Missile Defense Agency (MDA) Exhibit R-2 RDT&E Budget Item Justification	Date: May 2009
APPROPRIATION/BUDGET ACTIVITY: **RDT&E, DW/04 Advanced Component Development and Prototypes (ACD&P)**	R-1 NOMENCLATURE: **0603897C BMD Hercules**

COST ($ in Thousands)	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015
Total PE Cost	51,387	55,764	48,186					
WX02 Hercules Capability Development	48,943	54,151	46,358					
ZX40 Program-Wide Support	2,444	1,613	1,828					

A. Mission Description and Budget Item Justification

A.1 System Element Description

The Ballistic Missile Defense (BMD) Hercules Program Element develops and tests discrimination, counter-counter measure, and tracking algorithms for integration into the Ballistic Missile Defense System (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. Supporting algorithm development, Hercules uses the Applied Data Analysis Center (ADAC) to identify critical radar and electro-optical (EO) phenomenology from U.S. and foreign missile flights, ground tests, and laboratory measurements. ADAC also provides other MDA Elements data analysis support.

Hercules development efforts in FY08 and FY09 directly support and enable the Unifying Missile Defense Functions (UMDF) of Correlation/System Track and Discrimination, Engagement Coordination. Future Hercules development will add support for the UMDF of Hit/Kill Assessment. Previous Hercules development efforts in FY02-FY06 provided technology supporting the UMDF of Sensor Registration.

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

Hercules develops algorithms that improve sensor and weapon element discrimination, improve integration of sensor data within C2BMC, and expand integrated battle management capability. Hercules has developed and continues to develop key discrimination algorithms for X-Band radars, system tracking algorithms used in the C2BMC and the Ground-based Midcourse Defense (GMD) Fire Control (GFC), and system engagement planning algorithms used in the C2BMC. ADAC is the only MDA organization chartered to perform detailed analyses of phenomenology 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.

A.3 Major System Element Goals

Missile Defense Agency (MDA) Exhibit R-2 RDT&E Budget Item Justification	Date: May 2009
APPROPRIATION/BUDGET ACTIVITY: **RDT&E, DW/04 Advanced Component Development and Prototypes (ACD&P)**	R-1 NOMENCLATURE: **0603897C BMD Hercules**

Hercules has three major goals:

- Develop, deliver, and support integration of algorithms that provide new or expanded capability to include:
  - System track capability with global genealogy and ambiguity management.
  - Multi-sensor target selection to combine AN/TPY-2 and Sea Based X-Band Radar (SBX) target observations.
  - Robust weapon / sensor management capability.
  - Counter Counter-Measures (CCM) capabilities for the AN/TPY-2 and SBX in midcourse and forward based roles.
  - Enhancements to Standard Missile 3 (SM-3) and Multiple Kill Vehicle (MKV) variants.

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

A.4 Major Events Schedule and Description

Major Event	Project	Timeframe

B. Program Change Summary	FY 2008	FY 2009	FY 2010	FY 2011
Previous President's Budget (FY2009 PB)	52,462	55,955	55,289	
Current President's Budget (FY2010 PB)	51,387	55,764	48,186	
Total Adjustments	-1,075	-191	-7,103	
Congressional Program Reductions	0	-191	0	
Congressional Rescissions	0	0	0	

Missile Defense Agency (MDA) Exhibit R-2 RDT&E Budget Item Justification	Date: May 2009
APPROPRIATION/BUDGET ACTIVITY: **RDT&E, DW/04 Advanced Component Development and Prototypes (ACD&P)**	R-1 NOMENCLATURE: **0603897C BMD Hercules**

B. Program Change Summary	FY 2008	FY 2009	FY 2010	FY 2011
Total Congressional Increases	0	0	0	
Total Reprogrammings	-214	0	0	
SBIR/STTR Transfer	-861	0	0	
Adjustments to Budget Years	0	0	-7,103	

MDA Programmatic Changes:

FY08 decrease is a result of MDA programmatic changes.

FY09 decrease is a result of MDA programmatic changes.

FY10 decrease is a result of MDA programmatic changes.

