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BMDO RDT&E BUDGET ITEM JUSTIFICATION (R-2 Exhibit)	DATE February 1999
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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603173C Support Tech - Adv Tech Dev
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COST <i>(In Thousands)</i>	FY 1998 Actual	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	298207	272820	173704	180826	185315	187888	179225	179529	TBD	TBD
1155 Discrimination	33653	0	0	0	0	0	0	0	TBD	TBD
1161 Advanced Sensor Technology	28920	0	0	0	0	0	0	0	TBD	TBD
1180 Surveillance Technologies	0	31299	23639	26195	26247	27770	20816	21000	Continuing	Continuing
1264 Atmospheric Interceptor Technology	31606	0	0	0	0	0	0	0	0	0
1270 Adv Interceptor Materials and Systems Tech	42510	0	0	0	0	0	0	0	0	0
1280 Interceptor Technologies	0	73735	38508	38535	44308	43196	42870	41343	Continuing	Continuing
1360 Space Based Laser	118323	124963	75000	75000	75000	75000	75000	75000	Continuing	Continuing
1461 BMC4I	0	9642	5339	7814	7556	8370	7870	7401	Continuing	Continuing
1651 Innovative Science and Technology (IST)	4671	0	0	0	0	0	0	0	TBD	TBD
1660 Statutory and Mandated Programs	4008	0	2930	2943	2955	2972	3019	3066	TBD	TBD
3352 Modeling and Simulations	5015	0	0	0	0	0	0	0	TBD	TBD
3360 Test Resources	0	2532	0	0	0	0	0	0	TBD	TBD
4000 Operational Support	29501	30649	28288	30339	29249	30580	29650	31719	Continuing	Continuing

A. Mission Description and Budget Item Justification

To prepare for critical future active defense needs, BMDO will conduct a balanced program of high leverage technologies, including international cooperative efforts, that yield improved capabilities across a selected range of advanced sensors, as well as advances in innovative science. The objectives of these investments are subsystems with improved performance and reduced costs for acquisition programs.

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<p>The BMD technology program is designed to resolve many key R&D issues for future Theater and National Missile Defense systems. BMDO crafts the program as a component of the overall Department technology area plan. The efforts include:</p> <ul style="list-style-type: none"> • Advanced active and passive 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, high leverage sensor technologies and the engineering analysis required to determine, leverage, and integrate BMDO and service sponsored technologies into BMDO systems to address the evolving threat (Project 1180). • Development and Integration of the critical technologies for performing hypervelocity hit-to-kill intercepts of TBM's within and outside the atmosphere. Development and demonstration of advanced interceptor sensor processing and power components; multifunctional material and structures; low cost interceptor composite manufacturing processes; and including performing low cost flight test demonstrations. (Project 1280). • Development of advanced chemical laser systems technologies to demonstrate their integration with a high power laser beam and large optics. (Project 1360) • Development and demonstration of advanced technologies for BMD Battle Management Command, Control, Communication, Computer and Intelligence (BMC4I) to enhance kill assessment capabilities, increase situation awareness, and improve evaluation tools required to assess BMC4I system performance. (Project 1461) • Manpower authorizations and the associated costs specifically identified and measured to the performance of these programs (Project 4000). <p>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 <u>Brief Description of Element</u> section of each Program Element Summary.</p> <p>The Air Force share of SBL follows:</p> <table style="margin-left: 40px; border: none;"> <tr> <td style="text-align: right;">FY99</td> <td style="text-align: right;">FY00</td> <td style="text-align: right;">FY01</td> <td style="text-align: right;">FY02</td> <td style="text-align: right;">FY03</td> <td style="text-align: right;">FY04</td> <td style="text-align: right;">FY05</td> </tr> <tr> <td style="text-align: right;">34884</td> <td style="text-align: right;">63840</td> <td style="text-align: right;">63779</td> <td style="text-align: right;">63674</td> <td style="text-align: right;">63565</td> <td style="text-align: right;">64244</td> <td style="text-align: right;">64938</td> </tr> <tr> <td colspan="7" style="text-align: center;">(FY99 will be 33753 after SBIR Reduction)</td> </tr> </table> <p>FY 1998 Accomplishments:</p> <ul style="list-style-type: none"> • 33653 Discrimination: Provided analysis for Midcourse Space Experiment (MSX) cryogen phase data in support of Spaced Based Infrared System (SBIRS) and NMD/GBI. Supported operations of the MSX relevant to BMDO's mission. Provided Technical Analysis to BMDO with the specialized support required to resolve advanced technology development and technical operations issues, including trade studies of the cost, schedule, and technical risks of alternative program investment strategies. Supported the collection of signature data for technology needs by planning data collection and analyzing future signature and collection issues. 			FY99	FY00	FY01	FY02	FY03	FY04	FY05	34884	63840	63779	63674	63565	64244	64938	(FY99 will be 33753 after SBIR Reduction)						
