Missile Defense Agency (MDA) Exhibit R-2 RDT&E Budget Item Justification	Date: February 2008
APPROPRIATION/BUDGET ACTIVITY: **RDT&E, DW/04 Advanced Component Development and Prototypes (ACD&P)**	R-1 NOMENCLATURE: **0603897C BMD Hercules**

COST ($ in Thousands)	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013
Total PE Cost	46,268	52,462	55,955	55,289	56,400	51,902	52,784
0505 Hercules	45,262	0	0	0	0	0	0
WX02 Hercules Capability Development	0	50,018	54,342	53,360	54,786	50,394	51,210
0602 Program-Wide Support	1,006	0	0	0	0	0	0
ZX40 Program-Wide Support	0	2,444	1,613	1,929	1,614	1,508	1,574

Note: Starting in FY08, 0505 Hercules moved to a new project named WX02 Hercules Capability Development.

A. Mission Description and Budget Item Justification

A.1 System Element Description

The BMD Hercules Program Element develops and tests tomorrow's discrimination, counter-counter measures, and tracking algorithms for integration into the BMDS, thereby permitting MDA to outpace the evolving ballistic missile threat. In particular, Hercules develops algorithms that improve sensor and weapon element tracking and discrimination, improve integration of sensor data within Command and Control, Battle Management and Communications (C2BMC) and fire control, and expand integrated battle management capability. This national effort to develop robust, physics-based detection, tracking, and discrimination algorithms is based on the intelligence community's assessment that the evolving ballistic missile threat may include planned or unplanned countermeasures in all phases of their flight. Project Hercules then transfers these algorithms to BMDS elements for integration and provides technical assistance during the algorithm integration. These algorithms support existing BMDS Engagement Sequence Groups (ESGs), enable new Engagement Sequence Groups, and significantly improve the ability of the BMDS sensors, weapons, and C2BMC to detect, track, and identify threat ballistic missiles and potentially lethal objects. These activities are critical to keep pace with the evolving ballistic missile threat.

Applied Data Analysis Center (ADAC) identifies critical radar and electro-optical (EO) phenomenology from U.S. and foreign missile flights, ground tests, and laboratory measurements. ADAC provides MDA, particularly Project Hercules, with new concepts for algorithm, sensor, and weapon development. ADAC exploits analysis of evolving threats and environments to develop appropriate fidelity models that are then used for algorithm, element, and system testing leading to improvements in future BMD Systems.

Hercules exploits physical phenomenology associated with observable characteristics of warheads and countermeasures to develop more sophisticated algorithms (software) that improve the capability of existing and emerging BMDS hardware. Hercules algorithms enhance the capability of sensors for tracking and object characterization, enhance the C2BMC in system target selection and sensor and weapon resource

management; improve the fire control capability supporting launch of Ground-Based Midcourse Defense (GMD) interceptors; and enhance kill vehicle ability to process focal plane data for target selection. Previous Hercules projects developed preliminary capabilities for boost intercept. However, due to budget constraints these projects were terminated. As an algorithm matures, it undergoes several phases of development and test. These phases are concept exploration, concept development and concept test. Hercules conducts both digital testing and flight testing of its algorithms as part of the development process. At any particular time, the Hercules portfolio contains algorithms that are in each phase of development. Algorithms in the concept exploration area will enable emerging capability and provide the core algorithm development. This is currently a small but critical portion of the Hercules portfolio. The algorithms that are in test support BMDS near-term capabilities and are associated with specific projects that work in collaboration with the integrating BMDS element. Through dedicated projects, Hercules will deliver: 1) multi-sensor target selection to C2BMC to combine AN/TPY and Sea Based X-Band radar (SBX) target observations to include supporting system track capabilities as required as well as the next level of weapon / sensor management capability; 2) an initial Counter-Counter Measures (CCM) capability for the AN/TPY-2 and SBX; 3) adapted FBS capability to the Aegis SPY-1; and 4) EO/IR tracking, correlation, and discrimination capability to the Space Tracking and Surveillance System (STSS) and Airborne Infrared Sensor (AIRS) programs.

The Applied Data Analysis Center (ADAC) experts in the fields of optical and radar phenomenology analyze flight test and laboratory data to better understand phenomenology associated with missiles, re-entry vehicles, and countermeasures. ADAC experts analyze data from BMDS flight tests with particular emphasis on results from critical measurement program and countermeasure critical measurement flight tests for exploitable radar and EO phenomenology. The ADAC experts also review foreign flight tests and legacy flight tests to identify exploitable trends and validate the utility of identified phenomenology. ADAC experts also assess laboratory and ground testing that measure complementary phenomena. They then apply the ADAC expertise to validate BMDS engineering models and identify areas for improvement. ADAC provides the Ballistic Missile Defense (BMD) technology development community with the results of their analysis to stimulate algorithm and hardware development.

A.2 System Element Budget Justification and Contribution to the Ballistic Missile Defense System (BMDS)

Hercules algorithms support existing BMDS Engagement Sequence Groups (ESGs) and enable new Engagement Sequence Groups. In particular, Hercules develops algorithms that improve sensor and weapon element discrimination, improve integration of sensor data within C2BMC, and expand integrated battle management capability. Hercules developed key discrimination algorithms included in the AN/TPY 2 radar, system tracking algorithms used in the C2BMC and the GMD Fire Control (GFC), and system engagement planning algorithms used in the C2BMC. To provide capability identified in the Block 08 Test Bed Description Document (TBDD), Hercules will mature and transition algorithms for clutter mitigation, improved AN/TPY-2 radar discrimination, AEGIS discrimination, and C2BMC target selection capabilities.

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ADAC is the only MDA organization chartered to perform detailed analyses of phenomenologies observed on U.S. flight and ground tests, as well as on data collections from foreign launches. Understanding the physics behind these observations -- during all phases of flight (boost, through midcourse, and terminal) -- leads to robust new algorithm concepts, which are subsequently exploited by Project Hercules. ADAC also develops appropriate fidelity models used in algorithm testing, as well as testing for the Hercules Decision Architecture and the Elements. ADAC plays a key role in the MDA spiral technology development and in the support of the BMDS Block Development efforts

A.3 Major System Element Goals

Hercules has two major goals:

- Develop, deliver and support integration of algorithms that provide new or expanded capability to include:
  - Multi-sensor target selection to C2BMC to combine AN/TPY and SBX target observations to include supporting system track capabilities as required as well as the next level of weapon / sensor management capability.
  - An initial CCM capability for the AN/TPY-2 and Sea Based X-Band Radar (SBX).
  - Modified Forward Based Sensors (FBS) capability transitioned to the AEGIS SPY-1.
  - EO/IR tracking, correlation, and discrimination capabilities to the STSS program.
- Assess algorithm needs and begin development of concepts that support new, emerging and known future technology needs, such as new weapon systems and sensors or address evolving threat counter measures.

ADAC has three major goals:

- Provide in-depth analysis of domestic and foreign flight data. Understand the physics behind observed phenomenologies and assess potential implications to the BMD critical functions resulting from evolving threat developments.
- Develop robust new algorithm concepts for Project Hercules, with a particular emphasis on discrimination and mitigation of countermeasures. Develop forward-looking sensor design concepts for MDA, based on likely threat, scene, and weapon-capability environment.
- Leverage flight and ground test data to develop appropriate-fidelity digital models for Hercules algorithm, Element, and System testing. Use software tools/models to test Hercules Decision Architecture concepts through Red-Blue games.

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B. Program Change Summary	FY 2007	FY 2008	FY 2009
Previous President's Budget (FY 2008 PB)	49,674	53,658	54,264
Current President's Budget (FY 2009 PB)	46,268	52,462	55,955
Total Adjustments	-3,406	-1,196	1,691
Congressional Specific Program Adjustments	0	-834	0
Congressional Undistributed Adjustments	0	-362	0
Reprogrammings	-2,653	0	0
SBIR/STTR Transfer	-753	0	0
Adjustments to Budget Years	0	0	1,691

FY07 decrease of $3.406 million includes SBIR/STTR transfer and MDA reprogrammings.

FY08 decrease of $1.196 million includes a Congressionally specific program decrease of $0.834 million and a portion of the MDA Congressional undistributed reduction.

FY09 increase of $1.691 million is a result of adding the Radar Data Exploitation (RDE). RDE is part of the ADAC program.

Missile Defense Agency (MDA) Exhibit R-2A RDT&E Project Justification	Date: February 2008
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COST ($ in Thousands)	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013
0505 Hercules	45,262	0	0	0	0	0	0
RDT&E Articles Qty	0	0	0	0	0	0	0

Note: Starting in FY08, 0505 Hercules moved to a new project named WX02 Hercules Capability Development.

A. Mission Description and Budget Item Justification

Hercules is a national effort to develop robust, physics-based detection, tracking, and discrimination prototype software (algorithms), and transfers them to BMDS elements in order to improve the performance of C2BMC, sensor, and weapon functions. Hercules algorithms improve sensor and weapon element detection, tracking and discrimination, improve integration of sensor data within C2BMC, and expand integrated battle management capability in a countermeasure environment. They are critical in keeping pace with the evolving threat. Further, Hercules algorithms aid BMDS decision logic and enable the BMDS to make better battle management decisions, thus optimizing the utility of scarce resources. Hercules provides technical assistance to the BMDS elements during algorithm integration. Flight test data (domestic and foreign) is exploited to develop appropriate high fidelity models that are used for algorithm, element, and system testing that leads to improvements to the future BMDS Blocks. Hercules will provide requirements for and participate in BMDS system, element, and component tests as test opportunities arise. Dedicated Hercules tests for clutter mitigation and FBS algorithms, similar to CMCM tests are in planning and expected to occur in FY08 or FY09.

Hercules has several major functional areas:

- Decision Architecture applies advanced decision theory to improve real-time BMDS command and control, battle management and communications (C2BMC) capability. The Decision Architecture develops multi-sensor tracking and discrimination algorithms that use the output of other Hercules algorithm development efforts and develops resource management algorithms that coordinate the use of BMDS weapons and sensors. Multi-sensor discrimination permits target selection based on information gained from multiple sensors. Since multiple sensors observe different characteristics of threat objects, the Discrimination Fusion Engine (DFE) combines data to provide a more complete picture of the threat missile complex. The coordinated sensor and weapon management provides decision aids to the missile defense commander that will improve the use of different BMDS sensors and weapons. This capability will lead to better situational awareness, sensor resource allocation, and weapon magazine management options for integration into Global Engagement Manager (GEM).
- The Forward Based Sensors (FBS) effort develops discrimination algorithms that take advantage of unique FBS observables to provide robust discrimination solutions. FBS develops algorithms for both radar sensors and electro-optical sensors. The initial Hercules radar discrimination algorithm suite enables the AN/TPY-2 to perform the forward based discrimination function. Additional Hercules radar discrimination algorithms expand the AN/TPY-2 discrimination capability. Hercules will also support the integration of these algorithms on the Sea-Based X-Band (SBX)

radar. Hercules works with the MDA Sensors program to integrate the initial passive optics algorithms into an AIRS. Hercules also works with the Aegis program to provide a modified FBS capability for the SPY-1 radar.

- The Hercules Blue Team develops advanced algorithms that exploit a wide range of radar and electro-optical sensor technology areas. The Blue Team algorithms provide fire control, tracking, discrimination, and control algorithms with a primary focus on single sensor or kill vehicle applications and track management among BMDS sensors and weapons. These algorithms will improve surveillance sensors [Sea-Based X-Band Radar and Space Surveillance & Tracking System (STSS)], kill vehicles [including the Exoatmospheric Kill Vehicle (EKV), THAAD kill vehicle and the Multiple Kill Vehicle (MKV)], and weapon systems [including Aegis BMD and the Kinetic Energy Interceptor (KEI)].
- The Corporate Clutter Working Group (CCWG) develops algorithms to mitigate the effects of countermeasures used to reduce the effectiveness of BMDS sensors. These algorithms support tracking and discrimination in the presence of clutter countermeasures. In many cases, this group has the only effort within MDA working to mitigate a specific clutter issues. For each of the above task areas, a number of efforts have been identified to deliver tangible products to the BMDS Elements that address MDA strategic goals, such as birth-to-death track, forward-based sensor (FBS), multiple kill vehicles (MKV), battle management (C2BMC), and discrimination.
- The Engineering and Integration supports all Hercules development, provides an independent test capability within Hercules, and performs system engineering functions with the BMDS elements to facilitate algorithm transition. The Threat Engineering group generates realistic, simulated threat data for algorithm development and provides threat data to Hercules developers and BMDS elements in the form of Threat Data Packages (TDPs). The Digital Test Group conducts capability testing of developed algorithms to verify algorithm robustness and identify BMDS functions that require improvement prior to integration in operational systems. The Flight Test Group enables Hercules algorithm testing during BMDS flight test events using the BMDS Fusion Toolbox (BFT) sidecars. The Integration and Systems Engineering group reviews technical progress of the algorithms, provides recommendations to algorithm developers for improvements during the development process, and provides technical details to engineers in MDA System Engineering and the elements to perform system benefit analysis and integration of Hercules algorithms into the BMDS. Technical progress reviews occur at Algorithm-to-Test Transition (ATT) meetings, where developers certify their algorithms are ready for test, and at Characterization and Transition (CaT) meetings, where the test team presents results of their algorithm digital testing.

The Applied Data Analysis Center (ADAC) provides the seed corn for the future development of the BMDS. Rooted in forward-looking analysis of both domestic and foreign data collections on all classes of missile systems, ADAC identifies critical phenomenologies with the potential to improve the BMDS performance against evolving threats, and countermeasures: as well as to improve the performance of BMDS sensors, weapons and C2BMC. Analysts identify advanced concepts that exploit available phenomenology. These concepts are transferred to Project Hercules and other MDA organizations. Both algorithm and sensor concepts from ADAC focus on such areas as: birth-to-death track; FBS; countermeasure mitigation; MKV, kill enhancement device (KED), and advance discrimination initiative (ADI); as well as the Decision Architecture.

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B. Accomplishments/Planned Program

	FY 2007	FY 2008	FY 2009
Decision Architecture	4,950	0	0
RDT&E Articles (Quantity)	0	0	0

FY07 Accomplishments:

- Conducted joint engineering and development with C2BMC to develop specific requirements and demonstrate interfaces for C2BMC Block 08 target selection capability (multi-sensor discrimination fusion for AN/TPY-2 / SBX fusion). Delivered two engineering releases to X-Lab.
- Extended the target selection development to include emerging sensor observations specifically exploiting new features from STSS.
- Provided support for integration of the Integrated Engagement Planner into the Global Engagement Manager.
- Extended the development of the integrated engagement planning capability to include sensor-target pairing.
- Coordinated Digital and BFT flight tests of DFE and tracking capability and Suite 1 implementation into Aegis.

	FY 2007	FY 2008	FY 2009
Forward Based Sensors	4,488	0	0
RDT&E Articles (Quantity)	0	0	0

FY07 Accomplishments:

- Conducted digital and flight test of additional forward-based discrimination algorithms that will enhance radar (RF) and optical (EO/IR) sensor performance.
- Completed development of some and continued development of additional forward-based discrimination algorithms.
- Conducted joint engineering, development and integration with Aegis of modified FBS Suite 1 algorithms for Aegis Block 08 discrimination capability. Used at-sea demonstration of Aegis sidecar for Aegis discrimination algorithm development (FTM-12).
- Supported integration of passive optics discrimination algorithms into the STSS Test Bed.
- Started focused development of more general target region identification algorithm (D3) to support emerging weapon capabilities.

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	FY 2007	FY 2008	FY 2009
Blue Team	8,613	0	0
RDT&E Articles (Quantity)	0	0	0

FY07 Accomplishments:

- Supported engineering integration of correlation and target object map algorithms into the GFC/C that will improve the GMD system use of AN/TPY-2 data in the presence of evolving threat countermeasures.
- Continued development and transition of discrimination and kill vehicle enhancements to improve GMD target designation and negation capability.
- Continued development, transition and began integration of Aegis BMD radar and seeker correlation, handover and discrimination enhancements.
- Continued joint development and integration of tracking algorithm into the STSS.
- Continued algorithm development efforts for MKV.
- Started coordination for delivery and transition of MKV discrimination and engagement management capabilities.
- Continued development of advanced physics based discrimination techniques. Continued algorithm development to enhance EKV operations and start coordination for delivery and transition of enhanced EKV algorithms.
- Continued advanced radar architecture algorithm development and started coordination for delivery and transition of radar architecture algorithms.

	FY 2007	FY 2008	FY 2009
Corporate Clutter Working Group	3,200	0	0
RDT&E Articles (Quantity)	0	0	0

FY07 Accomplishments:

- Extended capability of radar clutter mitigation to additional forms of clutter. Supported transition of algorithms for CT-2 masking mitigation to the Green Team and end users.
- Conducted joint engineering requirement and interface specification for FY08/FY09 transition and integration of the integrated mitigation capability (IMC) into BMDS systems (TPY-2).
- Continued development of electro-optical sensor counter-countermeasure algorithms for EO/IR surveillance sensors.
- Continued rapid prototype insertion of clutter mitigation capability into radar string facilities.
- Continued integration of clutter mitigation algorithms into sensor string facility for Block 08 RF Electronic Counter-Countermeasure capability and extend to Block 10 RF Electronic Counter-countermeasure capability.

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- Continued coordination and support delivery and integration of an initial CCM capability for AN/TPY-2 and SBX.

	FY 2007	FY 2008	FY 2009
Engineering and Integration	24,011	0	0
RDT&E Articles (Quantity)	0	0	0

FY07 Accomplishments:

- Developed and delivered enhancements to Threat Data Packages (TDPs) to support algorithm development and test.
- Developed and delivered to MDA System Engineering threat data packages to support ECP-289 effort.
- Supported deployment of Aegis sidecar to conduct at-sea live-time testing operations.
- Participated in BMDS flight tests using sidecars to support algorithm development and transition/integration risk reduction. Supported planning for future BMDS flight tests support.
- Defined sidecar requirements for future BMD test range sensors.
- Continued discussion of current and potential new Engagement Sequence Groups (ESGs) with MDA System Engineering.
- Reviewed MDA interface and specification documents.
- Continued to conduct independent digital characterization testing of algorithms.
- Conducted four ATT and CaT algorithm technical reviews to support transition of additional algorithms from development to independent testing.
- Conducted congressionally mandated plume studies.

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C. Other Program Funding Summary

	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	Total Cost
PE 0207998C BRAC	0	103,219	159,938	61,931	8,724	0	0	333,812
PE 0603175C Ballistic Missile Defense Technology	183,849	108,423	118,718	115,234	120,152	127,012	130,358	903,746
PE 0603881C Ballistic Missile Defense Terminal Defense Segment	1,082,454	1,045,276	1,019,073	795,659	719,847	548,283	439,752	5,650,344
PE 0603882C Ballistic Missile Defense Midcourse Defense Segment	2,985,140	2,243,213	2,209,262	2,276,848	1,385,258	946,437	1,103,532	13,149,690
PE 0603883C Ballistic Missile Defense Boost Defense Segment	622,218	510,241	421,229	423,927	652,642	799,792	991,839	4,421,888
PE 0603884C Ballistic Missile Defense Sensors	514,989	586,121	1,221,143	1,184,280	1,099,649	1,077,632	823,583	6,507,397
PE 0603886C Ballistic Missile Defense System Interceptors	341,358	340,107	386,817	500,966	708,803	815,433	553,136	3,646,620
PE 0603888C Ballistic Missile Defense Test and Targets	584,615	621,861	673,691	672,976	690,938	708,991	719,209	4,672,281
PE 0603890C Ballistic Missile Defense System Core	425,889	413,934	432,262	482,947	605,219	561,947	571,498	3,493,696
PE 0603891C Special Programs - MDA	347,377	196,892	288,315	304,234	538,050	818,136	786,349	3,279,353
PE 0603892C Ballistic Missile Defense Aegis	1,125,426	1,126,337	1,157,783	1,234,220	1,078,539	1,066,712	1,102,542	7,891,559
PE 0603893C Space Tracking & Surveillance System	311,402	231,528	242,441	266,509	560,130	735,727	938,191	3,285,928
PE 0603894C Multiple Kill Vehicle	133,615	229,943	354,455	488,294	649,632	708,582	879,385	3,443,906
PE 0603895C BMD System Space Program	0	16,552	29,771	41,638	56,199	133,915	157,548	435,623
PE 0603896C BMD C2BMC	249,179	447,616	289,277	287,194	270,762	256,767	259,159	2,059,954
PE 0603898C BMD Joint Warfighter Support	49,833	49,394	69,982	73,997	77,205	80,168	81,948	482,527
PE 0603904C Missile Defense Integration & Operations Center	104,389	78,557	96,404	100,437	100,366	101,512	102,840	684,505
PE 0603905C BMD Concurrent Test and Operations	21,870	0	0	0	0	0	0	21,870
PE 0603906C Regarding Trench	0	1,986	2,978	4,964	4,963	8,933	8,933	32,757
PE 0603907C Sea Based X-Band Radar (SBX)	0	165,243	0	0	0	0	0	165,243
PE 0605502C Small Business Innovative Research - MDA	142,510	0	0	0	0	0	0	142,510
PE 0901585C Pentagon Reservation	15,527	6,019	19,734	5,040	5,284	5,370	5,456	62,430
PE 0901598C Management Headquarters - MDA	93,350	80,392	86,453	70,355	69,855	69,855	69,855	540,115

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D. Acquisition Strategy

Hercules is key to MDA's capability-based acquisition strategy, which emphasizes assessment, spiral-development testing and evolutionary acquisition through the definition of two-year capability blocks. Hercules develops algorithms providing enhanced and new capabilities through early TRL levels (TRL 1-5) into common baseline prototypes and supports transition and integration into specific BMDS Elements or Components.

Hercules algorithms are designed to provide improved or new capabilities to the BMDS and be common across a family of systems (i.e., X-band radars or EO/IR KV seekers) or applicable to BMDS level operations (i.e., C2BMC). The implementing elements or components will then engineer the common prototype into operational software. Hercules activities are performed by subject matter experts from government, Federally Funded Research and Development Centers (FFRDCs), University Affiliated Research Centers (UARCs), private industry including major defense contractors, government laboratories, and System Engineering and Technical Assistance (SETA) contractors.
Hercules uses annual task orders through various contracting methods (i.e., executing agents, direct contracts, modifications to other BMDS contracts) to fund and guide development activities. Battle manager, weapon, and sensor capability improvements will be transitioned into the future operational force structure by integrating the Hercules algorithms into BMDS components. BMDS component managers plan, budget, and procure the necessary hardware and software for deployed and sustained operational forces.

Missile Defense Agency (MDA) Exhibit R-3 RDT&E Project Cost Analysis	Date: February 2008
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I. Product Development Cost ($ in Thousands)

Cost Categories:	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY 2008 Cost	FY 2008 Award/ Oblg Date	FY 2009 Cost	FY 2009 Award/ Oblg Date	Total Cost
Decision Architecture								
Algorithm Development	C/CPFF	SPARTA/ Arlington	4,950	0	N/A	0	N/A	4,950
Forward Based Sensors								
Algorithm Development	C/Various	Various/Various	4,488	0	N/A	0	N/A	4,488
Blue Team								
Algorithm Development	C/Various	Various/Various	8,613	0	N/A	0	N/A	8,613
Corporate Clutter Working Group								
Algorithm Development	C/Various	Various/Various	3,200	0	N/A	0	N/A	3,200
Engineering and Integration								
Algorithm Development	C/Various	Various/Various	10,000	0	N/A	0	N/A	10,000
Subtotal Product Development			31,251	0		0		31251

Remarks

II. Support Costs Cost ($ in Thousands)

Cost Categories:	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY 2008 Cost	FY 2008 Award/ Oblg Date	FY 2009 Cost	FY 2009 Award/ Oblg Date	Total Cost
Engineering and Integration								
Algorithm Support	C/Various	Various/ Arlington	7,716	0	N/A	0	N/A	7,716
Subtotal Support Costs			7,716	0		0		7716

Remarks

Missile Defense Agency (MDA) Exhibit R-3 RDT&E Project Cost Analysis	Date: February 2008
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III. Test and Evaluation Cost ($ in Thousands)

Cost Categories:	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY 2008 Cost	FY 2008 Award/ Oblg Date	FY 2009 Cost	FY 2009 Award/ Oblg Date	Total Cost
Engineering and Integration								
Algorithm Test and Evaluation	C/MIPR	SMDC/Various	5,295	0	N/A	0	N/A	5,295
Subtotal Test and Evaluation			5,295	0		0		5295

Remarks

IV. Management Services Cost ($ in Thousands)

Cost Categories:	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY 2008 Cost	FY 2008 Award/ Oblg Date	FY 2009 Cost	FY 2009 Award/ Oblg Date	Total Cost
Engineering and Integration								
Algorithm Management Support	C/Various	Various/ Arlington	1,000	0	N/A	0	N/A	1,000
Subtotal Management Services			1,000	0		0		1000

Remarks

Project Total Cost			45,262	0		0		45,262

Remarks

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COST ($ in Thousands)	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013
WX02 Hercules Capability Development	0	50,018	54,342	53,360	54,786	50,394	51,210
RDT&E Articles Qty	0	0	0	0	0	0	0

Note: Starting in FY08, 0505 Hercules moved to a new project named WX02 Hercules Capability Development.

A. Mission Description and Budget Item Justification

Hercules is a national effort to develop robust, physics-based detection, tracking, and discrimination prototype software (algorithms), and transfers them to BMDS elements in order to improve the performance of C2BMC, sensor, and weapon functions. Hercules algorithms improve sensor and weapon element detection, tracking and discrimination, improve integration of sensor data within C2BMC, and expand integrated battle management capability in a countermeasure environment. They are critical in keeping pace with the evolving threat. Further, Hercules algorithms aid BMDS decision logic and enable the BMDS to make better battle management decisions, thus optimizing the utility of scarce resources. Hercules provides technical assistance to the BMDS elements during algorithm integration. Flight test data (domestic and foreign) is exploited to develop appropriate high fidelity models that are used for algorithm, element, and system testing that leads to improvements to the future BMDS Blocks. Hercules will provide requirements for and participate in BMDS system, element, and component tests as test opportunities arise. Dedicated Hercules tests for clutter mitigation and FBS algorithms, similar to CMCM tests are in planning and expected to occur in FY08 or FY09.

Hercules has several major functional areas:

- Decision Architecture applies advanced decision theory to improve real-time BMDS command and control, battle management and communications (C2BMC) capability. The Decision Architecture develops multi-sensor tracking and discrimination algorithms that use the output of other Hercules algorithm development efforts and develops resource management algorithms that coordinate the use of BMDS weapons and sensors. Multi-sensor discrimination permits target selection based on information gained from multiple sensors. Since multiple sensors observe different characteristics of threat objects, the Discrimination Fusion Engine (DFE) combines data to provide a more complete picture of the threat missile complex. The coordinated sensor and weapon management provides decision aids to the missile defense commander that will improve the use of different BMDS sensors and weapons. This capability will lead to better situational awareness, sensor resource allocation, and weapon magazine management options for integration into Global Engagement Manager (GEM).
- The Forward Based Sensors (FBS) effort develops discrimination algorithms that take advantage of unique FBS observables to provide robust discrimination solutions. FBS develops algorithms for both radar sensors and electro-optical sensors. The initial Hercules radar discrimination algorithm suite enables the AN/TPY-2 to perform the forward based discrimination function. Additional Hercules radar discrimination algorithms expand the AN/TPY-2 discrimination capability. Hercules will also support the integration of these algorithms on the Sea-Based X-Band (SBX)

radar. Hercules works with the MDA Sensors program to integrate the initial passive optics algorithms into an AIRS. Hercules also works with the Aegis program to provide a modified FBS capability for the SPY-1 radar.

- The Hercules Blue Team develops advanced algorithms that exploit a wide range of radar and electro-optical sensor technology areas. The Blue Team algorithms provide fire control, tracking, discrimination, and control algorithms with a primary focus on single sensor or kill vehicle applications and track management among BMDS sensors and weapons. These algorithms will improve surveillance sensors [Sea-Based X-Band Radar and Space Surveillance & Tracking System (STSS)], kill vehicles [including the Exoatmospheric Kill Vehicle (EKV), THAAD kill vehicle and the Multiple Kill Vehicle (MKV)], and weapon systems [including Aegis BMD and the Kinetic Energy Interceptor (KEI)].
- The Corporate Clutter Working Group (CCWG) develops algorithms to mitigate the effects of countermeasures used to reduce the effectiveness of BMDS sensors. These algorithms support tracking and discrimination in the presence of clutter countermeasures. In many cases, this group has the only effort within MDA working to mitigate a specific clutter issues. For each of the above task areas, a number of efforts have been identified to deliver tangible products to the BMDS Elements that address MDA strategic goals, such as birth-to-death track, forward-based sensor (FBS), multiple kill vehicles (MKV), battle management (C2BMC), and discrimination.
- The Engineering and Integration supports all Hercules development, provides an independent test capability within Hercules, and performs system engineering functions with the BMDS elements to facilitate algorithm transition. The Threat Engineering group generates realistic, simulated threat data for algorithm development and provides threat data to Hercules developers and BMDS elements in the form of Threat Data Packages (TDPs). The Digital Test Group conducts capability testing of developed algorithms to verify algorithm robustness and identify BMDS functions that require improvement prior to integration in operational systems. The Flight Test Group enables Hercules algorithm testing during BMDS flight test events using the BMDS Fusion Toolbox (BFT) sidecars. The Integration and Systems Engineering group reviews technical progress of the algorithms, provides recommendations to algorithm developers for improvements during the development process, and provides technical details to engineers in MDA System Engineering and the elements to perform system benefit analysis and integration of Hercules algorithms into the BMDS. Technical progress reviews occur at Algorithm-to-Test Transition (ATT) meetings, where developers certify their algorithms are ready for test, and at Characterization and Transition (CaT) meetings, where the test team presents results of their algorithm digital testing.

The Applied Data Analysis Center (ADAC) provides the seed corn for the future development of the BMDS. Rooted in forward-looking analysis of both domestic and foreign data collections on all classes of missile systems, ADAC identifies critical phenomenologies with the potential to improve the BMDS performance against evolving threats, and countermeasures: as well as to improve the performance of BMDS sensors, weapons and C2BMC. Analysts identify advanced concepts that exploit available phenomenology. These concepts are transferred to Project Hercules and other MDA organizations. Both algorithm and sensor concepts from ADAC focus on such areas as: birth-to-death track; FBS; countermeasure mitigation; MKV, kill enhancement device (KED), and advance discrimination initiative (ADI); as well as the Decision Architecture.

Missile Defense Agency (MDA) Exhibit R-2A RDT&E Project Justification	Date: February 2008
APPROPRIATION/BUDGET ACTIVITY: RDT&E, DW/04 Advanced Component Development and Prototypes (ACD&P)	R-1 NOMENCLATURE: 0603897C BMD Hercules

B. Accomplishments/Planned Program

	FY 2007	FY 2008	FY 2009
Decision Architecture	0	11,053	12,249
RDT&E Articles (Quantity)	0	0	0

FY08 Planned Program:
- Deliver to C2BMC and support integration of the target selection capability into the C2BMC
- Deliver to C2BMC the sensor target pairing capability.
- Expand flight test demonstrations of target selection capability to include expected features from emerging sensors (adjunct radar, STSS).
- Start extending the Decision Architecture to distributed operations focusing on System level Tracking.
- Continue digital and BFT flight test demonstration of evolving Decision Architecture components.

FY09 Planned Program:
- Support integration of the sensor target pairing capability into the C2BMC
- Conduct joint engineering and development with C2BMC of target selection algorithms that use additional sensor capability.
- Continue digital and BFT flight test demonstration of evolving Decision Architecture components.
- Continue extending the Decision Architecture to distributed operations including System Level Tracking.
- Modify target selection capability to include Hercules-developed lethal region (D3) identification capability.

	FY 2007	FY 2008	FY 2009
Forward Based Sensors	0	2,665	2,665
RDT&E Articles (Quantity)	0	0	0

FY08 Planned Program:
- Complete joint engineering and development with Aegis of modified FBS Suite 1 algorithms for Aegis Block 1.0 discrimination capability. Use at-sea demonstration of Aegis sidecar for Aegis discrimination algorithm development.
- Continue development of D3 discrimination capabilities.
- Begin development of advanced tracking algorithm for STSS.

Missile Defense Agency (MDA) Exhibit R-2A RDT&E Project Justification	Date: February 2008
APPROPRIATION/BUDGET ACTIVITY: **RDT&E, DW/04 Advanced Component Development and Prototypes (ACD&P)**	R-1 NOMENCLATURE: **0603897C BMD Hercules**

FY09 Planned Program:
- Continue development of D3 discrimination capabilities. Start coordination for delivery and transition of D3 discrimination capabilities.
- Complete integration of adapted FBS algorithms for operation on Aegis SPY-1 sensor.
- Continue development of advance tracking algorithm for STSS

	FY 2007	FY 2008	FY 2009
Blue Team	0	5,438	5,438
RDT&E Articles (Quantity)	0	0	0

FY08 Planned Program:
- Conduct joint requirement and interface definition for advanced radar resource management and data processing (radar architecture).
- Conduct joint algorithm insertion / assessment with STSS.
- Continue support of Aegis BMD algorithm integration.
- Continue development of enhanced tracking, correlation, and discrimination algorithms.
- Start coordination for delivery and transition of enhanced tracking, correlation, and discrimination algorithms.
- Continue development of advanced physics based discrimination techniques.
- Coordinate Digital and BFT flight tests of algorithms.

FY09 Planned Program:
- Complete Aegis BMD algorithm integration.
- Deliver and support integration of enhanced tracking, correlation, and discrimination algorithms.
- Start coordination for delivery and transition advanced physics based discrimination techniques.
- Coordinate Digital and BFT flight tests of algorithms

Missile Defense Agency (MDA) Exhibit R-2A RDT&E Project Justification	Date: February 2008
APPROPRIATION/BUDGET ACTIVITY: RDT&E, DW/04 Advanced Component Development and Prototypes (ACD&P)	R-1 NOMENCLATURE: 0603897C BMD Hercules

	FY 2007	FY 2008	FY 2009
Corporate Clutter Working Group	0	899	899
RDT&E Articles (Quantity)	0	0	0

FY08 Planned Program:

- Support integration of an initial CCM capability for AN/TPY-2 and SBX.
- Improve clutter mitigation capability in response to joint engineering effort and digital test effort.
- Continue integration of clutter mitigation algorithms into sensor string facility for Block 1.0 RF Electronic Counter-Countermeasure capability.
- Operate clutter mitigation algorithms during appropriate BMDS flight test.
- Start development of enhanced algorithms for detection and tracking in advanced RF clutter.
- Support engineering planning for transition and integration of the Block 1.0 CCM capability into the BMDS systems

FY09 Planned Program:

- Complete integration support of initial CCM capability.
- Continue support of integration of Block 1.0 clutter mitigation capability.
- Continue development of enhanced algorithms for detection and tracking in advanced RF clutter
- Improve clutter mitigation capability in response to joint engineering effort and digital test effort.
- Define requirements for future RF and EO/IR clutter mitigation capabilities.

	FY 2007	FY 2008	FY 2009
Engineering and Integration	0	20,619	20,699
RDT&E Articles (Quantity)	0	0	0

FY08 Planned Program:

- Continue development and delivery of evolving Threat Data Packages (TDPs) to support algorithm development and capability insertion.
- Participate in BMDS flight tests using sidecars to support algorithm development and testing. Support planning for future BMDS flight tests.
- Begin procurement of an additional sidecar for new BMD test range sensors.
- Continue identification and discussion of potential new ESGs with MDA System Engineering.
- Conduct digital characterization testing of algorithms.
- Conduct at least four ATT and CaT algorithm technical reviews per year.

Missile Defense Agency (MDA) Exhibit R-2A RDT&E Project Justification	Date: February 2008
APPROPRIATION/BUDGET ACTIVITY: RDT&E, DW/04 Advanced Component Development and Prototypes (ACD&P)	R-1 NOMENCLATURE: 0603897C BMD Hercules

FY09 Planned Program:

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- Participate in BMDS flight tests using sidecars to support algorithm development and testing. Support planning for future BMDS flight tests.
- Complete procurement of an additional sidecar for new BMD test range sensors.
- Continue identification and discussion of potential new ESGs with MDA System Engineering.
- Conduct digital characterization testing of algorithms.
- Conduct at least four ATT and CaT algorithm technical reviews per year.

	FY 2007	FY 2008	FY 2009
ADAC	0	9,344	12,392
RDT&E Articles (Quantity)	0	0	0

FY08 Planned Program:

- Analyze relevant new data collections--both domestic and non-cooperative foreign. Perform phenomenology analysis and data exploitation in support of Advanced Technology goals. Provide algorithm and sensor concepts to Project Hercules and the Elements.
- Continue analysis of MASINT radar data collected on foreign non-cooperative events to characterize new, evolving, and high tech threats, with a concentration on countermeasure characterization. Continue analysis of back-logged MASINT radar data relevant to current BMD issues such as forward-based discrimination algorithms, countermeasures, and RCS threat modeling.
- Complete the Forward-Based Sensors (FBS) Study.
- Complete assessing optical features for burnout estimation. Addresses a specific request to include liquid fuel propellants in the effort.
- Perform threat modeling supporting the Hercules Threat Engineering group: certain applications requiring threat signature data have been identified by the Project Hercules, STSS, MKV and THAAD. ADAC has identified an approach for bridging the gap between the (relatively slow) high-fidelity-data-anchored model and the (low fidelity) fast-running or table-look-up requirements. The effort will focus on continued development of this alternative approach.
- Host a number of MDA community-wide forums, an annual Clutter Type 4 (CT4) Workshop, two new Red/Blue games which will combine RF and IR as well as applied Project Hercules algorithms and Decision Architecture.
- Continue an anti-simulation countermeasure effectiveness study. The work in this area will focus on examining the suitability of certain correlated EO/IR and RF phenomenologies for possible exploitation by BMDS systems.
- Complete investigation of non-parametric motion solution using passive optics, expanding on the current radar efforts.

- Continue low thrust phenomenology analysis and modeling in support of Project Hercules FBS PO-2 algorithm.
- Continue developing and testing several new RF techniques, including clutter mitigation and target characterization for Project Hercules.
- Improve fidelity in existing models.
- Conduct study of potential impact to BMDS functions such as track, FBS, discrimination, countermeasures.
- Provide RF and EO/IR flight test data collection requirements support to Systems Engineering.

FY09 Planned Program:

- Analyze relevant new data collections--both domestic and non-cooperative foreign. Perform phenomenology analysis and data exploitation in support of Advanced Technology goals. Provide algorithm and sensor concepts to Project Hercules and the Elements.
- Continue analysis of MASINT radar data collected on foreign non-cooperative events to characterize new, evolving, and high tech threats, with a concentration on countermeasure characterization. Continue analysis of back-logged MASINT radar data relevant to current BMD issues such as forward-based discrimination algorithms, countermeasures, and RCS threat modeling.
- Perform threat modeling supporting the Hercules Threat Engineering group: certain applications requiring threat signature data have been identified by the Project Hercules, STSS, MKV and THAAD. ADAC has identified an approach for bridging the gap between the (relatively slow) high-fidelity-data-anchored model and the (low fidelity) fast-running or table-look-up requirements. The effort will focus on continued development of this alternative approach.
- Host a number of MDA community-wide forums, an annual Clutter Type 4 (CT4) Workshop, two new Red/Blue games which will combine RF and IR as well as applied Project Hercules algorithms and Decision Architecture.
- Complete an anti-simulation countermeasure effectiveness study. The work in this area will focus on examining the suitability of certain correlated EO/IR and RF phenomenologies for possible exploitation by BMDS systems.
- Complete low thrust phenomenology analysis and modeling in support of Project Hercules FBS PO-2 algorithm.
- Continue developing and testing several new RF techniques, including clutter mitigation and target characterization for Project Hercules.
- Improve fidelity in existing models.
- Continue study of potential impact to BMDS functions such as track, FBS, discrimination, countermeasures.
- Provide RF and EO/IR flight test data collection requirements support to Systems Engineering.
- Analyze relevant radar observations of threat tests to exploit certain characteristics in support of Hercules work.

Missile Defense Agency (MDA) Exhibit R-2A RDT&E Project Justification	Date: February 2008
APPROPRIATION/BUDGET ACTIVITY: RDT&E, DW/04 Advanced Component Development and Prototypes (ACD&P)	R-1 NOMENCLATURE: 0603897C BMD Hercules

C. Other Program Funding Summary

	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	Total Cost
PE 0207998C BRAC	0	103,219	159,938	61,931	8,724	0	0	333,812
PE 0603175C Ballistic Missile Defense Technology	183,849	108,423	118,718	115,234	120,152	127,012	130,358	903,746
PE 0603881C Ballistic Missile Defense Terminal Defense Segment	1,082,454	1,045,276	1,019,073	795,659	719,847	548,283	439,752	5,650,344
PE 0603882C Ballistic Missile Defense Midcourse Defense Segment	2,985,140	2,243,213	2,209,262	2,276,848	1,385,258	946,437	1,103,532	13,149,690
PE 0603883C Ballistic Missile Defense Boost Defense Segment	622,218	510,241	421,229	423,927	652,642	799,792	991,839	4,421,888
PE 0603884C Ballistic Missile Defense Sensors	514,989	586,121	1,221,143	1,184,280	1,099,649	1,077,632	823,583	6,507,397
PE 0603886C Ballistic Missile Defense System Interceptors	341,358	340,107	386,817	500,966	708,803	815,433	553,136	3,646,620
PE 0603888C Ballistic Missile Defense Test and Targets	584,615	621,861	673,691	672,976	690,938	708,991	719,209	4,672,281
PE 0603890C Ballistic Missile Defense System Core	425,889	413,934	432,262	482,947	605,219	561,947	571,498	3,493,696
PE 0603891C Special Programs - MDA	347,377	196,892	288,315	304,234	538,050	818,136	786,349	3,279,353
PE 0603892C Ballistic Missile Defense Aegis	1,125,426	1,126,337	1,157,783	1,234,220	1,078,539	1,066,712	1,102,542	7,891,559
PE 0603893C Space Tracking & Surveillance System	311,402	231,528	242,441	266,509	560,130	735,727	938,191	3,285,928
PE 0603894C Multiple Kill Vehicle	133,615	229,943	354,455	488,294	649,632	708,582	879,385	3,443,906
PE 0603895C BMD System Space Program	0	16,552	29,771	41,638	56,199	133,915	157,548	435,623
PE 0603896C BMD C2BMC	249,179	447,616	289,277	287,194	270,762	256,767	259,159	2,059,954
PE 0603898C BMD Joint Warfighter Support	49,833	49,394	69,982	73,997	77,205	80,168	81,948	482,527
PE 0603904C Missile Defense Integration & Operations Center	104,389	78,557	96,404	100,437	100,366	101,512	102,840	684,505
PE 0603905C BMD Concurrent Test and Operations	21,870	0	0	0	0	0	0	21,870
PE 0603906C Regarding Trench	0	1,986	2,978	4,964	4,963	8,933	8,933	32,757
PE 0603907C Sea Based X-Band Radar (SBX)	0	165,243	0	0	0	0	0	165,243
PE 0605502C Small Business Innovative Research - MDA	142,510	0	0	0	0	0	0	142,510
PE 0901585C Pentagon Reservation	15,527	6,019	19,734	5,040	5,284	5,370	5,456	62,430
PE 0901598C Management Headquarters - MDA	93,350	80,392	86,453	70,355	69,855	69,855	69,855	540,115

Missile Defense Agency (MDA) Exhibit R-2A RDT&E Project Justification	Date: February 2008
APPROPRIATION/BUDGET ACTIVITY: **RDT&E, DW/04 Advanced Component Development and Prototypes (ACD&P)**	R-1 NOMENCLATURE: **0603897C BMD Hercules**

D. Acquisition Strategy

Hercules is key to MDA's capability-based acquisition strategy, which emphasizes assessment, spiral-development testing and evolutionary acquisition. Hercules develops algorithms providing enhanced and new capabilities through early TRL levels (TRL 1-5) into common baseline prototypes and supports transition and integration into specific BMDS Elements or Components.

Hercules algorithms are designed to provide improved or new capabilities to the BMDS and be common across a family of systems (i.e., X-band radars or EO/IR KV seekers) or applicable to BMDS level operations (i.e., C2BMC). The implementing elements or components will then engineer the common prototype into operational software. Hercules activities are performed by subject matter experts from government, Federally Funded Research and Development Centers (FFRDCs), University Affiliated Research Centers (UARCs), private industry including major defense contractors, government laboratories, and System Engineering and Technical Assistance (SETA) contractors.

Hercules uses annual task orders through various contracting methods (i.e., executing agents, direct contracts, modifications to other BMDS contracts) to fund and guide development activities. Battle manager, weapon, and sensor capability improvements will be transitioned into the future operational force structure by integrating the Hercules algorithms into BMDS components. BMDS component managers plan, budget, and procure the necessary hardware and software for deployed and sustained operational forces.

Missile Defense Agency (MDA) Exhibit R-3 RDT&E Project Cost Analysis	Date: February 2008
APPROPRIATION/BUDGET ACTIVITY: RDT&E, DW/04 Advanced Component Development and Prototypes (ACD&P)	R-1 NOMENCLATURE: 0603897C BMD Hercules

I. Product Development Cost ($ in Thousands)

Cost Categories:	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY 2008 Cost	FY 2008 Award/ Oblg Date	FY 2009 Cost	FY 2009 Award/ Oblg Date	Total Cost
Decision Architecture								
Algorithm Development	C/CPFF	SPARTA/ Arlington	0	11,053	1/4Q	12,249	1/4Q	23,302
Forward Based Sensors								
Algorithm Development	C/CPFF	Raytheon/ Massachusetts	0	2,665	1/4Q	2,665	1/4Q	5,330
Blue Team								
Algorithm Development	C/FFRDC	MIT/LL/ Massachusetts	0	5,438	1/4Q	5,438	1/4Q	10,876
Corporate Clutter Working Group								
Algorithm Development	C/MIPR	Northrop Grumman	0	899	1/4Q	899	1/4Q	1,798
Subtotal Product Development			0	20,055		21,251		41306

Remarks

II. Support Costs Cost ($ in Thousands)

Cost Categories:	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY 2008 Cost	FY 2008 Award/ Oblg Date	FY 2009 Cost	FY 2009 Award/ Oblg Date	Total Cost
Engineering and Integration								
Algorithm Development	C/Various	SMDC/ Huntsville AL	0	2,388	1/4Q	2,388	1/4Q	4,776
Subtotal Support Costs			0	2,388		2,388		4776

Remarks

Missile Defense Agency (MDA) Exhibit R-3 RDT&E Project Cost Analysis	Date: February 2008
APPROPRIATION/BUDGET ACTIVITY: RDT&E, DW/04 Advanced Component Development and Prototypes (ACD&P)	R-1 NOMENCLATURE: 0603897C BMD Hercules

III. Test and Evaluation Cost ($ in Thousands)

Cost Categories:	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY 2008 Cost	FY 2008 Award/ Oblg Date	FY 2009 Cost	FY 2009 Award/ Oblg Date	Total Cost
Engineering and Integration								
Evaluation and Testing	C/Various	SMDC/ Huntsville AL	0	5,310	1/4Q	5,310	1/4Q	10,620
Modeling and Simulation	C/Various	MIT/LL/ Massachusets	0	2,970	1/4Q	2,970	1/4Q	5,940
ADAC								
Phenomenology Testing	C/Various	SMDC/ Huntsville AL	0	9,344	1/4Q	12,392	1/4Q	21,736
Subtotal Test and Evaluation			0	17,624		20,672		38296

Remarks

IV. Management Services Cost ($ in Thousands)

Cost Categories:	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY 2008 Cost	FY 2008 Award/ Oblg Date	FY 2009 Cost	FY 2009 Award/ Oblg Date	Total Cost
Engineering and Integration								
Algorithm Development	C/Various	Various/ Arlington	0	9,951	1/4Q	10,031	1/4Q	19,982
Subtotal Management Services			0	9,951		10,031		19982

Remarks

Project Total Cost			0	50,018		54,342		104,360

Remarks

Missile Defense Agency (MDA) Exhibit R-2A RDT&E Project Justification	Date: February 2008
APPROPRIATION/BUDGET ACTIVITY: RDT&E, DW/04 Advanced Component Development and Prototypes (ACD&P)	R-1 NOMENCLATURE: 0603897C BMD Hercules

COST ($ in Thousands)	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013
0602 Program-Wide Support	1,006	0	0	0	0	0	0
RDT&E Articles Qty	0	0	0	0	0	0	0

Note: Efforts within this project continue in FY 2008 under project ZX40

A. Mission Description and Budget Item Justification

Program-Wide Support provides funding for common non-headquarters support functions across the entire program such as strategic planning, program integration, business management, cost estimating, contracting, and financial management, to include preparation of financial statements, reimbursement of financial services provided by DFAS, internal review and audit, earned-value management, and program assessment. Includes costs for both government civilians performing these functions, as well as outside services and support contractors that augment government staff in these areas. Many of these costs reside within the Missile Defense Agency Executing Agents in the Services: Army Space and Missile Defense Command, Army PEO Space and Missile Defense, Office of Naval Research, and various Air Force laboratory and acquisition activities, although some functions and costs within this program element are performed by MDA employees assigned within the National Capital Region (NCR). Other costs included herein provide facility capabilities for MDA Executing Agent locations, such as physical and technical security, legal services, travel and training, office and equipment leases, utilities and communications, supplies and maintenance, and similar operating expenses. Also includes funding for charges on canceled appropriations in accordance with Public Law 101-510, legal settlements, and foreign currency fluctuation on a limited number of foreign contracts.

B. Accomplishments/Planned Program

	FY 2007	FY 2008	FY 2009
Civilian Salaries and Support	1,006	0	0
RDT&E Articles (Quantity)	0	0	0

See Section A: Mission Description and Budget Item Justification

Missile Defense Agency (MDA) Exhibit R-2A RDT&E Project Justification	Date: February 2008
APPROPRIATION/BUDGET ACTIVITY: RDT&E, DW/04 Advanced Component Development and Prototypes (ACD&P)	R-1 NOMENCLATURE: 0603897C BMD Hercules

C. Other Program Funding Summary

	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	Total Cost
PE 0207998C BRAC	0	103,219	159,938	61,931	8,724	0	0	333,812
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PE 0603881C Ballistic Missile Defense Terminal Defense Segment	1,082,454	1,045,276	1,019,073	795,659	719,847	548,283	439,752	5,650,344
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PE 0603886C Ballistic Missile Defense System Interceptors	341,358	340,107	386,817	500,966	708,803	815,433	553,136	3,646,620
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PE 0603905C BMD Concurrent Test and Operations	21,870	0	0	0	0	0	0	21,870
PE 0603906C Regarding Trench	0	1,986	2,978	4,964	4,963	8,933	8,933	32,757
PE 0603907C Sea Based X-Band Radar (SBX)	0	165,243	0	0	0	0	0	165,243
PE 0605502C Small Business Innovative Research - MDA	142,510	0	0	0	0	0	0	142,510
PE 0901585C Pentagon Reservation	15,527	6,019	19,734	5,040	5,284	5,370	5,456	62,430
PE 0901598C Management Headquarters - MDA	93,350	80,392	86,453	70,355	69,855	69,855	69,855	540,115

Missile Defense Agency (MDA) Exhibit R-2A RDT&E Project Justification	Date: February 2008
APPROPRIATION/BUDGET ACTIVITY: **RDT&E, DW/04 Advanced Component Development and Prototypes (ACD&P)**	R-1 NOMENCLATURE: **0603897C BMD Hercules**

COST ($ in Thousands)	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013
ZX40 Program-Wide Support	0	2,444	1,613	1,929	1,614	1,508	1,574
RDT&E Articles Qty	0	0	0	0	0	0	0

Note: In accordance with the Missile Defense Agency revised block structure, the content previously planned in Project 0602 for FY08-FY13 is now captured in Project ZX40.

A. Mission Description and Budget Item Justification

Program-Wide Support provides funding for common non-headquarters support functions across the entire program such as strategic planning, program integration, business management, cost estimating, contracting, and financial management, to include preparation of financial statements, reimbursement of financial services provided by DFAS, internal review and audit, earned-value management, and program assessment. Includes costs for both government civilians performing these functions, as well as outside services and support contractors that augment government staff in these areas. Many of these costs reside within the Missile Defense Agency Executing Agents in the Services: Army Space and Missile Defense Command, Army PEO Space and Missile Defense, Office of Naval Research, and various Air Force laboratory and acquisition activities, although some functions and costs within this program element are performed by MDA employees assigned within the National Capital Region (NCR). Other costs included herein provide facility capabilities for MDA Executing Agent locations, such as physical and technical security, legal services, travel and training, office and equipment leases, utilities and communications, supplies and maintenance, and similar operating expenses. Also includes funding for charges on canceled appropriations in accordance with Public Law 101-510, legal settlements, and foreign currency fluctuation on a limited number of foreign contracts.

B. Accomplishments/Planned Program

	FY 2007	FY 2008	FY 2009
Civilian Salaries and Support	0	2,444	1,613
RDT&E Articles (Quantity)	0	0	0

See Section A: Mission Description and Budget Item Justification

Missile Defense Agency (MDA) Exhibit R-2A RDT&E Project Justification	Date: February 2008
APPROPRIATION/BUDGET ACTIVITY: RDT&E, DW/04 Advanced Component Development and Prototypes (ACD&P)	R-1 NOMENCLATURE: 0603897C BMD Hercules

C. Other Program Funding Summary

	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	Total Cost
PE 0207998C BRAC	0	103,219	159,938	61,931	8,724	0	0	333,812
PE 0603175C Ballistic Missile Defense Technology	183,849	108,423	118,718	115,234	120,152	127,012	130,358	903,746
PE 0603881C Ballistic Missile Defense Terminal Defense Segment	1,082,454	1,045,276	1,019,073	795,659	719,847	548,283	439,752	5,650,344
PE 0603882C Ballistic Missile Defense Midcourse Defense Segment	2,985,140	2,243,213	2,209,262	2,276,848	1,385,258	946,437	1,103,532	13,149,690
PE 0603883C Ballistic Missile Defense Boost Defense Segment	622,218	510,241	421,229	423,927	652,642	799,792	991,839	4,421,888
PE 0603884C Ballistic Missile Defense Sensors	514,989	586,121	1,221,143	1,184,280	1,099,649	1,077,632	823,583	6,507,397
PE 0603886C Ballistic Missile Defense System Interceptors	341,358	340,107	386,817	500,966	708,803	815,433	553,136	3,646,620
PE 0603888C Ballistic Missile Defense Test and Targets	584,615	621,861	673,691	672,976	690,938	708,991	719,209	4,672,281
PE 0603890C Ballistic Missile Defense System Core	425,889	413,934	432,262	482,947	605,219	561,947	571,498	3,493,696
PE 0603891C Special Programs - MDA	347,377	196,892	288,315	304,234	538,050	818,136	786,349	3,279,353
PE 0603892C Ballistic Missile Defense Aegis	1,125,426	1,126,337	1,157,783	1,234,220	1,078,539	1,066,712	1,102,542	7,891,559
PE 0603893C Space Tracking & Surveillance System	311,402	231,528	242,441	266,509	560,130	735,727	938,191	3,285,928
PE 0603894C Multiple Kill Vehicle	133,615	229,943	354,455	488,294	649,632	708,582	879,385	3,443,906
PE 0603895C BMD System Space Program	0	16,552	29,771	41,638	56,199	133,915	157,548	435,623
PE 0603896C BMD C2BMC	249,179	447,616	289,277	287,194	270,762	256,767	259,159	2,059,954
PE 0603898C BMD Joint Warfighter Support	49,833	49,394	69,982	73,997	77,205	80,168	81,948	482,527
PE 0603904C Missile Defense Integration & Operations Center	104,389	78,557	96,404	100,437	100,366	101,512	102,840	684,505
PE 0603905C BMD Concurrent Test and Operations	21,870	0	0	0	0	0	0	21,870
PE 0603906C Regarding Trench	0	1,986	2,978	4,964	4,963	8,933	8,933	32,757
PE 0603907C Sea Based X-Band Radar (SBX)	0	165,243	0	0	0	0	0	165,243
PE 0605502C Small Business Innovative Research - MDA	142,510	0	0	0	0	0	0	142,510
PE 0901585C Pentagon Reservation	15,527	6,019	19,734	5,040	5,284	5,370	5,456	62,430
PE 0901598C Management Headquarters - MDA	93,350	80,392	86,453	70,355	69,855	69,855	69,855	540,115