Missile Defense Agency (MDA) Exhibit R-2A RDT&E Project Justification	Date: May 2009
APPROPRIATION/BUDGET ACTIVITY **RDT&E, DW/04 Advanced Component Development and Prototypes (ACD&P)**	R-1 NOMENCLATURE **0603897C BMD Hercules**

COST ($ in Thousands)	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015
WX02 Hercules Capability Development	48,943	54,151	46,358					
RDT&E Articles Qty	0	0	0					

Note: Beginning in FY10, Project Hercules will be allocated to the five Strategic Technology Portfolios (STPs).

A. Mission Description and Budget Item Justification

Project Hercules is a national effort to develop robust, physics-based detection, tracking, and discrimination prototype algorithms, and transfer them to Ballistic Missile Defense System (BMDS) elements in order to improve the performance of Command and Control, Battle Management and Communications (C2BMC), sensor, and weapon functions. These algorithms are critical in keeping pace with the evolving threat and are developed in the context of the five Strategic Technology Portfolios (STP) managed by MDA's Advanced Technology Directorate.

B. Accomplishments/Planned Program

	FY 2008	FY 2009	FY 2010	FY 2011
Systems Level R&D	8,290	9,321	0	
RDT&E Articles (Quantity)	0	0	0	

The Systems Team applies advanced decision theory to improve real-time BMDS C2BMC capability. The Systems Team develops multi-sensor tracking and discrimination algorithms providing robust system level tracking and decision aids. The coordinated sensor and weapon management development effort provides decision aids to the missile defense commander to improve management of different BMDS sensors and weapons. These capabilities will lead to better situational awareness, discrimination, sensor resource allocation, and weapon magazine.

FY08 Accomplishments:

- Conducted demonstration of initial target selection capability using simulated data from multiple AN/TPY-2 X-Band sensors.
- Initiated coordination for transition of enhanced target selection and systems level tracking w/genealogy ambiguity management capability.
- Initiated expansion of delivered system level discrimination capability to include system track generation w/genealogy ambiguity management.
- Provided support to C2BMC Element for assessment/integration of the delivered target selection capability.
- Continued development of enhanced tracking, correlation, and discrimination algorithms to include volumetric approaches.
- Continued development of weapon and sensor resource management algorithms.

Missile Defense Agency (MDA) Exhibit R-2A RDT&E Project Justification	Date: May 2009
APPROPRIATION/BUDGET ACTIVITY **RDT&E, DW/04 Advanced Component Development and Prototypes (ACD&P)**	R-1 NOMENCLATURE **0603897C BMD Hercules**

FY09 Planned Program/Accomplishments:

- Conduct initial demonstration of enhanced target selection and system track generation w/genealogy ambiguity management capability.
- Start expansion of target selection capability to include Hercules-developed lethal region (D3) identification capability.
- Continue development of enhanced tracking, correlation, and discrimination algorithms to include volumetric approaches.
- Continue development of weapon and sensor resource management algorithms.

	FY 2008	FY 2009	FY 2010	FY 2011
Platform Level R&D	15,945	12,399	0	
RDT&E Articles (Quantity)	0	0	0	

The Platform Team develops algorithms for application on individual sensor or weapons to enhance performance of the host mission and/or provide additional levels of information for systems level processing (forward based and midcourse discrimination, tracking, correlation, handover, clutter mitigation, resource management). These algorithms will improve surveillance and fire control sensor performance, provide additional discrimination data, and increase resistance to clutter. Kill vehicle algorithms will improve hand over, tracking, on board discrimination and resistance to clutter.

FY08 Accomplishments:

- Delivered advance tracking algorithms to Space Tracking and Surveillance System (STSS) Program.
- Initiated joint algorithm insertion/assessment with STSS.
- Continued development of advanced physics based discrimination techniques.
- Continued development of enhanced algorithms for detection and tracking in advanced radio frequency (RF) clutter.
- Continued development of seeker enhancement algorithms.
- Completed joint engineering and development with Aegis of modified Forward Based Sensor (FBS) Suite 1 algorithms for Aegis Block 1.0 discrimination capability.
- Used at-sea demonstration of Aegis sidecar for Aegis discrimination algorithm development.
- Improved clutter mitigation capability through joint engineering and digital test efforts.
- Completed integration of initial clutter mitigation algorithms into X-Band sensor string facility.