FY99	FY00	FY01	FY02	FY03	FY04	FY05																	
34884	63840	63779	63674	63565	64244	64938																	
(FY99 will be 33753 after SBIR Reduction)																							
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<ul style="list-style-type: none"> • 28920 Russian American Observational Satellites (RAMOS): Specialized infrared sensors developed by the U.S. and Russia were flown aboard the U.S. Flying Infrared Signature Technology Aircraft (FISTA) with data collected and analyzed. Additional efforts were focused on the modeling and simulation of high altitude cloud sun glint reflection and cloud and background scene structure in the mid-to-longwave infrared band. Completed CDR and various program execution approaches were examined. Active Plasma Experiment (APEX): Began experimental planning, finalized experiment objectives and criteria. Specified experiment design, electrical, mechanical, and environmental interfaces between US and Russian components and systems. Began fabrication of components to be used for flight tests. Advanced Sensor Technology Program (ASTP): Performed laboratory, ground, and chamber demonstrations of integrated sensor components and transitioned to Discriminating Interceptor Technology Program (DITP) under Project 1270. DITP was combined with materials and structures to form Project 1282 (EIT). • 31606 Atmospheric Interceptor Technology (AIT): Completed preparations for Jet Interaction, Strapdown Infrared Seeker (SIS), and Solid Divert Attitude Control System (SDACS) testing, awarded Integrated Test Bed (ITB) contract, defined Multi-Function Generator (MFG) effort and developed Rocket System Launch Program (RSLP) payload. • 42510 Advanced Interceptor Materials and Systems Technology: Continued development of DITP sensors, fusion processor, and fusion algorithms. Initiated DITP integrated sensor demonstration project. Delivered Space Technology Research Vehicle (STRV)-2 Experiment Module. Conducted Critical Design Reviews (CDRs) and initiated fabrication of STRV-1d flight experiments. Delivered Solar Concentrator Array with Refractive Linear Element Technology (SCARLET) advanced concentrator solar array for flight testing. Continued development of thermal battery, lightweight composite structures and propulsion system components for interceptors. This activity was combined with DITP to form Project 1282, Exoatmospheric Interceptor Technology (EIT). • 118323 Performed integrated laser, beam control and large optics system testing with an uncooled deformable mirror in high power beam train. Performed laser optimization testing, advanced nozzle testing, and advanced nozzle ring fabrication. Completed passive and active Acquisition, Tracking and Pointing (ATP) laboratory tests. Continued uncooled resonator fabrication. Conducted Concept Definition Studies. Developed Demonstration Objectives Document (DOD). • 5015 Funded modernization and upgrades to Mission Oriented Information Technology Resources (ITR) in BMDO and BMDO-funded missile defense development programs in order to satisfy validated requirements of the ITR user community (Project 3352). Provided funding for the BMDO Data Centers Program to archive, manage, develop data products, distribute and provide remote access to all relevant BMD data. Specific priorities include: Advanced Missile Signature Center (AMSC) - supported Virtual Data Centers (VDC) design, development, testing, implementation and Initial Operational Capability (IOC), and MSX data management; Background Center of Expertise (BCoE) - supported VDC design, development, testing, implementation and IOC, transition to backgrounds data center of expertise; Missile Defense Data Center (MDDC) - supported VDC design, development, testing, implementation and IOC; BMD Simulation Support Center (SSC) - supported VDC design, development, testing, implementation and IOC, and established initial functions and capabilities as back-up data archive (Project 3352). • 4671 IST (1651) - Provided research and development support for a pilot production line for Photoconductor on Active Pixel (POAP) detectors, for both visible and x-ray imaging applications. 		

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•	2627 TA (1660) - TA Database: Maintained up-to-date information on potential BMD programs that have commercial applications. Updated graphics and interactive modes into national information infrastructure on BMD-sponsored technologies. Panel Reviews: Provided assistance to large, medium and small businesses wishing to bring BMD supported technology to the commercial market. Outreach: Developed publications, brochures, target articles for journals and newspapers, quarterly newsletters, conference exhibits, ads and reports on BMDO technology, etc. 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.	
•	1381 HBCU/MI (1660) - HBCU/MI program incrementally funded 8 contracts.	
•	29501 Management and Operational Support: Continued providing management and support for BMDO and TO overhead/indirect fixed costs, and continued to provide management and analysis support to the technology program in areas such as cost/schedule/performance assessment, cost estimating and analysis, budget analysis and formulation, program planning and control, contract management.	
