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

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	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).

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- 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.

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B. Program Change Summary ($ in Thousands)

	FY 1996	FY 1997	FY 1998	FY 1999	Total Cost
Previous President's Budget	125,537	132,319	157,629	150,345	565,830
Appropriated Value		262,319			
Adjustments to Appropriated Value:					
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	147,557	144,902	674,364

Change Summary Explanation:

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.

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 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.

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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.

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– $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.

– $26,205 Total

Acquisition Strategy: This project funds its efforts through executing agents in the Air Force, Army, Navy and BMDO via existing contracts.

B. Program Change Summary ($ in Thousands)

	FY 1996	FY 1997	FY 1998	FY 1999	Total Cost
Previous President's Budget	1,539	13,931	27,078	26,670	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

Change Summary Explanation:

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.

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.

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, PE 0603871C	730,656	828,864	504,091	393,085	309,748	309,584	391,858	392,433	Cont	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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	PROJECT 1155

D. Schedule Profile

	FY 1996				FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Start MSX data analysis					X											
Analyze Signature Collection Reqmts					X	X	X	X	X	X	X	X	X	X	X	X
Perform Data Collection Missions					X	X	X	X	X	X	X	X	X	X	X	X
Upgrade Signature Data Collection										X	X	X	X	X	X	X
Perform Signature Collection Demos							X	X			X	X			X	X

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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
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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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:

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	PROJECT 1161

- 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.
- 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.

FY 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

FY 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.

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- $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.
- $32,797 Total

FY 1998 ($ in Thousands)

- $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

FY 1999 ($ in Thousands)

- $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/consoles 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

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Acquisition Strategy: 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.

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

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	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

D. Schedule Profile

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

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	FY 1996				FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Deliver Radar Sensor Subsystem																X

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PROJECT: 1270

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	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 ladar 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

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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 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 ladar at AMOR and WSMR. Initiated fabrication of 6-m CO2 Multi-Folded Ladar (MFL). Fabricated breadboard 2-D solid state ladar 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 ladar 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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– $43,032 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 ladar transmitter integrated with receiver and controls. Fabricate 3-D solid state imaging ladar transmitter. Complete Si-APD ladar 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 seeker HWIL tests. 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/producibility 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,

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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; options for the design, fabrication, and test of the KKVs; 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. The DITP program uses: USASSDC in-house expertise and contractors for ladar 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 Cost
Previous President's Budget	22,899	30,109	28,519	27,888	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 Compl	Total Cost
2400 NMD Program, PE 0603871C	730,656	828,864	504,091	393,085	309,748	309,9584	391,858	392,433	Cont	Cont
1161 Advanced Sensor Technology, PE 0603173C	19,326	32,797	24,527	22,743	19,723	18,921	16,995	25,566	Cont	Cont

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	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To Compl	Total Cost
1161 Advanced Sensor Technology, PE 0603872C	1,270	3,334	3,364	3,208	3,199	3,151	3,148	3,153	Cont	Cont

D. Schedule Profile

	FY 1996				FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
AIT Aero-Optical shock tunnel tests (window #1)	X															
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									

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BUDGET ACTIVITY
3 - Advanced Technology Development

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	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 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								
Deliver Advanced SCARLET Array to Spacecraft Integrator									X							
Initiate KV ground plane EMI shield demo									X							
Initiate prototype cryo-GBR design									X							
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

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	FY 1996				FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Perform AMOR testing (image discrimination) to support ladar downselect																X

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PROJECT: 1360

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
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.

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(5) The 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).

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.

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.

PROGRAM ACCOMPLISHMENTS AND PLANS

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.

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.

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.

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.

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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 1QFY97 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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– $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

FY 1998 ($ in Thousands)

– $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

FY 1999 ($ in Thousands)

– $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

Acquisition Strategy: 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)	DATE February 1997
BUDGET ACTIVITY: 3 - Advanced Technology Development	PE NUMBER AND TITLE: 0603173C Support Technologies - ATD / PROJECT: 1360

B. Program Change Summary ($ in Thousands)

	FY 1996	FY 1997	FY 1998	FY 1999	Total Cost
Previous President's Budget	75,345	28,449	28,971	28,670	161,435
Appropriated Value		108,449			
Adjustments to Appropriated Value:					
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

Change Summary Explanation:

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

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

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 1360

D. Schedule Profile

	FY 1996				FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	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

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	

FY 1999 ($ in Thousands)
- $0
- $0 Total

B. Program Change Summary ($ in Thousands)

	FY 1996	FY 1997	FY 1998	FY 1999	Total Cost
Previous President's Budget	0	0	0	0	0
Appropriated Value					
Adjustments to Appropriated Value:					
a. Internal BMDO Adjustments		2,233			
Current Budget Submit/President's Budget	0	2,233	0	0	1,758

Change Summary Explanation:

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.

Schedule:

Technical:

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 Science and Technology, PE 0602173C	47,852	56,009	50,923	50,094	43,774	41,411	42,505	43,506	Cont	Cont

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1997
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603173C Support Technologies - ATD PROJECT 1651

D. Schedule Profile

	FY 1996				FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
SCARLET solar array hardware delivery								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: 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

A. Mission Description and Budget Item Justification

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.

Two specific programs in advanced technology are managed under this project

1. Technology Applications
2. Historically Black Colleges and Universities/Minority Institutions (HBCU/MIs)

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.

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.

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.

FY 1996 ($ in Thousands)

- $808 Database: Completed enhancement of the database, investigated international access to the BMDO technology; and initiated migration to the national information infrastructure.
- $554 Panel Reviews: Provided assistance to large, medium and small businesses wishing to bring BMD supported technology to the commercial market.

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: 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

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: 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)

	FY 1996	FY 1997	FY 1998	FY 1999	Total Cost
Previous President's Budget	4,965	6,476	12,258	7,595	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 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603173C Support Technologies - ATD
	PROJECT 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

D. Schedule Profile

	FY 1996				FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Technology Applications																
Annual Report			X				X				X				X	
Special Tech Applications Report		X		X		X		X		X		X		X		X
BMDO Update	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
HBCU/MI Solicitation/Review for incremental funding	X				X				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: 3 - Advanced Technology Development	PE NUMBER AND TITLE: 0603173C Support Technologies - ATD / PROJECT: 3352

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.

– $2,002 Total

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.

– $1,554 Total

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.

– $1,898 Total

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)

	FY 1996	FY 1997	FY 1998	FY 1999	Total Cost
Previous President's Budget	0	1,459	1,559	1,907	4,925
Appropriated Value		1,459			
Adjustments to Appropriated Value:					
a. General Reductions (FFRDC, Inflation etc.)		-2			
b. Internal BMDO Adjustments		545			
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			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
None																

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

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	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.

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	

– $200 Total

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