Missile Defense Agency (MDA) Exhibit R-2A RDT&E Project Justification	Date: May 2009
APPROPRIATION/BUDGET ACTIVITY **RDT&E, DW/04 Advanced Component Development and Prototypes (ACD&P)**	R-1 NOMENCLATURE **0603897C BMD Hercules**

- Started development of enhanced algorithms for detection and tracking in advanced RF clutter.
- Supported engineering planning for transition and integration of an initial CCM capability into the BMDS systems.

FY09 Planned Program/Accomplishments:

- Demonstrate knowledge point for Near Term Electronic Counter Counter-Measure algorithm (NT-ECCM).
- Continue development and testing of future kill vehicle seeker systems Engagement Management Algorithms.
- Demonstration of MKV Engagement Management Algorithm.
- Initiate transition project for Standard Missile 3 (SM-3) seeker enhancement algorithms.
- Complete Aegis BMD algorithm integration .
- Initiate advanced tracking algorithm development for STSS.
- Develop enhanced algorithms for detection and tracking in advanced RF clutter.
- Improve initial clutter mitigation capability in response to joint engineering effort and digital test effort.
- Delivered tracking algorithm to DE for capability demo.
- Delivered IR correlation algorithm to STSS for evaluation.

	FY 2008	FY 2009	FY 2010	FY 2011
Evaluation and Maturation	15,275	19,295	0	
RDT&E Articles (Quantity)	0	0	0	

The Evaluation and Maturation (E&M) Team supports all Hercules development by providing an independent evaluation capability via digital testing within Hercules and mechanisms for live-time demonstration of algorithms. Additionally, the E&M Team supports system engineering functions with the BMDS elements to facilitate algorithm transition into a fielded system. The E&M Team also generates realistic, simulated threat data for algorithm development and provides threat data to Hercules developers, BMDS elements, and other DoD users.

FY08 Accomplishments:

- Developed and delivered four Threat Data Packages and 13 Special Data Packages in support of algorithm development and capability insertion.
- Supported planning for future BMDS flight tests.

Missile Defense Agency (MDA) Exhibit R-2A RDT&E Project Justification	Date: May 2009
APPROPRIATION/BUDGET ACTIVITY **RDT&E, DW/04 Advanced Component Development and Prototypes (ACD&P)**	R-1 NOMENCLATURE **0603897C BMD Hercules**

- Begun procurement of a new sidecar for the new XTR-1 radar (Pacific Tracker test support ship).

FY09 Planned Program/Accomplishments:

- Develop and deliver 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 and plan for future BMDS flight tests.
- Complete procurement of an additional sidecar for new BMD test range sensor (XTR).
- Conduct digital characterization testing of algorithms to support development and transition.
- Conduct quarterly ATT and CaT algorithm technical reviews

	FY 2008	FY 2009	FY 2010	FY 2011
ADAC	9,433	13,136	0	
RDT&E Articles (Quantity)	0	0	0	

The Applied Data Analysis Center (ADAC) provides the direction for the future development of the BMDS by analysis of both domestic and foreign data collections. ADAC identifies critical phenomenology 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.

FY08 Accomplishments:

- Performed phenomenology analysis and data exploitation on new data collections in support of Advanced Technology goals and provided algorithm and sensor concepts for future development.
- Continued analysis of Measures and Signals Intelligence (MASINT) radar data collected on foreign non-cooperative events to characterize new, evolving, and high tech threats, with a concentration on countermeasure characterization.
- Continued analysis of back-logged MASINT radar data relevant to current BMD issues such as forward-based discrimination algorithms, countermeasures, and Radar Cross Section (RCS) threat modeling.
- Completed assessing optical features for burnout estimation that addressed a specific request to include liquid fuel propellants in the effort.
- Completed an anti-simulation countermeasure effectiveness study that focused on examining the suitability of certain correlated EO/IR and RF phenomenology for possible exploitation by BMDS systems.

Missile Defense Agency (MDA) Exhibit R-2A RDT&E Project Justification	Date: May 2009
APPROPRIATION/BUDGET ACTIVITY **RDT&E, DW/04 Advanced Component Development and Prototypes (ACD&P)**	R-1 NOMENCLATURE **0603897C BMD Hercules**

- Completed low thrust phenomenology analysis and modeling in support of Project Hercules FBS PO-2 algorithm.
- Provided RF and EO/IR flight test data collection requirements support to Systems Engineering.

FY09 Planned Program/Accomplishments:

- Analyze relevant new data collections--both domestic and non-cooperative foreign.
- Perform phenomenology analysis and data exploitation in support of Advanced Technology goals and provide algorithm and sensor concepts to Project Hercules and the Elements.
- Develop and test several new RF techniques, including clutter mitigation and target characterization for Project Hercules.
- Study potential impacts to BMDS functions such as track, FBS, discrimination, countermeasures from evolving threats.
- Improve upon existing phenomenology models

	FY 2008	FY 2009	FY 2010	FY 2011
Hercules Technology Development	0	0	32,015	
RDT&E Articles (Quantity)	0	0	0	

Note: Beginning in FY10, Project Hercules will be allocated to the five Strategic Technology Portfolios (STPs)

STP 1 - Persistent Sensor Coverage - EO/IR & RF technologies for persistent sensor coverage. Hercules is developing advanced algorithms for: sensor-to-sensor correlation to help mitigate the effects of sensor converge gaps, sensor-to-kill vehicle handover for transition of discrimination data to the kill vehicle, and expanding sensor performance to reduce gaps and measure new features. These algorithms enable and support system level multi-sensor data integration functions for system tracking, discrimination, and battle management. This includes approaches and techniques for system level tracking using data from multiple sensors using different phenomenology that address ambiguity management and global genealogy.

FY10 Planned Program:

- Continue development of discrimination algorithms that exploit unique opportunities in EO/IR.
- Conduct early TRL 1 phenomenology research for on radar data collected by BMDS sensors.
- Conduct early TRL 1 phenomenology research EO/IR data collected by BMDS sensors.

Missile Defense Agency (MDA) Exhibit R-2A RDT&E Project Justification	Date: May 2009
APPROPRIATION/BUDGET ACTIVITY **RDT&E, DW/04 Advanced Component Development and Prototypes (ACD&P)**	R-1 NOMENCLATURE **0603897C BMD Hercules**

STP 2 - Pervasive Weapons Coverage - Directed energy and interceptor technologies to enable early engagements. Hercules is developing forward based sensor discrimination algorithms exploiting unique opportunities existing in boost and early ascent of the threat. These algorithms support and enable early engagements by allowing earlier decisions which helps reduce hardware performance requirements.

FY10 Planned Program:

- Research into approaches at the system level to address advanced evolving threats concerns.
- Identify algorithmic options for enabling boost engagements.
- Deliver/demonstrate performance enhancements to SM-3 seeker.
- Develop toward TRL-5 Demonstration for future kill vehicle seeker systems Engagement Management.
- Develop sensor surveillance algorithms to support weapons engagement that exploit a wide range of sensor technology areas.

STP 3 - Global Battle Management - Battle Management/fusion/tracking algorithms and Kill Assessment capabilities to improve engagement success. Hercules has an extensive development effort for advanced battle management algorithms. This includes, methods and techniques for resource (weapons and sensors) management, i.e., allocation and management of weapons and sensor resources in an integrated fashion.

FY10 Planned Program:

- Deliver and demonstrate the capability to produce system level tracking to support system level discrimination.
- Conduct joint Hercules-element studies leading to future transition projects.
- Deliver and support integration of enhanced tracking and correlation algorithms to support handover of data to kill vehicle sensors.
- Develop advanced algorithms that take advantage of tracks from multiple sensors providing geographic and phenomenological diversity to form robust system level tracks.
- Demonstrate the capability to manage weapon and sensor resources.
- Conduct early technology readiness level 1 (TRL) research on data collected on foreign ballistic missile flight tests to identify physics based characteristics.
- Continue development of future advanced algorithms for battle management.

Missile Defense Agency (MDA) Exhibit R-2A RDT&E Project Justification	Date: May 2009
APPROPRIATION/BUDGET ACTIVITY **RDT&E, DW/04 Advanced Component Development and Prototypes (ACD&P)**	R-1 NOMENCLATURE **0603897C BMD Hercules**

STP 4 - Effective Targeting - Sensors and algorithms to enhance probability of kill. In addition to the Global Battle Management algorithms that help determine how to allocate resources, Hercules has developed and is developing methods for systems level discrimination and lethality estimation using multi-sensor data, and, algorithms for data handover to the kill vehicle, improvement of kill vehicle sensor range resolution, and aim point of selection. For future kill vehicle systems, algorithms address how to allocate kill vehicles to enhance the probability of kill. This includes how many kill vehicles are required to negate a target and how to most effectively engage the targets of interest.

FY10 Planned Program:

- Conduct research and develop algorithms that take advantage of features and attributes measured from multiple sensors providing geographic and phenomenological diversity for robust discrimination.
- Continue development of and start coordination for delivery and transition of lethal region discrimination capabilities to include volumetric approaches to tracking and discrimination functions.
- Develop highly detailed physics based models that provide a wide range of data for developing robust algorithms.

STP 5 - Effectiveness in Adverse Environments - Effective BMDS capability under stressing conditions. Hercules is developing algorithms to mitigate the effects of both intentional and unintentional clutter for RF and EO/IR sensors to preserve and maintain forward based discrimination and midcourse surveillance functionality.

FY10 Planned Program:

- Initiate research into approaches at the sensor level to address advanced threats.
- Improve clutter mitigation capability in response to joint engineering effort and digital test effort.
- Conducts early research and develops algorithms to mitigate the effects of countermeasures.
- Start transition effort of clutter mitigation capability for SPY-1.

	FY 2008	FY 2009	FY 2010	FY 2011
Program Office	0	0	14,343	
RDT&E Articles (Quantity)	0	0	0	

Missile Defense Agency (MDA) Exhibit R-2A RDT&E Project Justification	Date: May 2009
APPROPRIATION/BUDGET ACTIVITY **RDT&E, DW/04 Advanced Component Development and Prototypes (ACD&P)**	R-1 NOMENCLATURE **0603897C BMD Hercules**

This includes the management of the Strategic Technology Portfolios (STPs) and technology program analysis. This effort is comprised of entirely Program Management costs associated with Advanced Technology development, no article quantities are reported.

FY10 Planned Program

- Funds government personnel salaries for program management, project support, project costs and travel.
- Support activities for technology development.
- Conduct individual testing of algorithms across Project Hercules.

Missile Defense Agency (MDA) Exhibit R-2A RDT&E Project Justification	Date: May 2009
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 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015	Total Cost
PE 0603175C Ballistic Missile Defense Technology	106,437	119,308	109,760						
PE 0603881C Ballistic Missile Defense Terminal Defense Segment	1,034,478	956,686	719,465						
PE 0603882C Ballistic Missile Defense Midcourse Defense Segment	2,198,664	1,507,481	982,922						
PE 0603883C Ballistic Missile Defense Boost Defense Segment	503,475	400,751	186,697						
PE 0603884C Ballistic Missile Defense Sensors	574,231	777,693	636,856						
PE 0603886C Ballistic Missile Defense System Interceptors	330,874	385,493	0						
PE 0603888C Ballistic Missile Defense Test and Targets	619,137	919,956	966,752						
PE 0603890C Ballistic Missile Defense Enabling Programs	416,937	402,778	369,145						
PE 0603891C Special Programs – MDA	193,157	175,712	301,566						
PE 0603892C Ballistic Missile Defense Aegis	1,126,337	1,113,655	1,690,758						
PE 0603893C Space Tracking & Surveillance System	226,499	208,923	180,000						
PE 0603894C Multiple Kill Vehicle	223,084	283,481	0						
PE 0603895C BMD System Space Program	16,237	24,686	12,549						
PE 0603896C BMD C2BMC	439,997	288,287	340,014						
PE 0603898C BMD Joint Warfighter Support	45,400	69,743	60,921						
PE 0603904C Missile Defense Integration & Operations Center (MDIOC)	77,102	106,040	86,949						
PE 0603906C Regarding Trench	1,945	2,968	6,164						
PE 0603907C Sea Based X-Band Radar (SBX)	155,244	146,895	174,576						
PE 0603908C BMD Europ Intercep Site	0	362,007	0						
PE 0603909C BMD Europ Midcourse Radar	0	76,537	0						
PE 0603911C BMD European Capability	0	0	50,504						
PE 0603912C BMD European Comm Support	0	27,008	0						
PE 0603913C Israeli Cooperative	0	0	119,634						
PE 0605502C Small Business Innovative Research BMDO	137,409	0	0						
PE 0901585C Pentagon Reservation	5,971	19,667	19,709						
PE 0901598C Management Headquarters – MDA	83,907	81,174	57,403						

Note: The Ballistic Missile Defense System (BMDS) is an integrated, interoperable, global defense system. The programs which comprise the BMDS are interdependent.

Missile Defense Agency (MDA) Exhibit R-2A RDT&E Project Justification	Date: May 2009
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, incremental-development testing and evolutionary acquisition. Hercules develops algorithms providing enhanced and new capabilities through early Technology Readiness 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: May 2009
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 2009 Cost	FY 2009 Award/ Oblg Date	FY 2010 Cost	FY 2010 Award/ Oblg Date	FY 2011 Cost	FY 2011 Award/ Oblg Date	Total Cost
Systems Level R&D										
Algorithm Development	C/CPFF	Various	25,289	9,321	1/4Q	0	N/A			34,610
Platform Level R&D										
Algorithm Development	C/FFRDC	Various	45,392	12,399	1/4Q	25,165	N/A			57,791
Subtotal Product Development			70,681	21,720		25,165				92,401

Remarks

Performing Activity a/o Vendor: Johns Hopkins University - Applied Physics Laboratory (APL), Boeing, Lockheed Martin (LM), Massachusetts Institute of Technology Lincoln Laboratory (MIT/LL), Northrop Grumman (NG), National Air and Space Intelligence Center (NASIC), Naval Surface Warfare Center Corona (NSWC-Corona), Raytheon, Sandia National Lab (SNL), SEG, Sparta, and other small businesses on a case by case basis.

II. Support Costs Cost ($ in Thousands)

Cost Categories:	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY 2009 Cost	FY 2009 Award/ Oblg Date	FY 2010 Cost	FY 2010 Award/ Oblg Date	FY 2011 Cost	FY 2011 Award/ Oblg Date	Total Cost
Evaluation and Maturation										
Algorithm Development	C/Various	SPARTA/ Huntsville AL	11,100	3,700	1/4Q	0	N/A			14,800
Hercules Technology Development										
Algorithm Development	C/Various	Various	0	0	N/A	3,810	1Q			3,810
Program Office										
Algorithm Development	C/Various	SPARTA/ Huntsville AL	0	0	N/A	14,343	1Q			14,343
Subtotal Support Costs			11,100	3,700		18,153				32,953

Missile Defense Agency (MDA) Exhibit R-3 RDT&E Project Cost Analysis	Date: May 2009
APPROPRIATION/BUDGET ACTIVITY: RDT&E, DW/04 Advanced Component Development and Prototypes (ACD&P)	R-1 NOMENCLATURE: 0603897C BMD Hercules

Remarks

III. Test and Evaluation Cost ($ in Thousands)

Cost Categories:	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY 2009 Cost	FY 2009 Award/ Oblg Date	FY 2010 Cost	FY 2010 Award/ Oblg Date	FY 2011 Cost	FY 2011 Award/ Oblg Date	Total Cost
Evaluation and Maturation										
Evaluation and Testing	C/Various	Various (see remark 1)	44,677	15,595	1/4Q	0	N/A			60,272
ADAC										
Phenomenology Testing	C/Various	Various (see remark 2)	27,922	13,136	1/4Q	0	N/A			41,058
Hercules Technology Development										
Evaluation and Testing	C/Various	Various (see remarks 1&2)	0	0	N/A	3,040	1Q			3,040
Subtotal Test and Evaluation			72,599	28,731		3,040				104,370

Remarks

1. SMDC/ Huntsville AL (FY08), MDA / Huntsville (FY09 - FY11), MIT/LL / Burlington MA, AFRL / Eglin AFB
2. SMDC/ Huntsville AL (FY08), MDA / Huntsville (FY09 - FY11), MIT/LL / Burlington MA

IV. Management Services Cost ($ in Thousands)

Cost Categories:	Contract Method & Type	Performing Activity & Location	Total PYs Cost	FY 2009 Cost	FY 2009 Award/ Oblg Date	FY 2010 Cost	FY 2010 Award/ Oblg Date	FY 2011 Cost	FY 2011 Award/ Oblg Date	Total Cost
Subtotal Management Services										
Project Total Cost			154,380	54,151		46,358				254,889

Remarks

Missile Defense Agency (MDA) Exhibit R-2A RDT&E Project Cost Analysis	Date: May 2009
APPROPRIATION/BUDGET ACTIVITY: **RDT&E, DW/04 Advanced Component Development and Prototypes (ACD&P)**	R-1 NOMENCLATURE: **0603897C BMD Hercules**

COST ($ in Thousands)	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015
ZX40 Program-Wide Support	2,444	1,613	1,828					
RDT&E Articles Qty	0	0	0					

A. Mission Description and Budget Item Justification

Program-Wide Support provides funding for common non-headquarters support functions across the entire program. Includes costs for both government civilians performing these functions, as well as outside services and support contractors that augment government staff in these areas. Other costs included 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 fluctuations on a limited number of foreign contracts.

B. Accomplishments/Planned Program

	FY 2008	FY 2009	FY 2010	FY 2011
Civilian Salaries and Support	2,444	1,613	1,828	
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 Cost Analysis	Date: May 2009
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C. Other Program Funding Summary

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PE 0603884C Ballistic Missile Defense Sensors	574,231	777,693	636,856						
PE 0603886C Ballistic Missile Defense System Interceptors	330,874	385,493	0						
PE 0603888C Ballistic Missile Defense Test and Targets	619,137	919,956	966,752						
PE 0603890C Ballistic Missile Defense Enabling Programs	416,937	402,778	369,145						
PE 0603891C Special Programs – MDA	193,157	175,712	301,566						
PE 0603892C Ballistic Missile Defense Aegis	1,126,337	1,113,655	1,690,758						
PE 0603893C Space Tracking & Surveillance System	226,499	208,923	180,000						
PE 0603894C Multiple Kill Vehicle	223,084	283,481	0						
PE 0603895C BMD System Space Program	16,237	24,686	12,549						
PE 0603896C BMD C2BMC	439,997	288,287	340,014						
PE 0603898C BMD Joint Warfighter Support	45,400	69,743	60,921						
PE 0603904C Missile Defense Integration & Operations Center (MDIOC)	77,102	106,040	86,949						
PE 0603906C Regarding Trench	1,945	2,968	6,164						
PE 0603907C Sea Based X-Band Radar (SBX)	155,244	146,895	174,576						
PE 0603908C BMD Europ Intercep Site	0	362,007	0						
PE 0603909C BMD Europ Midcourse Radar	0	76,537	0						
PE 0603911C BMD European Capability	0	0	50,504						
PE 0603912C BMD European Comm Support	0	27,008	0						
PE 0603913C Israeli Cooperative	0	0	119,634						
PE 0605502C Small Business Innovative Research BMDO	137,409	0	0						
PE 0901585C Pentagon Reservation	5,971	19,667	19,709						
PE 0901598C Management Headquarters – MDA	83,907	81,174	57,403						

Note: The Ballistic Missile Defense System (BMDS) is an integrated, interoperable, global defense system. The programs which comprise the BMDS are interdependent.

Missile Defense Agency (MDA) Exhibit R-2A RDT&E Project Cost Analysis	Date **May 2009**
APPROPRIATION/BUDGET ACTIVITY **RDT&E, DW/04 Advanced Component Development and Prototypes (ACD&P)**	R-1 NOMENCLATURE **0603897C BMD Hercules**

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