Total	298207	
FY 1999 Planned Program:		
•	31299 Surveillance Technology: Continue satellite operation and data analysis for the Midcourse Space Experiment (MSX). Deliver Space Technology Research Vehicle-1d (STRV-1d) flight experiments. Launch STRV-1d and STRV-2 flight experiments. Complete performance analysis of SCARLET flight experiment data. Complete design of SCARLET Plasma Electric Discharge Experiment (SPEDE) flight experiment. Provide for low level planning and development of Advanced Radar Technology enhancements of transmitter/receiver technologies and signal processing architectures. Continue development of advanced technologies for space surveillance systems. Investigate sensors systems for low observable target. Perform overarching and integrated technology engineering analysis. This includes: development and update of BMDO Technology Master Plan to serve as guidance for BMDO and multi-service technology programs; detailed systems and architecture engineering analysis based on technology development needs; support of technology conference activities required to assure government and industry technology interface; and engineering-based Program Planning, Budgeting System Analyses.	
•	73735 Interceptor Technology: Complete AIT Integrated Test Bed technology trade study. Conduct initial testing of Jet Interaction, SIS, and SDACS. Continue DITP Laser Radar, Passive Sensor, and Fusion Processor/Algorithm component development. Deliver DITP Government Furnished Equipment (GFE) Subsystem and conduct seeker integration and demonstration System Requirements Review and PDR. Conduct ground and laboratory testing of intermediate GFE subsystems. Conduct PDR and CDR for Master Frequency Generator (MFG) and RSLP launch. Complete development of interceptor thermal battery. Continue development of lightweight high performance multi-functional structures for interceptors. Continue development of advanced technology components for future interceptor systems. Leverage /fund Service technology development areas of value to UAV BPI.	
•	9642 BMC4I Advanced Technology: Provide planning, development, and research for NMD and TMD Kill Assessment algorithm development and modeling. Leverage communications infrastructure to extend range and bandwidth of missile defense nodes. Develop advanced metric tracking and discrimination, correlation, fusion processing and networking technology to improve Situation Awareness and Engagement. Demonstrate real-time, geographically distributed computing technologies to support BMC4I using BMDO simulation and Hardware-in-the-Loop (HWIL) capabilities. Support Active Plasma Experiment, a U.S./Russian effort to study high-speed artificial plasma jets interaction with the atmosphere.	
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• 124963	SBL: Complete Alpha laser high power optimization for power extraction and mode filling. Continue high power testing to improve brassboard integrated system performance, and data correlation; begin high power auto alignment tests. Perform conceptual design of Beta laser and beam expander for flight configured integrated ground experiment. Continue uncooled resonator and gain generator ring fabrication for the Beta laser. Complete ATP ground tests at WSMR against full scale boosting targets and perform balloon checkout flight. Initiate large, lightweight, deployable optics concept study known as Advanced Mirror System Development (AMSD). Conduct architecture and affordability study for directed energy concepts with space components.	
• 30649	Management and Operational Support: Continued providing management and support for BMDO and TO overhead/indirect fixed costs, and continued to provide management and analysis support to the technology program in areas such as cost/schedule/performance assessment, cost estimating and analysis, budget analysis and formulation, program planning and control, contract management.	
• 2532	Operations and Maintenance: Provide funds for the Aero-Optic Evaluation Center (AOEC) located at the Calspan-University of Buffalo Research Center (CUBRC) and the Army Missile Optical Range (AMOR) located on Redstone Arsenal, Alabama.	
Total	272820	
FY 2000 Planned Program:		
• 23639	Surveillance Technology: Continue analysis of Midcourse Space Experiment (MSX) data in support of Space Based Infrared System (SBIRS) and NMD/GBI. Provide research and development of radar technologies in the areas of Transmitter/Waveform Generators, Antennas, Threats/Environments, Receiver/Signal Processors, Controller/Data Processors, and Electro-Mechanical Support used by MDAP systems. Complete data analysis of STRV-2 and STRV-1d flight experiments. Deliver SPEDE flight experiment to Space Test Program. Continue development of advanced technologies for space surveillance systems. Perform overarching and integrated technology engineering analysis. This includes: development and update of BMDO Technology Master Plan to serve as guidance for BMDO and multi-service technology programs; detailed systems and architecture engineering analysis based on technology development needs; support of technology conference activities required to assure government and industry technology interface; and engineering-based Program Planning, Budgeting System Analyses.	
