for Blue Team Analysis to study counter-countermeasures to TMD system.  
 - \$5,817 Support BMDO operations and personnel management.  
 - \$356 Provided personnel management support to Program Executive Officer, Missile Defense, Huntsville, AL.  
 - \$65,260 Total

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

DATE

February 1997

BUDGET ACTIVITY

PE NUMBER AND TITLE

PROJECT

**4 - Demonstration and Validation**

**0603872C Joint Theater Missile Defense**

**3251**

FY 1999 (\$ in Thousands):

- \$1,113 Continue utilization of TOTS at US BMD test ranges.
- \$14,263 Provide Scientific, Engineering and Technical Assistance (SETA) support of TMD systems acquisition.
- \$14,250 Using FFRDC resources, perform independent and technical engineering assessment and studies to support fielding TMD systems.
- \$2,257 Provide technical support to congressional directed studies (e.g. JEA).
- \$5,314 Inter-Service Integration Efforts.
- \$315 Technical Support for BMDO services.
- \$950 Support Blue Team analysis to study counter-countermeasures to TMD systems.
- \$17,234 SEI Contract, system software and engineering, and TMD system survivability.
- \$5,970 Support BMDO operations and personnel management.
- \$365 Provided personnel management support to Program Executive Officer, Missile Defense, Huntsville, AL.
- \$62,031 Total

Acquisition Strategy: This project uses a combination of FFRDC, competitively awarded SETA contracts, and a Memorandum of Understanding (MOU) with the United Kingdom Ministry of Defense.

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

	FY 1996	FY 1997	FY 1998	FY 1999	Total
					Cost
Previous President's Budget	47,919	55,669	67,892	60,858	232,338
Current Budget Submit/President's Budget	45,358	50,909	65,260	62,031	223,558

Change Summary Explanation:

- Funding: Funding transferred to higher priority projects.
- Schedule: None
- Technical: None

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

	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To	Total
									Compl	Cost

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

DATE February 1997

BUDGET ACTIVITY  
 4 - Demonstration and Validation  
 PE NUMBER AND TITLE  
 0603872C Joint Theater Missile Defense  
 PROJECT  
 3251

D. Schedule Profile

	FY 1996		FY 1997		FY 1998		FY 1999		
	1	2	3	4	1	2	3	4	PROJECT
Engineering Milestone T&E Milestone									
Tech Demo Milestone									
Contract Milestone									
- Deliver TMD Sys RD				X				X	X
- Deliver TMD Sys Assessment Doc				X				X	X
- Deliver TMD Int Test Plan				X				X	X
- Deliver TMD C3I Int Assessment				X				X	X
- Deliver TMD Surv Assessment				X				X	X
- TMD BMC3 WG Plan/Exec			X					X	X
- TIBS/TRAP Msg Int				X				X	X
BMD0 EADYTB Node Development									
- Node IOC				X					X
- Full distributed Operations						X			
Support through delivery of integration engineering analysis the following TMD events:									
- Navy Area TBMD Def COEA comp									
- Navy Area TBMD Defense MS II				X					
- THAAD Flight Test						X		X	
- Complete NATO Mag Set Tests				X					
- TMD-GBR Target Tests						X			
- PAC-3 CDR						X			
- BPI PDR						X			
- C3I Integration Test							X		
- System Integration Test								X	
- THAAD MS II								X	
- PAC-3 LRIP Decision								X	
- BPI KKV CDR								X	

Project 3251

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Exhibit R-2 (PE 0603872C)

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

BUDGET ACTIVITY		DATE												PROJECT
4 - Demonstration and Validation		0603872C Joint Theater Missile Defense												3251
		FY 1996			FY 1997			FY 1998			FY 1999			
		1	2	3	4	1	2	3	4	1	2	3	4	
- MEADS SRR														
- Navy Theater-wide Informed Decision														
- Navy Theater-wide TBMD MS I														
- BPI Integration Tests														
- THAAD UCT														
- UOES Delivery														
- PAC-3 MS III														
- MEADS MS II/III														

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

DATE February 1997

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT	
<b>4 - Demonstration and Validation</b>	<b>0603872C Joint Theater Missile Defense</b>	<b>3251</b>	

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

	FY 1996	FY 1997	FY 1998	FY 1999	
Developmental Test & Evaluation	2,470	1,107	1,134	1,113	
Program Management Support	29,134	25,821	33,340	32,035	
Systems Engineering	10,529	16,303	24,613	22,548	
Program Management Personnel	3,225	7,678	6,173	6,335	
<b>Total</b>	<b>45,358</b>	<b>50,909</b>	<b>65,260</b>	<b>62,031</b>	

**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 1996	Budget			Total Program	
						FY 1996	FY 1997	FY 1998		FY 1999
<b>Product Development Organizations</b>										
<b>Support and Management Organizations</b>										
SETA	CPAF	Nov 96			9,775	8,953	13,915	14,263	ONGOING	46,906
Other Supt. Cont.		Multiple			28,094	28,563	38,463	35,006	ONGOING	130,126
OGA's	MIPR	Multiple			5,019	12,286	11,748	11,649	ONGOING	40,702
<b>Test and Evaluation Organizations</b>										
DT&E					2,470	1,107	1,134	1,113	ONGOING	5,824

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)		DATE	February 1997	PROJECT						
BUDGET ACTIVITY		PE NUMBER AND TITLE								
4 - Demonstration and Validation		0603872C Joint Theater Missile Defense								
B. Budget Acquisition History and Planning Information Continued (\$ in Thousands)										
Item Description	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Delivery Date	Total	Budget FY 1996	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<b>Government Furnished Property:</b>										
Product Development Property										
Support and Management Property										
Test and Evaluation Property										
Subtotal Product Development										
Subtotal Support and Management										
Subtotal Test and Evaluation										
Total Project										
					42,888	49,802	64,126	60,918		217,734
					2,470	1,107	1,134	1,113		5,824
					45,358	50,909	65,260	62,031		223,558

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

DATE **February 1997**

BUDGET ACTIVITY

PE NUMBER AND TITLE

**4 - Demonstration and Validation**

**0603872C Joint Theater Missile Defense**

PROJECT  
**3261**

COST (\$ In Thousands)	FY 1996 Actual	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
3261 TMD BM/C3I (BM/C3I Concepts)	0	32,357	34,094	35,864	43,717	44,576	43,210	43,286	Continuing	Continuing

**A. Mission Description and Budget Item Justification**

The primary mission of this project is to provide the warfighter with an integrated and interoperable Theater Missile Defense (TMD) Battle Management/Command, Control, Communications, and Intelligence (BM/C3I) capability having the flexibility to meet a wide range of threats and expected needs. The BM/C3I architecture for TMD is built upon the existing command and control (C2) structure for Theater Air Defense (TAD) and adds the communications linking TMD C2 nodes, weapons, and sensors, and the TMD interfaces to intelligence systems and other supporting capabilities. The BMDO, from its joint perspective, uses this project to oversee independent weapon systems development and to provide guidance, standards, equipment, integration, and analysis to maximize the performance of a multitude of sensors, interceptors, and C2 nodes and to synergize their individual contributions to an integrated Joint theater-wide TMD system. BMDO has three major thrusts to the TMD BM/C3I integration program.

The first thrust establishes the links and means for receipt of and in-theater dissemination of early warning and launch warning information from space-based and intelligence systems external to TMD. This project supports the system engineering of their capability and prototype development of items such as improved displays for early in-theater warning information. This project focuses on linking separate external systems into the theater.

The second thrust of the BM/C3I program focuses on communication and interoperability among TMD weapon systems. Interoperability includes both the communications equipment, and protocols as well as the common command and control procedures among different weapons systems to ensure a truly integrated theater-wide ballistic missile defense system. The cornerstone of TMD interoperability is the Joint Data Net (JDN) which uses the Joint Tactical Information Distribution System (JTIDS) and the Tactical Data Information Link-JTIDS (TADIL-J) message format. This project integrates JTIDS terminals into existing Theater Ballistic Missile Defense (TBMD) C2 platforms and provides the necessary software upgrades. This funding is critical for timely inter-Service interoperability.

The third thrust of the BM/C3I program directs attention to upgrades of Service C2 centers. Various command center upgrades are included in this project to reduce decision-making time necessary to effectively engage ballistic missiles. Again, BMDO leverages off several existing Service-funded theater air defense command center upgrades and this project funds only the specific TMD-related aspects of these upgrades. BMDO's central direction and support of hardware and software developments will produce an integrated C2 capability for TMD.

The joint warfighters and BM/C3I developers evaluate the effects of early warning, improved interoperability, integration, and command center upgrades on joint TBMD doctrine through BM/C3I work shops and analysis.

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

DATE

February 1997

BUDGET ACTIVITY

PE NUMBER AND TITLE

PROJECT

**4 - Demonstration and Validation**

**0603872C Joint Theater Missile Defense**

**3261**

All of the efforts in this project are designed to provide a seamless interoperable architecture to provide timely warning and information necessary to reduce decision times and allow more opportunities to efficiently and effectively engage hostile missiles. The end result will kill more missiles and will reduce casualties to U.S. and other friendly forces.

FY 1996 (\$ in Thousands):

- \$0 There is no funding under this project in this PE for FY96. This project was transferred from PE 0603864 per Congressional Direction.  
 - \$0 Total

FY 1997 (\$ in Thousands):

- \$5,390 BM/C3I Integration - Army: Integrate JTIDS into Army systems; develop terminal initialization parameters; demonstrate enclave interoperability; integrate User Operational Evaluation System (UOES) upper/lower tier; continue TMD Cell/TOC automation.  
 - \$14,515 BM/C3I Integration - Air Force: Continue JTIDS integration efforts, initiate integration into two additional existing platforms; Air Operations Center/Command Reporting Center (AOC/CRC) upgrades for TMD; begin development of JTIDS Range Extension (JRE) capability.  
 - \$5,400 BM/C3I Integration - USMC: Complete development of AN/TPS-59 cue acceptance software; commence development of TAOM BM/C3I TMD software.  
 - \$283 BM/C3I Integration - Navy: Support joint development of JTIDS Range Extension (JRE).  
 - \$4,394 BM/C3I Integration - Joint/Combined: Obtain/approve additional TADIL-J TMD messages; transition MIDS development to the Army; conduct evaluations of JTIDS networks to determine value of JTIDS Time Slot Reallocation (TSR); begin software integration of TMD messages; obtain NATO approval of additional TADIL-J messages; perform an integrated engineering analysis for the joint composite tracking network (JCTN) including the cooperative engagement capability.  
 - \$2,375 BM/C3I Integration - Joint National Test Facility (JNTF): Conduct TMD BMC3I work shop; conduct C2 tests to refine C2 procedures; deploy joint TMD planning capability to command centers for initial user testing.  
 - \$32,357 Total

FY 1998 (\$ in Thousands):

- \$9,995 BM/C3I Integration - Army: Field two Tactical Operations Centers (TOC) to active Army brigades; support JTIDS Range Extension (JRE) efforts; participate in JTIDS network management activities; initiate Joint TMD Planner (JTMDP) integration into Army host platforms.  
 - \$12,654 BM/C3I Integration - Air Force: Develop an automated intelligence database function; continue JTIDS platform integration; initiate one additional platform; continue JRE development; technology development of distributed battle management; and validate TMD battlefield situation display software.  
 - \$291 BM/C3I Integration - Navy: Continue support of joint development of JRE.  
 - \$2,500 BM/C3I Integration - USMC: Complete testing of AN/TPS-59 cue capability; and continue TAOM BMC3I software development.  
 - \$6,098 BM/C3I Integration - Joint/Combined: Update TADIL-J message set approval and initiate definition and development of joint composite tracking network (JCTN).

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

DATE **February 1997**

BUDGET ACTIVITY

**4 - Demonstration and Validation**

PE NUMBER AND TITLE

**0603872C Joint Theater Missile Defense**

PROJECT

**3261**

- \$2,556 BM/C3I Integration - JNTF: Continue BM/C3I work shops; update Joint TMD Planner (JTMDP) based on initial user test results; and provide Global Command and Control System (GCCS) capability for TMD applications evaluations.

- \$34,094 Total

FY 1999 (\$ in Thousands):

- \$7,916 BM/C3I Integration - Army: Continue integration of THAAD EMD and Navy TMD systems into brigade TOC planner; continue JRE support.
- \$11,701 BM/C3I Integration - Air Force: Start JTIDS TMD integration to AOC; continue installation on AWACS, test integration on Airborne Battlefield Command and Control Center (ABCCC); perform TMD BSD SW modification to AOC; upgrade Intelligence Preparation of the Battlespace (IPB) GCCS decision support tool; continue JRE development.
- \$290 BM/C3I Integration - Navy: Continue support of JRE
- \$13,666 BM/C3I Integration - Joint: Continue JCTN development and update TMD TADIL message sets.
- \$2,291 BM/C3I Integration - JNTF: Continue BM/C3I work shops; perform user assessments of TMD GCCS TMD applications; and identify product improvements to the JTMDP.
- \$35,864 Total

**Acquisition Strategy:** The 3261 Project acquisition strategy leverages existing system acquisition programs (which are subject to milestone decisions and testing) and accomplishes supporting tasks to satisfy BM/C3I performance requirements. A significant portion of this project entails systems engineering of separately funded and managed service programs so that all systems will interoperate when fielded.

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

	FY 1996	FY 1997	FY 1998	FY 1999	Total
Previous President's Budget	0	31,388	36,562	39,018	106,968
Current Budget Submit/President's Budget	0	32,357	34,094	35,864	102,315

**Change Summary Explanation:**

Funding: Congressional direction eliminated the TMD BM/C3I program elements 0603864/0604864C and placed this project under the Joint TMD activities program element. Consistent with this direction, a determination was made that this program is more appropriately funded with Dem/Val funds. Navy tasks directly supporting the Navy Area TBMD program were deleted from this project for FY1997 and beyond, and funded under the Navy Area TBMD program element (Project 2263) to unify control. Additional FY1997 funds were authorized and appropriated for cooperative engagement capability (CEC) integration. This will be addressed in an integrated engineering analysis for the joint composite tracking network. In FY1997, Project 3261 was cut to pay various PBD reductions including those for COBRA JUDY and MEADS. In FY1997-2003, Project 3261 was cut as part of a reallocation of BMDO funds to support the JNTF. Schedule: None



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

DATE

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BUDGET ACTIVITY

PE NUMBER AND TITLE

PROJECT

**4 - Demonstration and Validation**

**0603872C Joint Theater Missile Defense**

**3261**

FY 1996

FY 1998

FY 1999

1

2

3

4

1

2

3

4

1

2

3

4

1

2

3

4

ABCCC TMD integration on C-130 test

platform

Fielding of USMC TAOM TMD upgrades

X

X

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

DATE

February 1997

BUDGET ACTIVITY

PE NUMBER AND TITLE

4 - Demonstration and Validation

0603872C Joint Theater Missile Defense

PROJECT

3261

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

	FY 1996	FY 1997	FY 1998	FY 1999
a. Hardware Development	0	5,677	10,460	17,322
b. Software Development	0	19,258	13,837	10,274
c. Project Management	0	300	307	318
d. System Engineering	0	7,122	9,490	7,950
Total		32,357	34,094	35,864

**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 1996	Budget	Budget	Budget	Total Program
						FY 1996	FY 1997	FY 1998	
Product Development Organizations									
OGA	MIPRs/Allot	Multiple				32,357	34,094	35,864	Cont
Support and Management Organizations									Cont
Test and Evaluation Organizations									

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

DATE **February 1997**

BUDGET ACTIVITY

PE NUMBER AND TITLE

**4 - Demonstration and Validation**

**0603872C Joint Theater Missile Defense**

PROJECT

**3265**

COST (\$ In Thousands)	FY 1996 Actual	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
3265 User Interface	15,286	14,031	14,680	21,976	22,060	22,113	22,048	22,118	Continuing	Continuing

**A. Mission Description and Budget Item Justification**

This project provides the Joint Staff and the warfighting Commanders-in-Chief (CINCs) with the means to ensure that the Theater Missile Defense (TMD) development reflects evolving military needs and the combined warfare capabilities of allies and friends. To accomplish this, there must be clearly articulated tactics, doctrine, policies, and procedures. The three areas which provide the information base to effectively transition TMD capabilities into the existing and planned operational activities and war plans are described below.

The project's primary area is focused on the refinement of existing and near-term TMD capabilities. This is accomplished through the CINC's TMD Assessments Program, which involves the execution of numerous operationally realistic military exercises. These exercises provide the basis for the assessment, development, and improvement of TMD capabilities. Specific activities include the integration of new technology and hardware into the CINC operations, and the integration of User Operational Evaluation Systems (UOES) to examine the effectiveness of architectures and operational concepts. UOES is a prototype operational system of hardware and procedures which will be user-operated for field evaluation purposes. Through the Assessments Program, the CINCs develop Battle Management Command, Control, and Communications (BM/C3) architectures, formulate and test operational concepts, and determine or refine operational requirements. This program exercises communications architectures and develops operational concepts that will enable rapid integration of the PATRIOT Advanced Capability (PAC-3), Theater High Altitude Area Defense (THAAD), and Navy Area Theater Ballistic Missile Defense (TBMD) into the theater's warfighting capability. In future years, the CINCs' TMD Assessment Program will continue to develop ways to improve the CINCs' warfighting capabilities and integrate emerging TMD capabilities through simulation and employment of UOES hardware. Within the context of Combined Warfare, the Assessments Program focuses on providing the means for the U.S. and its allies to develop an understanding of each other's doctrine and common concepts of operation, and to determine equipment compatibility and interoperability.

The second area focuses on understanding the changing threat and how to best counter that threat. This is accomplished through the conduct of Warfare Analysis Laboratory Exercises (WALEX). Relying primarily on computer simulation tools and real experiences from the CINC's Assessment program, these exercises are performed to educate the TMD development community concerning the challenges presented by the theater missile threat. The WALEX provide forums for discussion of complex issues associated with concepts of operation for existing and future capabilities.

The third area focuses on the integration of warfighter operational requirements with near and far term Ballistic Missile Defense (BMD) program development. TMD programs (e.g. THAAD, Navy TBMD, etc.) are in various stages of development, and are scheduled for future deployment. This project area ensures that the experiences gleaned from such programs as the CINC's Assessment program are factored into all TMD programs. These programs are to develop and acquire TMD systems and architectures to (a) deploy theater missile defense capability to protect forward-deployed armed forces of the U.S., friends, and allies; and, (b) demonstrate advanced technologies for near-term insertion options and concept development of new systems. Analyses and simulations address systems effectiveness of proposed

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TMD system architectures against ballistic missile threats to U.S. deployed forces, our allies and friends. Analytical results are also used to support activities required for the Defense acquisition process. Theater gaming with the CINCs is also supported to identify roles, missions, and requirements for TMD.

FY 1996 (\$ in Thousands):

-	\$3,000	Supported USEUCOM Joint Project Optic Needle.
-	\$3,000	Supported USCENTCOM Joint Project Optic Cobra.
-	\$2,900	Supported USFK Joint Project Ormate Impact.
-	\$1,654	Supported USACOM TMD Exercises.
-	\$1,628	Supported USPACOM TMD Exercises.
-	\$318	Integrated improved TMD model supporting Command Post Exercises and allies/friends.
-	\$325	Reviewed Operational Requirement Documents.
-	\$500	Developed operational concept(s) of operations for BMD.
-	\$268	Conducted theater and strategic wargaming, including GLOBAL 96.
-	\$293	Conducted mission analysis for BMD (including allies/friends).
-	\$400	Conducted four Warfare Analysis Laboratory Exercises.
-	\$1,000	Integrated capability to display simulated TBMs on PATRIOT Engagement Control System radar scopes supporting Field Training Exercises.
-	\$15,286	Total

FY 1997 (\$ in Thousands):

-	\$3,000	Support USEUCOM Joint Project Optic Needle.
-	\$3,200	Support USCENTCOM Joint Project Optic Cobra.
-	\$3,250	Support USFK Joint Project Ormate Impact.
-	\$2,440	Support USACOM TMD Exercises.
-	\$613	Support USPACOM TMD Exercises.
-	\$400	Review ORDs.
-	\$139	Conduct theater and strategic wargaming, including GLOBAL 97.
-	\$250	Conduct mission analysis for TMD (including allies/friends).
-	\$739	Conduct five Warfare Analysis Laboratory Exercises.
-	\$14,031	Total

FY 1998 (\$ in Thousands):

-	\$3,000	Support USEUCOM Joint Project Optic Needle.
-	\$3,000	Support USCENTCOM Joint Project Optic Cobra.
-	\$2,750	Support USFK Joint Project Ormate Impact.

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- \$2,000	Support USACOM TMD Exercises.
- \$1,900	Support USPACOM TMD Exercises.
- \$576	Integrate capability to display simulated TBMs on developing operator radar scopes supporting Field Training Exercises.
- \$100	Review ORDs/CRD
- \$94	Conduct theater and strategic wargaming, including GLOBAL 98.
- \$485	Conduct mission analysis for TMD (including allies/friends)
- \$775	Conduct five Warfare Analysis Laboratory Exercises.
- \$14,680	Total

FY 1999 (\$ in Thousands):

- \$4,900	Support USEUCOM Joint Project Optic Needle.
- \$4,000	Support USCENCOM Joint Project Optic Cobra.
- \$4,000	Support USFK Joint Project Ormate Impact.
- \$3,800	Support USACOM TMD Exercises.
- \$3,500	Support USPACOM TMD Exercises.
- \$292	Integrate capability to display simulated TBMs on developing operator radar scopes supporting Field Training Exercises.
- \$100	Review ORDs/CRD
- \$93	Conduct theater and strategic wargaming, including GLOBAL 99.
- \$484	Conduct mission analysis for TMD (including allies/friends).
- \$807	Conduct six Warfare Analysis Laboratory Exercises.
- \$21,976	Total

Acquisition Strategy: Management is executed through the use of weekly task plans, monthly progress and expenditure reports, quarterly reviews, and semi-annual assessments. Each theater conducts monthly In-Process Reviews to monitor and manage the preparation for scheduled activities. ORDs/CRD and CONOPs are updated throughout the year.

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

	FY 1996	FY 1997	FY 1998	FY 1999	Total Cost
Previous President's Budget	15,293	13,869	15,128	22,725	67,015
Current Budget Submit/President's Budget	15,286	14,031	14,680	21,976	65,973

**Change Summary Explanation:**

Funding: Additional funds received in FY97 for Roving Sands support

Schedule: None

Technical: None

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

	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To Compl Cont.	Total Cost Cont.

**D. Schedule Profile**

	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To Compl Cont.	Total Cost Cont.
1	2	3	4	1	2	3	4	1		
X	X	X	X	X	X	X	X	X		
X	X	X	X	X	X	X	X	X		

Joint Projects  
Model and Wargame  
Refine ORD/CONOPS



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BUDGET ACTIVITY		DATE		PROJECT					
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BUDGET ACTIVITY		PE NUMBER AND TITLE		PROJECT					
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Item Description	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Delivery Date	Total					
				Prior to FY 1996	Total				
				Budget FY 1996	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Product Development Property				15,286	14,031	14,680	21,976		65,973
Support and Management Property				15,286	14,031	14,680	21,976		65,973
Test and Evaluation Property									
Subtotal Product Development				15,286	14,031	14,680	21,976		65,973
Subtotal Support and Management				15,286	14,031	14,680	21,976		65,973
Subtotal Test and Evaluation									
Total Project				15,286	14,031	14,680	21,976		65,973

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COST (\$ In Thousands)	FY 1996 Actual	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
Threat and Countermeasures Program	19,865	21,419	27,986	29,154	27,981	27,891	28,779	27,898	Continuing	Continuing

**A. Mission Description and Budget Item Justification**

Threat and Countermeasures Program. The BMDO Theater Missile Defense (TMD) Threat Program defines potential adversary military forces, principally Theater Ballistic Missile (TBM) threats. To accomplish this mission, BMDO has a threat development program which is based on intelligence community projections and is traceable to quantifiable analysis. This project produces capstone threat and countermeasure documentation to ensure consistent technical threat definitions across all the Services. It does not duplicate Service-unique activities. The program consists of three component tasks: Intelligence Threat, Countermeasures Integration, and System Threat Scenario Generation.

Intelligence Threat Task. The purpose of this task is to provide an Intelligence Community-Validated TMD threat description. The threat is divided into four major categories under this task: Operational Threat Environment, Targets, System Specific Threats (SST), and Reactive Threats. The Operational Threat Environment includes assessments of the TBM operational and technological environments and projects the effects of developments and trends on TMD mission capability. The Targets category includes a projection of foreign TBM systems and countermeasures that enhance their performance. This includes force structure, performance characteristics, and sample signatures. SST addresses threats to the TMD "family of systems" including reconnaissance, surveillance, and target acquisition; lethal and non-lethal threats; and regional integrated SST assessments. The Reactive Threats category includes those that an adversary may develop as a result of deployment of the TMD "family of systems."

System Threat Scenario Generation Task. The accurate specification and characterization of ballistic missiles and the appropriate development and integration of scenarios using these characterizations are critical to the analysis of alternative ballistic missile architectures, the performance assessments of potential technology applications, and the operational performance evaluations of candidate designs. This task provides baseline and excursion scenario descriptions in documentary and digital form for use in BMDO TMD cost and operational effectiveness analyses (COEA). These descriptions are the only approved threat employment portrayals authorized for acceptable BMDO analysis. This task:

- Identifies user needs for threat scenario descriptions.
- Identifies analyses needed to fully specify and characterize the threat missile systems, penetration aids, tactics, etc., and ensures the analyses are accomplished.
- Provides the analysis results to all interested agencies for review and comment.
- Addresses critical threat issues which arise during the analysis process.
- Ensures all supporting agencies' views on threat issues are fully aired.
- Reviews, approves, produces, and distributes all System Threat Scenario Descriptions.

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Produces threat computer digital media and supporting documentation for use by the development and acquisition communities.

Countermeasures Integration Task. The BMDO Countermeasure Integration (CMI) Program assists TMD acquisition program offices in developing theater ballistic missile defense systems that are robust to potential countermeasures and are practical and within the means of anticipated adversaries. Included in this mission are CMI Program support to the TMD threat development process and advance warning to BMDO system designers. The BMDO CMI Program reviews TMD systems for susceptibilities and identifies potential countermeasures, determines credibility through analyses and tests, characterizes credible countermeasures by providing designs and performance parameters, informs intelligence and system threat developers of potential countermeasures, informs TMD system designers with advance warning of potential countermeasures, and assists TMD system designers in developing counter-countermeasures. Providing vulnerability and susceptibility information to the system designers early enables them to build robustness into their designs during the early stages of the system development process, a cost-effective means for providing a flexible high-performance design. The CMI Program takes a "rest-of-world" perspective in developing credible, potential countermeasures.

FY 1996 (\$ in Thousands):

- \$4,981	Intelligence Threat Task: Provided Capstone System Threat Assessment Report (STAR), specialty threats, targets analyses, operational threat environment intelligence assessments, management, and planning support.
- \$4,737	System Threat Scenario Generation Task: Continued development of threat system characterizations and scenario descriptions in response to the analysis needs of the system/element developers. Upgraded the threat modeling capability and produce digital media and supporting documentation through the Joint National Test Facility (JNTF). Developed scenarios depicting threat systems employed in theater environments.
- \$10,147	Countermeasures (CM) Integration Task: Performed TMD CM Red/Blue activities and counter-countermeasure parametric studies and TMD CM technical experiments and evaluations. Supported CM Skunkworks teams in conducting CM concept, design, fabrication, tests. Conducted non-technical analysis, oversight, and database management.
- \$19,865	Total

FY 1997 (\$ in Thousands):

- \$5,327	Intelligence Threat Task: Provide Capstone STAR, specialty threats, targets analyses, operational threat environment intelligence assessments, management, and planning support.
- \$4,438	System Threat Scenario Generation Task: Continue development of threat system characterizations and scenario descriptions in response to the analysis needs of the system/element developers. Upgrade the threat modeling capability and produce digital media and supporting documentation through the JNTF. Develop scenarios depicting threat systems employed in theater environments.
- \$11,654	Countermeasures (CM) Integration Task: Perform TMD CM Red/Blue activities and counter-countermeasure parametric studies and TMD CM technical experiments and evaluations. Support CM Skunkworks teams in conducting CM concept, design, fabrication, tests. Conduct non-technical analysis, oversight, and database management.
- \$21,419	Total

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FY 1998 (\$ in Thousands):

- \$6,944	Intelligence Threat Task: Provide Capstone STAR, specialty threats, targets analyses, operational threat environment intelligence assessments, management, and planning support.
- \$5,389	System Threat Scenario Generation Task: Continue development of threat system characterizations and scenario descriptions in response to the analysis needs of the system/element developers. Upgrade the threat modeling capability and produce digital media and supporting documentation through the JNTF. Develop scenarios depicting threat systems employed in theater environments.
- \$15,653	Countermeasures (CM) Integration Task: Perform TMD CM Red/Blue activities and counter-measure parametric studies and TMD CM technical experiments and evaluations. Support CM Skunkworks teams in conducting CM concept, design, fabrication, tests. Conduct non-technical analysis, oversight, and database management.
- \$27,986	Total

FY 1999 (\$ in Thousands):

- \$7,282	Intelligence Threat Task: Provide Capstone STAR, specialty threats, targets analyses, operational threat environment intelligence assessments, management, and planning support.
- \$5,648	System Threat Scenario Generation Task: Continue development of threat system characterizations and scenario descriptions in response to the analysis needs of the system/element developers. Upgrade the threat modeling capability and produce digital media and supporting documentation through the JNTF. Develop scenarios depicting threat systems employed in theater environments.
- \$16,224	Countermeasures (CM) Integration Task: Perform TMD CM Red/Blue activities and counter-measure parametric studies and TMD CM technical experiments and evaluations. Support CM Skunkworks teams in conducting CM concept, design, fabrication, tests. Conduct non-technical analysis, oversight, and database management.
- \$29,154	Total

Acquisition Strategy: Funding is provided to executing agents who accomplish tasks under existing contracts via Military Interdepartmental Purchase Requests (MIPR); Scientific, Engineering, and Technical Assistance (SETA) contracts; and Federally Funded Research and Development Centers (FFRDCs) contracts.

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

	<u>FY 1996</u>	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	Total
Previous President's Budget	19,684	23,170	28,930	30,438	102,222
Current Budget Submit/President's Budget	19,865	21,419	27,986	29,154	98,424
					<u>Cost</u>

**Change Summary Explanation:**

Funding: Funding adjustments made to support revisions in TMD core program schedules and requirements.

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Schedule: None  
 Technical: None

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

	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To Compl	Total Cost Cont
2400 NMD Program, PE 0603871C	730,656	828,864	504,091	393,085	309,748	309,584	391,858	392,433		

**D. Schedule Profile**

	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 1999	FY 1999
1	X	4	1	3	4	2	4	1	2	3
2	X	X	X	X	X	X	X	X	X	X
3	X	X	X	X	X	X	X	X	X	X
4	X	X	X	X	X	X	X	X	X	X
5	X	X	X	X	X	X	X	X	X	X
6	X	X	X	X	X	X	X	X	X	X
7	X	X	X	X	X	X	X	X	X	X
8	X	X	X	X	X	X	X	X	X	X
9	X	X	X	X	X	X	X	X	X	X
10	X	X	X	X	X	X	X	X	X	X
TMD Capstone STAR										
Countermeasures Risk Assessment										
Process										
Semi-Annual Update										
(Starting 3Q/FY96)										

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

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BUDGET ACTIVITY  
 PE NUMBER AND TITLE  
 0603872C Joint Theater Missile Defense PROJECT 3270

**4 - Demonstration and Validation**

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

	FY 1996	FY 1997	FY 1998	FY 1999	Total
a. Intelligence Threat	4,788	5,327	6,944	7,282	26,341
b. System Threat Scenario Generation	4,869	4,438	5,389	5,648	20,344
c. Countermeasures Integration	10,208	11,654	15,653	16,224	53,745
<b>Total</b>	<b>19,865</b>	<b>21,419</b>	<b>27,986</b>	<b>29,154</b>	<b>98,424</b>

**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		Budget to Complete	
					Prior to FY 1996	FY 1996		
DOE Sandia Lab			0	0	1,988	1,575	2,200	5,763
JNTE-SPC			0	0	1,250	2,000	0	3,250
MIT Lincoln Lab			0	0	2,133	2,850	2,850	7,833
CM Tech Eval			0	430	0	0	0	430
Physitron			0	0	0	0	1,136	1,136
USASSDC			0	1,500	0	0	0	1,500
Sandia TDP			0	0	0	0	0	0
<b>Total</b>			<b>0</b>	<b>2,340</b>	<b>400</b>	<b>3,300</b>	<b>3,300</b>	<b>8,813</b>

**Product Development Organizations**

**Support and Management Organizations**

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total	Budget to Complete
DOE Sandia Lab			0	0	1,988	1,575
JNTE-SPC			0	0	1,250	2,000
MIT Lincoln Lab			0	0	2,133	2,850
CM Tech Eval			0	430	0	0
Physitron			0	0	0	1,136
USASSDC			0	1,500	0	0
Sandia TDP			0	0	0	0
<b>Total</b>			<b>0</b>	<b>2,340</b>	<b>400</b>	<b>3,300</b>

**Test and Evaluation Organizations**

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total	Budget to Complete
Dynetics			0	0	2,213	3,300
SPC CM			0	0	400	0
<b>Total</b>			<b>0</b>	<b>0</b>	<b>2,213</b>	<b>3,300</b>

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Contractor or Government Performing Activity		PE NUMBER AND TITLE									
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Contractor or Government Performing Activity	Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1996	Budget FY 1996	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Booz-Allen					0	2,223	1,966	0	0	0	4,189
SPC-Threat					0	1,906	2,000	2,000	2,000	2,000	7,906
Nichols-Threat					0	2,014	2,351	2,960	2,960	2,960	10,285
CHOP/Phillips					0	0	3,642	4443	6,358	6,358	14,443
MSIC					0	0	125	131	450	450	706
NAIC					0	0	125	131	450	450	706
TRW					0	3,720	1,944	1,148	1,460	1,460	8,272
Loral					0	1,130	532	353	450	450	2,465
Dept of Commerce					0	750	750	0	0	0	1,500
TBE					0	3,720	0	0	0	0	3,720
NGIC					0	0	0	1,250	0	0	1,250
IDA					0	0	0	2,000	0	0	2,000
Miscellaneous					0	132	0	3,445	5540	5540	9,117
<b>B. Budget Acquisition History and Planning Information Continued (\$ in Thousands)</b>											
<b>Government Furnished Property:</b>											
Item Description	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Delivery Date	Total Prior to FY 1996	Budget FY 1996	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program	
<b>Product Development Property</b>											
<b>Support and Management Property</b>											

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BUDGET ACTIVITY		DATE		PROJECT				
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PE NUMBER AND TITLE		0603872C Joint Theater Missile Defense						
Item Description	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Delivery Date	Total				
				Budget FY 1996	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete
<u>Test and Evaluation Property</u>								
Subtotal Product Development								
Subtotal Support and Management								
Subtotal Test and Evaluation								
Total Project								
				1,930	5,371	6,425	6,186	19,912
				17,935	16,048	21,561	22,968	78,512
				19,865	21,419	27,986	29,154	98,424

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COST (\$ In Thousands)	FY 1996 Actual	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
3352 Modeling and Simulations	71,362	64,180	73,173	72,984	74,959	74,961	78,333	75,661	Continuing	Continuing

**A. Mission Description and Budget Item Justification**

This project provides for the development/modification and validation of modeling and simulation (M&S) techniques and tools that are critical in assessing the projected, alternative, and demonstrated performance capabilities of Theater Missile Defense (TMD) and National Missile Defense (NMD) systems. These large and complex M&S tools require high-performance vector and parallel processing super-computers, scalar processors, and advanced graphic workstations for operation. Portions of this processing capability are housed at the Joint National Test Facility (JNTF) in Colorado Springs, CO, and the Advanced Research Center/Simulation Center (ARC/SC) in Huntsville, AL. These facilities operate in a distributed integrated simulation environment and host the modeling and simulation wargames that provide analysis, integration, demonstration, and performance verification of BMD systems. The JNTF and ARC/SC facilities and the Joint Missile Defense Network (JMDN), which links BMD Contractors, Services and other DoD government facilities, are utilized by all Services. Procedures are established to ensure efficient utilization of these facilities and to provide verification, validation, and accreditation (VV&A) of the models, simulations, and systems portrayed. This cost effective approach reduces the need for more costly live fire missile test programs and establishes requirements for future technology needs. It promotes enhancements of M&S technologies that support: the acquisition process; the development and fielding of operational capabilities; and the development of common tools, methodologies, and protocols beneficial to data exchange, integration of various modeling and simulations, and software reusability of M&S applications.

This project funds the development, operation, and VV&A of the Extended Air Defense Test Bed (EADTB) and the Extended Air Defense Simulation (EADSIM) which support the analysis required for TMD program acquisition and integration. The EADTB is a flexible distributed simulation tool that can determine the performance of existing and conceptual extended air and missile defense systems with the added complexity of theater missile defense threats. This is a multi-node test bed that is comprised of high and medium fidelity models of sensors, environments, weapon systems, threats, and Battle Management Command, Control and Communication (BM/C3) systems. The capabilities of the EADTB are being incrementally developed and accredited with the Services. EADSIM is a low to medium detail simulation system that operates on a stand-alone workstation. This simulation is used for architectural analysis of EAD systems and provides user interface for scenario preparation and model description.

M&S activities also funded by this project include: development, enhancement, and maintenance of the theater test beds and conduct of wargames that provide the analysis, integration, demonstration, and performance verification for TMD systems. It ensures joint usage of simulation tool resources, supports allied and friendly international participation and cooperation in wargaming exercises. This project focuses M&S support in five primary areas: standardization, assessments, development/modification, computer architectures/networks, and program management for BMD and Service M&S programs.

Funding for these facilities is distributed through Project 3352. Three Program Elements (PEs), (NMD, TMD, and Support Technology) provided funding. This cost sharing approach ensures cooperation, contributes to achieving synergy across the efforts, and minimizes duplication of modeling and simulation resources. The total

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funding profile remains flat on an annual basis, with adjustments for inflation. For example, the decrease in TMD funding for JNTF in FY97 is offset by a corresponding increase in NMD funding. These PEs include the costs for operations and maintenance of the JNTF and ARC/SC facilities, and the JMDN which includes: computer hardware and software, communications networks, security, and other essential capabilities necessary to develop and operate reconfigurable, and multiple experiment test bed environments. This document describes the TMD portion of funding for these activities.

FY 1996 (\$ in Thousands):

- \$31,983 Provided super-computing and wargaming resources at JNTF. Continued use of the JNTF for threat scenario generation and threat tape production for U.S. and international Wargames and Exercises. Continued to provide studies and analysis expertise and resources to BMDO and the BMD community to address BMD issues across the entire development and operational spectrum. Continued support as the central hub of the JMDN linking Services, contractors, and other DoD/government facilities. Began the development of the BMD Simulation Support Center (SSC).
- \$1,695 Provided JNTF TMD M&S support in six primary areas: standardization, assessments, development/modification, accreditation, computer architecture/networks, and program management for BMDO and Service M&S programs.
- \$22,749 Delivered EADTB Version 3 (this provides basic simulation capability for small TMD scenarios to support BM/C3 special studies) and Version 4 (upgrades include ground clutter, reporting responsibility, functional sensor, and terrain following algorithms); incorporation of DIS capability; provided EADTB support to STC, THAAD, and BM/C3 studies and analysis. Provided EADSIM baseline maintenance; continued EADTB VV&A activities; provided EADTB site support to all nodes, including the STC node. Began the development of Service certified Specific System Representations (SSRs) for EADTB. This figure also included civilian salaries.
- \$8,204 Provided super-computing resources at the ARC/SC to operate a multiple experiment test bed environment for conducting research and development activities for the Army's Ground Based Elements (THAAD, PATRIOT, and BM/C3 components), EADTB, EADSIM, and the THAAD Test Bed. Continued to support maintenance, modification, and enhancements of/to: CFD analysis; COEA of TMD systems; technical base analysis; concept studies; and alternative trade-off analysis. This figure also include Army civilian salaries.
- \$3,515 Provided Army TMD M&S support in six primary areas: standardization, assessments, development/modification, accreditation, computer architecture/networks, and program management for BMDO and Service M&S programs.
- \$1,271 Provided Air Force TMD M&S support in six primary areas: standardization, assessments, development/modification, accreditation, computer architecture/networks, and program management for BMDO and Service M&S programs.
- \$1,330 Provided Navy TMD M&S support in six primary areas: standardization, assessments, development/modification, accreditation, computer architecture/networks, and program management for BMDO and Service M&S programs.
- \$615 Provided TMD M&S support in six primary areas: standardization, assessments, development/modification, accreditation, computer architecture/networks, and program management for BMDO and Service M&S programs.
- \$71,362 Total

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

DATE

February 1997

BUDGET ACTIVITY

## 4 - Demonstration and Validation

PE NUMBER AND TITLE

0603872C Joint Theater Missile Defense

PROJECT

3352

## FY 1997 (\$ in Thousands):

-	\$15,310	Deliver 4.1, 4.2, and 4.3 (upgrades include threat tape enhancements, EADTB site support - including JNTF, Ft. Bliss, NSWC, TACCSF, and NC3A). Continue development of EADTB Service certified SSRs and EADTB deliver Version 5 (upgrades include limited ground force interactions, and additional space based sensor enhancements). Limited EADSIM and EADTB site support. Continue EADTB VV&A activities. Provide EADSIM baseline maintenance. This figure also includes civilian salaries.
-	\$26,075	Provide infrastructure and core capability funding for the JNTF. This includes: operations and maintenance of the facilities, personnel, computer hardware and software, communications, networks, systems engineering, security, and other capabilities essential to common system support to the BMDO; super-computing and wargaming resources for TMD Wargame and Workshop efforts; studies and analysis expertise and resources to the BMD community to address BMD issues across the entire development and operational spectrum; and development and operation of the Joint TMD Planning Tool; development of the BMD Simulation Support Center; contribution to the JNTF Modernization/Rolling Technology Update; and continued support to the Information System Security Engineering/Multi-Level Security program. Continue support as the central hub of the JMDN linking Services, contractors, and other DoD/government facilities. This figure also includes JNTF civilian salaries.
-	\$3,853	Provide JNTF Project funding to support: one TMD Wargame, one TMD Workshop, Human in Control Test Bed modifications, and the development of the BMD SSC. This area also provides JNTF support in five primary M&S areas: standardization, assessments, development/modification, computer architecture/networks, and program management for BMDO and Service M&S programs. Also support the development of DPS and JDN Common Rule Sets SSRs for the EADTB program.
-	\$12,864	Provide super-computing resources at the ARC/SC to operate a multiple experiment test bed environment for conducting research and development activities for the Army's Ground Based Elements including the EADTB, EADSIM, and the THAAD Test Bed. Major areas of support include maintenance, modification, and enhancements of/to: CFD analysis; COEA of TMD systems; technical base analysis; concept studies; and alternative trade-off analysis.
-	\$1,537	Provide BMDO M&S support in five primary areas: standardization, assessments, development/modification, computer architecture/networks, and program management for BMDO and Service M&S programs.
-	\$2,078	Provide Army M&S support in five primary areas: standardization, assessments, development/modification, computer architecture/networks, and program management for BMDO and Service M&S programs. Also support the development of Army certified THAAD, JTAGS, Corps SAM, PAC-2 and PAC-3 SSRs for the EADTB program.
-	\$666	Provide Air Force M&S support in five primary areas: standardization, assessments, development/modification, computer architecture/networks, and program management for BMDO and Service M&S programs. Also support the development of Air Force certified AWACS SSR for the EADTB program.
-	\$599	Provide Navy M&S support in five primary areas: standardization, assessments, development/modification, computer architecture/networks, and program management for BMDO and Service M&S programs. Also support the development of a Navy certified TBMD Aegis SSR for the EADTB program.
-	\$1,198	Modernize JNTF's computer capabilities based on supporting BMD program priorities.
-	\$64,180	Total

Project 3352

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Exhibit R-2 (PE 0603872C)

UNCLASSIFIED

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

DATE February 1997

PROJECT  
3352

PE NUMBER AND TITLE

0603872C Joint Theater Missile Defense

BUDGET ACTIVITY

4 - Demonstration and Validation

FY 1998 (\$ in Thousands):

-	\$40,722	Provide infrastructure and core capability funding for the JNTF. This includes: operations and maintenance of the facilities, personnel, computer hardware and software, communications, networks, systems engineering, security, and other capabilities essential to common system support to the BMDO; super-computing and wargaming resources for TMD Wargame and Workshop efforts; studies and analysis expertise and resources to the BMDO community to address BMD issues across the entire development and operational spectrum; and development and operation of the Joint TMD Planning Tool; development of the BMD Simulation Support Center; contribution to the JNTF Modernization/Rolling Technology Update; and continued support to the Information System Security Engineering/Multi-Level Security program. Continue support as the central hub of the JMDN linking Services, contractors, and other DoD/government facilities. This figure also includes JNTF civilian salaries.
-	\$13,257	Deliver EADTB Phase I SSRs and user required enhancements to support SSR development, and Version 6. Provide limited site support to all EADTB users. Provide EADSIM baseline maintenance. Continue limited EADTB VV&A activities. Port EADTB to an affordable Silicon Graphic platform. This area also funds civilian salaries.
-	\$7,907	Provide super-computing resources at the ARC/SC to operate a multiple experiment test bed environment for conducting research and development activities for the Army's Ground Based Elements including the EADTB, EADSIM, the THAAD Test Bed, TISES, and TMDSE.
-	\$7,173	Major areas of support include maintenance, modification, and enhancements of/to: CFD analysis; COEA of TMD systems; technical base analysis; concept studies; and alternative trade-off analysis.
-	\$1,203	Provide M&S support in five primary areas: standardization, assessments, development/modification, computer architecture/networks, and program management for BMDO and Service M&S programs.
-	\$2,911	Continue to modernize BMDO's computer capabilities based on supporting BMD program priorities. Continue upgrade of host processing resources to address inadequate user response time; establishment of a WAN; upgrade supercomputers to support modeling and simulations; implementation of new technology to support multimedia applications replace obsolete computational resources; and implement nearline and online mass storage to support user software analysis.
-	\$73,173	Provide JNTF Project funding to support: one TMD Wargame, Human in Control Test Bed modifications, and the development of the BMD SSC. This area also provides JNTF support in five primary M&S areas: standardization, assessments, development/modification, computer architecture/networks, and program management for BMDO and Service M&S programs.
-	Total	

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

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PROJECT  
3352

PE NUMBER AND TITLE

0603872C Joint Theater Missile Defense

BUDGET ACTIVITY

## 4 - Demonstration and Validation

## FY 1999 (\$ in Thousands):

- \$40,443	Provide infrastructure and core capability funding for the JNTF. This includes: operations and maintenance of the facilities, personnel, computer hardware and software, communications, networks, systems engineering, security, and other capabilities essential to common system support to the BMDO; super-computing and wargaming resources for TMD Wargame and Workshop efforts; studies and analysis expertise and resources to the BMD community to address BMD issues across the entire development and operational spectrum; and development and operation of the Joint TMD Planning Tool; development of the BMD Simulation Support Center; contribution to the JNTF Modernization/Rolling Technology Update; and continued support to the Information System Engineering/Multi-Level Security program. Continue support as the central hub of the JMDN linking Services, contractors, and other DoD/government facilities. This figure also includes JNTF civilian salaries.
- \$14,409	Deliver EADTB development and enhancements. Provide limited site support to all EADTB users. Provide EADSIM baseline maintenance. Continue limited EADTB VV&A activities. This area also funds civilian salaries.
- \$7,754	Provide super-computing resources at the ARC/SC to operate a multiple experiment test bed environment for conducting research and development activities for the Army's Ground Based Elements including the EADTB, EADSIM, the THAAD Test Bed, TISES, and TMDSE. Major areas of support include maintenance, modification, and enhancements of/to: CFD analysis; COEA of TMD systems; technical base analysis; concept studies; and alternative trade-off analysis.
- \$6,068	Provide M&S support in five primary areas: standardization, assessments, development/modification, computer architecture/networks, and program management for BMDO and Service M&S programs.
- \$1,409	Continue to modernize BMDO's computer capabilities based on supporting BMD program priorities. Continue upgrade of supercomputers to support modeling and simulations; implementation of new technology to support multimedia applications: replace obsolete computational resources.
- \$2,901	Provide JNTF Project funding to support: one TMD Wargame, Human in Control Test Bed modifications, and the development of the BMD SSC. This area also provides JNTF support in five primary M&S areas: standardization, assessments, development/modification, computer architecture/networks, and program management for BMDO and Service M&S programs.
- \$72,984	Total

**Acquisition Strategy:** The tasks in this project are met through full and open competition. Primary M&S support is performed at the JNTF, ARC/SC, and other test bed facilities. The JNTF support contracts were awarded to Loral (Operations & Maintenance) and TRW (Research & Development) in FY95; both contracts are Cost Plus Award Fee. The ARC/SC contractor is a Cost Plus Fixed Fee (CPFF) with COLSA, first awarded in June of 1989. The prime contractor for development and operation of the EADTB is Hughes Aircraft, which was awarded a Cost Plus Award Fee (CPAF) contract in September 1989.

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

DATE **February 1997**

BUDGET ACTIVITY  
 PE NUMBER AND TITLE  
**0603872C Joint Theater Missile Defense**

PROJECT  
**3352**

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

	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	Total Cost
Previous President's Budget	69,409	53,042	61,204	62,318	61,204	62,318	62,318	62,318	245,973
Current Budget Submit/President's Budget	71,362	64,180	73,173	72,984	73,173	72,984	72,984	72,984	281,699

**Change Summary Explanation:**

- Funding: None
- Schedule: None
- Technical: None

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

	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To Compl Cont'd	Total Cost
3352 Modeling and Simulation, PE 0603173C	0	2,002	1,554	1,898	643	1,512	1,544	1,582		
3352 Modeling and Simulation, PE 0603171C	16,041	32,803	22,308	22,535	17,744	18,876	19,798	19,722		

**D. Schedule Profile**

	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 1999
1	2	3	4	1	2	3	4	1	2
Delivery of EADTB Version 3									
GBR/THAAD Integration Testing	X								
NMD/TMD Wargame 96-A/B	X								
Delivery of EADSIM Ver 6.0	X								
Delivery of German EADTB Software				X					
Delivery of EADTB Version 4.1									
Simulation Support Center PDR									
Conduct TMD GBR Software Testing									
Complete EADTB TBMD SSR Dvmt				X					
EADTB SSR Development PDR				X					

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

DATE

February 1997

BUDGET ACTIVITY

PE NUMBER AND TITLE

0603872C Joint Theater Missile Defense

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3352

	FY 1996				FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Conduct ARGUS Assessment																
Conduct "ARGUS 2000" PDR				X												
JTMDFP Interim Release - Ver 0.5				X												
Initial JTMDFP Software Rqmts Review				X												
Coordinate Wargame 2000 Requirements Document (PDR)					X											
Complete V&V of EADTB TBMD SSR					X											
TPT Requirement Scrubber (Assessment)					X											
Simulation Support Center CDR					X											
EA TAD BMC4I Wargame						X										
Begin Wargame 2000 design/development						X										
Form BMDO Wargame Federation for the Wargame 2000 CDR						X										
Delivery of EADTB Version 4.2							X									
Complete EADTB CMD SSR Dvmt							X									
EADTB SSR Development CDR							X									
SI&I Tool Assessment							X									
Complete BMD M&S Roadmap							X									
Host TMD Workshop								X								
Conduct "ARGUS 2000" CDR							X									
JTMDFP System Specifications Review							X									
Delivery of EADTB Version 4.3								X								
JTMDFP Software Requirements Review									X							
Deliver EADTB Version 5										X						
Host EA TAD C4I Workshop																
Complete V&V of EADTB CMD SSR																
JTMDFP Ver 1.0 Release																
Conduct Wargame 2000 Integration Testing/Demo																
Complete EADTB SSR Dvmt Phase I																
Deliver EADSIM Version 7.0																
Simulation Support Center IOC																

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BUDGET ACTIVITY

PE NUMBER AND TITLE

0603872C Joint Theater Missile Defense

PROJECT

3352

4 - Demonstration and Validation

FY 1996

1

2

3

4

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FY 1997

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FY 1998

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FY 1999

2

3

4

1

2

3

4

Update M&S Roadmap

Conduct Wargame 2000 Integration

Testing with ARGUS

Deliver EADTB Version 6

JTM DP Ver 2.0 Release

Deliver Wargame 2000; IOC

TMD GBR S/W Testing

Deliver EADTB Version 7

EADTB Final FQT



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

DATE February 1997

BUDGET ACTIVITY PE NUMBER AND TITLE PROJECT  
**4 - Demonstration and Validation** 0603872C Joint Theater Missile Defense 3352

Contractor or Government Performing Activity	Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity	Project Office	Total Prior to FY 1996	Budget				Total Program
						FY 1996	FY 1997	FY 1998	FY 1999	
Madison	Contract Comp/CPFF			EAC	1,522	3,216	1,977	1,938	Cont'd	8,653
Research Corp - Sim Center				EAC	20,963	12,906	10,798	11,831	Cont'd	56,498
Hughes Aircraft - EADTB Dvmt	CPAF	Sep-89		EAC	15,007	10,976	25,797	25,774	Cont'd	77,554
Loral - JNTF				EAC	7,478	8,452	6,631	6,516	Cont'd	29,077
TRW - JNTF				EAC	615	1,537	7,173	6,068	Cont'd	15,393
BMDO M&S				EAC	7,811	7,196	2,911	2,901	Cont'd	20,819
Service M&S				EAC	0	0	1,203	1,409	Cont'd	2,612
BMDO Computer Mods				EAC	0	1,198	0	0	Cont'd	1,198
JNTF Computer Mods				EAC	0	0	0	0	Cont'd	0
Support and Management Organizations				EAC	3,903	2,404	2,459	2,578	Cont'd	11,344
Army Civilian				EAC	2,941	3,081	2,957	2,910	Cont'd	11,889
JNTF Civilian				EAC	722	466	670	657	Cont'd	2,515
Navy Civilian				EAC	5,835	3,100	4,667	4,586	Cont'd	18,188
JNTF - NAAS				EAC					Cont'd	

Test and Evaluation Organizations

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

**Government Furnished Property:**

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

		DATE		February 1997		PROJECT				
BUDGET ACTIVITY		PE NUMBER AND TITLE		0603872C Joint Theater Missile Defense		3352				
Item Description	Method/Type or Funding Vehicle	Award or Obligation Date	Delivery Date	Total Prior to FY 1996	Budget FY 1996	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Contract</u>										
<u>Product Development Property</u>										
<u>Support and Management Property</u>										
<u>Test and Evaluation Property</u>										
Subtotal Product Development										
Subtotal Support and Management										
Subtotal Test and Evaluation										
Total Project										
				57,961	55,129	62,420	62,253	237,763		
				13,401	9,051	10,753	10,731	43,936		
				71,362	64,180	73,173	72,984	281,699		

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

DATE **February 1997**

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
<b>4 - Demonstration and Validation</b>	<b>0603872C Joint Theater Missile Defense</b>	<b>3354</b>

COST (\$ In Thousands)	FY 1996 Actual	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
3354 Targets Support	23,046	22,842	27,603	18,721	42,755	42,226	42,463	42,578	Continuing	Continuing

**A. Mission Description and Budget Item Justification**

This project provides core funding for targets and services needed to support the testing and evaluation of all Theater Missile Defense (TMD) programs, in particular THAAD, PATRIOT, PAC3, Navy Area TBMD and Navy Theater -Wide TBMD, USMC Hawk, and the US Air Force Air Borne Laser (ABL). This project is a segment of the BMDO Consolidated Targets Program (CTP). The CTP mission is to provide threat representative ballistic missile target system support to interceptor and sensor development and acquisition programs. Each target system is tailored and reconfigured to meet unique mission requirements for each test. This project funds the development and demonstration of target systems and Foreign Military Acquisition (FMA) targets to support TMD test and evaluation. The TMD programs fund the actual acquisition of Theater targets development of this program. The Theater High-Altitude Area Defense (THAAD) system, Patriot Advanced Capability - 3 (PAC-3) system, Navy Area TBMD (Lower Tier) and Navy Theater-Wide TBMD (Upper Tier) systems require target system support to accomplish their planned test and evaluation. The THAAD program intends to use the HERA target system with planned launches at White Sands, NM and from Wake Island into the Kwajalein Missile Range (KMR) impact area. Additionally, THAAD testing in the Pacific requires short range (200-600 Km) and long range (1000-2900 KM) target presentations which require development of a long range air launch target system. The PAC-3 program will use STORM and HERA targets launched from White Sands and Wake Island. The Navy will use the air launch target launched at Pacific Missile Range Facility (PMRF) (Barking Sands, Kauai, HI). This project is developing a short range (200-600 Km) air drop ballistic target and a long range (1000-2900 Km) winged air-launched target to satisfy the collective target requirements of THAAD and both Navy programs for multiple simultaneous engagements, multi-axis scenarios, and short range and long-range threat target presentations. The project is also developing reentry vehicles to simulate the full range of threat targets.

FY 1996 (\$ in Thousands):

- \$6,800 Continued support of FMA target systems and development to support TMD EMD test and evaluation.
- \$2,646 Continued development and demonstration of new HERA and STORM target configurations, supporting THAAD Dem/Val, PAC-3 EMD and Navy Area.
- \$5,800 Developed short range air drop target capability to meet requirements.
- \$4,995 Provided technical support for targets program operations at the executing agent.
- \$2,805 Initiated development of advanced payload (modular target reentry vehicle) for PAC3, THAAD EMD.
- \$23,046 Total

FY 1997 (\$ in Thousands):

- \$8,500 Continue support of FMA target systems and target development to support TMD test and evaluation.
- \$4,862 Continue development and demonstration of HERA and STORM target configurations.

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

DATE

February 1997

BUDGET ACTIVITY

**4 - Demonstration and Validation**

PE NUMBER AND TITLE

0603872C Joint Theater Missile Defense

PROJECT

3354

- \$2,208 Demonstrate short range air drop target capability to meet requirements.  
 - \$7,172 Technical support for targets program operations at executing agent.  
 - \$100 Initiate development of advanced payload (long range threat representative target) for THAAD , Navy Theater Wide.  
 - \$22,842 Total

FY 1998 (\$ in Thousands):

- \$2,000 Initiate EMD of Short Range air drop ballistic missile target for Navy Area Wide and THAAD.  
 - \$9,000 Initiate Dem/Val of Long Range target for Navy Theater Wide THAAD.  
 - \$1,362 Continue development and sensor characterization of advanced target payloads for THAAD, Navy Theater Wide.  
 - \$10,241 Continue development of targets capability to meet additional requirements for Navy, THAAD, EMD.  
 - \$2,000 Continue support of FMA target systems.  
 - \$3,000 Provide technical support for targets program operations at the executing agent.  
 - \$27,603 Total

FY 1999 (\$ in Thousands):

- \$3,300 Continue EMD of Short Range air drop ballistic missile target for Navy Area Wide and THAAD  
 - \$6,800 Initiate EMD of Long Range target for Navy Theater Wide and THAAD.  
 - \$1,500 Continue development and sensor characterization of advanced target payloads for THAAD and Navy Theater Wide.  
 - \$3,121 Continue development of target capability to meet additional target requirements for Navy Theater/Area and THAAD EMD.  
 - \$1,000 Continue support of FMA target systems  
 - \$3,000 Provide technical support for targets program operations at the executing agent.  
 - \$18,721 Total

**Acquisition Strategy:** The Hera and Storm target systems are being developed by the executing agent: U.S. Army, Space and Strategic Defense Command (SSDC), Targets and Test and Evaluation (TT&E) office in Huntsville, AL. The Hera target system, being developed by Coleman Research Corporation (Orlando, FL) is being procured with a contract for a quantity of 25 targets. Two additional options are available for procurement of 25 targets in each option. Orbital Sciences Corporation has delivered three Storm Maneuvering Tactical Target Vehicles (MTTV). Additional targets include the Lance target system and Foreign Material Acquisition. The development and demonstration of the air drop ballistic target system is being managed by the executing agent: National Air Intelligence Center, Wright Patterson AFB, OH. The air drop demonstration contractor team is Xontech and Space Vector Corporation. The first demonstration is planned for January 1997. A possible second launch will support a Pacific TMD exercise in FY97. Follow-on acquisition of short range and long range Alternate Air Ballistic target systems will begin in FY98 to meet a delivery requirement in FY00. The acquisition will be conducted by the executing agent: USA/SSDC/TT&E office with an Air Force sub-agency arrangement.

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

DATE **February 1997**

BUDGET ACTIVITY

PE NUMBER AND TITLE

**4 - Demonstration and Validation**

PROJECT  
**3354**

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

	FY 1996	FY 1997	FY 1998	FY 1999	Total Cost
Previous President's Budget	20,259	22,939	28,443	19,359	91,000
Current Budget Submit/President's Budget	23,046	22,842	27,603	18,721	92,212

**Change Summary Explanation:**

Funding: Funding adjustments made to support higher priority projects

Schedule: None

Technical: None

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

	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To Compl	Total Cost
2257 PATRIOT, PE 0604865C	352,547	381,092	206,057	101,430	0	0	0	0	TBD	TBD
2260 THAAD, PE 0603861C	565,818	341,307	294,064	16,778	0	0	0	0	TBD	TBD
2260 THAAD, PE 0604861C	0	277,508	261,480	578,467	603,213	584,561	413,884	372,674	Cont	Cont
2263 Navy Area System, PE 0603867C	277,565	59,315	0	0	0	0	0	0	TBD	TBD
1266 *Navy Theater-Wide System, PE 0603868C	200,442	304,171	194,898	192,073	191,229	190,930	145,490	149,444	Cont	Cont
3360 Test Resources, PE 0603872C	31,139	35,507	30,888	30,201	29,942	29,793	30,312	30,363	Cont	Cont

**D. Schedule Profile**

	FY 1996	FY 1997	FY 1998	FY 1999	FY 1999
HERA supporting TMD-RST 1	1	2	3	4	2
HERA Pile Driver Demo		4	1	2	3
Lance support to Navy Lower Tier (Area) Tests	X	X			

Project 3354

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Exhibit R-2 (PE 0603872C)

**UNCLASSIFIED**

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

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BUDGET ACTIVITY

PE NUMBER AND TITLE

**0603872C Joint Theater Missile Defense**

PROJECT

**3354**

	FY 1996				FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
HERA supporting THAAD Dem/Val flight testing		X		X		X		X		X		X		X		X
Lance supporting USMC TBMD tests			X													
HERA Blk-2B Demo				X												
Willow Dune #1																
Willow Dune #2																
Air Drop target Demo					X											
STORM/HERA supporting PAC-3 EMD flight testing								X		X		X		X		X
HERA supporting THAAD LUT									X							
Navy Lower Tier (Area) target support																
THAAD EMD target support																
THAAD AUT																
Storm supporting PAC-2																
HERA MTV Demo																
HERA Wake Demo																X

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

DATE February 1997

BUDGET ACTIVITY PE NUMBER AND TITLE PROJECT  
**4 - Demonstration and Validation** 0603872C Joint Theater Missile Defense 3354

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

	FY 1996	FY 1997	FY 1998	FY 1999	
FMA Prep/presentation	6,800	8,500	0	0	
Hardware Development	16,246	14,342	27,603	18,721	
Total	23,046	22,842	27,603	18,721	

**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 1996	Budget			Total Program
						FY 1996	FY 1997	FY 1998	
<b>Product Development Organizations</b>									
USASSDC					17,196	20,584	15,553	6,671	60,004
USAF NAIC					5,800	2,208	12,000	12,000	32,008
<b>Support and Management Organizations</b>									
<b>Test and Evaluation Organizations</b>									
NAWC					50	50	50	50	200

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

**Government Furnished Property:**

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

DATE **February 1997**

BUDGET ACTIVITY  
**4 - Demonstration and Validation**  
 PE NUMBER AND TITLE  
**0603872C Joint Theater Missile Defense**  
 PROJECT  
**3354**

Item Description	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Delivery Date	Total					Total Program
				Prior to FY 1996	Budget FY 1996	Budget FY 1997	Budget FY 1998	Budget FY 1999	
<u>Product Development Property</u>									
<u>Support and Management Property</u>									
<u>Test and Evaluation Property</u>									
Subtotal Product Development									
Subtotal Support and Management									
Subtotal Test and Evaluation									
Total Project									
				22,996	22,792	27,553	18,671	92,012	
				50	50	50	50	200	
				23,046	22,842	27,603	18,721	92,212	

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BUDGET ACTIVITY

4 - Demonstration and Validation

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0603872C Joint Theater Missile Defense

PROJECT

3359

COST (\$ In Thousands)	FY 1996 Actual	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
3359 System Test and Evaluation	33,568	42,792	40,307	26,444	30,263	32,250	31,590	31,636	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project provides for BMDO planning, oversight, and coordination of integrated Test and Evaluation activities, as well as inter-service Test and Evaluation efforts for assessment of the Family of Systems (FoS). Once the test plans are developed, test resource and target development and support is provided. (Test resources located in Project 3360 include test facilities, ranges and test instrumentation; target development and support is found in Project 3354). The program provides for support to the Major Defense Acquisition Program (MDAP) mandatory Live-Fire Test and Evaluation (LFT&E). This includes estimates of probability of kill of chemical/biological submunitions, creation of models to determine chemical/biological ground effects, confirmation of damage laws from low mass/high-velocity intercepts, confirmation of damage laws from high velocity rods, development of generic lethality targets. Additionally, this project provides the following: independent assessments of the JTMD system; maturity evaluation of technology programs; multiple-fidelity models and simulation to support system development testing; and execution of independent technical reviews, system analyses and performance evaluations which contribute to new or enhanced capabilities; management of the development process, and the decision-making process related to the allocation of resources. The performance evaluation has as its primary goals the identification and understanding of system-level performance drivers and the mitigation of technical risk, and to provide timely answers to critical issues and questions required by decision authorities through an annual Consolidated Evaluation Report (CER).

FY 1996 (\$ in Thousands):

- \$18,662 Completed Build 1 development of the Theater Missile Defense System Exerciser (TMDSE). Integrated PATRIOT, AEGIS, Joint Tactical Ground Station (JTAGS), Shield and Command and Control components into the basic TMDSE architecture. Completed test planning for scheduled FoS System Integration Tests (SITs). Performed a Hardware-in-the Loop (HWIL) test for early interoperability assessment. Performed post HWIL analysis. Began Build 2 TMDSE development which adds THAAD and TPS-59 (HAWK) Radar to the Build 1 architecture. Supported Build 1 transition to the Joint National Test Facility (JNTF).
- \$8,656 Performed atmospheric chemical dispersion experiments that allowed validation data to determine post-intercept chemical transport to the ground. Developed prototype intercept-to-ground model Post Engagement Ground Effect Model (PEGEM). Determined biological agent demise mechanisms from UV irradiation, heat/pressure at intercept.
- \$2,656 Executed consolidated evaluation program. Conducted special studies and technical investigations. Participated in THAAD, PATRIOT and NTWDS Test Readiness Reviews. Conducted assessments of TMDSE testing. Monitored FoS MDAP flight testing and confirmed attainment of test objectives. Participated in SIT planning activities. Developed assessment plans for of FoS activities. Developed TMD consolidated Evaluation Plan.

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**0603872C Joint Theater Missile Defense**

PROJECT

**3359**

- \$2,655 Participated in SIT planning activities by chairing the Data Management and Assessment subgroup of the SIT planning team and by coordinating Operational Test Agency activities with regard to TMD operational assessments. Monitored MDAP flight testing and attainment of test objectives. Provide CER detailing current maturity of TMD Family of Systems architecture.  
 - \$939 Provided technical support for System Test activities at the Executing Agent.  
 - \$33,568 Total

FY 1997 (\$ in Thousands):

- \$18,210 Execute SIT-97. Perform HWIL tests and analysis, and perform-SIT analysis. Integration tests of the Family of System will be performed. Complete Build 2 development of TMDSE to include PATRIOT, AEGIS, JTAGS, Shield, TPS-59 (HAWK) Radar, THAAD and Command and Control components. Perform test planning for scheduled SITs.  
 - \$15,203 Develop generic lethality targets for sled testing of interceptor lethality to support development and live fire test and evaluation. Provide a consistent documentation source for threat lethality target designs. Provide lethality data analyses for target response of HTIC and fragmentation engagements with threat targets to evaluate the effectiveness of TMD interceptors. Initial Verification & Validation of the Post Engagement Ground Effect Model (PEGEM) model for low altitude intercepts.  
 - \$2,301 Execute integrated evaluation plan and methodology. Conduct special studies and technical investigations. Participate in FoS MDAP Test Readiness Reviews. Participate in PAC-3 Test Readiness reviews. Conduct independent assessments of TMDSE testing. Monitor THAAD, PAC-3, and NTWDS testing.  
 - \$3,500 Conduct operational assessment activities for the TMD FoS. Develop critical operational issues, measures of effectiveness, and measures of performance. Develop operational assessment plan for the FoS Command and Control architecture. Perform operational assessment of the FoS System Integration Test.  
 - \$2,300 Manage operational assessment activities for the TMD FoS and MDAPs. Continue monitoring of THAAD, PAC-3, and NTWDS testing. Provide updated Comprehensive Evaluation Report (CER) utilizing current test data from MDAPs, SITs, CINC Assessments, and Wargames, as well as analytical techniques to estimate the TMD system maturity.  
 - \$1278 Provided technical support for System Test activities at the Executing Agent.  
 - \$42,792 Total

FY 1998 (\$ in Thousands):

- \$19,077 Transition TMDSE Build 2 to the Joint National Test Facility. Begin Build 3 development of TMDSE which adds THAAD radar Testbed HWIL, multiple AEGIS ships and Patriot elements, and increased fidelity of BMC<sup>3</sup>. Perform test planning for scheduled SITs. Perform HWIL tests and analysis in conjunction with the schedule. Plan SIT 98 and plan post SIT analysis. Integration and interoperability testing of the TMD Family of Systems will be performed.

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**3359**

- \$15,492 Maintain endgame Parametric Endo-Exo Lethality Simulation (PEELS) and postgame (PEGEM) model simulations at current state of knowledge of lethality phenomena. Provide realistic model based on test data and analyses for atmospheric transport, diffusion, deposition, and evaporation of Chemical, Biological Weapon (CBW) agents released from ground level to high altitude. Provide plans to examine lethality as a function of mass and velocity, high velocity phenomena, agent response, and ground effects.
- \$2,445 Maintain support to execute the Consolidated Evaluation Program and methodology and conduct special studies and technical investigations. Participate in THAAD, PAC-3, and NTWDS Test Readiness Reviews. Provide evaluation support to the BMD Acquisition Review Council (BMDARC) prior to PAC-3 MS III. Participate in SM-2 Blk IVA Flight Test Readiness Reviews. Provide evaluation support to BMDARC for the Navy Area TBMD UOES. Assess results of HWILT 98 events and TMDSE testing. Monitor THAAD Pre-Production Qualification test (PPQT).
- \$2,445 Manage operational assessment activities for the TMD FoS. Continue monitoring of THAAD testing. Monitor PAC-3 EMD testing and Navy Area testing. Provide updated CER utilizing current test data from MDAPs, SITs, CINC Assessments, and Wargames, as well as analytical techniques to estimate the TMD system maturity.
- \$848 Provide technical support for System Test activities at Executing Agent
- \$40,307 Total

FY 1999 (\$ in Thousands):

- \$8,475 Execute SIT-99. Complete TMDSE Build 3 transition to the Joint National Test Facility. Additional integration and interoperability testing of the TMD FoS will be conducted. Plan and perform HWIL test 99. Perform Post SIT and HWIL test analysis.
- \$11,981 Maintain endgame (PEELS) and post engagement (PEGEM) model simulations at current state of knowledge of lethality phenomena. Provide realistic model based on test data and analyses for atmospheric transport, diffusion, and deposition and evaporation of CBW agents released from ground level to high altitude. Provide plans to examine lethality as a function of mass and velocity, high-velocity phenomena, agent response, and ground effects.
- \$2,571 Execute Consolidated Evaluation Program and methodology. Conduct special studies and technical investigations. Participate in PAC-3 Test Readiness Reviews. Provide evaluation support to the BMD Acquisition Review Council (BMDARC) prior to PAC-3 MS III. Participate in SM-2 Blk IVA Flight Test Readiness Reviews. Provide evaluation support to BMDARC for the Navy Area TBMD UOES. Assess results of TMDSE FoS HWIL testing.
- \$2,571 Manage operational assessment activities for the TMD system. Continue monitoring of THAAD testing. Monitor PAC-3 EMD testing and Navy Area testing. Provide updated CER utilizing current test data from MDAPs and SITs, CINC Assessments, and Wargames as well as analytical techniques to estimate the TMD system maturity.
- \$846 Provide technical support for System Test activities at Executing Agent
- \$26,444 Total

**Acquisition Strategy:** This effort will use Service executing agents through existing contracts to construct a TMD Family of Systems HWIL capability, TMD System Exerciser (TMDSE) and conduct TMD system level live flight testing. The strategy provides for lethality sled testing managed by BMDO and executed by Service labs

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against TMD targets. It also provides Service and BMDO system evaluation funding. The evaluation process is an iterative process which should begin early in the development cycle to add value to the development of the system. Critical system characteristics and issues should be identified early in the process and be evaluated to allow for informed decision-making. Family of System evaluations and assessments will be performed by Service OTAs and JHU/APL.

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

	<u>FY 1996</u>	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 1999</u>	<u>Total</u>
Previous President's Budget	35,117	43,421	42,789	27,741	149,068	Cost
Current Budget Submit/President's Budget	33,568	42,792	40,307	26,444	143,111	

**Change Summary Explanation:**

Funding: Funding transferred to higher priority projects.

Schedule: Changing funding priorities in FY1996 resulted in a TMDSE hardware-in-the-loop Build 2 slip of approximately 6 months. Beginning development of Build 3 slips to FY1998. Completion of Build 3 to FY99.

Technical: None

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

	<u>FY 1996</u>	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	To Compl	Total Cost

**D. Schedule Profile**

	<u>FY 1996</u>	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 1999</u>	<u>FY 1999</u>	<u>FY 1999</u>
1	2	3	4	1	2	3	4	1	2
2	3	4	1	2	3	4	1	2	3
3	4	1	2	3	4	1	2	3	4
4	X								

TMDSE Build 1  
HWIL  
SIT  
JT&E  
TMDSE Build 2

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BUDGET ACTIVITY	PE NUMBER AND TITLE												PROJECT	
	0603872C Joint Theater Missile Defense													
4 - Demonstration and Validation	FY 1996			FY 1997			FY 1998			FY 1999			3359	
	1	2	3	4	1	2	3	4	1	2	3	4		
SM2 BIK IVA														
HWIL					X									
THAAD PPQT								X						
JT&E														
SIT														
HWIL													X	



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**4 - Demonstration and Validation**

**0603872C Joint Theater Missile Defense**

PROJECT

**3359**

Item Description	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Delivery Date	Total		Budget FY 1996	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
				Prior to FY 1996	FY 1996						
<u>Product Development Property</u>											
<u>Support and Management Property</u>											
<u>Test and Evaluation Property</u>											
				12,689	10,072	10,189	2,418	35,368			
Subtotal Product Development				3,402	3,200	3,500	3,500	13,602			
Subtotal Support and Management				17,477	29,520	26,618	20,526	94,141			
<b>Total Project</b>				<b>33,568</b>	<b>42,792</b>	<b>40,307</b>	<b>26,444</b>	<b>143,111</b>			

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**4 - Demonstration and Validation**

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**3360**

COST (\$ In Thousands)	FY 1996 Actual	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
3360 Test Resources	31,139	35,507	30,888	30,201	29,942	29,793	30,312	30,363	Continuing	Continuing

**A. Mission Description and Budget Item Justification**

This project provides for BMDO planning, oversight and coordination of integrated test and evaluation facilities. The project includes inter-element as well as inter-service test and evaluation efforts, and provides infrastructure for common ground test facilities, ranges and instrumentation. Project 3360 funds the common TMD test infrastructure costs including BMDO use. Individual programs pay only the direct costs associated with their specific testing efforts.

The mission common ground test facilities include:

- Kinetic Kill Vehicle Hardware-in-the-Loop Simulator (KHILS) at Eglin AFB, FL
- Aero-Optic Evaluation Center (AOEC) located at Calspan Corp, Buffalo, NY
- Hypervelocity Wind Tunnel Number 9 (Tunnel 9) at the Naval Surface Warfare Center, White Oak, MD
- National Hover Test Facility (NHTF) at Edwards AFB, CA
- Army Missile Optical Range (AMOR) at the U.S. Army Missile Command, Redstone Arsenal, AL
- Infrared and Blackbody Standards at the National Institute of Standards and Technology (NIST) in Gaithersburg, MD.
- Hypervelocity Ballistic Range G Light Gas Gun at the Arnold Engineering and Development Center (AEDC) in Tullahoma, TN
- Captive Carry Capability at the Nevada Test Site
- 7V and 10V Space Chambers at the Arnold Engineering Development Center, Tullahoma, TN
- Portable Optical Sensor Tester (POST) and the Characterization of Low Background Mosaics (CALM) at Rockwell International, Anaheim, CA
- Naval Research and Development (NRaD) facility IR Devices Branch located at the Naval Command, Control and Ocean Surveillance Center, San Diego, CA
- The Center for Research Support (CERES) at the Joint National Test Facility, Falcon AFB, CO

The mission common range facilities include national ranges such as:

- White Sands Missile Range (WSMR) located in Las Cruces, NM
- Kwajalein Missile Range (KMR) and the Wake Island Complex located in the South Ocean
- Pacific Missile Range Facility (PMRF) located at Kauai, HI
- Gulf Test Range (GTR) located at Eglin AFB, Fort Walton Beach, FL.

The range instrumentation special test equipment, data collection assets, and range instrumentation include:

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**4 - Demonstration and Validation**

High Altitude Observatory (HALO) with the Infrared Imaging System (IRIS) sensor, based at Aeromet, Inc., Tulsa, OK  
 Sea-Lite Beam Director (SLBD), based at White Sands Missile Range, Las Cruces, NM  
 High Altitude Optical Imaging System (HAOIS), based at White Sands Missile Range, Las Cruces, NM.  
 Mobile Range Safety System and Kwajalein Range Safety Control System Upgrades  
 NP-3 Aircraft upgrade for remote area safety support.  
 Miscellaneous improvements to BMDO infrastructures and support systems

These ground test, range and instrumentation assets provide valuable risk reduction and test implementation capability in support of the TMD test and evaluation. The ground test facilities provide a cost effective method of testing and evaluating applicable component, sub-system and system level technologies. The common range facilities provide a cost effective method of flight testing missile and target components applicable to the TMD program and FoS, BMC<sup>3</sup> and interoperability testing. The range instrumentation provides a cost effective capability to collect target signature characteristics, phenomenology data, and target/interceptor diagnostics on flight tests. These facilities and capabilities support systems design, verification and validation of target realism, and the evaluation of test results.

FY 1996 (\$ in Thousands):

- \$14,198	Provided ground test facility infrastructure and upgrades for BMDO testing including: digital emulation at KDEC, end game hardware-in-the-loop testing of integrated IR sensor systems at KHILS, wind tunnel testing at Tunnel 9 in support of THAAD, sensor testing at CALM, POST, NRAd, and AEDC 7V/10V, propellant loading expertise in support of THAAD and hover test capability from the NHTF, complete development of a light gas gun capability for Lethality testing at AEDC Range G, IR phenomenology characterization at Tunnel 9, AMOR and KHILS, and primary IR standards, and black body and optical materials calibrations at the NIST. Completed full operational capability of the WISP system, and conducted SHARRP and THAAD HWIL testing at KHILS. Demonstrated real-time data capability link at CERES. Conducted THAAD DemVal window stress tests at Tunnel 9. Performed AIT aero-optic/seeker tests and Navy Lower Tier (Area) system aero-optic testing at AOEC. Installed a new spectral calibration chamber and conducted THAAD window emissivity tests at NIST.
- \$7,724	Provided test range infrastructure, upgrades including provision of caretaker activities at Wake Island, WSMR/Ft Wingate and development of TMD launch sites and range facilities at WSMR and Wake Island, and associated range instrumentation sites.
- \$9,199	Provided range instrumentation, upgrades, data collection, and analyses for BMDO testing including: Full Operational Capability (FOC) of Kwajalein Missile Range Safety System (KMRSS) at KMR, IOC of P-3 Range Safety System, and data collecting and processing by SLBD at WSMR and HALO/IRIS sensor.
- \$18	Provided technical support for Resources activities at the Executing Agent.
- \$31,139	Total

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3360

## 4 - Demonstration and Validation

## FY 1997 (\$ in Thousands):

-	\$13,944	Provide ground test facility infrastructure and upgrades for BMDO testing including: end game hardware-in-the-loop testing of integrated IR sensor systems at KHILS, wind tunnel testing at Tunnel 9 to support THAAD and Navy Sea-Based TBMD programs, EKV and SMTS sensor testing at CALM, POST and NRaD, EKV sensor testing at AEDC 7V/10V, propellant loading expertise and EKV hover test capability from the NHTF, Patriot and Navy lethality testing at AEDC Range G, IR phenomenology characterization at Tunnel 9, AMOR and KHILS; primary IR standards and black body optical materials calibrations at the NIST. Provide LBIR spectral broadband calibration and THAAD window characterization at NIST. Perform THAAD HWIL testing at KHILS. Conduct AIT and Navy Area seeker aero-optic tests at AOEC. Provide orbital experiment and satellite operations support at CERES.
-	\$12,076	Provide test range infrastructure including caretaker activities at Wake Island and WSMR/Ft Wingate, upgrades, and development of TMD launch and range facilities, and associated range instrumentation sites, includes environmental shelter for Wake Island. Continue development of a range standard for intercept debris analysis.
-	\$9,195	Provide range instrumentation, upgrades, data collection, and analyses for BMDO testing including: data collecting and processing by SLBD at WSMR and HALO/IRIS sensor. Achieve FOC of HAOIS at WSMR and P3 Remote Area Safety Aircraft (RASA). Support upgraded KMRSS and KMR Range Safety System to support Multiple Shot Engagements. Support System Integration tests (SIT 97).
-	\$292	Provide technical support for Resource activities at the Executing Agent.
-	\$35,507	Total

## FY 1998 (\$ in Thousands):

-	\$14,036	Provide ground test facility infrastructure and upgrades for BMDO testing including: end game hardware-in-the-loop testing of integrated IR sensor systems including THAAD and Navy at KHILS, wind tunnel testing at Tunnel 9 to support AIT, sensor testing at CALM, POST, NRaD, and AEDC 7V/10V, propellant loading expertise and GBI hover test support from the NHTF, THAAD and Navy TBMD lethality testing at AEDC Range G, IR phenomenology characterization at Tunnel 9, AMOR and KHILS, and primary IR standards, and black body and optical materials calibrations at the NIST. Support THAAD flight test anomaly investigation and objective window testing at Tunnel 9. Provide orbital experiment and satellite operations support at CERES
-	\$9,113	Provide test range infrastructure including provision caretaker activities at Wake Island, WSMR and Ft Wingate, and upgrades for BMDO testing including development of TMD launch and range facilities, and associated range instrumentation sites, including new development at PMRF and second environmental shelter at Wake Island.
-	\$7,456	Provide range instrumentation, upgrades, data collection, and analyses for BMDO testing including: data collecting and processing by SLBD, HAOI at WSMR and HALO/IRIS sensor. Support FOC of upgraded KMRSS to support Multiple Shot Engagements. Achieve FOC of second NP-3 RASA.
-	\$283	Provide technical support for Resources activities at the Executing Agent.
-	\$30,888	Total

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**4 - Demonstration and Validation**

**0603872C Joint Theater Missile Defense**

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**3360**

FY 1999 (\$ in Thousands):

- \$13,735 Provide ground test facility infrastructure and upgrades for BMDO testing including: end game hardware-in-the-loop testing of integrated IR sensor systems at KHILS, wind tunnel testing at Tunnel 9 to support AIT, sensor testing at CALM, POST, NRaD, and AEDC 7V/10V, propellant loading expertise and hover test capability from the NHTF, lethality testing at AEDC Range G, IR phenomenology characterization at AMOR and KHILS, and primary IR standards, black body and optical materials, calibrations at the NIST. Support THAAD flight test anomaly investigation and objective window testing at Tunnel 9. Provide orbital experiment and satellite operations support at CERES.
- \$9,139 Provide test range infrastructure including caretaker activities at Wake Island, WSMR and Ft Wingate, and upgrades for BMDO testing including development of TMD launch and range facilities, and associated range instrumentation sites, including new development at PMRF.
- \$7,044 Provide range instrumentation, upgrades, data collection, and analyses for BMDO testing including: data collecting and processing by SLBD, HAOI at WSMR and HALO/IRIS sensor. Support SIT 99.
- \$283 Provide technical support for Resource activities at Executing Agent.
- \$30,201 Total

Acquisition Strategy: In using ranges and test facilities, BMDO implements a Reliance process which: a) maintains perspective of national technical test capabilities; b) responds to program requirements; c) uses existing test resources where possible; d) requires coordination prior to development of new resources; and e) consolidates management of existing resources where possible and practicable. This policy results in a variety of acquisition methods. Executing Agent Project Managers for the elements and tasks under this project include the three military services and the BMDO. Service Project Manager organizations specifically include: the U.S. Army Space and Strategic Defense Command (USASSDC); the U.S. Navy Office of Naval Research; Navy Ballistic Missile Defense Technology; and the U.S. Air Force Phillips Laboratory. The majority of the ground test facilities are government owned and operated, with some degree of contractor support, which support multiple BMDO users. The test ranges are part of the DoD Major Range and Test Facility Base (MRTFB). The HALO/IRIS sensor are operated by competitively awarded contracts. The ROBS laser radar is undergoing analysis for future application. SLBD is operated by the U.S. Army (government and contractor personnel). Data from SLBD is collected and processed by FFRDC personnel.

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

	<u>FY 1996</u>	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	Total
Previous President's Budget	30,162	33,322	33,082	32,546	129,112
Current Budget Submit/President's Budget	31,139	35,507	30,888	30,201	127,735

Change Summary Explanation:

Funding: None  
Schedule: None

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Technical: None

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

	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To Compl	Total Cost
1155 Phenomenology Program, PE 0603872C	36,908	31,338	37,835	38,622	34,464	37,300	37,205	36,490	Cont	Cont
1266 Navy Theater-wide TBMD, PE 0603868C	200,442	304,171	194,898	192,073	191,229	190,930	145,190	149,444	Cont	Cont
2400 NMD Program, PE 0603871C	730,656	828,864	504,091	393,085	309,748	309,584	391,858	392,433	Cont	Cont
1270 Advanced Interceptors, PE 0603173C	26,788	68,409	31,492	29,412	42,890	46,133	49,460	42,449	Cont	Cont
2257 PATRIOT, PE 0604865C	352,547	381,092	206,057	101,430	0	0	0	0	TBD	TBD
2259 Israeli Cooperative Projects, PE 0603872C	59,352	43,892	38,715	38,662	38,624	38,591	0	0	TBD	TBD
2260 THAAD System, PE 0603861C	565,818	341,307	294,647	16,778	0	0	0	0	TBD	TBD
2260 THAAD System, PE 0604861C	0	277,508	261,480	578,467	603,213	584,561	413,884	372,674	Cont	Cont
2263 Navy Area TBMD, PE 0604867C	0	241,330	267,822	226,748	222,145	158,271	52,433	38,089	Cont	Cont
3157 Environmental Siting & Fac, PE 0603872C	4,369	5,972	3,600	3,640	3,631	3,609	3,606	3,612	Cont	Cont
3354 Targets, PE 0603872C	23,046	22,842	27,603	18,721	42,755	42,226	42,463	42,578	Cont	Cont
3359 System Test and Evaluation, PE 0603872C	33,568	42,792	40,307	26,444	30,263	32,250	31,590	31,636	Cont	Cont

**D. Schedule Profile**

	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 1999		
1	2	3	4	1	2	3	4	1	2	3	4
KDEC Support to THAAD	X										
AMOR KHILS Support	X										
NHTF Support to THAAD	X										
TMD Target Sensing at AMOR	X										
AIT tests at AOEC	X										
WSMR THAAD Dem/Val Tests	X										
Tunnel 9 THAAD Support	X										
HALO/IRIS WSMR Data Coll	X										
Navy Area TBMD tests at AOEC	X										
KMRSS IOC	X										
KMR TCMP Launch	X										

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Exhibit R-2 (PE 0603872C)





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

DATE

February 1997

BUDGET ACTIVITY

PE NUMBER AND TITLE

**4 - Demonstration and Validation**

**0603872C Joint Theater Missile Defense**

PROJECT

**3360**

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 1996	Budget	Budget	Budget	Budget	Total Program
					FY 1996	FY 1997	FY 1998	FY 1999	
<u>Product Development Property</u>									
<u>Support and Management Property</u>									
<u>Test and Evaluation Property</u>									
Subtotal Product Development									
Subtotal Support and Management									
Subtotal Test and Evaluation									
Total Project					31,139	35,507	30,888	30,201	127,735
					31,139	35,507	30,888	30,201	127,735

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

		DATE										February 1997
BUDGET ACTIVITY		PE NUMBER AND TITLE										PROJECT
4 - Demonstration and Validation		0603872C Joint Theater Missile Defense										4000
COST (\$ In Thousands)		FY 1996 Actual	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost	
4000	Operational Support	0	82,876	87,516	84,809	88,185	89,886	92,553	92,987	Continuing	Continuing	

**A. Mission Description and Budget Item Justification**

This project provides support in three basic areas: personnel and related support costs; funding to meet fluctuation costs and contract terminations; and assistance required to fund support service contracts for the Theater Missile Defense (TMD) program..

Personnel and related support costs common to all TMD projects include support of the Office of the Director, Ballistic Missile Defense Organization and his staff located within the Washington, D.C. area, as well as BMDO's Executing Agents within the US Army Space & Strategic Defense Command, U.S. Army PEO Missile Defense, U.S. Navy PEO for Theater Defense, U.S. Air Force PEO office, and the National Test Facility. This project supports funding for overhead/indirect personnel costs, benefits, and infrastructure costs such as rents, utilities, supplies, etc.

The BMDO prioritizes funding within this project to meet operational, contractual, and statutory fiscal requirements for the TMD program. Operational requirements include reimbursable services acquired through the Defense Business Operating Fund (DBOF), such as accounting services provided by the Defense Finance and Accounting Service (DFAS). Contractual requirements include reserves for special termination costs on designated contracts and provisions for terminating other programs as required. BMDO has additional requirements to provide for foreign currency fluctuations on its limited number of foreign contracts. Finally, statutory requirements include funding for charges to canceled appropriations in accordance with Public Law 101-510.

Assistance required to support BMDO overhead management functions for the TMD program is contained in this project. This assistance ranges from operational contracts to fully support functions such as ADP operations, automated tool, Access control offices, and graphics support, to supportive efforts required, as well as to supplement the BMDO government personnel. Typical efforts include cost estimating, security management, contracts management, strategic relations management and information management. These efforts include assessment of technical project design, development and testing, test planning, assessment of technology maturity and technology integration across BMDO projects; and support of design reviews and technology interface meetings. Program control tasks include assessment of schedule, cost, and performance, with attendant documentation of the many related programmatic issues. The requirement for this area is based on most economical and efficient utilization of contractors versus government personnel.

The Fiscal Year 1996 Defense Authorization Act eliminated the management program element effective with the Fiscal Year 1997 President's Budget submission. This overhead management and indirect program support funding has been realigned in accordance with Public Law 104-106.

**UNCLASSIFIED**

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

DATE **February 1997**

BUDGET ACTIVITY **4 - Demonstration and Validation** PE NUMBER AND TITLE **0603872C Joint Theater Missile Defense** PROJECT **4000**

<u>FY 1996 (\$ in Thousands):</u>	
- \$0	
- \$0	Total
<u>FY 1997 (\$ in Thousands):</u>	
- \$82,876	Continue providing management and support for overhead/indirect fixed costs such as civilian payroll, travel, rents & utilities and supplies.
- \$82,876	Total
<u>FY 1998 (\$ in Thousands):</u>	
- \$87,516	Continue providing management and support for overhead/indirect fixed costs such as civilian payroll, travel, rents & utilities and supplies.
- \$87,516	Total
<u>FY 1999 (\$ in Thousands):</u>	
- \$84,809	Continue providing management and support for overhead/indirect fixed costs such as civilian payroll, travel, rents & utilities and supplies.
- \$84,809	Total

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

	<u>FY 1996</u>	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	Total Cost
Previous President's Budget	0	88,179	88,928	85,741	262,848
Current Budget Submit/President's Budget	0	82,876	87,516	84,809	255,201

**Change Summary Explanation:**

Funding: Management costs realigned to technical program elements effective with FY 1997.  
 Schedule: None  
 Technical: None



# **THAAD System (EMD) PE 0604861C**

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

BUDGET ACTIVITY		DATE		PROJECT							
5 - Engineering and Manufacturing Development		February 1997		2260							
		PE NUMBER AND TITLE									
		0604861C Theater High-Altitude Area Defense System - TMD									
COST (\$ In Thousands)		FY 1996 Actual	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
2260 Theater High Altitude Area Defense		0	277,508	261,480	578,467	603,213	584,561	413,884	372,674	Continuing	Continuing

**A. Mission Description and Budget Item Justification**

The Theater High Altitude Area Defense (THAAD) System Engineering and Manufacturing Development (EMD) phase will refine and mature the Demonstration/Validation (Dem/Val) system design to ensure component and system performance, producibility, and supportability. The EMD contractor will design, develop, fabricate, integrate, assemble, test, check-out, evaluate, document, deliver, and support the THAAD system.

**FY 1996 (\$ in Thousands):**

- \$0 N/A  
 - \$0 Total

**FY 1997 (\$0 in Thousands):**

- \$268,537 Funds are being reprogrammed to Dem/Val to support revised flight test schedule  
 - \$5,769 Targets: Funds are being reprogrammed to Dem/Val to support revised flight test schedule  
 - \$1,697 OT&E: Funds are being reprogrammed to Dem/Val to support revised flight test schedule  
 - \$1,505 Small Business Innovative Research  
 - \$277,508 Total

**FY 1998 (\$ in Thousands):**

- \$258,873 Award EMD contract. Begin preparation and training for the THAAD Limited User Test (LUT) for the User Operational Evaluation System (UOES). Begin software maintenance. Begin THAAD objective system design. Initiate material purchases for hardware. Continue lethality studies and algorithm development. Continue pursuing integration of THAAD Battle Management/Command, Control, Communications, Computers, Intelligence (BM/C4I) with the Project Manager (PM), Air Defense Command and Control Systems (ADCCS) to take advantage of previous Army developments of force operations software. Includes support for ADCCS to establish test requirements and cases for Computer Software Component integration and test.  
 - \$2,607 Targets: Continue procurement of targets to support THAAD flight tests. Maintain infrastructure to support TMD targets.  
 - \$261,480 Total

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

DATE **February 1997**

BUDGET ACTIVITY

PE NUMBER AND TITLE

**5 - Engineering and Manufacturing Development**

**0604861C Theater High-Altitude Area Defense**

PROJECT

**2260**

**System - TMD**

**EY 1999 (\$ in Thousands):**

- \$555,200 Begin delivery of EMD hardware (Launcher and Testbeds). Participate in Theater Critical Measurements Program (TCMP)-3 to evaluate the Radar and BM/C4I. Participate in System Integration Test (SIT)-2 exercise to evaluate system interoperability. Conduct the additional UOES tests (AUT). Continue system design engineering, lethality analysis, and algorithm development. Begin ground testing and integration of the THAAD system including UOES Radar. Conduct requirements and design reviews.
- \$16,498 Targets: Continue procurement of targets to support THAAD flight tests. Maintain infrastructure to support TMD targets.
- \$5,375 Lethality - Continue lethality simulation code validation, begin design/development of test hardware.
- \$1,394 OT&E. Continue independent assessment of THAAD system.
- \$578,467 Total

**Acquisition Strategy**

The EMD phase contract (missile, launcher, BM/C4I, and Radar) will be a sole source award to the Dem/Val contractor team (As approved September 15, 1995 by USD(A&T)) utilizing the DoD Acquisition Streamlining approach. The contractor team for the EMD phase will become the contractor team for the Low Rate Initial Production (LRIP) and Full Rate Production (FRP) phases. A single prime contractor will have total system performance responsibility for the EMD, LRIP, and FRP.

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

	EY 1996	EY 1997	EY 1998	EY 1999	Total
Previous FY 97 President's Budget	0	212,798	481,513	534,820	Cost 1,229,131
Appropriated Value		277,798			
Adjustments to Appropriated Value:					
a. General Reductions (FFRDC, Inflation etc.)		-290			
FY 98/President's Budget Request	0	277,508	261,480	578,467	1,117,455

**Change Summary Explanation:**

**Funding:** A request has been submitted to reprogram FY 97 EMD funds to Dem/Val. This submission reflects the realignment of FY98 and FY99 funds between Dem/Val and EMD funds.

**Schedule:** The Milestone II DAB Review milestone has slipped due to longer than expected Flight 6 failure investigation and Flight 7 preparation. The Flight 6 failure investigation caused Flight 7 to move from September to December 1996. An inertial measurement unit software error, found during software verification testing of FTV-07, further delayed the flight test to late February 1997.

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

DATE February 1997

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
5 - Engineering and Manufacturing Development	0604861C Theater High-Altitude Area Defense System - TMD	2260

Technical: None

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

	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To Compl	To *Cont	Total Cost *Cont
2260, THAAD Procurement, SSN C494000*	0	0	0	0	0	*33,785	*531,725	*606,315			
2260, THAAD MILCON, PE 0604861C	13,104	0	4,565	0	0	0	0	4,994			
2260, THAAD Dem/Val, PE 0603861C	565,818	341,307	294,647	16,778	0	0	0	0	0	0	1,215,634
* IN ARMY TOA											

**D. Schedule Profile**

	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 1999	FY 1999
EMD Contract Award	1	2	3	4	1	2	3	4	2	2
Limited User Test						X				
Additional UOES Test										X

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

DATE February 1997

BUDGET ACTIVITY

PE NUMBER AND TITLE

5 - Engineering and Manufacturing Development

0604861C Theater High-Altitude Area Defense System - TMD

PROJECT 2260

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

	FY 1996	FY 1997	FY 1998	FY 1999	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
a. Prime Contract	0	268,537	224,173	425,200				
b. Other Government Activities	0	0	8,100	55,600				
c. Support Contracts	0	0	26,600	51,900				
d. Program Management	0	0	0	22,500				
e. Targets	0	5,769	2,607	16,498				
f. Lethality	0	0	0	5,375				
g. OT&E	0	1,697	0	1,394				
h. Small Business and Innovative Research	0	1,505	0	0				
<b>Total</b>		277,508	261,480	578,467				

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

Contractor or Government Performing Activity	Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1996	Budget			
						FY 1996	FY 1997	FY 1998	
<b>Product Development Organizations</b>									
LMMS	CPFF/SS	Feb 97	0	0	0	249,600	224,173	425,200	898,973
RAYTHEON	CPFF/CPAF	Feb 97	0	0	0	18,937	0	0	18,937
<b>Support and Management Organizations</b>									
SETA	C/CPAF	April 98	0	0	0	0	11,050	22,500	33,550
Other Spt Cont	Various	Multiple	0	0	0	0	15,550	29,400	44,950
OGAs	MIPR	Multiple	0	0	0	0	8,100	53,300	61,400
SBIR			0	0	0	1,505	0	0	1,505

**Test and Evaluation Organizations**

Project 2260

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

DATE February 1997

BUDGET ACTIVITY

PE NUMBER AND TITLE

**5 - Engineering and Manufacturing Development**

**0604861C Theater High-Altitude Area Defense**

PROJECT

**2260**

**System - TMD**

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 1996	Budget				Total Program
						FY 1996	FY 1997	FY 1998	FY 1999	
WSMR/USAKA	MIPR	April 98			0	0	0	0	24,800	24,800
OT&E					0	1,697	0	0	1,394	3,091
Targets					0	5,769	2,607	0	16,498	24,874
Lethality					0	0	0	0	5,375	5,375

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

**Government Furnished Property:**

**Contract**

Item Description	Method/Type or Funding Vehicle	Award or Obligation Date	Delivery Date	Total Prior to FY 1996	Budget				Total Program	
					FY 1996	FY 1997	FY 1998	FY 1999		Budget to Complete
N/A				0	0	0	0	0	0	0
Support and Management Property				0	0	0	0	0	0	0
N/A				0	0	0	0	0	0	0

**Product Development Property**

N/A				0	268,537	224,173	425,200	917,910
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**Support and Management Property**

N/A				0	1,505	34,700	105,200	141,405
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**Test and Evaluation Property**

N/A				0	7,466	2,607	48,067	58,140
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**Subtotal Product Development**

268,537 224,173 425,200 917,910

**Subtotal Support and Management**

1,505 34,700 105,200 141,405

**Subtotal Test and Evaluation**

7,466 2,607 48,067 58,140

**Total Project**

277,508 261,480 578,467 1,117,455

Project 2260



**BM/C<sup>3</sup>I (EMD)**  
**PE 0604864C**

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

DATE **February 1997**

BUDGET ACTIVITY

PE NUMBER AND TITLE

PROJECT  
3261

**5 - Engineering and Manufacturing Development**

**0604864C Battle Management and C41 for TMD Acquisition**

COST (\$ In Thousands)	FY 1996 Actual	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
	3261 TMD BM/C3I (BM/C3I Concepts)	10,118	0	0	0	0	0	0	0	TBD

**A. Mission Description and Budget Item Justification**

The primary mission of this project is to provide the warfighter with an integrated and interoperable Theater Missile Defense (TMD) Battle Management/Command, Control, Communications, and Intelligence (BM/C3I) capability having the flexibility to meet a wide range of threats and expected needs. The BM/C3I architecture for TMD is built upon the existing command and control (C2) structure for Theater Air Defense (TAD) and adds the communications linking TMD C2 nodes, weapons, and sensors, and the TMD interfaces to intelligence systems and other supporting capabilities. The BMDO, from its joint perspective, uses this project to oversee independent weapon systems development and to provide guidance, standards, equipment, integration, and analysis to maximize the performance of a multitude of sensors, interceptors, and C2 nodes and to synergize their individual contributions to an integrated Joint theater-wide TMD system. BMDO has three major thrusts to the TMD BM/C3I integration program.

The first thrust establishes the links and means for receipt and in-theater early warning and dissemination of launch warning information from space-based and intelligence systems external to TMD. This project supports the system engineering of their capability and prototype development of items such as improved displays for early in-theater warning information. This project focuses on linking separate external systems into the theater.

The second thrust of the BM/C3I program focuses on communication of, and interoperability among, TMD weapon systems. Interoperability includes both the communications equipment, and protocols as well as the common command and control procedures among different weapons systems to ensure a truly integrated theater-wide ballistic missile defense system. The cornerstone of TMD interoperability is the Joint Data Net (JDN) which uses the Joint Tactical Information Distribution System (JTIDS) and the Tactical Data Information Link-JTIDS (TADIL-J) message format. This project integrates JTIDS terminals into existing Theater Ballistic Missile Defense (TBMD) C2 platforms and provides the necessary software upgrades. This funding is critical for timely inter-Service interoperability.

The third thrust of the BM/C3I program directs attention to upgrades of Service C2 centers. Various command center upgrades are included in this project to reduce decision-making time necessary to effectively engage ballistic missiles. Again, BMDO leverages off several existing Service-funded theater air defense command center upgrades and this project funds only the specific TMD-related aspects of these upgrades. BMDO's central direction and support of hardware and software developments will produce an integrated C2 capability for TMD.

The joint warfighters and BM/C3I developers evaluate the effects of early warning, improved interoperability, integration, and command center upgrades on joint TBMD doctrine through BM/C3I work shops and analysis.

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

DATE **February 1997**

BUDGET ACTIVITY

**5 - Engineering and Manufacturing Development**

PE NUMBER AND TITLE

**0604864C Battle Management and C41 for TMD Acquisition**

PROJECT

**3261**

All of the efforts in this project are designed to provide a seamless interoperable architecture to provide timely warning and information necessary to reduce decision times and allow more opportunities to efficiently and effectively engage hostile missiles. The end result will kill more missiles and will reduce casualties to U.S. and other friendly forces.

**FY 1996 (\$ in Thousands):**

- \$10,118 Joint/Combined: Conduct TMD BM/C3I work shops; conduct command and control (C2) tests to refine C2 procedures; initiate Multifunctional Information Distribution System (MIDS) Army development efforts; complete rapid & contingency deployable prototypes of the Combat Integration Capability (CIC) and the Sector Anti-Air Warfare Facility (SAAWF); conduct modeling and analysis of JTIDS network structure in support of TMD; support inter-Service integration efforts; initiate joint TMD planning capability; develop follow-on TADIL-J messages; test and refine existing messages.

- \$10,118 Total

**FY 1997 (\$ in Thousands):**

- \$0  
- \$0 Total

**FY 1998 (\$ in Thousands):**

- \$0  
- \$0 Total

**FY 1999 (\$ in Thousands):**

- \$0  
- \$0 Total

**Acquisition Strategy:** The 3261 Project acquisition strategy leverages existing system acquisition programs (which are subject to milestone decisions and testing) and accomplishes supporting tasks to satisfy BM/C3I performance requirements. A significant portion of this project entails systems engineering of separately funded and managed service programs so that all systems will interoperate when fielded.

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

DATE	February 1997	PROJECT	3261
PE NUMBER AND TITLE	0604864C Battle Management and C41 for TMD		
BUDGET ACTIVITY	Acquisition		

**5 - Engineering and Manufacturing Development**

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

	FY 1996	FY 1997	FY 1998	FY 1999	Total
Previous President's Budget	13,885	0	0	0	Cost 13,885
Current Budget Submit/President's Budget	10,118	0	0	0	10,118

**Change Summary Explanation:**

Funding: Congressional direction eliminated the TMD BM/C31 program elements 0603864/0604864C and placed this project under the Joint TMD activities program element. Consistent with this direction, a determination was made that this program is more appropriately funded with Dem/Val funds. Navy tasks directly supporting the Navy Area TBMD program were deleted from this project for FY1997 and beyond and funded under the Navy Area TBMD program element (Project 2263) to unify control.

Schedule: None

Technical: None

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

While this program is not dependent upon funding from other programs, it supports these programs by providing capstone systems engineering, common BM/C31 guidance, government furnished equipment, interface support, joint network design analysis, and other actions necessary to achieve interoperability among independent systems.

	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To	Total
3261 TMD BM/C31 PE: 0603864C	27,382	0	0	0	0	0	0	0	Compl	Cost
3261 TMD BM/C31 PE: 063872C	0	32,357	34,094	35,864	43,717	44,576	43,210	43,286	TBD	Cont

**D. Schedule Profile**



# **PATRIOT Advanced Capability-3 Missile (EMD) PE 0604865C**

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

DATE **February 1997**

BUDGET ACTIVITY		PE NUMBER AND TITLE										PROJECT	
5 - Engineering and Manufacturing Development		0604865C Patriot PAC-3										2257	
COST (\$ In Thousands)		FY 1996 Actual	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost		
2257	PATRIOT PAC-3	352,547	381,092	206,057	101,430	0	0	0	0	TBD	TBD		

**A. Mission Description and Budget Item Justification**

PATRIOT is a long-range, mobile, field Army and Corps air defense system, which uses guided missiles to simultaneously engage and destroy multiple targets at varying ranges. The PATRIOT Advanced Capability Level 3 (PAC-3) Upgrade Program is the latest evolution of the phased material change improvement program to PATRIOT. The material changes will provide improved performance across the spectrum for system and threat intercept performance. The material changes include a new PAC-3 missile (previously known as ERINT), remote launch capabilities, communications and computer/software improvements, and radar upgrades to enhance system performance by improving its multi-function capability for tracking, and target handling capability against air breathing, ballistic and cruise missile threats. The PATRIOT operates as lower tier of the Army's Theater Missile Defense (TMD) task force and is developing the capacity to interact with the Navy Cooperative Engagement Capability (CEC) system. PATRIOT is pursuing integration of PATRIOT BMC31 with the Project Manager, Air Defense Command and Control Systems to take advantage of previous Army developments that can be incorporated into the PATRIOT program.

**FY 1996 (\$ in Thousands):**

- \$259,892 Continued PAC-3 missile Engineering and Manufacturing Development (EMD) program; begin formal flight testing; conducted missile Critical Design Review (CDR).
- \$64,296 Continued ground systems modifications development program and TMD/Theater High Altitude Area Defense (THAAD) integration/cueing program.
- \$15,911 Initiated PAC-3 EMD target and test support, including advanced threat-like reentry vehicles.
- \$11,727 Continued operational test and evaluation and lethality efforts.
- \$721 Government personnel to support lethality efforts in FY96.
- \$352,547 Total

**FY 1997 (\$ in Thousands):**

- \$293,914 Continue PAC-3 missile EMD program and formal flight testing.
- \$27,382 Continue PAC-3 EMD target and test support, including target build-up for FY98 testing.
- \$18,443 Continue operational test and evaluation and lethality efforts.
- \$40,767 Continue ground systems modifications development program.
- \$ 586 SBIR Reduction.
- \$381,092 Total

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

DATE

February 1997

BUDGET ACTIVITY

PE NUMBER AND TITLE

**5 - Engineering and Manufacturing Development**  
**0604865C Patriot PAC-3**

PROJECT

2257

**FY 1998 (\$ in Thousands):**

- \$160,191 Continue PAC-3 missile EMD program with formal flight testing.
- \$24,990 Continue PAC-3 EMD target and test support, provide target presentation of White Sands Missile Range (WSMR) New Mexico.
- \$16,052 Continue operational test and evaluation and lethality efforts.
- \$4,824 Complete modifications development program.
- \$206,057 Total

**FY 1999 (\$ in Thousands):**

- \$93,844 Complete PAC-3 Missile EMD program.
- \$2,724 Complete PAC-3 EMD target and test support.
- \$4,862 Complete PAC-3 operational test and evaluation and lethality efforts.
- \$101,430 Total

**Acquisition Strategy:** The PAC-3 Upgrade Program will provide enhancements to the current PATRIOT system through a series of upgrades divided into three configurations which will be individually tested and procured. Missile and ground equipment configurations will be fielded through hardware retrofit and concurrently released software builds. During EMD, an expanded risk reduction/mitigation program (PE: 0604866C, Proj: 2257) was implemented to address areas of risk identified during the Dem/Val phase. The PAC-3 Risk Reduction and Mitigation program is a multi-faceted effort involving two prime contractors and three contracts. The risk reduction/mitigation modification efforts are for existing EMD contracts with each of the two prime contractors.

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

	FY 1996	FY 1997	FY 1998	FY 1999	Total
Previous President's Budget Appropriated Value	363,008	381,509	195,337	101,262	Cost 1,041,116
Adjustment to Appropriated Value:		381,509			
a. General Reduction (FFRDC, Inflation etc.)		-417	206,057	101,430	1,041,126
FY 1998 President's Budget Request	352,547	381,092			

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

DATE February 1997

BUDGET ACTIVITY

PE NUMBER AND TITLE

PROJECT

**5 - Engineering and Manufacturing Development**

**0604865C Patriot PAC-3**

**2257**

**Change Summary Explanation:**

- Funding: FY 1996 (+ 126): Realigned from PE 0604866C (+126).
  - FY 1997 (- 417): Project decremented for undistributed Defense-Wide reductions.
  - FY 1998 (+10,720): Project decremented (-640) for undistributed Defense-Wide reductions. Funds realigned (+1,360) from procurement.
  - FY 1999 (+ 168): Project decremented (-470) for undistributed Defense-Wide reductions. Funds realigned (+638) from procurement.
- Schedule: The EMD program was extended to 4QFY99 in accordance with Department of Defense guidance.
- Technical: None

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

	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To Compl	Total Cost
2257, PAC3 Procurement, PE 0208865C	285,989	219,413								976,698
2257, Risk Reduction Mitigation, PE 0604866C	23,358									92,686
2257, Major MILCON, PE 0603865C	1,349									1,349
Missile Procurement, Army, (2032a), PAC3			349,109	369,885	459,233	445,367	433,145	396,760	Cont	
*Army TOA										

**D. Schedule Profile**

	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 1999
Configuration 1 First Unit Equipped(FUE)	1	4	1	4	1	2	4	1	2
PAC-3 Missile CDR	*								3
Configuration 2 Contractor Development	*								3
Test and Evaluation (CDT&E)									4
Configuration 2 Follow-On Test and Evaluation (FOT&E)	*								3
PDB-4 Software Release				X					
Configuration 2 FUE				X					
Controlled Test Flight 1					X				
Controlled Test Flight 2									X
Guidance Test Flight 1									X

Project 2257

UNCLASSIFIED

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

DATE

February 1997

BUDGET ACTIVITY

5 - Engineering and Manufacturing Development

PE NUMBER AND TITLE

0604865C Patriot PAC-3

PROJECT

2257

	FY 1996				FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
PAC-3 Missile Low-Rate Initial Production (LRIP)																
Configuration 3 CDT&E																
Configuration 3 Initial Operational Test and Evaluation (IOT&E)																
PDB-5 Software Release																
PAC-3 FUE																
Milestone III (FRP)																

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

BUDGET ACTIVITY		DATE		PROJECT	
5 - Engineering and Manufacturing Development		February 1997		2257	
PE NUMBER AND TITLE					
0604865C Patriot PAC-3					
<b>A. Project Cost Breakdown (\$ in Thousands)</b>					
	FY 1996	FY 1997	FY 1998	FY 1999	
PAC-3 Missile (EMD)	352,547	381,092	206,057	101,430	
Total	352,547	381,092	206,057	101,430	
<b>B. Budget Acquisition History and Planning Information (\$ in Thousands)</b>					
<b>Performing Organizations:</b>					
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 1996
					FY 1996
<b>Product Development Organizations</b>					
Raytheon(CDI III)	SS-CPIF	Jul-93			48,550
Raytheon Remote Launch/Common	SS-CPIF	Nov-95			3,000
Raytheon (Integr)	SS-CPIF	Oct-94			22,521
LMVS (EMD)	SS-CPIF	Oct-94			165,000
RDEC (OGA)					10,355
					FY 1996
					FY 1997
					FY 1998
					FY 1999
					Budget to Complete
					Total Program
<b>Support and Management Organizations</b>					
Nichols	MIPR				3,040
CAS	SS-CPIF				4,850
OGA/In-house	PO				8,805
Raytheon (E/S)	SS-CPIF				12,047
SBIR Reduction					586
Govt Proj Per & Spt					0
					FY 1996
					FY 1997
					FY 1998
					FY 1999
					Budget to Complete
					Total Program
					70,500
					66,500
					138,221
					658,385
					55,917
					11,111
					25,146
					50,754
					57,604
					586
					1,329

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

DATE February 1997

BUDGET ACTIVITY  
 5 - Engineering and Manufacturing Development  
 PE NUMBER AND TITLE  
 0604865C Patriot PAC-3  
 PROJECT  
 2257

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 1996	Budget				Total Program
						FY 1996	FY 1997	FY 1998	FY 1999	
<b>Test and Evaluation Organizations</b>										
WSMR/ARL	MIPR				8,555	12,068	16,742	15,883	17,065	70,313
OT&E	MIPR				600	5,760	2,579	6,537	1,534	17,010
Targets	MIPR				0	14,611	27,382	24,990	2,724	69,707
Lethality	MIPR				2,837	7,528	15,429	9,081	3,328	38,203

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

Item Description	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Delivery Date	Total Prior to FY 1996	Budget				Total Program
					FY 1996	FY 1997	FY 1998	FY 1999	
<b>Government Furnished Property:</b>									
<b>Contract</b>									
<b>Product Development Property</b>									
<b>Support and Management Property</b>									
<b>Test and Evaluation Property</b>									
<b>Subtotal Product Development</b>									
<b>Subtotal Support and Management</b>									
<b>Subtotal Test and Evaluation</b>									
<b>Total Project</b>									



# **PAC-3 And Risk Reduction (EMD) PE 0604866C**

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

DATE February 1997

BUDGET ACTIVITY

PE NUMBER AND TITLE

**5 - Engineering and Manufacturing Development**

**0604866C ERINT/Patriot PAC-3 Risk Reduction**

PROJECT

**2257**

**TMD**

COST (\$ In Thousands)	FY 1996 Actual	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
2257 PAC3 Risk Reduction	23,358	0	0	0	0	0	0	0	TBD	TBD

**A. Mission Description and Budget Item Justification**

The ERINT was selected as the PAC-3 missile as a result of successful tests and a thorough evaluation of the missile's capabilities by the U.S. Army. The Dem/Val missile conducted three successful intercepts against tactical ballistic missile and air breathing targets. Following the missile selection, a Defense Acquisition Board (DAB) review of the PAC-3 program was conducted resulting in approval for the PAC-3 missile to enter Engineering and Manufacturing Development (EMD). In support of this decision, the PAC-3 Acquisition Program Baseline (APB) was approved during Feb 95. Efforts have been moving forward in the development and fielding of the PAC-3 System with major upgrades divided into three steps/configurations. Configuration 1 completed Production Confirmatory Testing with First Unit Equipped (FUE) declared during Dec 95. This configuration includes an Expanded Weapons Control Computer (EWCC), an Optical Disk (OD), an Embedded Data Recorder, a Pulse Doppler Processor and a Guidance Enhancement Missile (GEM). Although GEM is not included as a part of Configuration 1, it is included for fielding. Configuration 2 completed comprehensive software testing and received a production decision during Oct 95 for Communication Enhancement Phase I. Configuration 2 also includes Radar Enhancement Phase II, and Classification, Discrimination, and Identification (CDI) Phase I. Configuration 3 completed a System Design Review (SDR) and a Preliminary Design Review (PDR) for the PAC-3 missile segment during FY 95. In addition to the new missile, Configuration 3 also includes Radar Enhancement Phase III, CDI Phase III, and Remote Launch/Communications Enhancement Upgrades (RL/CEU). Efforts now focus on completing the radar and remote launch enhancements to the system, continuing work on PAC-3 integration, and continuing PAC-3 missile EMD. PATRIOT is pursuing integration of PATRIOT BMC31 with the Project Manager, Air Defense Command and Control Systems to take advantage of previous Army developments that can be incorporated into the PATRIOT program.

**FY 1996 (\$ in Thousands):**  
 - \$23,358 Continuation of the Risk Reduction/Mitigation program.  
 - \$23,358 Total

**FY 1997 (\$ in Thousands):**  
 - \$0  
 - \$0 Total

**FY 1998 (\$ in Thousands):**  
 - \$0  
 - \$0 Total





# **Navy Area Theater Missile Defense (EMD) PE 0604867C**

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

		DATE February 1997										PROJECT
BUDGET ACTIVITY		PE NUMBER AND TITLE										2263
5 - Engineering and Manufacturing Development		0604867C Navy Area TMD										2263
COST (\$ in Thousands)		FY 1996 Actual	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost	
2263	Navy Area TMD	0	241,330	267,822	226,748	222,145	158,271	52,433	38,089	Continuing	Continuing	
<p>To see the other Program Elements and Appropriations associated with Navy Area TMD, see section C of this R2.</p> <p><b>A. Mission Description and Budget Item Justification</b>                      The Navy Area Theater Ballistic Missile Defense (TBMD) project builds on the national investment in AEGIS ships, weapon systems, and Navy Standard Missile II (SM-2) Block IV missiles. Two classes of ships continue to be deployed with the AEGIS combat system: the CG-47 Ticonderoga-class cruisers and the DDG-51 Burke-class destroyers. Navy TBMD will take advantage of the attributes of naval forces including overseas presence, mobility, flexibility, and sustainability in order to provide protection to debarkation ports, coastal airfields, amphibious objective areas, Allied forces ashore, and other high value sites. Navy assets will provide an option for initial TBMD allowing the insertion of additional land-based TBMD assets and other expeditionary forces in an opposed environment.</p>												
FY 1996 (\$ in Thousands):												
-	\$0	No funding in Fiscal Year 1996										
-	\$0	Total										
FY 1997 (\$ in Thousands):												
-	\$236,099	Continue systems engineering and analysis. Continue development of User Operational Evaluation System (UOES) and tactical computer programs; initiate development of computer program design specifications for the Tactical Program; conduct Tactical Program system design review (SDR) and preliminary design review (PDR); conduct UOES critical design review (CDR). Continue detailed missile design. Continue procurement and fabrication of Engineering and Manufacturing Development (EMD) test rounds. Provide technical support for AEGIS weapon system design activities. Continue test planning. Continue required lethality analyses, lethality model refinements and testing in support of Live Fire Test & Evaluation (LFT&E). Initiate procurement of high fidelity sled track test targets for the FY98-99 LFT&E. Continue to design the interface for TBMD-related upgrades to AEGIS and Joint Maritime Command Information System (JMCIS). Continue Command and Control Processor (C2P) development.										
-	\$5,231	Continue building, and delivery of, targets to support Navy TBMD flight tests. Maintain infrastructure to support TMD targets.										
-	\$241,330	Total										

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

DATE

February 1997

BUDGET ACTIVITY

**5 - Engineering and Manufacturing Development**

PE NUMBER AND TITLE

**0604867C Navy Area TMD**

PROJECT

**2263**

FY 1998 (\$ in Thousands):

- \$ 258,845 Continue tactical computer program development; deliver AEGIS UOES computer program; conduct tactical program CDR. Continue Engineering/Manufacturing development of the missile. Begin delivery of Inert Operational Missile(IOM)/Engineering Design Model (EDM) test rounds and White Sands Missile Range (WSMR) New Mexico flight test missiles. Continue fabrication of UOES missiles. Provide technical support for AEGIS Weapon System design activities. Continue LFT&E activities. Continue Systems Engineering and Analysis. Continue implementation of JMCIS TBMD segments and TBMD messages in C2P.
- \$8,977 Continue building and delivery of targets to support Navy TBMD flight tests. Maintain infrastructure to support TMD targets.
- \$267,822 Total

FY 1999 (\$ in Thousands):

- \$ 185,590 Continue tactical computer program development. Integrate EMD IOM round into AEGIS UOES computer program. Continue EMD of the missile. Continue delivery of IOM/EDM test round, WSMR flight test missiles and UOES/EMD missiles. Begin Developmental Testing (DT) of missile at WSMR. Continue LFT&E activities. Continue implementation of JMCIS TBMD segments and TBMD messages in C2P.
- \$41,158 Continue building and delivery of targets to support Navy TBMD flight tests. Maintain infrastructure to support TMD targets.
- \$226,748 Total

**Acquisition Strategy:** This strategy consists of a Navy Area TBMD Program evolving to a Theater-Wide Defense TBMD program. The Navy Area Program will build on existing force structure by modifying the SM-2 Block IV missile and AEGIS Combat System to achieve TBMD capability.

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

	FY 1996	FY 1997	FY 1998	FY 1999	Total
Previous President's Budget	95,732	241,582	268,470	226,119	831,903
Appropriated Value		241,582			
Adjustments to Appropriated Value:					
a. General Reductions (FFRDC, Inflation etc.)	0	-252	267,822	226,748	735,900
Current Budget Submit/President's Budget					

**Change Summary Explanation:**

**Funding:** Delays in the risk reduction flight tests, SM-2 Blk IVA design immaturity, and cost growth in targets necessitated a program restructure and an FY96 notification reprogramming from P.E. 0604867C to P.E. 0603867C. Additional risk reduction flight test delays in early FY1997 necessitated a request to reprogram funds from P.E. 060487C to 060387C.



UNCLASSIFIED

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE	February 1997
BUDGET ACTIVITY		PE NUMBER AND TITLE	PROJECT
5 - Engineering and Manufacturing Development		0604867C Navy Area TMD	2263
<ul style="list-style-type: none"><li>- UOES 4thQFY00</li><li>- LRIP 2ndQFY01</li><li>- Navy Area TBMD TECHEVAL (DT) 2ndQFY01</li><li>- Navy Area TBMD OPEVAL 4thQFY01</li><li>- Acquisition Milestone III 2ndQFY02</li><li>- FUE 3rdQFY02</li></ul>			

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

DATE

February 1997

BUDGET ACTIVITY

PE NUMBER AND TITLE

5 - Engineering and Manufacturing Development

0604867C Navy Area TMD

PROJECT

2263

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

	FY 1996	FY 1997	FY 1998	FY 1999
a. Program Management/Integration	0	2,227	2,225	2,300
b. System Engineering	0	54,481	37,181	34,139
c. Program Management	0	5,106	5,800	5,500
d. Program Support	0	7,206	8,300	7,850
e. Ship System MODS	0	0	0	0
f. Design & Analysis	0	55,182	68,050	58,000
g. Hardware Fab. & Proc	0	86,229	100,775	75,000
h. Test and Evaluation	0	7,867	4,971	8,809
i. Test Equipment	0	4,217	3,500	5,000
j. Engineering Support	0	7,132	8,500	6,200
k. Travel	0	120	150	200
l. Development Test & Evaluation	0	10,611	24,470	21,600
m. Operational Test & Evaluation	0	405	1,500	2,000
n. Other/Miscellaneous	0	547	2,400	150
Total		241,330	267,822	226,748

**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 1996	Budget FY 1996	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
						FY 1996	FY 1997	FY 1998	FY 1999	Complete	Program
Martin Marietta	CPFF		0	0	0	39,280	43,600	30,000	TBD	TBD	112,880
NSWC/Dahlgren			0	0	0	7,540	7,500	6,000	TBD	TBD	21,040

Project 2263

Page 5 of 7 Pages

Exhibit R-3 (PE 0604867C)

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

DATE February 1997

BUDGET ACTIVITY

PE NUMBER AND TITLE

**5 - Engineering and Manufacturing Development**

PROJECT  
**2263**

Contractor or Government Performing Activity	Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1996	Budget FY 1996	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
APL/JHU					0	13,913	14,651	8,639	TBD	TBD	37,203
Holloman AFB					0	960	1,200	1,100	TBD	TBD	3,260
SM Co					0	136,162	155,230	143,000	TBD	TBD	434,392
Motorola					0	7,840	9,000	7,050	TBD	TBD	23,890
RFAS					0	412	600	500	TBD	TBD	1,512
Miscellaneous					0	12,220	11,456	7,870	TBD	TBD	31,546
<b>Support and Management Organizations</b>											
Raymond					0	536	690	750	TBD	TBD	1,976
Engineering											
NSWC/Port					0	139	192	200	TBD	TBD	531
Hueneme Div											
NAWC/Pt Mugu					0	139	192	200	TBD	TBD	531
Vitro					0	1,120	1,500	1,100	TBD	TBD	3,720
Miscellaneous					0	2,920	2,750	2,306	TBD	TBD	7,976
<b>Test and Evaluation Organizations</b>											
NAWC/WPNDIV					0	556	720	550	TBD	TBD	1,826
Pt Mugu											
BMDO					0	3,513	6,316	3,334	TBD	TBD	13,163
WSMR NM					0	1,200	1,750	1,200	TBD	TBD	4,150
NSWC/Port					0	680	850	1,680	TBD	TBD	3,210
Hueneme											
NAWC/China Lake					0	3,600	4,500	3,600	TBD	TBD	11,700
Miscellaneous					0	8,600	5,125	7,669	TBD	TBD	21,394

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

Government Furnished Property:

Project 2263

Page 6 of 7 Pages

Exhibit R-3 (PE 0604867C)

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

DATE

February 1997

BUDGET ACTIVITY

PE NUMBER AND TITLE

PROJECT

**5 - Engineering and Manufacturing Development**

**0604867C Navy Area TMD**

**2263**

Item Description	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Delivery Date	Total Prior to FY 1996	Budget	Budget	Budget	Budget	Total Program
					FY 1996	FY 1997	FY 1998	FY 1999	
<b>Product Development Property</b>									
<b>Support and Management Property</b>									
<b>Test and Evaluation Property</b>									
Subtotal Product Development					218,327	243,237	204,159		665,723
Subtotal Support and Management					4,854	5,324	4,556		14,734
Subtotal Test and Evaluation					18,149	19,261	18,033		55,443
<b>Total Project</b>					<b>241,330</b>	<b>267,822</b>	<b>226,748</b>		<b>735,900</b>



# Management PE 0605218C

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

DATE **February 1997**

BUDGET ACTIVITY	PE NUMBER AND TITLE										PROJECT
	0605218C Ballistic Missile Defense										
COST (\$ In Thousands)	FY 1996 Actual	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost	
4000 Program Management and Support	158,748	0	0	0	0	0	0	0	TBD	TBD	

**A. Mission Description and Budget Item Justification**

This project provides support in three basic areas: personnel and related support costs; funding to meet fluctuation costs and contract terminations; and assistance required to fund support service contracts.

Personnel and related support costs common to all BMDO projects include support of the Office of the Director, Ballistic Missile Defense Organization and his staff located within the Washington, D.C. area, as well as BMDO's Executing Agents within the US Army Space & Strategic Defense Command, U.S. Army PEO Air and Missile Defense, U.S. Navy PEO for Theater Air Defense, SAFAQP, and the Joint National Test Facility. This project supports funding for overhead/indirect personnel costs, benefits, and infrastructure costs such as rents, utilities, supplies, etc.

The BMDO prioritizes funding within this project to meet operational, contractual, and statutory fiscal requirements. Operational requirements include reimbursable services acquired through the Defense Business Operating Fund (DBOF), such as accounting services provided by the Defense Finance and Accounting Service (DFAS). Contractual requirements include reserves for special termination costs on designated contracts and provisions for terminating other programs as required. BMDO has additional requirements to provide for foreign currency fluctuations on its limited number of foreign contracts. Finally, statutory requirements include funding for charges to cancelled appropriations in accordance with Public Law 101-510.

Assistance required to support BMDO overhead management functions is contained in this project. This assistance ranges from operational contracts to fully support functions such as ADP operations, Access control offices, and graphics support, to supportive efforts required, as well as to supplement the BMDO government personnel. Typical efforts include cost estimating, security management, contracts management, strategic relations management and information management. These efforts include assessment of technical project design, development and testing, test planning, assessment of technology maturity and technology integration across BMDO projects; and support of design reviews and technology interface meetings. Program control tasks include assessment of schedule, cost, and performance, with attendant documentation of the many related programmatic issues. The requirement for this area is based on most economical and efficient utilization of contractors versus government personnel.

The FY 1996 Defense Authorization Act eliminates the management program element effective with the FY 1997 President's Budget submission. This overhead management and indirect program support funding has been realigned in accordance with Public Law 104-106.

This project is assigned to the Budget Activity and Program Element codes as identified in this descriptive summary in accordance with existing Department of Defense policy. It further provides an audit trail for FY 1995 and FY 1996 management account funding.

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

DATE

February 1997

BUDGET ACTIVITY

PE NUMBER AND TITLE

**6 - Management and Support**      **0605218C Ballistic Missile Defense**

PROJECT

**4000**

FY 1996 (\$ in Thousands):

- \$ Provided management and support for overhead/indirect fixed costs such as civilian payroll, travel, rents & utilities and supplies.
- \$ The funding provided by this project has enabled the executing agents to centralize funding and management of these common and recurring operating and infrastructure costs.
- \$ Products were generated on a continuing basis.
- \$0 Total

FY 1997 (\$ in Thousands):

- \$ This project has no funding in FY 1997 under this PE.
- \$0 Total

FY 1998 (\$ in Thousands):

- \$ This project has no funding in FY 1998 under this PE.
- \$0 Total

FY 1999 (\$ in Thousands):

- \$ This project has no funding in FY 1999 under this PE.
- \$0 Total

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

	<u>FY 1996</u>	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	Total
Previous President's Budget	146,530	0	0	0	146,530
Current Budget Submit/President's Budget	158,748	0	0	0	158,748

Change Summary Explanation:

Funding: Funding reduced in conjunction with congressional direction to eliminate program growth; management costs realigned to technical program elements effective with FY 1997.

Schedule: None

Technical: None

Project 4000

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

DATE

February 1997

BUDGET ACTIVITY

PE NUMBER AND TITLE

**6 - Management and Support**

**0605218C Ballistic Missile Defense**

PROJECT

**4000**

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

	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To Compl	Total Cost

**D. Schedule Profile**

1	2	3	4	1	2	3	4	1	2	3	4
		FY 1996			FY 1997		FY 1998		FY 1999		

2000-02-13



# BMDO Procurement Annex

PROCUREMENT SUMMARY  
 BALLISTIC MISSILE DEFENSE ORGANIZATION  
 AS OF FY98-99 PRESIDENT'S BUDGET  
 (DOLLARS IN MILLIONS)

DESC	PES	PE	FY98	FY99	FY00	FY01	FY02	FY03
BES98-99 BAL	THAAD	0208861C	0.000	0.000	0.000	0.000	195.370	532.598
BES98-99 BAL	HAWK	0208863C						
BES98-99 BAL	NAVY AREA	0208867C	15.500	44.600	130.000	161.000	236.000	225.000
BES98-99 BAL	PAC3	0208865C	361.400	372.000	462.100	448.200	435.300	397.600
BES98-99 BAL	TMD BMC3	0208864C	20.186	25.981	0	0	0	0
TOTAL BES98-99			397.086	442.581	592.100	609.200	866.670	1155.198
PBD224	THAAD	0208861C	0.000	0.000	0.000	34.000	339.000	75.000
PAC3 REALIGN	PAC3	0208865C	-10.697	0.000	0.000	0.000	0.000	0.000
PBD224C3	THAAD	0208861C	0.000	0.000	0.000	34.000	534.370	607.598
PBD224C3	NAVY AREA	0208867C	15.500	44.600	130.000	161.000	236.000	225.000
PBD224C3	PAC3	0208865C	350.703	372.000	462.100	448.200	435.300	397.600
PBD224C3	TMD BMC3	0208864C	20.186	25.981	0	0	0	0
TOTAL PB98-99			386.389	442.581	592.100	643.200	1205.670	1230.198

PROCUREMENT FUNDING REALIGNED TO SERVICES EFFECTIVE FY98

**NOTE FROM THE EDITOR**

THE PROCUREMENT APPROPRIATIONS FOR EMDO HAVE BEEN DELETED FROM ITS FY 1998-1999 PRESIDENT'S BUDGET SUBMISSION. AS A RESULT OF PBD 224 C3, THE FY 1998-2003 EMDO PROCUREMENT APPROPRIATIONS HAVE BEEN TRANSFERRED TO ARMY AND NAVY. JUSTIFICATION MATERIALS (P-FORMS) SUPPORTING BMD PROCUREMENT HAVE BEEN PROVIDED THE AFFECTED MILITARY DEPARTMENT FOR INCLUSION IN THEIR BUDGET SUBMISSION.



# **BMDO MILCON Summaries**

BALLISTIC MISSILE DEFENSE ORGANIZATION  
FY 1998 MILITARY CONSTRUCTION (MILCON)  
BUDGET ESTIMATE SUBMISSION

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BALLISTIC MISSILE DEFENSE ORGANIZATION  
FY 1998 MILITARY CONSTRUCTION PROJECT SUMMARY  
BY PROGRAM BUDGET DECISION NO. (PBD)

<u>PBD</u>	<u>TITLE</u>	<u>COST (\$000)</u>
301.1 (OPERATIONS FACILITIES)	CONSTRUCT/ALTER THAAD TEST FACILITIES, USAKA	4,565
314 (PLANNING AND DESIGN, MILITARY CONSTRUCTION)	PLANNING AND DESIGN VARIOUS LOCATIONS	540
315 (MINOR CONSTRUCTION MILITARY CONSTRUCTION)	MINOR CONSTRUCTION VARIOUS LOCATIONS	1,965
	FY 1998 TOTAL:	7,070

BALLISTIC MISSILE DEFENSE ORGANIZATION  
MILITARY CONSTRUCTION PROGRAM - FY 1998  
(APPROPRIATION REQUEST IN THOUSANDS OF DOLLARS)

PROGRAM BUDGET DECISION NO. 301.1  
CONSTRUCTION OF OPERATIONS FACILITIES

<u>CATCODE</u>	<u>BASE/STATE/PROJECT</u>	<u>PROJECT TITLE</u>	<u>COST(\$000)</u>
312-90	U.S. ARMY KWAJALEIN ATOLL (USAKA)	CONSTRUCT/ALTER THAAD TEST FACILITIES	4,565
		TOTAL:	4,565

BALLISTIC MISSILE DEFENSE ORGANIZATION  
MILITARY CONSTRUCTION PROGRAM - FY 1998  
(APPROPRIATION REQUEST IN THOUSANDS OF DOLLARS)

PROGRAM BUDGET DECISION NO. 314

PLANNING AND DESIGN

<u>CATCODE</u>	<u>BASE/STATE</u>	<u>PROJECT TITLE</u>	<u>COST</u>
	VARIOUS LOCATIONS	PLANNING AND DESIGN	540
		<u>TOTAL:</u>	540

BALLISTIC MISSILE DEFENSE ORGANIZATION  
MILITARY CONSTRUCTION PROGRAM - FY 1998  
(APPROPRIATION REQUEST IN THOUSANDS OF DOLLARS)

PROGRAM BUDGET DECISION NO. 315

MINOR CONSTRUCTION PROGRAM

<u>CATCODE</u>	<u>BASE/STATE</u>	<u>PROJECT TITLE</u>	<u>COST (\$000)</u>
	VARIOUS LOCATIONS	MINOR CONSTRUCTION	1,965
		TOTAL:	1,965

BALLISTIC MISSILE DEFENSE ORGANIZATION  
MILITARY CONSTRUCTION PROGRAM - FY 1998

DD FORMS 1390

1. COMPONENT BMDO	<b>FY 1998 MILITARY CONSTRUCTION PROGRAM</b>						2. DATE				
3. INSTALLATION AND LOCATION U.S. ARMY KWAJALEIN ATOLL (USAKA)				4. COMMAND BALLISTIC MISSILE DEFENSE ORGANIZATION			5. AREA CONSTR. COST INDEX 2.54				
6. PERSONNEL  STRENGTH:	PERMANENT			STUDENTS			SUPPORTED				
	OFFICER	ENLISTED	CIVILIAN	OFFICER	ENLISTED	CIVILIAN	OFFICER	ENLISTED	CIVILIAN	TOTAL	
a. AS OF N/A											
b. END FY N/A										N/A	
7. INVENTORY DATA (\$000)											
a. .... TOTAL ACREAGE										N/A	
b. ....INVENTORY TOTAL AS OF										N/A	
c. ....AUTHORIZATION NOT YET IN INVENTORY										N/A	
d. ....AUTHORIZATION REQUESTED IN THIS PROGRAM										4,565	
e. ....AUTHORIZATION IN FOLLOWING PROGRAM										N/A	
f. .... PLANNED IN NEXT THREE PROGRAM YEARS										N/A	
g. .... REMAINING DEFICIENCY										N/A	
h. ....GRAND TOTAL										4,565	
8. PROJECTS REQUESTED IN THIS PROGRAM											
CATEGORY		PROJECT TITLE				SCOPE		COST		DESIGN STATUS	
<u>CODE</u>		<u>FY 1998</u>						<u>(\$000)</u>		<u>START</u> <u>COMPLETE</u>	
312-90		Construct/Alter THAAD Test Facilities				LS		4,565		FEB 96 JUL 97	
		TOTAL						4,565			
9. Future Projects: Typical planned next three years											
NONE											
10. Mission or Major Functions:											
Research and development of various weapons systems											
11. Outstanding pollution and safety deficiencies:											
a. Air Pollution:										0	
b. Water pollution:										0	
c. Occupational safety and health (OSH):										0	

BALLISTIC MISSILE DEFENSE ORGANIZATION  
MILITARY CONSTRUCTION PROGRAM - FY 1998

DD FORMS 1391

<b>1. COMPONENT</b> BMDO	<b>FY 1997 MILITARY CONSTRUCTION PROJECT DATA</b>	<b>2. DATE</b>
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<b>3. INSTALLATION AND LOCATION</b> U.S. ARMY KWAJALEIN ATOLL (USAKA)	<b>4. PROJECT TITLE</b> CONSTRUCT/ALTER THAAD TEST FACILITIES
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<b>5. PROGRAM ELEMENT</b> 0604225C	<b>6. CATEGORY CODE</b> 312-90	<b>7. PROJECT NUMBER</b> BMDO 377	<b>8. PROJECT COST (\$000)</b> 4,565
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<b>9. COST ESTIMATES</b>				
ITEM	U/M	QUANTITY	UNIT COST	COST (\$000)
PRIMARY FACILITIES				3,018
Construct Equipment Storage/Maintenance Facility	SM	1,270	1,859	(2,361)
Alter Equipment Storage Building	SM	821	378	(310)
Radar Site	SM	7,033	49	(347)
SUPPORTING FACILITIES				878
Utilities/Communications	LS			(678)
Site Improvements	LS			(20)
Physical Security	LS			(180)
SUBTOTAL				3,896
CONTINGENCY (10.0%)				390
TOTAL CONTRACT COST				4,286
SUPERVISION, INSPECTION & OVERHEAD (6.5%)				279
TOTAL REQUEST				4,565
TOTAL REQUEST (ROUNDED)				4,565
INSTALLED EQUIPMENT (NON-ADDITIVE)				(0)

**10. DESCRIPTION OF PROPOSED CONSTRUCTION:** Construct new facility and alter a second facility to provide equipment storage, maintenance, and administrative support space. Construction consists of new building with partition walls, ceilings, overhead doors, electrical distribution, air conditioning, physical security/lighting, and fire protection systems. Alteration consists of partition walls, air conditioning, physical security/lighting, and fire protection systems. Construct a new radar hardstand. Includes fencing, utilities, site improvements and communications support. Air conditioning: 51 tons.

**11. REQUIREMENT:** 2,091 SM ADEQUATE: 0 SUBSTANDARD: 821 SM  
**PROJECT:** Construct a new facility and radar site on Kwajalein Island and alter an existing facility on Meck Island to support the Theater Missile Defense (TMD) Theater High Altitude Area Defense (THAAD) missile and engineering and manufacturing development (EMD) tests at USAKA. (NEW MISSION)  
**REQUIREMENT:** THAAD missiles require adequate launch, radar, and support facilities for long range testing at USAKA to demonstrate their system capability and support developmental and EMD tests. USAKA is the only existing test range capable of providing THAAD EMD test requirements. An over-water range supported by appropriate facilities is absolutely essential to demonstrate the system's required capability.  
**CURRENT SITUATION:** Complete EMD testing on the THAAD system cannot be accomplished at existing short-range over-land ranges, such as the White Sands Missile Range, NM. The over-water (continued on next page)

1. COMPONENT BMDO	FY 1997 MILITARY CONSTRUCTION PROJECT DATA	2. DATE																																
3. INSTALLATION AND LOCATION U.S. ARMY KWAJALEIN ATOLL (USAKA)																																		
4. PROJECT TITLE CONSTRUCT/ALTER THAAD TEST FACILITIES	5. PROJECT NUMBER BMDO 377																																	
<p>11. (Continued) <u>CURRENT SITUATION</u>: range at USAKA was selected for THAAD EMD testing due to target range and range safety requirements. It can satisfy the long range and high altitude test requirements necessary for the THAAD EMD testing. No facilities at USAKA exist which can be used to satisfy this requirement with alteration and/or expansion, without interference to other range users. There is no existing location on USAKA with adequate facilities for the radar site and new construction must be provided.</p> <p><u>IMPACT IF NOT PROVIDED</u>: If this project is not provided, realistic testing and operational check out of the TMD THAAD system cannot be accomplished. Failure to provide this project will delay THAAD EMD testing resulting in significant cost impact to this Congressionally mandated program. The THAAD system reliability cannot be fully assessed, testing and operational check out will be compromised, and the need for system improvements will not be identified. This would delay deployment of the system which could be detrimental to the security of the United States.</p> <p><u>PHYSICAL SECURITY</u>: This project has been coordinated with the physical security plan, and all physical security and/or combating terrorism (CBT/T) measures are included.</p> <p><u>ENVIRONMENTAL COMPLIANCE</u>: The TMD Extended Range Environmental Impact Statement (EIS) and the USAKA Supplemental EIS address the environmental impacts of tests. The TMD Extended Range EIS and the USAKA Supplemental EIS Record of Decision have been completed. A Record of Environmental Consideration was completed 19 July 1996.</p> <p>12. SUPPLEMENTAL DATA:</p> <p>a. Estimated Design Data:</p> <table border="0"> <tr> <td>(1) Status:</td> <td></td> </tr> <tr> <td>(a) Date Design Started:</td> <td>February 1996</td> </tr> <tr> <td>(b) Percent Complete as of August 1996</td> <td>35%</td> </tr> <tr> <td>(c) Percent Complete as of May 1997</td> <td>100%</td> </tr> <tr> <td>(d) Design Complete:</td> <td>July 1997</td> </tr> <tr> <td>(2) Basis:</td> <td></td> </tr> <tr> <td>(a) Standard or Definitive Design:</td> <td><u>      </u> YES <u>  X  </u> NO</td> </tr> <tr> <td>(b) Where design was most recently used:</td> <td>NA</td> </tr> <tr> <td>(3) Total Cost (c) = (a) + (b) = (d) + (c):</td> <td></td> </tr> <tr> <td>(a) Production of Plans &amp; Specifications:</td> <td>\$258,600</td> </tr> <tr> <td>(b) All Other Design Cost:</td> <td>\$172,400</td> </tr> <tr> <td>(c) Total:</td> <td>\$431,000</td> </tr> <tr> <td>(d) Contract:</td> <td>\$344,800</td> </tr> <tr> <td>(e) In-house:</td> <td>\$86,200</td> </tr> <tr> <td>(4) Construction Start:</td> <td>January 1998</td> </tr> <tr> <td>(b) Installed Equipment (Non-Additive):</td> <td>NONE</td> </tr> </table>			(1) Status:		(a) Date Design Started:	February 1996	(b) Percent Complete as of August 1996	35%	(c) Percent Complete as of May 1997	100%	(d) Design Complete:	July 1997	(2) Basis:		(a) Standard or Definitive Design:	<u>      </u> YES <u>  X  </u> NO	(b) Where design was most recently used:	NA	(3) Total Cost (c) = (a) + (b) = (d) + (c):		(a) Production of Plans & Specifications:	\$258,600	(b) All Other Design Cost:	\$172,400	(c) Total:	\$431,000	(d) Contract:	\$344,800	(e) In-house:	\$86,200	(4) Construction Start:	January 1998	(b) Installed Equipment (Non-Additive):	NONE
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1. COMPONENT BMDO	FY 1998 MILITARY CONSTRUCTION PROJECT DATA			2. DATE	
3. INSTALLATION AND LOCATION VARIOUS LOCATIONS		4. PROJECT TITLE PLANNING AND DESIGN			
5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER BMDO-468	8. PROJECT COST (\$000) 540		
9. COST ESTIMATES					
ITEM		U/M	QUANTITY	UNIT COST	COST (\$000)
PLANNING AND DESIGN		LS			540
10. DESCRIPTION OF PROPOSED CONSTRUCTION: The funds requested will be used to provide financing for architectural and engineering services and for construction design of Ballistic Missile Defense Organization (BMDO) Military Construction projects.					
11. REQUIREMENT: As required (New Mission)  <u>REQUIREMENT:</u> These planning and design funds are required to complete the design of facilities in the FY 1999 BMDO Military Construction program, initiate design of facilities in the FY 2000 BMDO Military Construction program, complete design of unspecified minor military construction projects, not otherwise authorized by law, but which are anticipated to arise during FY 1998, and accomplish planning and design for major and complex technical projects with a long lead-time to be included in subsequent BMDO Military Construction programs.  This request also includes funds to initiate site designs required to support the National Missile Defense program as described in the President's budget request to field, as early as 2003, a system able to deal with threats of ballistic missile attack by rogue states. This program, based upon a three-year development phase followed by a three-year deployment phase has been commonly referred to as "3+3". The single site, if deployed, will require an estimated \$600 million in facility construction over three years.					

1. COMPONENT BMDO		FY 1998 MILITARY CONSTRUCTION PROJECT DATA			2. DATE	
3. INSTALLATION AND LOCATION VARIOUS LOCATIONS			4. PROJECT TITLE UNSPECIFIED MINOR CONSTRUCTION			
5. PROGRAM ELEMENT		6. CATEGORY CODE	7. PROJECT NUMBER BMDO-474		8. PROJECT COST (\$000) 1,965	
<b>9. COST ESTIMATES</b>						
ITEM				U/M	QUANTITY	UNIT COST
UNSPECIFIED MINOR CONSTRUCTION				LS		1,965
10. DESCRIPTION OF PROPOSED CONSTRUCTION: Provide a lump sum amount for unspecified construction projects, not otherwise authorized by law, having a funded cost of \$1,500,000 or less, including normal construction, alteration or conversion of permanent or temporary facilities, in accordance with 10 USC Section 2805 and projects having a funded cost of \$3,000,000 or less that are intended solely to correct a deficiency that is life-threatening, health-threatening, or safety-threatening, in accordance with Section 2811 of Public Law 104-106.						
11. REQUIREMENT: As required (New Mission)						
<p><u>REQUIREMENT:</u> These funds provide the means of accomplishing urgent projects that are not identified but which are anticipated to arise during FY 1998. Included would be projects to support new requirements, support new concepts, or other essential support to Ballistic Missile Defense Organization (BMDO) programs.</p>						

BALLISTIC MISSILE DEFENSE ORGANIZATION  
FY 1999 MILITARY CONSTRUCTION (MILCON)  
BUDGET ESTIMATE SUBMISSION

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FY 1999 MILCON DD FORMS 1390/1391 (BY PBD)	2

BALLISTIC MISSILE DEFENSE ORGANIZATION  
FY 1999 MILITARY CONSTRUCTION PROJECT SUMMARY  
BY PROGRAM BUDGET DECISION NO. (PBD)

<u>PBD</u>	<u>TITLE</u>	<u>COST (\$000)</u>
314 (PLANNING AND DESIGN, MILITARY CONSTRUCTION)	PLANNING AND DESIGN VARIOUS LOCATIONS	13,162
315 (MINOR CONSTRUCTION MILITARY CONSTRUCTION)	MINOR CONSTRUCTION VARIOUS LOCATIONS	1,538
	FY 1999 TOTAL:	14,700

BALLISTIC MISSILE DEFENSE ORGANIZATION  
MILITARY CONSTRUCTION PROGRAM - FY 1999  
(APPROPRIATION REQUEST IN THOUSANDS OF DOLLARS)

PROGRAM BUDGET DECISION NO. 314

PLANNING AND DESIGN

<u>CATCODE</u>	<u>BASE/STATE</u>	<u>PROJECT TITLE</u>	<u>COST</u>
	VARIOUS LOCATIONS	PLANNING AND DESIGN	13,162
		<u>TOTAL:</u>	13,162

BALLISTIC MISSILE DEFENSE ORGANIZATION  
MILITARY CONSTRUCTION PROGRAM - FY 1999  
(APPROPRIATION REQUEST IN THOUSANDS OF DOLLARS)

PROGRAM BUDGET DECISION NO. 315

MINOR CONSTRUCTION PROGRAM

<u>CATCODE</u>	<u>BASE/STATE</u>	<u>PROJECT TITLE</u>	<u>COST(\$000)</u>
	VARIOUS LOCATIONS	MINOR CONSTRUCTION	1,538
		TOTAL:	1,538

BALLISTIC MISSILE DEFENSE ORGANIZATION  
MILITARY CONSTRUCTION PROGRAM - FY 1999

DD FORMS 1391

1. COMPONENT BMDO		FY 1999 MILITARY CONSTRUCTION PROJECT DATA			2. DATE	
3. INSTALLATION AND LOCATION VARIOUS LOCATIONS			4. PROJECT TITLE UNSPECIFIED MINOR CONSTRUCTION			
5. PROGRAM ELEMENT		6. CATEGORY CODE	7. PROJECT NUMBER BMDO-475		8. PROJECT COST (\$000) 1,538	
9. COST ESTIMATES						
ITEM				U/M	QUANTITY	COST (\$000)
UNSPECIFIED MINOR CONSTRUCTION				LS		1,538
10. DESCRIPTION OF PROPOSED CONSTRUCTION: Provide a lump sum amount for unspecified construction projects, not otherwise authorized by law, having a funded cost of \$1,500,000 or less, including normal construction, alteration or conversion of permanent or temporary facilities, in accordance with 10 USC Section 2805 and projects having a funded cost of \$3,000,000 or less that are intended solely to correct a deficiency that is life-threatening, health-threatening, or safety-threatening, in accordance with Section 2811 of Public Law 104-106.						
11. REQUIREMENT: As required (New Mission)						
REQUIREMENT: These funds provide the means of accomplishing urgent projects that are not identified but which are anticipated to arise during FY 1999. Included would be projects to support new requirements, support new concepts, or other essential support to Ballistic Missile Defense Organization (BMDO) programs.						

1. COMPONENT BMDO		FY 1999 MILITARY CONSTRUCTION PROJECT DATA			2. DATE	
3. INSTALLATION AND LOCATION VARIOUS LOCATIONS			4. PROJECT TITLE PLANNING AND DESIGN			
5. PROGRAM ELEMENT		6. CATEGORY CODE	7. PROJECT NUMBER BMDO-469		8. PROJECT COST (\$000) 13,162	
9. COST ESTIMATES						
ITEM				U/M	QUANTITY	COST (\$000)
PLANNING AND DESIGN				LS		13,162
Theater Missile Defense				LS		(347)
National Missile Defense				LS		(12,815)
10. DESCRIPTION OF PROPOSED CONSTRUCTION: The funds requested will be used to provide financing for architectural and engineering services and for construction design of Ballistic Missile Defense Organization (BMDO) Military Construction projects.						
11. REQUIREMENT: As required (New Mission)						
<p><u>REQUIREMENT:</u> These planning and design funds are required to complete design for the FY 2000 BMDO Military Construction program, initiate design of facilities in the FY 2001 BMDO Military Construction program, complete design of unspecified minor military construction projects, not otherwise authorized by law, but which are anticipated to arise during FY 1999, and accomplish planning and design for major and complex technical projects with a long lead-time to be included in subsequent BMDO Military Construction programs.</p> <p>This request includes \$12.815 million of planning and design funds to initiate the design of facilities required to support the National Missile Defense program as described in the President's budget request to field, as early as 2003, a system able to deal with threats of ballistic missile attack by rogue states. This program, based upon a three-year development phase followed by a three-year deployment phase has been commonly referred to as "3+3". The single site, if deployed, will require an estimated \$600 million in facility construction over three years.</p>						