• 38508	Interceptor Technology: Conduct AIT ITB PDR. Complete initial Jet Interaction model validation, SIS prototype design, SDACS prototype design. Deliver MFG to PAC-3. Deliver and test DITP sensor subsystem. Begin integration of DITP sensor subsystem. Ground test DITP fused-sensor system and conduct integration/demonstration CDR. Develop DITP Flight Test 1 GFE. Fabricate and ground test multi-functional structure. Continue development of advanced technology components for future interceptor systems.	
• 5339	BMC4I Advanced Technology: Continue development and research for NMD and TMD Kill Assessment modeling and simulation. Leverage communications infrastructure to extend range and bandwidth of missile defense nodes. Develop advanced metric tracking and discrimination, correlation, fusion processing and networking technology to improve Situation Awareness and Engagement. Develop modeling and simulation tools and HWIL test-beds to evaluate BMC4I technologies integrated with representations of the actual sensors and weapons systems under development. Demonstrate real-time, geographically distributed computing technologies to support BMC4I using BMDO simulation and HWIL capabilities.	
• 75000	SBL: Conduct System Conceptual Design Review (CoDR) for flight configured integrated ground experiment. Complete fabrication of Beta laser gain generator and uncooled resonator. Perform ATP flight tests against TBM representative targets. Continue design validation and risk reduction for the integrated ground experiment. Complete and select concept(s) to pursue from the large, lightweight, deployable optics study.	

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<ul style="list-style-type: none"> • 28288 Management and Operational Support: Continued providing management and support for BMDO and TO overhead/indirect fixed costs, and continued to provide management and analysis support to the technology program in areas such as cost/schedule/performance assessment, cost estimating and analysis, budget analysis and formulation, program planning and control, contract management. • 2930 Government civilian salaries. <p>Total 173704</p>		
FY 2001 Planned Program:		
<ul style="list-style-type: none"> • 26195 Surveillance Technology: Provide research and development of radar technologies in the areas of Transmitter/Waveform Generators, Antennas, Threats/Environments, Receiver/Signal Processors, Controller/Data Processors, and Electro-Mechanical Support used by MDAP systems. Launch SPEDE flight experiment. Continue development of advanced technologies for space surveillance systems. Perform overarching and integrated technology engineering analysis. This includes: development and update of BMDO Technology Master Plan to serve as guidance for BMDO and multi-service technology programs; detailed systems and architecture engineering analysis based on technology development needs; support of technology conference activities required to assure government and industry technology interface; and engineering-based Program Planning, Budgeting System Analyses. • 38535 Interceptor Technology: Conduct AIT ITB CDR and perform ITB ground tests. Complete Jet Interaction model validation. Deliver prototypes for SIS and SDACS. Conduct DITP Flight Test 1. Deliver GFE and fused-sensor system for DITP Flight Test-2. Flight test advanced multi-functional interceptor structure. Continue development of advanced technology components for future interceptor systems. • 7814 BMC4I Advanced Technology: Continue development and research for NMD and TMD Kill Assessment modeling and simulation. Develop advanced interoperability messaging and translation protocols to improve communications. Initialize development of pre-planning and adaptive battle management tools to account for probability of kill and available inventory. Develop advanced metric tracking and discrimination, correlation, fusion processing and networking technology to improve Situation Awareness and Engagement. Develop modeling and simulation tools and HWIL test-to evaluate BMC4I technologies integrated with representations of the actual sensors and weapons systems under development. Demonstrate utility of virtual distributed HWIL test-bed to illustrate increased communication bandwidth. • 75000 SBL: Continue design activities leading to a system PDR in FY02 for a flight configured integrated ground experiment. Install and initiate testing of Beta laser. Modify brassboard beam control and large optics hardware for ground experiment design validation and risk reduction. Begin advanced ATP risk reduction and design validation activities. Begin fabrication of large, lightweight, deployable optics demonstration hardware. • 30339 Management and Operational Support: Continued providing management and support for BMDO and TO overhead/indirect fixed costs, and continued to provide management and analysis support to the technology program in areas such as cost/schedule/performance assessment, cost estimating and analysis, budget analysis and formulation, program planning and control, contract management. • 2943 Government civilian salaries. <p>Total 180826</p>		
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B. Program Change Summary	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>
Previous President's Budget (FY 1999 PB)	299788	166676	165431	163514
Congressional Adjustments		111000		
Appropriated Value		277676		
Adjustments to Appropriated Value				
a. Congressional Reductions (FFRDC, Inflation, etc)		-4356		
b. OSD Reductions		-500		
c. Emergency Supplemental				
Adjustments to Budget Years Since FY 1999 PB				
Current Budget Submit (FY 2000 / 2001 PB)	298207	272820	173704	180826

Change Summary Explanation: