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: **0603884C Ballistic Missile Defense Sensors**

COST ($ in Thousands)	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015
Total PE Cost	574,231	767,593	636,856					
AX11 Ballistic Missile Defense Radars Block 1.0	5,500	5,723	0					
BX11 Ballistic Missile Defense Radars Block 2.0	28,500	101,879	3,191					
CX11 Ballistic Missile Defense Radars Block 3.0	99,561	96,167	12,447					
DX11 Ballistic Missile Defense Radars Block 4.0	91,542	0	0					
EX11 Ballistic Missile Defense Radars Block 5.0	27,510	143,781	92,401					
WX11 Ballistic Missile Defense Radars Capability Development	169,077	250,300	333,315					
XX11 Ballistic Missile Defense Radars Sustainment	146,056	145,218	160,395					
ZX40 Program-Wide Support	6,485	24,525	35,107					

The best way to dissuade, deter, and defeat ballistic missile threats is through integrated ballistic missile defense capabilities -- weapons, sensors and Command and Control, Battle Management and Communications (C2BMC). A potential or actual attack may cross regions and may fly higher and faster than stand-alone, autonomous capabilities operated by a single Military Service can defend against. Integrated BMD capabilities draw on space-, land-, and sea-based assets operated by multiple Services to provide both the best sensor information on the enemy missile's location and track as well as a more diverse and effective set of weapon options for the Combatant Commander to defeat the attack -- all connected by a unifying C2BMC system. As a result, an effort funded in a Program Element may be critical to success of efforts in other Program Elements -- we refer to these connections as ``interdependencies``. Throughout the budget justification material, we have attempted to highlight interdependencies in order to explain for fully the relationship between different parts of the proposed program.

BMD Systems Engineering provides System Description Documents and System Specifications for elements to design, build, integrate and test BMDS components. These products optimize performance at the system level and further ensure that the assessment of the designed BMD System is based on sufficient ground and flight testing. Compliance of Sensors to BMD System level requirements is monitored in a series of requirements and design reviews both at the system and element levels.

Modeling and simulation (M&S) activities support all phases of Sensors development, including development of modifications to the X-Band, UEWR, and Cobra Dane digital representations, flight test missions, ground tests, war games, exercises, and performance assessment. Models and simulations are tailored to the specific need of a component in its current phase of development, ranging from low-to-medium fidelity analyses supporting concept definitions studies, to high-fidelity models used to support engineering development, or testing and are integrated into the BMD Digital Simulations Architecture. Digital simulations support Program Assessment (PA) events, which provide critical system level performance data relative to all elements, the system engineer, M&S developers, OTA and Warfighter. Further, the M&S Digital tools are accredited for each

application and for specific objectives; tools are put through a rigorous verification and validation process, reviewing coding and specifications, and comparing analyses against actual flight test results. Planning support is required to assist in the V&V plan development, test execution, analysis for V&V reports and program office M&S certification. The Digital End-to-End simulation of the BMDS requires a PA Integrated V&V Plan and Report (at both element and system level), and a PA-system level Accreditation Plan and Report.

Sensors will support the BMDS HWIL Modeling and Simulation Program by providing and integrating into the BMDS system-level HWIL single stimulation framework to support full-envelope BMDS ground test, flight test, and training events based upon Agency and warfighter needs.

MDA Element testing is based on an integrated, comprehensive, and phased test program. Element systems, subsystems, and components are tested early in development and are necessary prior to conducting BMD-System level testing. Sensors Element Level testing is funded as part of a developmental program and reflected in this Program Element (PE) submission. This PE also provides Sensors participation in the consolidated MDA-wide System Test Program and the resources for the planning, design, execution, and management of Sensors in BMD System testing in accordance with the BMDS Test Policy, MDA Directive 3202.03 (Jan 09). This applies to all Flight, Integrated Ground, and Distributed Ground Tests and Post-test analysis and reconstructions listed in the Integrated Master Test Plan (IMTP).

A. Mission Description and Budget Item Justification

The Ballistic Missile Defense System (BMDS) development approach allows sensor technologies and capabilities to be incorporated as they mature and evolve into a layered network of sensors. The sensors network is connected to the BMDS through C2BMC which enables control/tasking of radars; in addition, C2BMC provides fire control-quality metric data to BMDS weapon systems. Overlapping sensor coverage with a diversity of sensor types will improve detection, track, discrimination and kill assessments. The extended sensor coverage and accuracy provided by a network of layered sensors makes the BMDS more efficient; reduces the number of target engagements needed, conserving interceptor inventory and ensuring a high probability of successful engagement.

AN/TPY-2 radars can be configured to operate either as a THAAD Fire Unit Radar (terminal mode (TH)) or Forward-Based Radar. AN/TPY-2 radars are transportable, adding flexibility to respond to geographical changes in threats. Under this Program Element, four AN/TPY-2 radars have completed manufacturing (AN/TPY-2 #2, 3, 5), and one is in production (AN/TPY-2 #7). This program element provides TPY-2 radars for THAAD batteries.

The current and planned utilization of the AN/TPY-2 radars supports US STRATCOM, COCOMs, THAAD, and the Aegis weapon system. Currently, TPY-2 radars are supporting missile defense in both Japan and Israel. The current utilization of radars includes: AN/TPY-2 #1 - BMDS

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: 0603884C Ballistic Missile Defense Sensors

Test Asset (BMD Sensors PE 0603884C); AN/TPY-2 #2 - deployed to Shariki, Japan (BMD Sensors PE 0603884C); AN/TPY-2 #3 - deployed to Israel (BMD Sensors PE 0603884C); AN/TPY-2 #4 - THAAD Development Environmental Qualification (Terminal PE 0603881C); AN/TPY-2 #5 - THAAD Fire Unit #1 (BMD Sensors PE 0603884C), AN/TPY-2 #6 - BMDS Test Asset (BMD Sensors PE 0603884C); and AN/TPY-2 #7 - THAAD Fire Unit #2 (Terminal PE in FY07, jointly funded in Terminal/BMD Radars PEs in FY08, BMD Sensors PE starting in FY09).

The External Sensors Lab (ESL) provides a test bed to utilize metric sensor data to enhance the efficiency and effectiveness of the overall BMDS. Algorithms developed by ESL will contribute to precision radar cueing, system track, and hit/kill assessment. Precision radar cueing by ESL has been successfully demonstrated several times during flight testing. ESL provides engineering-level code to the C2BMC program for maturing the algorithms into robust, operationally suitable code.

A.1 System Element Description

The BMDS objectives for the Sensors Directorate are to close existing sensor coverage gaps and expand the capability provided for the warfighter by increasing the probability of kill for ballistic missile threats. The Sensors Directorate's mission is to develop, acquire, field, test and operate BMDS sensors (until transferred to the warfighters/Combatant Commanders (COCOMs)) utilizing the Block approach to deliver increasing BMDS capabilities.

The Ballistic Missile Defense (BMD) Radars Program Element (PE) includes:

- Development, delivery and deployment of AN/TPY-2 radars for either forward-based or THAAD Fire Unit use to meet warfighter needs
- Development of radar discrimination advanced algorithms and Common X-Band software for TPY-2 radars to address evolving threats
- System engineering, and software development and testing support
- Modeling and simulation efforts to include: enhanced sensor models, development of RF scene generators, integration of digital simulations into the BMDS modeling and simulation architecture, and verification, validation, and accreditation (VV&A) of radar models
- Implementation of BMDS Unifying Missile Defense Functions (UMDF) to improve BMDS efficiency and effectiveness
- Participation in BMDS flight and ground test campaigns
- Upgrade the Thule Early Warning Radar (EWR) to add missile defense capability to this sensor
- Sustainment of deployed radars
- Continuation of ESL, a test bed to utilize metric sensor data to enhance the efficiency and effectiveness of the overall BMDS
- Continuation of the Airborne Infrared Sensors (AIRS) program

- Initiation of the Mobile Sensors effort.

The AN/TPY-2 used in a forward-based role provides detection and tracking during the boost phase. This significantly reduces the uncertainty in target discrimination and reaction time, increasing the probability of a successful BMDS engagement. The AN/TPY-2 used in a terminal mode as a Fire Unit Radar (FUR) is an integral component of the THAAD Fire Unit. The FUR is capable of tracking multiple threats and multiple interceptors during engagements. It provides surveillance, acquisition, track, discrimination, interceptor communications, and hit assessment data collection for the fire control.

The Thule Early Warning Radar (EWR) located at Thule Air Base, Greenland, is an Ultra High Frequency (UHF) radar that is being upgraded to include missile defense functionality. This capability will expand defense of the U.S. to include defense against limited Iranian long-range threats.

The radars located at Beale Air Force Base (AFB), CA, and RAF Fylingdales, UK, respectively, are UHF radars that are completing their upgrades for Missile Defense to the UEWR configuration. The COBRA DANE radar located at Eareckson AFS, Shemya, Alaska (AK) is currently part of the BMDS Block 1 architecture.

The External Sensors Lab (ESL) provides a test bed to utilize metric sensor data to enhance the efficiency and effectiveness of the overall BMDS. Algorithms developed by ESL will contribute to precision radar cueing, system track, and hit/kill assessment.

The GBR-P is a large, steerable, X-band phased array radar currently located at Kwajalein Missile Range, Kwajalein Atoll. This radar is currently maintained in caretaker status and is available to support BMDS testing and X-Band software development efforts. The upgrade of this radar to support the European Component is on hold pending host nation ratification and Administration approval.

The Sensors PE was provided a FY09 Congressional increase for the Airborne Infrared Surveillance (AIRS) program. AIRS is quantifying the potential benefit of airborne Electro-Optical Infrared (EO/IR) Sensors capabilities to enhance BMDS Engagement Sequence Group (ESG) options.

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

Since its emphasis is on proving component and subsystem maturity prior to integration into a more complex integrated system, the Sensors program falls under RDT&E Budget Activity 4, Advanced Component Development and Prototypes (ACD&P).

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: **0603884C Ballistic Missile Defense Sensors**

The goals of MDA Sensors activities are to: 1) develop, upgrade, integrate, test, and field sensors within the BMDS sensor network; 2) support BMDS ground and flight testing; 3) provide BMDS sensors sustainment and warfighter support; 4) enhance the performance of the BMDS by extending sensor coverage and accuracy provided by a network of layered sensors; and 5) implement Unifying Missile Defense Functions that enhance BMDS efficiency and effectiveness.

BMD Sensor efforts in the MDA Block structure are as follows:

Block 1.0 (Defend U.S. from Limited North Korean Long-Range Threats)

- Provide commercial power to AN/TPY-2 #2 forward based radar site at Shariki, Japan

Block 2.0 (Defend Allies and Deployed Forces from Short-to-Medium-Range Threats in One Region/Theater)

- Complete AN/TPY-2 #5 Radar acceptance testing and use radar to support THAAD Fire Unit #1
- Complete AN/TPY-2 #7 Radar production with plans to use the radar to support THAAD Fire Unit #2

Block 3.0 (Expand Defense of the U.S. to Include Iranian Long-Range Threats)

- Upgrade Thule to UEWR configuration
- Provide radar discrimination capability
- Provide capability to support the Unifying Missile Defense Functions

Block 4.0 (Defend Allies & Deployed Forces in Europe from Limited Iranian Long-Range Threats, Expand Protection of U.S.)

- European Midcourse Radar activities are contained in the EMR PE 0603909C for FY09 and the European Capability PE 0603911C in FY10.

Block 5.0 (Expand Defense of Allies & Deployed Forces from Short-to-Intermediate-Range Threats in Two Regions/Theaters)

- Complete AN/TPY-2 #3 radar deployment, site construction, and communications suite procurement
- Manufacture and deploy communications suite for AN/TPY-2 forward based radars

- Provide program management expertise across all blocks

BMDS Capability Development:

- Continue AN/TPY-2 S/W Enhancements, Development, and Modeling & Simulation
- Initiate Common Software effort for AN/TPY-2 radars Perform Test & Evaluation for all radars
- Continue BMDS Sensors System Engineering
- Continue External Sensor development efforts
- AIRS experiments (Congressional add)
- Mobile Sensors enhancements (Congressional add)
- Develop, execute, and implement Unifying Missile Defense Functions

BMDS Sustainment

- Sustain deployed radars
- Sustain BMDS Radars communications for deployed radars
- Provide BMDS Radars site security for deployed radars

A.4 Major Events Schedule and Description

Major Event	Project	Timeframe
Delivery		
Development Milestones		
AN/TPY-2 #5 Delivery to THAAD	BX11	3Q FY 2008
Deliver Prime Power Units (PPU) for THAAD Training (1 in 2Q; 1 in 4Q)	BX11	2Q FY 2009 - 4Q FY 2009
Deliver PPUs for THAAD (1 in 1Q; 1 in 2Q; 2 in 3Q)	BX11	1Q FY 2010 - 3Q FY 2010
AN/TPY-2 #7 Delivery to THAAD	BX11	4Q FY 2010
Other		
Operation & Sustainment		
Initiate Transition of Beale & Fylingdales Radars to USAF	XX11	4Q FY 2008
Transfer COBRA DANE to USAF	XX11	2Q FY 2009

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: **0603884C Ballistic Missile Defense Sensors**

B. Program Change Summary	FY 2008	FY 2009	FY 2010	FY 2011
Previous President's Budget (FY2009 PB)	586,121	1,076,983	1,116,740	
Current President's Budget (FY2010 PB)	574,231	767,593	636,856	
Total Adjustments	-11,890	-309,390	-479,884	
Congressional Program Reductions	0	-309,390	0	
Congressional Rescissions	0	0	0	
Total Congressional Increases	0	0	0	
Total Reprogrammings	-3,355	0	0	
SBIR/STTR Transfer	-8,535	0	0	
Adjustments to Budget Years	0	0	-479,884	

FY08/09 decreases include SBIR/STTR transfer and MDA adjustments.

European Midcourse Radar (EMR) funding is moved to the new EMR PE 0603909C for FY09 and to the new European Capability PE 0603911C for FY10.

SBX funds are moved to the SBX PE (0603907C) for FY09-10.

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: **0603884C Ballistic Missile Defense Sensors**

COST ($ in Thousands)	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015
AX11 Ballistic Missile Defense Radars Block 1.0	5,500	5,723	0					
RDT&E Articles Qty	0	0	0					

Note:

A. Mission Description and Budget Item Justification

Ballistic Missile Defense Radars (BMDS) Block 1.0 (Project AX11) defends the U.S. from limited North Korean long-range threats. This effort funds the Commercial Power Project supporting AN/TPY-2 #2 Forward Based Radar in Shariki, Japan. It will provide commercial power as the primary power source.

B. Accomplishments/Planned Program

	FY 2008	FY 2009	FY 2010	FY 2011
AN/TPY-2 #2 Commercial Power	5,500	5,723	0	
RDT&E Articles (Quantity)	0	0	0	

This effort includes installation of power lines between the commercial power source and the radar site, and procurement of required power conversion equipment to meet radar and site requirements.

FY08 Accomplishments:

- Completed Preliminary Design of Commercial Power upgrades
- Began procurement of long-lead equipment

FY09 Planned Program

- Japanese complete installation of power lines from substation to radar site
- Complete site construction to support power equipment installation
- Complete Commercial Power installation and checkout

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: **0603884C Ballistic Missile Defense Sensors**

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 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 0603897C BMD Hercules	51,387	55,764	48,186						
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: 0603884C Ballistic Missile Defense Sensors

D. Acquisition Strategy

The Consolidated - Contractor Logistics Support (C-CLS) contract was awarded in FY08 to operate and maintain the AN/TPY-2 radars and provide logistical support for other radars in the BMDS Radars PE. The C-CLS contract provides the operations and support activities required for site surveys, planning, relocation, depot maintenance, forward-based system operations, repair, and replacement. The contract is an Indefinite Delivery/Indefinite Quantity (IDIQ) task order contract.

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: 0603884C Ballistic Missile Defense Sensors

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
AN/TPY-2 #2 Commercial Power										
AN/TPY-2 #2 - Commercial Power	SS/CPAF	Raytheon / MA	4,248	5,723	1/2Q	0	N/A	0	N/A	9,971
AN/TPY-2 #2 - Support	MIPR	USA Garrison, HPPM-PAC, 35 MSG, NSA / Japan, HI, VA	1,252	0	N/A	0	N/A	0	N/A	1,252
Subtotal Product Development			5,500	5,723		0		0		11,223

Remarks

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
Subtotal Support Costs										

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
Subtotal Test and Evaluation										

Remarks

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: 0603884C Ballistic Missile Defense Sensors

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										

Remarks

Project Total Cost			5,500	5,723		0		0		11,223

Remarks

Missile Defense Agency (MDA) Exhibit R-4 Schedule Profile

Date: **May 2009**

APPROPRIATION/BUDGET ACTIVITY: **RDT&E, DW/04 Advanced Component Development and Prototypes (ACD&P)**

R-1 NOMENCLATURE: **0603884C Ballistic Missile Defense Sensors**

Fiscal Year	2008				2009				2010				2011				2012				2013				2014				2015			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Deployment/Site Prep/ Activation																																
Complete Power Upgrade for AN/TPY-2 #2								△																								

Legend

▲	Significant Event (complete)	△	Significant Event (planned)
★	Milestone Decision (complete)	☆	Milestone Decision (planned)
◆	Element Test (complete)	◇	Element Test (planned)
▼	System Level Test (complete)	▽	System Level Test (planned)
▲▲	Complete Activity	△△	Planned Activity

Missile Defense Agency (MDA) Exhibit R-4A Schedule Detail	Date: May 2009
APPROPRIATION/BUDGET ACTIVITY: **RDT&E, DW/04 Advanced Component Development and Prototypes (ACD&P)**	R-1 NOMENCLATURE: **0603884C Ballistic Missile Defense Sensors**

Schedule Profile	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015
Deployment/Site Prep/ Activation								
Complete Power Upgrade for AN/TPY-2 #2		4Q						

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: **0603884C Ballistic Missile Defense Sensors**

COST ($ in Thousands)	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015
BX11 Ballistic Missile Defense Radars Block 2.0	28,500	101,879	3,191					
RDT&E Articles Qty	1	0	1					

Note:
RDT&E Articles: AN/TPY-2 #5 radar production began in FY05 and was delivered to MDA in FY08. AN/TPY-2 #7 radar production began in FY07 and will be delivered to MDA in FY10.

A. Mission Description and Budget Item Justification

The Sensors contribution to Block 2.0 is to manufacture, test, and deliver AN/TPY-2 #5 and AN/TPY-2 #7 to support the Terminal High Altitude Area Defense (THAAD) Fire Units #1 and #2.

B. Accomplishments/Planned Program

	FY 2008	FY 2009	FY 2010	FY 2011
AN/TPY-2 #5 (Fire Unit Radar # 1)	9,074	3,193	0	
RDT&E Articles (Quantity)	1	0	0	

The AN/TPY-2 Radar hardware is a transportable system composed of the Antenna Equipment Unit, Electronics Equipment Unit, and Cooling Equipment Unit. This effort includes the material, labor, engineering and management support for production of AN/TPY-2 #5. (This radar was originally procured as a Block 5.0 forward- based radar, therefore it does not include a Prime Power Unit (PPU)).

FY08 Accomplishments:

RDT&E Articles: AN/TPY-2 #5 radar production began in FY05 and was delivered to MDA in FY08

- Completed Near Field Range (NFR) testing of AN/TPY-2 #5
- Completed factory integration and testing
- Conducted radar system integration at Vandenberg AFB, CA

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: **0603884C Ballistic Missile Defense Sensors**

FY09 Planned Program:

- Provide Contractor Logistical Support (CLS) for Fire Unit Radar (FUR) #1

	FY 2008	FY 2009	FY 2010	FY 2011
AN/TPY-2 #7 (Fire Unit Radar #2)	19,426	98,686	3,191	
RDT&E Articles (Quantity)	0	0	1	

FY08 Accomplishments:

- Began manufacturing of Antenna Subassemblies
- Initiated subcontracts and began manufacturing of other Radar Components (Cooling Unit (CEU), Electronics Unit (EEU) and Prime Power Units (PPUs))

FY09 Planned Program:

- Continue manufacturing and integration of Radar Antenna
- Continue manufacturing of other Radar Components (EEU, CEU, and PPUs)
- Deliver two Prime Power Units (PPUs) for Army New Equipment Training

FY10 Planned Program:

- Complete radar component integration and check-out
- Deliver AN/TPY-2 #7 and four Prime Power Units (PPUs) for THAAD FUR #2

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: 0603884C Ballistic Missile Defense Sensors

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 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 0603897C BMD Hercules	51,387	55,764	48,186						
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: 0603884C Ballistic Missile Defense Sensors

D. Acquisition Strategy

This contract supports production of AN/TPY-2 radars for use as BMDS forward-based radars or as THAAD Fire Unit Radars (FURs). Design enhancements focus on software changes for the forward-based algorithms and C2BMC connectivity. Also included is the manufacture of Prime Power Units (PPUs). The AN-TPY-2 BMDS contract is Cost Plus Award Fee (CPAF). AN/TPY-2 #7 radar manufacturing is being done on a Cost Plus Incentive Fee (CPIF) CLIN.

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: 0603884C Ballistic Missile Defense Sensors

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
AN/TPY-2 #5 (Fire Unit Radar # 1)										
AN/TPY-2 #5 Manufacture	SS/CPAF	Raytheon / MA	9,074	3,193	1Q	0	N/A	0	N/A	12,267
AN/TPY-2 #7 (Fire Unit Radar #2)										
AN/TPY-2 #7 Manufacture	SS/CPAF	Raytheon / MA	19,426	98,686	1Q	3,191	1Q	0	N/A	121,303
Subtotal Product Development			28,500	101,879		3,191		0		133,570

Remarks

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
Subtotal Support Costs										

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

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: 0603884C Ballistic Missile Defense Sensors

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 Test and Evaluation										

Remarks

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										

Remarks

Project Total Cost			28,500	101,879		3,191		0		133,570

Remarks

Missile Defense Agency (MDA) Exhibit R-4 Schedule Profile

Date: **May 2009**

APPROPRIATION/BUDGET ACTIVITY: **RDT&E, DW/04 Advanced Component Development and Prototypes (ACD&P)**

R-1 NOMENCLATURE: **0603884C Ballistic Missile Defense Sensors**

Fiscal Year	2008				2009				2010				2011				2012				2013				2014				2015			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Testing Milestones																																
AN/TPY-2 #5 Integration & Testing																																
Development Milestones																																
Manufacture AN/TPY-2 #5 Hardware Complete																																
AN/TPY-2 #5 Delivery to THAAD																																
Deliver Prime Power Units (PPU) for THAAD Training (1 in 2Q; 1 in 4Q)																																
Manufacture AN/TPY-2 #7 Hardware Complete																																
AN/TPY-2 #7 Delivery to THAAD																																
Deliver PPUs for THAAD (1 in 1Q; 1 in 2Q; 2 in 3Q)																																

Legend

Significant Event (complete)		Significant Event (planned)	
Milestone Decision (complete)		Milestone Decision (planned)	
Element Test (complete)		Element Test (planned)	
System Level Test (complete)		System Level Test (planned)	
Complete Activity		Planned Activity	

Missile Defense Agency (MDA) Exhibit R-4A Schedule Detail	Date: May 2009
APPROPRIATION/BUDGET ACTIVITY: **RDT&E, DW/04 Advanced Component Development and Prototypes (ACD&P)**	R-1 NOMENCLATURE: **0603884C Ballistic Missile Defense Sensors**

Schedule Profile	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015
Testing Milestones								
AN/TPY-2 #5 Integration & Testing	1Q-3Q							
Development Milestones								
Manufacture AN/TPY-2 #5 Hardware Complete	2Q							
AN/TPY-2 #5 Delivery to THAAD	3Q							
Deliver Prime Power Units (PPU) for THAAD Training (1 in 2Q; 1 in 4Q)		2Q-4Q						
Manufacture AN/TPY-2 #7 Hardware Complete			3Q					
AN/TPY-2 #7 Delivery to THAAD			4Q					
Deliver PPUs for THAAD (1 in 1Q; 1 in 2Q; 2 in 3Q)			1Q-3Q					

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: 0603884C Ballistic Missile Defense Sensors

COST ($ in Thousands)	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015
CX11 Ballistic Missile Defense Radars Block 3.0	99,561	96,167	12,447					
RDT&E Articles Qty	0	0	1					

Note:
RDT&E Article: The Thule Upgraded Early Warning Radar (UEWR) effort began in FY06 and will be completed in FY10.

A. Mission Description and Budget Item Justification

The Ballistic Missile Defense (BMD) Sensors Block 3.0 (Project CX11) effort expands defense of the U.S. to include defense against limited Iranian long-range threats. The BMDS Sensors contribution to Block 3.0 includes the upgrade of Thule Early Warning Radar (EWR), the insertion of advanced algorithms into AN/TPY-2 software to enhance discrimination capabilities in X-Band radars, and enhancements to the sensors through the Unifying Missile Defense Functions.

The Thule EWR upgrade will be delivered in FY10 and will maintain a common configuration with the Beale AFB, CA, and RAF Fylingdales, UK upgrades. These upgrades include hardware and software modifications that enhance capabilities and integrate these UEWRs into the BMDS Architecture. The addition of Thule UEWR into the BMDS sensor architecture will improve BMDS sensor coverage and provide new Engagement Sequence Groups (ESGs) options against long range missile threats from Iran.

Discrimination efforts provide for the development of advanced algorithms, and the integration and verification of enhanced capability. These efforts also support the Unifying Missile Defense Functions in the implementation of system wide enhancements to increase the probability of a successful engagement.

B. Accomplishments/Planned Program

	FY 2008	FY 2009	FY 2010	FY 2011
Thule Early Warning Radar Upgrade	71,230	79,587	0	
RDT&E Articles (Quantity)	0	0	1	

The addition of the Thule Upgraded Early Warning Radar (UEWR) into the BMDS sensor architecture will improve BMDS sensor coverage.

FY08 Accomplishments:

- Completed UEWR Facility modifications

- Began hardware and software installation
- Initiated BMDS Communications Room upgrade

FY09 Planned Program:

- Conduct BMDS Integration testing
- Complete hardware and software installations
- Complete Thule UEWR development test and evaluation
- Conduct operational test Force Developers Evaluation (FDE)
- Complete Thule Ops Acceptance by USAF

	FY 2008	FY 2009	FY 2010	FY 2011
Radar Discrimination Capability Common Advanced Algorithm Insertion	28,331	16,580	12,447	
RDT&E Articles (Quantity)	0	0	0	

This effort provides for the integration and verification of near-term discrimination capability for the BMDS. Radar discrimination data is provided via the C2BMC to BMDS weapon systems.

FY08 Accomplishments:

- Completed CR 2.4 software full qualification testing (FQT)
- Delivered data tapes for near term discrimination system testing
- Developed method for Common Discrimination Database generation Commenced design of advanced discrimination algorithms
- Defined basic UMDF capability to implement in sensors

FY09 Planned Program:

- Conduct Validation and Verification of near-term discrimination
- Initiate design of advanced discrimination algorithms
- Commence prototype development of integrated discrimination

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: **0603884C Ballistic Missile Defense Sensors**

FY10 Planned Program:

- Assess near-term discrimination response in GTI-04, GTD-04, and GTX-05B
- Participate in Performance Assessments (PA-09, PA-10)
- Evaluate CR-2.4 performance using targets of opportunity
- Integrate prototype designs into TPY-2 digital representation

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: 0603884C Ballistic Missile Defense Sensors

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 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 0603897C BMD Hercules	51,387	55,764	48,186						
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: 0603884C Ballistic Missile Defense Sensors

D. Acquisition Strategy

A sole source contract was awarded for the procurement and installation of the Thule Early Warning Radar hardware and software upgrade kits. The contract has Firm Fixed Price (FFP) and a Cost Plus Award Fee (CPAF) CLINs. The AN/TPY-2 project uses an existing radar design to minimize development costs and schedule. Design enhancements focus on software changes that provide advanced algorithms for radar discrimination. The AN-TPY-2 is a Cost Plus Award Fee (CPAF) contract.

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: 0603884C Ballistic Missile Defense Sensors

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
Thule Early Warning Radar Upgrade										
Prime Contractor	SS/CPAF	Raytheon / MA	40,359	29,837	1Q	0	N/A	0	N/A	70,196
Site Activation, Management, Lodging, ISA Services, Transportation	MIPR	MDA-DFW / AL	2,999	4,576	1Q	0	N/A	0	N/A	7,575
Embedded Test, Engineering Services, GCN Connectivity, SSCO, Lab Upgrades	SS/CPAF	Boeing / CA, AL	9,600	10,937	1/2Q	0	N/A	0	N/A	20,537
Integration / Support	MIPR	850 ELSG / MA	3,747	2,498	1Q	0	N/A	0	N/A	6,245
Survivable SATCOM	MIPR	DISA / VA	9,325	16,172	1Q	0	N/A	0	N/A	25,497
Engineering Support, Beam Steering Circuit Cards	MIPR	OGA	5,200	10,165	1Q	0	N/A	0	N/A	15,365
Thule BMDS Test Integration	SS/CPAF	Raytheon / MA	0	3,400	1Q	0	N/A	0	N/A	3,400
Thule UEWR - C2 High Altitude EMP Room	MIPR	DISA / VA	0	2,002	1Q	0	N/A	0	N/A	2,002
Radar Discrimination Capability Common Advanced Algorithm Insertion										
Near/Far Term Discrimination Efforts	C/CPAF	Raytheon / MA	28,331	16,580	1Q	12,447	1Q	0	N/A	57,358
Subtotal Product Development			99,561	96,167		12,447		0		208,175

Remarks

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: 0603884C Ballistic Missile Defense Sensors

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
Subtotal Support Costs										

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
Subtotal Test and Evaluation										

Remarks

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										

Remarks

Project Total Cost			99,561	96,167		12,447		0		208,175

Remarks

Missile Defense Agency (MDA) Exhibit R-4 Schedule Profile

Date: **May 2009**

APPROPRIATION/BUDGET ACTIVITY: **RDT&E, DW/04 Advanced Component Development and Prototypes (ACD&P)**

R-1 NOMENCLATURE: **0603884C Ballistic Missile Defense Sensors**

Fiscal Year	2008				2009				2010				2011				2012				2013				2014				2015			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Testing Milestones																																
Complete Thule UEWR DT&E						▲																										
PA-09									△																							
PA-10												△																				
Program Milestones																																
Thule Ops Acceptance by USAF								△																								
Software																																
Conduct V&V of CR-2.4								△																								

Legend

▲	Significant Event (complete)	△	Significant Event (planned)
★	Milestone Decision (complete)	☆	Milestone Decision (planned)
◆	Element Test (complete)	◇	Element Test (planned)
▼	System Level Test (complete)	▽	System Level Test (planned)
▲▲	Complete Activity	△△	Planned Activity

Missile Defense Agency (MDA) Exhibit R-4A Schedule Detail	Date: May 2009
APPROPRIATION/BUDGET ACTIVITY: **RDT&E, DW/04 Advanced Component Development and Prototypes (ACD&P)**	R-1 NOMENCLATURE: **0603884C Ballistic Missile Defense Sensors**

Schedule Profile	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015
Testing Milestones								
Complete Thule UEWR DT&E		2Q						
PA09			1Q					
PA10			4Q					
Program Milestones								
Thule Ops Acceptance by USAF		4Q						
Software								
Conduct V&V of CR-2.4		4Q						

Missile Defense Agency (MDA) Exhibit R-4 Schedule Profile	Date: May 2009
APPROPRIATION/BUDGET ACTIVITY: RDT&E, DW/04 Advanced Component Development and Prototypes (ACD&P)	R-1 NOMENCLATURE: 0603884C Ballistic Missile Defense Sensors

COST ($ in Thousands)	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015
DX11 Ballistic Missile Defense Radars Block 4.0	91,542	0	0					
RDT&E Articles Qty	0	1	0					

A. Mission Description and Budget Item Justification

Funding for the European Midcourse Radar (EMR) is contained in program element 0603909C for FY09 and PE 0603911C for FY10.

B. Accomplishments/Planned Program

	FY 2008	FY 2009	FY 2010	FY 2011
European Midcourse Radar (EMR) Upgrade	28,192	0	0	
RDT&E Articles (Quantity)	0	0	0	

FY08 Accomplishments:

- Defined top level requirements for the GBR-P upgrade and the site
- Awarded Contract for Facilities Requirement Document (FRD) and Site activation planning documents
- Began initial site planning
- Conducted site surveys and performed Environmental Analysis
- Supported Host Nation agreement negotiations
- Conducted site planning exercise

	FY 2008	FY 2009	FY 2010	FY 2011
AN/TPY-2 #6 European Forward-Based Radar (EFBR) Manufacture	39,379	0	0	
RDT&E Articles (Quantity)	0	1	0	

This effort includes the material, labor, engineering and management support for production of AN/TPY-2 #6 and deployment of the radar to a European Southern Radar Site. Acquisition of AN/TPY-2 #6 was initiated in FY07 and was delivered in FY09. The radar deployment and activation effort includes planning and coordination with Host Nation and Combatant Commanders (COCOMs), supporting radar site design efforts, package and transport of the radar to the overseas site, radar setup, calibration, and activation. This effort also includes deployment preparations at Vandenberg AFB, procurement of backup generators for deployment and radar activation in Europe.

Missile Defense Agency (MDA) Exhibit R-4 Schedule Profile	Date: May 2009
APPROPRIATION/BUDGET ACTIVITY: **RDT&E, DW/04 Advanced Component Development and Prototypes (ACD&P)**	R-1 NOMENCLATURE: **0603884C Ballistic Missile Defense Sensors**

FY08 Accomplishments:

- Completed production and assembly of Transmit/Receive Integrated Modules (TRIMMs)
- Continued hardware production and integration
- Began Near Field Range (NFR) testing
- Began initial site planning and development of facility requirements
- Supported site surveys for overseas site

	FY 2008	FY 2009	FY 2010	FY 2011
Program Management Support Across All Blocks	23,971	0	0	
RDT&E Articles (Quantity)	0	0	0	

This effort provides Program Management support across all BMDS Radars Blocks where sensors work is performed. It provides for civilian salaries and travel. In addition, it provides other technical and business operations support services, technical oversight, and performance analysis provided by FFRDCs, UARCs, and Advisory & Assistance Services. FY09 effort continues in Project EX11.

Missile Defense Agency (MDA) Exhibit R-4 Schedule Profile	Date: May 2009
APPROPRIATION/BUDGET ACTIVITY: RDT&E, DW/04 Advanced Component Development and Prototypes (ACD&P)	R-1 NOMENCLATURE: 0603884C Ballistic Missile Defense Sensors

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 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 0603897C BMD Hercules	51,387	55,764	48,186						
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.

D. Acquisition Strategy

Missile Defense Agency (MDA) Exhibit R-4 Schedule Profile	Date: May 2009
APPROPRIATION/BUDGET ACTIVITY: RDT&E, DW/04 Advanced Component Development and Prototypes (ACD&P)	R-1 NOMENCLATURE: 0603884C Ballistic Missile Defense Sensors

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
European Midcourse Radar (EMR) Upgrade										
Upgrade	CPAF	Raytheon/ MA	13,483	0	N/A	0	N/A	0	N/A	13,483
Site Activation, Facilities Design	MIPR	MDA-DFW / AL	14,204	0	N/A	0	N/A	0	N/A	14,204
EC Systems	CPAF	Boeing/ AL	505	0	N/A	0	N/A	0	N/A	505
AN/TPY-2 #6 European Forward-Based Radar (EFBR) Manufacture										
Manufacture	SS/BPA	Raytheon / MA	39,379	0	N/A	0	N/A	0	N/A	39,379
Deploy/Site Preparation (Generators, Comms Install, Power)	Various	Raytheon, ACE / MA, AL	0	0	N/A	0	N/A	0	N/A	
Program Management Support Across All Blocks										
Civilian Salaries / Travel / Other Support	MIPR	MDA / VA, MA, AL	2,849	0	N/A	0	N/A	0	N/A	2,849
Technical / Business Operations Support	C/CPFF	CSC, NGC / VA	8,006	0	N/A	0	N/A	0	N/A	8,006
Technical Oversight / Performance Analysis	FFRDC	MITRE, MIT-LL, JHU-APL / VA, MA, MD	7,247	0	N/A	0	N/A	0	N/A	7,247
Other Govt Agencies	MIPR	DLA, NASIC, Hanscomb AFB / VA, MA	5,869	0	N/A	0	N/A	0	N/A	5,869
Subtotal Product Development			91,542	0		0		0		91,542

Remarks

Missile Defense Agency (MDA) Exhibit R-4 Schedule Profile	Date: May 2009
APPROPRIATION/BUDGET ACTIVITY: RDT&E, DW/04 Advanced Component Development and Prototypes (ACD&P)	R-1 NOMENCLATURE: 0603884C Ballistic Missile Defense Sensors

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
Subtotal Support Costs										

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
Subtotal Test and Evaluation										

Remarks

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										

Remarks

Project Total Cost			91,542	0		0		0		91,542

Remarks

Missile Defense Agency (MDA) Exhibit R-4 Schedule Profile

Date: **May 2009**

APPROPRIATION/BUDGET ACTIVITY: **RDT&E, DW/04 Advanced Component Development and Prototypes (ACD&P)**

R-1 NOMENCLATURE: **0603884C Ballistic Missile Defense Sensors**

Fiscal Year	2008				2009				2010				2011				2012				2013				2014				2015			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Acquisition Milestones																																
EMR Contract Award (FRD / IDIQ)		▲																														

Legend

▲	Significant Event (complete)	△	Significant Event (planned)
★	Milestone Decision (complete)	☆	Milestone Decision (planned)
◆	Element Test (complete)	◇	Element Test (planned)
▼	System Level Test (complete)	▽	System Level Test (planned)
▲▲	Complete Activity	△△	Planned Activity

Missile Defense Agency (MDA) Exhibit R-4A Schedule Detail	Date: May 2009
APPROPRIATION/BUDGET ACTIVITY: **RDT&E, DW/04 Advanced Component Development and Prototypes (ACD&P)**	R-1 NOMENCLATURE: **0603884C Ballistic Missile Defense Sensors**

Schedule Profile	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015
Acquisition Milestones								
EMR Contract Award (FRD / IDIQ)	2Q							

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: **0603884C Ballistic Missile Defense Sensors**

COST ($ in Thousands)	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015
EX11 Ballistic Missile Defense Radars Block 5.0	27,510	143,781	92,401					
RDT&E Articles Qty	0	0	0					

Note:

A. Mission Description and Budget Item Justification

BMDS Block 5.0 efforts expand defense of allies and deployed forces from short-to-intermediate-range threats in two regions/theaters. Specifically the BMD Radars Block 5.0 (Project EX11) effort provides for:

- Deployment and site activation for AN/TPY-2 #3 forward-based radar
- Continuing manufacture of transportable Ballistic Missile Defense System (BMDS) Communications System Complex (BCSC-T), High Mobility Multipurpose Wheeled Vehicle (HMMWV) Based Communications Node (HBCN), or the C2BMC Deployable Interface Node (CDIN) as required to support deployment of AN/TPY-2 forward-based radar sites
- Continuing development of the Ballistic Missile Defense Systems (BMDS) Communications Networks (BCN) to support radar communications
- Continuing development of a HBCN and CDIN BCN support system that will fulfill requirements for a rapidly deployable re-configurable BMDS communications suite
- Continuing Program Management support across PE 0603884C. It provides for civilian salaries and travel. In addition, it provides other technical and business operations support services, technical oversight, and performance analysis provided by FFRDCs, UARCs, and Advisory & Assistance services. FY09 is a continuation of effort from Project DX11 in FY08.

B. Accomplishments/Planned Program

	FY 2008	FY 2009	FY 2010	FY 2011
AN/TPY-2 #3 Radar Deployment, and Site Activation	27,510	37,645	0	
RDT&E Articles (Quantity)	0	0	0	

AN/TPY-2 #3 was deployed to Israel in CY 2008. The Deployment/Site Preparation/Activation effort included planning and coordination with Host Nation and Combatant Commanders (COCOMs), radar site design, site preparation, and transport of the radar to Israel, radar setup, calibration, and activation.

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: 0603884C Ballistic Missile Defense Sensors

FY08 Accomplishments:

- Conducted site survey in Israel
- Completed site design and preparation
- Transported radar to Israel.

FY09 Planned Program:

- Continue site activation activities in Israel

	FY 2008	FY 2009	FY 2010	FY 2011
AN/TPY-2 C2BMC Fielding	0	58,631	34,937	
RDT&E Articles (Quantity)	0	0	0	

The C2BMC program provides network communications to both task AN/TPY-2 radars and pass radar data to BMDS elements. The Ballistic Missile Defense Systems (BMDS) Communications Networks (BCN) provides a survivable, robust, diverse and redundant, end-to-end, high availability operational communications network (COMNET) connectivity that quickly and unambiguously shares information across the global Ballistic Missile Defense System. The BCN will standardize the BMDS communication systems capabilities at all BMDS locations.

The transportable BMDS Communications System Complex (BCSC) locations are designated BCSC - Transportable (BCSC-T) to facilitate the transportability inherent with the radars and engagement management facilities it supports. The BCSC-T will be survivable in accordance with the BMDS Core Standards, especially MDA-STD-001. In addition to the BCSC-T, MDA needs to have a rapidly deployable, re-configurable BMDS communications suite to meet the short term specific needs of MDA missions. The High Mobility Multipurpose Wheeled Vehicle (HMMWV) Based Communications Node (HBCN) and the C2BMC Deployable Interface Node (CDIN), a transit case BCN support system will fulfill this requirement for deployable re-configurable BMDS communications suites.

The HBCN is an integrated communication suite consisting of two customized HMMWVs and a Tactical Operations Center (TOC). Its purpose is to enable communications between AN/TPY-2 Radar and the C2BMC suite and the rest of the BMDS. The HBCN contains both mission communication equipment and campus communication equipment. One HMMWV will be dedicated to providing the mission communications consisting of a High Availability Communication Node Equipment (HACNE) C2BMC Network Interface Processor (CNIP) and other supporting equipment. The other HMMWV will be dedicated to providing the campus communications consisting of Defense Information Services Network

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: 0603884C Ballistic Missile Defense Sensors

(DISN) Service Delivery Node, Defense Red Switch Network (DRSN), Secret Internet Protocol Router Network (SIPRNET), Non-secure Internet Protocol Router Network (NIPRNET), organic Satellite Communications (SATCOM) and SATCOM interface. All operations can be performed within the HMMWVs or be remoted in a TOC. The TOC is an expandable 20'x20' room capable of supporting the C2BMC operators.

The CDIN durable military transit case Ballistic Missile Defense Systems (BMDS) Communications Networks (BCN) support system is both vehicle and facility independent. However, even though it is facility independent it must be installed in some kind of a shelter or building. The recommended facility is the expandable TOC identified for the High Mobility Multipurpose Wheeled Vehicle (HMMWV) Based Communications Node (HBCN). The CDIN system will be capable of providing the mission and campus communications for a rapidly deployed AN/TPY-2 Radar.

Also, the Extremely High Frequency (EHF) Teleports will be upgraded to provide AN/TPY-2 data to Ground Based Midcourse (GMD) and Aegis Engagement Sequence Groups (ESGs) to alleviate issues with Ultra High Frequency (UHF) communications. This satisfies a Combatant Command (COCOM) requirement for EHF operational capability due to continuous issues with UHF communications supporting the BMDS mission. Locations: United States -- Northwest, VA; Wahiawa, HI. International -- Ramstein; and Middle East. These teleport terminals provide an entry point (Northwest at Chesapeake, VA) into the US from the European Gateway. These upgrades include an X/Ka-Band capability, and associated baseband equipment. They will provide the BMDS necessary satellite communications connectivity to the European Gateway at Ramstein. This funding supports the BMDS essential minimum communications connectivity provisions for robust, redundant, secure, survivable communications path directly in the BMDS and GMD Fire Control (GFC). These teleports provide multiple diverse network routing paths to ensure no single points of failure.

FY08 Accomplishments:

- See Program Element 0603896C BMD C2BMC, Project EX01, BMD C2BMC Block 5.0.

FY09 Planned Program:

- Support AN/TPY-2 Ballistic Missile Defense System (BMDS) Communications networks
- Provide engineering support for AN/TPY-2/BCSC-T MET SATCOM integration into the overall BMDS
- Acquisition of rapidly deployable, re-configurable BMDS communications suites
- Upgrade EHF Teleports in Wahiawa, HI

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: **0603884C Ballistic Missile Defense Sensors**

- Continue development, production and fielding of the Protected Anti-Jam/Anti-Scintillation Wide band Net Centric System (PAAWNS) to support the SATCOM and OM-88 modems
- Support exercises and testing relative to the AN/TPY-2 radar system with the BMDS Communications Networks (High Mobility Multipurpose Wheeled Vehicle (HMMWV) Based Communications Node (HBCN) and transit case support systems)

FY10 Planned Program:

- Acquisition of MET SATCOM X/Ka-band capability for teleport upgrades
- BMDS Communications Systems integration and certifications
- Support exercises and tests of the AN/TPY-2 radar system with the BMDS Communications Networks (HBCN and transit case support systems
- Initiate communications teleports in Middle East and Northwest, VA

	FY 2008	FY 2009	FY 2010	FY 2011
Program Management Support Across All Blocks	0	47,505	57,464	
RDT&E Articles (Quantity)	0	0	0	

This effort provides Program Management support across all BMDS Radars Blocks where sensors work is performed. It provides for civilian salaries and travel. In addition, it provides other technical and business operations support services, technical oversight, and performance analysis provided by FFRDCs, UARCs, and Advisory & Assistance Services. FY09 is a continuation of effort from Project DX11 in FY08.

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: 0603884C Ballistic Missile Defense Sensors

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 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 0603897C BMD Hercules	51,387	55,764	48,186						
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: 0603884C Ballistic Missile Defense Sensors

D. Acquisition Strategy

AN/TPY-2 #7 radar manufacturing is being done on a Cost Plus Incentive Fee (CPIF) CLIN.

The HBCN and transit case BMDS Communications Networks (BCN) Program Plans address the design, development, acquisition, testing, integration, activation, and fielding. The overall executing agent is the Defense Information Systems Agency (DISA) via an existing Memorandum of Agreement (MOA) with MDA.

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: 0603884C Ballistic Missile Defense Sensors

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
AN/TPY-2 #3 Radar Deployment, and Site Activation										
AN/TPY-2 #3 - Site Activation/Power	MIPR	MDA-DFW / AL	0	10,204	1Q	0	N/A	0	N/A	18,371
AN/TPY-2 #3 - Operations, deployment	SS/CPAF	Raytheon / MA	21,033	25,879	1Q	0	N/A	0	N/A	46,912
AN/TPY-2 #3 - Operations and Support	MIPR	USAEUR, 7A/ EUR	3,110	0	N/A	0	N/A	0	N/A	3,110
AN/TPY-2 #3 - Transportation, Comms Installation, Government Support	MIPR	TRANSCOM, ACE	0	1,562	1/4Q	0	N/A	0	N/A	1,562
AN/TPY-2 #5 - VAFB Operations	CPAF	Raytheon / MA	1,570	0	N/A	0	N/A	0	N/A	1,570
AN/TPY-2 #5 - Manufacture	SS/CPAF	Raytheon/ MA	1,276	0	N/A	0	N/A	0	N/A	1,276
AN/TPY-2 #3 - Other Govt Agency Support	MIPR	249TH ENG BAT, USAFE, USA Eng, 35 MSG / EUR	521	0	N/A	0	N/A	0	N/A	521
AN/TPY-2 C2BMC Fielding										
AN/TPY-2 BMDS Deployable Comms Suites	MIPR	PM DCATS / VA	0	14,801	1Q	1,958	1Q	0	N/A	16,759
AN/TPY-2 US Comms / Teleports	MIPR	NAVSEA / VA	0	3,832	1Q	4,000	1Q	0	N/A	7,832

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: 0603884C Ballistic Missile Defense Sensors

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
AN/TPY-2 Teleport SATCOM	MIPR	DISA / PM DCATS / NAVSEA / VA	0	480	N/A	16,100	4Q	0	N/A	16,580
AN/TPY-2 US Comms / PAAWNS	MIPR	DISA / VA	0	2,611	1Q	4,110	1Q	0	N/A	6,721
AN/TPY-2 Exercise Support (FTX-03)	MIPR	MDA / VA	0	3,360	1Q	0	N/A	0	N/A	3,360
AN/TPY-2 Comms Fielding	SS/CPAF	Lockheed Martin Team,/ VA	0	4,350	1Q	0	N/A	0	N/A	4,350
AN/TPY-2 Comms Fielding	MIPR	DISA / VA	0	22,807	1Q	0	N/A	0	N/A	22,807
AN/TPY-2 Comms Fielding	MIPR	DISA / VA	0	6,390	1Q	8,769	1Q	0	N/A	15,159
Program Management Support Across All Blocks										
Civilian Salaries / Travel / Other Support	MIPR	MDA / AL, MA, VA	0	10,520	1/4Q	22,914	1/4Q	0	N/A	33,434
Contractor Support Services	C/CPFF	CSC, NG,BAE, Dynetics/ AL, VA	0	21,847	1/2Q	17,132	1/2Q	0	N/A	38,979
Technical Oversight / Performance Analysis	FFRDC	MITRE, MIT-LL, JHU-APL/ VA, MA, MD	0	15,138	1/3Q	12,663	1/3Q	0	N/A	27,801
Other Govt Agencies	MIPR	AMRDEC	0	0	N/A	4,755	1/3Q	0	N/A	4,755
	MIPR	MDA/DOB	0	0	N/A	0	N/A	0	N/A	
Subtotal Product Development			27,510	143,781		92,401		0		263,692

Remarks

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: 0603884C Ballistic Missile Defense Sensors

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
Subtotal Support Costs										

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
Subtotal Test and Evaluation										

Remarks

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										

Remarks

Project Total Cost			27,510	143,781		92,401		0		263,692

Remarks

Missile Defense Agency (MDA) Exhibit R-4 Schedule Profile

Date: **May 2009**

APPROPRIATION/BUDGET ACTIVITY: **RDT&E, DW/04 Advanced Component Development and Prototypes (ACD&P)**

R-1 NOMENCLATURE: **0603884C Ballistic Missile Defense Sensors**

Fiscal Year	2008				2009				2010				2011				2012				2013				2014				2015			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Deployment/Site Prep/ Activation																																
AN/TPY-2 BMDS Deployable Comms Suites												△																				

Legend

▲	Significant Event (complete)	△	Significant Event (planned)
★	Milestone Decision (complete)	☆	Milestone Decision (planned)
◆	Element Test (complete)	◇	Element Test (planned)
▼	System Level Test (complete)	▽	System Level Test (planned)
▲▲	Complete Activity	△△	Planned Activity

Missile Defense Agency (MDA) Exhibit R-4A Schedule Detail	Date: May 2009
APPROPRIATION/BUDGET ACTIVITY: **RDT&E, DW/04 Advanced Component Development and Prototypes (ACD&P)**	R-1 NOMENCLATURE: **0603884C Ballistic Missile Defense Sensors**

Schedule Profile	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015
Deployment/Site Prep/ Activation								
AN/TPY-2 BMDS Deployable Comms Suites			4Q					

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: 0603884C Ballistic Missile Defense Sensors

COST ($ in Thousands)	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015
WX11 Ballistic Missile Defense Radars Capability Development	169,077	250,300	333,315					
RDT&E Articles Qty	0	1	1					

Note:

A. Mission Description and Budget Item Justification

Sensors Capability Development includes completion of existing software builds for AN/TPY-2, and consolidation of common software functionality across X-Band radars. Existing software will be migrated to a common software build that will standardize functionality, and minimize software development and maintenance costs.

Additional Capability Development efforts include Test & Evaluation, BMDS Architecture engineering, Common Threat engineering, External Sensors Lab (ESL), and Airborne Infrared Surveillance (AIRS) efforts. The T&E effort covers Sensors BMDS-level testing including flight tests, ground tests, and Concurrent Training, Testing and Operations (CTTO). The CTTO capability will allow warfighter and MDA to safely conduct concurrent training, test and operations with BMDS sensors.

BMDS Architecture Engineering efforts address two areas: Infrared (IR) Sensor Integration and Advanced Sensor Development and Prototypes.

- The objective of Infrared (IR) Sensor Integration is to provide a pervasive cueing and early track capability with IR sensors, with a focus on regional defense scenarios. This initiative will accelerate existing efforts to create an operational interface with Overhead Persistent Infrared (OPIR) sensors external to the BMDS as a near-term contingency capability. This will enable interceptor launch on an OPIR track, a capability critical to extending interceptor reach against regional threats, and to controlling the growth of interceptor inventory as regional threats multiply. This effort will also explore the feasibility of fielding unmanned aerial vehicles to augment regional IR sensor coverage.
- The objective of Advanced Sensor Development and Prototypes is to develop scalable prototypes of advanced options for threat negation; to assess the potential capability in terms of interceptor inventory savings; and, to evaluate the technical and programmatic feasibility toward an increased threat-negation capability.

Common Threat engineering produces common and consistent adversary trajectory and signature data to enable Ballistic Missile Defense (BMD) System and sub-system concept and requirements, design, verification, and assessment. Common Threat data is contained in the Adversary

Capability Document (ACD) and Adversary Data Packages (ADP) and drives BMDS ground tests, flight tests, digital simulations, and pre-mission analysis activities. It is also used to develop the BMD System Description Document and BMD System Specification.

The External Sensors Lab (ESL) provides a test bed to utilize metric sensor data to enhance the efficiency and effectiveness of the overall BMDS. Algorithms developed by ESL will contribute to precision radar cueing, system track, and hit/kill assessment. Precision radar cueing by ESL has been successfully demonstrated several times during flight testing. ESL provides engineering-level code to the C2BMC program for maturing the algorithms into robust, operationally suitable code.

The Airborne Infrared Surveillance (AIRS) program is a proof of concept program to demonstrate and evaluate the potential benefits of airborne infrared sensor systems to the Ballistic Missile Defense System (BMDS). The AIRS program was funded by a Congressional Add in FY09.

Capability Development also includes quality, safety, and mission assurance operations to ensure compliance with Agency requirements for design, test, manufacturing, quality, safety, and reliability. Funding will also provide quality and safety infrastructure support for Agency operations.

B. Accomplishments/Planned Program

	FY 2008	FY 2009	FY 2010	FY 2011
X-Band Basic Program	110,632	145,528	134,489	
RDT&E Articles (Quantity)	0	1	1	

This effort includes: systems engineering, risk management, configuration control, design reviews, and integrated product teams supporting software algorithms for discrimination, development of common X-Band software, development of mission profiles to support TPY-2 operations worldwide, enhancement of radar availability at operating locations, and development of critical engagement conditions (CECs) and empirical measurement events (EMEs).

FY08 Accomplishments:

- Advanced algorithm maturation
- Completed CR-2.4 testing in contractor's test facility

FY09 Planned Program:

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: **0603884C Ballistic Missile Defense Sensors**

- Complete CR-2.4 TPY-2 integration and testing at Vandenberg Air Force Base (VAFB)
- Complete electromagnetic integration (EMI) testing at VAFB and White Sands Missile Range
- Complete mission profile deliveries to support TPY-2 #3 operations in Israel
- Deliver baseline discrimination capability for TPY-2 #3
- Deliver CR-1.3.7 for TPY-2 #2 at Shariki, Japan
- Begin development of the common software build (CX-1)
- Begin CX-2 requirements development
- Initiate TPY-2 availability enhancements at worldwide operating locations
- Provide systems engineering ``reach-back`` for consolidated contractor logistics support contract
- Support critical engagement conditions (CECs) and empirical measurement events (EMEs) development and traceability to integrated master test plan (IMTP)

FY10 Planned Program:

- Conduct CX-1 design reviews
- Deliver the first common software build for integrated ground testing (CX-1)
- Complete AN/TPY-2 CX-1 full qualification testing (FQT)
- Integrate and test CX-1 on TPY-2 radar
- Support mission profile enhancement to support TPY-2 #3 operations in Israel
- Support baseline discrimination enhancements for TPY-2 #3 operations in Israel
- Continue TPY-2 availability enhancements at worldwide operating locations
- Provide systems engineering ``reach-back`` for consolidated contractor logistics support contract
- Initiate CX-2 development efforts
- Initiate CX-3 requirements development.

	FY 2008	FY 2009	FY 2010	FY 2011
BMDS Radars Test & Evaluation	42,067	72,665	118,145	
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: 0603884C Ballistic Missile Defense Sensors

The test program covers the full spectrum of sensors testing. For the TPY-2 radar, test activities begin with subcomponents and continue through BMDS system level ground and flight testing of delivered radars. For Upgraded Early Warning Radars (UEWRs) and Cobra Dane, test activities are focused on verification and demonstration of the missile defense functionality. This effort provides for pre and post-flight test analysis, the geographic re-positioning of TPY-2 radars, and development of mission profiles to include search fences for testing and test support positioning for SBX. Concurrent Test, Training and Operations (CTTO) capability for TPY-2 and UEWRs are also funded under this effort. There is high interdependency within the BMDS for both ground and flight test activities; C2BMC is required to task TPY-2 radars, and pass TPY-2 radar information to Aegis and the Ground-Based Midcourse Defense element. The program leverages numerous Targets of Opportunity (TOOs) to provide relevant and cost-effective flight test opportunities.

MDA Element testing is based on an integrated, comprehensive, and phased test program. Element systems, subsystems, and components are tested early in development and are necessary prior to conducting BMD-System level testing. Sensors Element Level testing is funded as part of a developmental program and reflected in this Program Element (PE) submission. This PE also provides Sensors participation in the consolidated MDA-wide System Test Program and the resources for the planning, design, execution, and management of Sensors in BMD System testing in accordance with the BMDS Test Policy, MDA Directive 3202.03 (Jan 09). This applies to all Flight, Integrated Ground, and Distributed Ground Tests and Post-test analysis and reconstructions listed in the Integrated Master Test Plan (IMTP).

Sensors will support the BMDS HWIL Modeling and Simulation Program by providing and integrating into the BMDS system-level HWIL single stimulation framework to support full-envelope BMDS ground test, flight test, and training events based upon Agency and warfighter needs.

Sensors will support System Pre Flight predictions for each system level flight test using the test framework set up with the BMDS configuration for a particular flight test. This provides the confidence in Flight Test execution by predicting element performance and exercising element interfaces. This work is also used to proof out the construct of the flight test to ensure if the required data and data management plan will support System Post Flight Reconstruction (SPFR) objectives. System Post Flight Reconstruction will use a HWIL and/or a Digital M&S Environment to replicate the day of flight for the BMDS configuration, modified to represent the actual environment conditions and target dynamics observed in flight. The results of this testing are used to increase confidence in the models and simulations by anchoring the results with emphasis on the critical engagement conditions (CECs) and empirical measurement events (EMEs) back to the real world event. SPFR is used for validation (anchoring) of models and simulations.

FY08 Accomplishments:

- Initiated AN/TPY-2 CR-2 verification testing on ground test Strings

- Executed radar testing, including test site support during targets of opportunity (TOO) flight tests
- Conducted TOO flight tests with the External Sensors Lab (ESL)
- Conducted TOO flight tests with AIRS
- Completed support of BMDS Ground Test (GT-2) Campaign including GTD-2
- Conducted ground tests with the AN/TPY-2 HWIL to demonstrate BMDS forward-based sensor role in support of the BMDS GT-3 campaign
- Provided Test Site Support at VAFB
- Completed development, installation, and initiated testing the Missile Defense System Exerciser node for AN/TPY-2 HWIL
- Continued concurrent test, training, and operations (CTTO) development and demonstration planning and execution in conjunction with MDSE ground test integration efforts
- Continued Distributed Test SIM (DESIM) maturation of AN/TPY-2 for BMDS wargames, and C2BMC cycle testing

FY09 Planned Program:

- Plan and execute radar testing, including test site support, during TOO and BMDS flight tests
- Plan and conduct TOO flight tests with the External Sensors Lab (ESL)
- Plan, prepare scenarios, and conduct ground tests with the AN/TPY-2 HWIL
- Provide Test Site Support at VAFB
- Complete development, and test of the Missile Defense System Exerciser (MDSE) node for AN/TPY-2 HWIL
- Continue CTTO development and demonstration planning and execution in conjunction with MDSE ground test integration efforts
- Conduct BMDS ground testing with Thule Upgraded Early Warning Radar (UEWR)
- Continue Distributed Test SIM (DESIM) maturation of AN/TPY-2 and Thule UEWR for BMDS wargames, and C2BMC cycle testing

FY10 Planned Program:

- Support AN/TPY-2 software (CR-2.4) testing and critical engagement condition (CEC) for advanced discrimination techniques
- Support BVT-01 flight test from VAFB utilizing TPY-2
- Support Glory Trip 200 utilizing SBX
- Support THAAD flight tests (FTT-12, FTT-13)
- Support Cobra Dane flight testing and CECs for scan angles, and monopulse tracking

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: **0603884C Ballistic Missile Defense Sensors**

- Support other flight tests as targets of opportunity
- Participate in GTI-04, GTD-04, GTX-05B
- Plan, develop, integrate and test a common BMDS HWIL stimulation framework with the Elements for the GTX, GTI, GTD ground tests, ALTBMD exercises, Assured Response (AR) exercises, Juniper Cobra exercises, Near-Term Discrimination (NTD) excursions test, and Concurrent Test, Training, and Operations (CTTO) demos
- Provide Test Site Support at VAFB for AN/TPY-2 testing
- Continue CTTO development for TPY-2 and UEWRs
- Complete Thule UEWR BMDS integration testing

	FY 2008	FY 2009	FY 2010	FY 2011
EO/IR Sensors	2,000	800	0	
RDT&E Articles (Quantity)	0	0	0	

The Airborne Infrared Surveillance (AIRS) program is a proof of concept program to demonstrate and evaluate the potential benefits of airborne infrared sensor systems to the Ballistic Missile Defense System (BMDS). This program evaluates the AIRS ability to operate as the primary sensor in an Engagement Sequence Group (ESG), i.e. use AIRS data to engage ballistic missile threats. The AIRS program was funded by a Congressional Add in FY08 and FY09.

FY08 Planned Program:

- Demonstrated AIRS ability to provide airborne IR launch and engagement functionality during flight tests

FY09 Planned Program:

- Continue to demonstrate AIRS capabilities during flight tests

	FY 2008	FY 2009	FY 2010	FY 2011
Operations and Maintenance of Core IT Services	0	9,898	0	
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: **0603884C Ballistic Missile Defense Sensors**

Project funds also support dedicated information technology services for mission specific research and test efforts to include classified and unclassified networks, software licenses, sustainment and information assurance certification.

	FY 2008	FY 2009	FY 2010	FY 2011
External Sensors	7,628	10,756	18,602	
RDT&E Articles (Quantity)	0	0	0	

The External Sensors Lab (ESL) provides a test bed to utilize metric sensor data to enhance the efficiency and effectiveness of the overall BMDS. Algorithms developed by ESL will contribute to precision radar cueing, system track, and hit/kill assessment. Precision radar cueing by ESL has been successfully demonstrated several times during flight testing. ESL provides engineering-level code to the C2BMC program for maturing the algorithms into robust, operationally suitable code.

FY08 Accomplishments:

- Developed acquisition strategy for making forward-based cueing capability operational
- Integrated new data feeds to ESL for new OPIR sensors

FY09 Planned Program:

- Continue testing and demonstration of External Sensor capabilities
- Continue External Sensor operations at the MDIOC lab
- Develop software code for operational site
- Initiate acquisition of hardware equipment and software for operational site
- Conduct sophisticated sensor/algorithm/CONOPs experiment
- Initiate acquisition for hardware upgrade for the Missile Defense Integration and Operations Center Lab

FY10 Planned Program:

- Continue to develop and deliver algorithm enhancements to utilize metric sensor data to enhance BMDS efficiency and effectiveness

	FY 2008	FY 2009	FY 2010	FY 2011
BMDS Architecture	0	0	10,718	

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: 0603884C Ballistic Missile Defense Sensors

RDT&E Articles (Quantity)	0	0	0	

The objective of InfraRed (IR) Sensor Integration is to provide a pervasive cueing and early track capability with IR sensors, with a focus on regional defense scenarios. This initiative will accelerate existing efforts to create an operational interface with high fidelity Overhead Persistent Infrared (OPIR) sensors external to the BMDS as a near-term contingency capability. This will enable interceptor launch on an OPIR track, a capability critical to extending interceptor reach against regional threats, and to controlling the growth of interceptor inventory as regional threats multiply. This effort would also explore the feasibility of using an existing airborne platform and sensors with slight modifications to augment regional IR sensor coverage.

The objective of advanced sensor development and prototypes is to develop scalable prototypes of advanced options for threat negation; to assess the potential capability in terms of interceptor inventory savings; and, to evaluate the technical and programmatic feasibility toward an increased threat-negation capability.

FY10 Planned Program:

- Determine and characterize OPIR interface requirements
- Execute initial development of regionally-tailored OPIR processing and connectivity; assess for performance via simulation
- Execute planning and coordination for real-time track demonstrations using a UAV (associated with scheduled BMDS test events) using an existing airborne platform
- Execute advanced sensor small-scale laboratory testing; initiate mid-scale prototype design; initiate design of mission-representative support hardware.

	FY 2008	FY 2009	FY 2010	FY 2011
Common Threat	0	0	2,540	
RDT&E Articles (Quantity)	0	0	0	

Common Threat engineering produces common and consistent adversary trajectory and signature data to enable Ballistic Missile Defense (BMD) System and sub-system concept and requirements, design, verification, and assessment.

FY10 Planned Program:

- Provide updated common and consistent adversary trajectory and signature data.

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: 0603884C Ballistic Missile Defense Sensors

	FY 2008	FY 2009	FY 2010	FY 2011
Mobile Sensors Enhancement	0	4,000	0	
RDT&E Articles (Quantity)	0	0	0	

Mobile Sensors enhancement is funded by a Congressional add in FY09. MDA's BMDS architecture intends to close existing sensor coverage gaps by deploying a global sensor network. Today, the AN/TPY-2 forward based X-Band radar and sea based X-Band radar (SBX) are selectively deployed in the Pacific region and planned for Europe. A subset of AEGIS ships, modified for ballistic missile defense (BMD), provide long-range search and track for theater ballistic missile defense. A mobile maritime sensor (MMS), leveraging radar technology from the Cobra Judy Replacement program, will enhance BMDS capability, increasing threat coverage and availability to the BMDS global sensor network and providing continuous X-band radar coverage throughout the threat's trajectory. The MMS could also provide a dual-use, multi-mission capability to perform BMD concurrently with support to the intelligence community by performing technical treaty verification. The MMS produces significant cost savings to future Navy platforms, with networked MMSs providing a path to optimize future Navy ship radars for fleet and theater BMD and Anti-Air Warfare.

FY09 Planned Program:

- FY2009 tasks will refine MMS performance predictions to optimize platform deployment.

	FY 2008	FY 2009	FY 2010	FY 2011
Sensors System Engineering & UMDF	6,750	6,653	48,821	
RDT&E Articles (Quantity)	0	0	0	

Modeling and simulation (M&S) activities support all phases of Sensors development, including development of modifications to the X-Band, UEWR, and Cobra Dane digital representations, flight test missions, ground tests, war games, exercises, and performance assessment. Models and simulations are tailored to the specific need of a component in its current phase of development, ranging from low-to-medium fidelity analyses supporting concept definition studies, to high-fidelity models used to support engineering development, or testing and are integrated into the BMD Digital Simulations Architecture. Digital simulations support Program Assessment (PA) events, which provide critical system level performance data relative to all elements, the system engineer, M&S developers, OTA and Warfighter. Further, the M&S Digital tools are accredited for each application and for specific objectives; tools are put through a rigorous verification and validation process, reviewing coding and specifications, and

comparing analyses against actual flight test results. Planning support is required to assist in the V&V plan development, test execution, analysis for V&V reports and program office M&S certification. The Digital End-to-End simulation of the BMDS requires a PA Integrated V&V Plan and Report (at both element and system level), and a PA-system level Accreditation Plan and Report.

MDA has a set of Unifying Missile Defense Functions (UMDFs), which increase the effectiveness of the BMD System (including probability of engagement success, increase in defended area and raid size capacity, additional redundancy of architecture, unity of command) through the integration of MDA developed capabilities. These UMDF efforts are Sensor Registration (reporting of sensor errors / biases), Correlation (ensuring the information from multiple sensors seeing a threat relates to the same object), System Track (creating a single engageable track of a threat from multiple reports provided by different land, sea, and space based multiple sensors), Discrimination (identifying object details to determine the target from debris or decoys), Battle Management (combining the best sensors and shooters to ensure the highest probability of a kill), Hit / Kill assessment (determining if the target selected was destroyed after missile impact), and Communications (providing the worldwide connection of sensors and shooters to command authorities). UMDFs are implemented across the BMDS elements to create and utilize system level data and decisions that allow Combatant Commanders the ability to automatically and manually optimize sensor coverage and interceptor inventory to defend against all ranges of ballistic threats.

FY08 Accomplishments:

- Initiated digital representation of AN/TPY-2 into the BMDS ground test architecture

FY09 Planned Program: Modeling and Simulation

- Complete AN/TPY-2 digital simulation representation (CRUSHM, 2.4) that incorporates advanced discrimination techniques. (2nd Qtr FY09)
- Complete development of high-performance RF scene generator for flight and ground testing of AN/TPY-2 advance discrimination algorithms in FY09. (3rd QTR FY09)
- Complete demonstration of the integration of AN/TPY-2 RF scene generator in to the BMDS HWIL single stimulation framework. (1st QTR FY09)
- Complete integration of the AN/TPY-2 digital simulation (CRUSHM, 1.3) into the BMD Digital Simulations Architecture for support of PA-09. (PA09 1st QTR FY10)
- Complete development of critical engagement conditions (CEC) and empirical measurement events (EME) criteria that address the most significant model uncertainties of the sensor models. (3rd QTR FY09)

- Complete an integrated V&V plan and report for the AN/TPY-2 simulation (CRUSHM, 1.3) as integrated into the BMD Digital Simulations Architecture for PA-09. (3rd QTR FY09)
- Complete post-flight reconstructions (PFR) of flight tests (FTX-02, FTX-03 and FTG-05) and tracking of calibration satellites to provide detailed empirical evidence of the model suitability to represent the sensor. (4th QTR FY09)

Unifying Missile Defense Functions (UMDF)

- Complete BMDS System Engineering requirement traceability to Unifying Missile Defense Functions (UMDF). (2nd QTR FY09)
- Complete initial UMDF integrated delivery plan for FY10. (3rd QTR FY09)
- Complete initial discrimination database development to support Aegis Launch on AN/TPY-2. (3rd QTR FY09)
  - Demonstrate capability during BMDS ground and flight testing (GTX-03C, FTM-15)
  - Deliver discrimination database for Aegis Launch on AN/TPY-2
- Complete discrimination database for AN/TPY-2 CR2.4 to support FY10 ground and flight testing of near-term discrimination. (4th QTR FY09)

FY10 Planned Program:

Modeling and Simulation

- Initiate enhancements of sensor models as required through application of CEC/EME results from flight and ground tests, and satellite tracking campaign. (1st QTR FY10)
- Complete initial digital simulation of first generation common software (CX1) for the X-band sensors. (4th QTR FY10)
- Initiate development of Unifying Missile Defense Functions (UMDF) modeling; (4th QTR FY10)
- Sensor registration to include bias and covariance consistency
  - Common messaging and discrimination feature reporting
  - Post-intercept debris and electronic counter-countermeasures (ECCM)
- Complete integration of the next generation AN/TPY-2 digital simulation (CRUSHM, 2.4) into the BMD Digital Simulations Architecture for support of PA-10. (3rd QTR FY10)
- Complete integration of the RF scene generator for the AN/TPY-2 (CR2.4) into the BMDS Hardware in the Loop (HWIL) single stimulation framework in support of GTI-04 (integrated ground test). (2nd QTR FY10)
- Complete integrated V&V plan and report for the AN/TPY-2 simulation (CRUSHM, 2.4) (2nd QTR FY10)
- Complete VV&A plan for the RF scene generator (RDSIS) supporting AN/TPY-2 CR2.4 (3rd QTR FY10)

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: **0603884C Ballistic Missile Defense Sensors**

- Complete PFR of FTM-15 and FTG-06 to anchor models (4th QTR FY10)
- Complete analysis of calibration satellite tracking events to anchor models. (4th QTR FY10)

Unifying Missile Defense Functions (UMDF)

- Initiate development of mission profiles to enable coordinated tasking/control of multiple AN/TPY-2 radars. (1st QTR FY10)
- Initiate algorithm development to facilitate sensor registration capabilities; (2nd QTR FY10)
- Initiate development of X-band "sidecar" to facilitate the development of integrated BMDS capabilities; (2nd QTR FY10)
- Complete initial engineering trade studies for sensor registration, discrimination, system track, battle management and hit/kill assessment. (4th QTR FY10)

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: 0603884C Ballistic Missile Defense Sensors

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 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 0603897C BMD Hercules	51,387	55,764	48,186						
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: 0603884C Ballistic Missile Defense Sensors

D. Acquisition Strategy

Test & Evaluation projects use multiple existing development contracts depending on the system(s) involved in the testing.

The BMDS radar (AN/TPY-2) project used an existing radar design to minimize development costs and schedule. Design enhancements focus on software changes for the forward based algorithms and C2BMC connectivity.

The Common Software work will begin on the existing AN/TPY-2 development contract.

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: 0603884C Ballistic Missile Defense Sensors

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
X-Band Basic Program										
Common X-Band software development	SS/CPAF	Raytheon / MA	110,632	145,528	1/4Q	134,489	1/4Q	0	N/A	390,649
EO/IR Sensors										
AIRS Prime Contractor	SS/CPFF	LS / Aeromet/ OK	1,970	800	1/4Q	0	N/A	0	N/A	2,770
Analysis / Technical Engineering and Test Support	FFRDC	JHU-APL / MD	30	0	N/A	0	N/A	0	N/A	30
External Sensors										
Prime Contractor	SS/CPAF	Northrop Grumman (RaPID) / CO	4,749	3,914	1/3Q	4,778	1Q	0	N/A	13,441
Systems Engineering/Aerospace Analysis	FFRDC	MITRE/AERO Space/ VA	575	365	1Q	372	1Q	0	N/A	1,312
Live Test Support / Algorithm Development & Analysis	MIPR	NASIC (WPAFB)/ OH	740	781	1/2Q	798	1/2Q	0	N/A	2,319
Analysis, Test Support, Aegis Support	MIPR	NSWC-DD / VA	700	781	1/2Q	798	1/2Q	0	N/A	2,279
Lab Development, Integration, and Accreditation	MIPR	Various/ VA	0	521	1Q	532	N/A	0	N/A	1,053
Accreditation	MIPR	MDIOC (JRDC - NG)/ CO	364	1,042	1Q	1,064	1Q	0	N/A	2,470
Operations Migration	CPAF	Northrop Grumman / CO	0	3,352	1/3Q	10,260	1/3Q	0	N/A	13,612

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: 0603884C Ballistic Missile Defense Sensors

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
Algorithm Development and Ops	MIPR	FMBMB/ CO	500	0	N/A	0	N/A	0	N/A	500
BMDS Architecture										
Overhead Persistent Infrared (OPIR) Interface Development	MIPR	FFRDC	0	0	N/A	10,718	1Q	0	N/A	10,718
Common Threat										
Common Threat	MIPR	MDA-DEE / AL, VA	0	0	N/A	2,540	1/3Q	0	N/A	2,540
Mobile Sensors Enhancement										
Mobile Sensors Prime Contractor	SS/CPAF	LS/Aeroment/ OK	0	4,000	1/2Q	0	N/A	0	N/A	4,000
Sensors System Engineering & UMDF										
Advanced Sensor Tech Demo		TBD	0	6,653	1/2Q	4,468	1Q	0	N/A	11,121
BMDS Sensor Integration	Various	APL, MIT, Raytheon/ MD, MA, VA, AL	0	0	N/A	23,874	1Q	0	N/A	23,874
BMD Sensor M&S	Various	Raytheon, APL, NGC, NTB/ MA, MD, VA, AL	5,250	0	N/A	15,553	1Q	0	N/A	20,803
BMDS Sensors V&V		TBD	0	0	N/A	3,298	1Q	0	N/A	3,298
Advanced Sensor Technology	Various	DARPA, APL, MIT/ VA, MD, MA, AL	0	0	N/A	1,628	1Q	0	N/A	1,628
OGA - Knowledge Center support		MDA-DE/ VA, AL	1,500	0	N/A	0	N/A	0	N/A	1,500
Subtotal Product Development			127,010	167,737		215,170		0		509,917

Remarks

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: 0603884C Ballistic Missile Defense Sensors

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
Operations and Maintenance of Core IT Services										
O&M of Core IT Services		TBD	0	9,898	1Q	0	N/A	0	N/A	9,898
Subtotal Support Costs			0	9,898		0		0		9,898

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
BMDS Radars Test & Evaluation										
AN/TPY-2 Flt/Grnd Test Support	SS/CPAF	Raytheon, MDA / MA, VA	32,039	66,892	1/3Q	0	N/A	0	N/A	98,931
Qualification Demonstration, Sustain Dual Role for THAAD	SS/CPAF	Lockheed Martin / AL, CA	0	1,965	1/4Q	0	N/A	0	N/A	1,965
AN/TPY-2 Host Tenant Agreement	MIPR	VAFB / CA	150	544	1Q	0	N/A	0	N/A	694
Operational Test Agency Support	MIPR	OTA/ Various	0	2,176	1Q	2,800	1Q	0	N/A	4,976
Government Testing Oversight	MIPR	NSWC-PHD / CA	1,000	1,088	1Q	0	N/A	0	N/A	2,088
Forward Based Flight/Ground Test Support	SS/CPAF	Raytheon/ MA, VA	0	0	N/A	30,178	1/4Q	0	N/A	30,178
Inter Sensor Testing		TBD	0	0	N/A	3,221	1/4Q	0	N/A	3,221

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: 0603884C Ballistic Missile Defense Sensors

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
Warfighter Exercises		TBD	0	0	N/A	1,596	1/4Q	0	N/A	1,596
Digital Signal Injection	SS/CPAF	Raytheon/ MA, VA	0	0	N/A	15,626	1/4Q	0	N/A	15,626
Thule Testing	SS/CPAF	Raytheon/ MA, VA	0	0	N/A	3,700	1Q	0	N/A	3,700
Thule CTTO Infrastructure	SS/CPAF	Raytheon/ MA, VA	0	0	N/A	10,638	1Q	0	N/A	10,638
UEWR CTTO Infrastructure		TBD	0	0	N/A	12,766	1Q	0	N/A	12,766
COBRA DANE CTTO Infrastructure		TBD	0	0	N/A	5,851	1Q	0	N/A	5,851
COBRA DANE Flight/Ground Test Support		OGA / Raytheon / MA	0	0	N/A	2,861	1Q	0	N/A	2,861
SBX CTTO Infrastructure	SS/CPAF	Raytheon/ MA, VA	0	0	N/A	6,276	1Q	0	N/A	2,021
SBX Flight/Ground Test Support	SS/CPAF	Raytheon/ MA, VA	0	0	N/A	17,313	1Q	0	N/A	17,313
SBX MDSE Infrastructure	SS/CPAF	Raytheon/ MA, VA	0	0	N/A	5,319	1Q	0	N/A	5,319
ESL Testing	MIPR	NG (RaPID)/ CO	1,200	0	N/A	0	N/A	0	N/A	1,200
Test Analysis, Modeling & Simulation	MIPR	JHU-APL / MD	7,678	0	N/A	0	N/A	0	N/A	7,678
Subtotal Test and Evaluation			42,067	72,665		118,145		0		232,877

Remarks

IV. Management Services Cost ($ in Thousands)

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: **0603884C Ballistic Missile Defense Sensors**

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										
Remarks										
Project Total Cost			169,077	250,300		333,315		0		752,692
Remarks										

Missile Defense Agency (MDA) Exhibit R-4 Schedule Profile	Date: May 2009
APPROPRIATION/BUDGET ACTIVITY: **RDT&E, DW/04 Advanced Component Development and Prototypes (ACD&P)**	R-1 NOMENCLATURE: **0603884C Ballistic Missile Defense Sensors**

Fiscal Year	2008				2009				2010				2011				2012				2013				2014				2015			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Development Milestones																																
Complete CR-2.4 Full Qual Testing (FQT)			▲																													
Complete TPY-2 Digi Sim CRUSHM 2.4						▲																										
Complete RF Scene Generator for TPY-2 Adv Discrim							△																									
Complete Initial Development of CEC/EME`s							△																									
Complete V&V of TPY-2 Simulation in PA-09									△																							
Complete AN/TPY-2 CX-1 FQT												△																				

Legend

▲	Significant Event (complete)	△	Significant Event (planned)
★	Milestone Decision (complete)	☆	Milestone Decision (planned)
◆	Element Test (complete)	◇	Element Test (planned)
▼	System Level Test (complete)	▽	System Level Test (planned)
▲▬▲	Complete Activity	△▬△	Planned Activity

Missile Defense Agency (MDA) Exhibit R-4A Schedule Detail	Date: May 2009
APPROPRIATION/BUDGET ACTIVITY: **RDT&E, DW/04 Advanced Component Development and Prototypes (ACD&P)**	R-1 NOMENCLATURE: **0603884C Ballistic Missile Defense Sensors**

Schedule Profile	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015
Development Milestones								
Complete CR-2.4 Full Qual Testing (FQT)	3Q							
Complete TPY-2 Digi Sim CRUSHM 2.4		2Q						
Complete RF Scene Generator for TPY-2 Adv Discrim		3Q						
Complete Initial Development of CEC/EME`s		3Q						
Complete V&V of TPY-2 Simulation in PA-09			1Q					
Complete AN/TPY-2 CX-1 FQT			4Q					

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: **0603884C Ballistic Missile Defense Sensors**

COST ($ in Thousands)	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015
XX11 Ballistic Missile Defense Radars Sustainment	146,056	145,218	160,395					
RDT&E Articles Qty	0	0	0					

Note:

A. Mission Description and Budget Item Justification

This effort provides for the operation and support of BMD Radars until transferred to a Service component. Sustainment also includes MDA support for maintenance of radar missile defense software after transition. This includes:

- AN/TPY-2s
- European Midcourse Radar (EMR) caretaker (FY08)
- Thule Upgraded Early Warning Radar (UEWR)
- COBRA DANE radar
- Beale and Fylingdales UEWRs

B. Accomplishments/Planned Program

	FY 2008	FY 2009	FY 2010	FY 2011
BMDS Radars (Sustainment)	70,320	103,044	118,015	
RDT&E Articles (Quantity)	0	0	0	

MDA uses Contractor Logistics Support (CLS) to operate and sustain the AN/TPY-2 radars. The forward-based radar effort includes:

- Depot level logistics support
- O&S during testing at Vandenberg Air Force Base (VAFB), CA
- Operational spares, repair, and replacement
- Radar operators/maintainers, site maintenance, fuel, utility, and communications support costs

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: **0603884C Ballistic Missile Defense Sensors**

FY08 Accomplishments:

- Operated and sustained AN/TPY-2 #2 in Japan, AN/TPY-2 #3 in Israel and AN/TPY-2 #5 at VAFB during government acceptance testing
- Developed additional mission plans for AN/TPY-2 #3 in Israel
- Maintained the GBR-P radar in caretaker status

FY09 Planned Program:

- Operate and sustain AN/TPY-2 forward-based radars (2) overseas and at other locations supporting BMDS ground/flight testing
  - Provide personnel to support radar operations in Israel and Japan
  - Provide training, facility maintenance, depot support, and spares
  - Provide superdome computer maintenance
  - Operate and maintain site power in Japan
  - Provide generator overhaul and replacements in Japan
- Support transition and transfer of TPY-2 forward based radars
- Provide XBR depot support and spares

FY10 Planned Program:

- Operate and sustain AN/TPY-2 forward-based radars (2) overseas and at other locations supporting BMDS ground/flight testing
  - Provide personnel to support radar operations in Israel and Japan
  - Provide training, facility maintenance, depot support, and spares
  - Provide superdome computer maintenance
  - Operate and maintain site power in Japan
  - Provide generator overhaul and replacements in Japan
- Support transition and transfer of TPY-2 forward based radars
- Provide XBR depot support and spares
- Maintain the GBR-P radar (currently in caretaker status)

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: **0603884C Ballistic Missile Defense Sensors**

	FY 2008	FY 2009	FY 2010	FY 2011
BMDS Radars Communications (Sustainment)	0	18,061	13,901	
RDT&E Articles (Quantity)	0	0	0	

This Operations and Support (O&S) effort supports the AN/TPY-2 Communications suites. It includes communications suite operational spares, repair, and replacement; communications operators/maintainers; communications support costs; and sustains 24/7/365 C2BMC operations.

The FY08 Ballistic Missile Defense (BMDS) Radars Communications (Sustainment) efforts were included in Program Element 0603896C BMD C2BMC, Project XX01, BMD C2BMC Sustainment.

FY09 Planned Program:

- Provide 24/7/365 sustainment for C2BMC Communications capabilities associated with AN/TPY-2
- Provide on-site C2BMC support of fielded sites for hardware and software
- Provide C2BMC operator training for fielded capabilities
- Provide sustaining engineering support and integrated logistics support for fielded hardware and software

FY10 Planned Program:

- Continue 24/7/365 sustainment for Communications capabilities associated with AN/TPY-2
- Continue on-site C2BMC support of fielded sites for hardware and software
- Continue C2BMC operator training for fielded capabilities
- Continue sustaining engineering support and integrated logistics support for fielded hardware and software

	FY 2008	FY 2009	FY 2010	FY 2011
Radar Site Security	1,741	0	0	
RDT&E Articles (Quantity)	0	0	0	

The Radars Site Security effort includes personnel, training, and lodging to provide site security 24 Hours per day, 7 days a week during site construction, activation and operations. This includes Site Security for AN/TPY-2 forward-based radars.

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: 0603884C Ballistic Missile Defense Sensors

FY08 Accomplishments:

- Site security for AN/TPY-2 #2 deployed site at Shariki transferred to U.S. Army

	FY 2008	FY 2009	FY 2010	FY 2011
Upgraded Early Warning Radars (Beale, Fylingdales, COBRA DANE)	73,995	24,113	28,479	
RDT&E Articles (Quantity)	0	0	0	

For UEWR, this program provides for hardware replacement of decades old processing technology and new communications equipment, and the development of new software that supports these missions. For CDU, the program provides for minor changes to existing hardware and new communications equipment, and the development of missile defense software integrated into the existing legacy software.

FY08 Accomplishments:

- Completed Early Warning Radar (EWR) equipment removal and facility reconfiguration at Fylingdales
- Achieved STRATCOM Certification for all missions at Beale
- Completed EWR equipment removal and facility reconfiguration at Beale
- Transitioned Beale and Fylingdales radars to USAF

FY09 Planned Program:

- Transferred COBRA DANE to USAF
- Provide sustainment transition support to the USAF for Beale and Fylingdales
- Provide maintenance of the System Programming Agency (SPA) sustainment string
- Install UEWR software enhancements (VCN-2)
- Provide sustainment of the upgraded COBRA DANE radar
- Provide for program management office support personnel

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: **0603884C Ballistic Missile Defense Sensors**

FY10 Planned Program:

- Provide maintenance of the SPA sustainment string
- Provide sustainment of the upgraded COBRA DANE radar
- Continue UEWR/CDU Common Mission software sustainment
- Achieve Air Force acceptance of VCN-2 (Beale, Fylingdales, Thule)
- Provide for program management office support personnel

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: 0603884C Ballistic Missile Defense Sensors

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 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 0603897C BMD Hercules	51,387	55,764	48,186						
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: 0603884C Ballistic Missile Defense Sensors

D. Acquisition Strategy

A Contractor Logistics Support (CLS) contract was awarded to operate and maintain the AN/TPY-2 radars. This is an Indefinite Delivery Indefinite Quantity (IDIQ) task order contract.

Beale and Fylingdales UEWR software development will be completed under a follow-on Ground-Based Midcourse Defense (GMD) contract. Long term sustainment will be performed through a USAF radar sustainment activity.

The BCSC-T Program Plan addresses the design, development, acquisition, testing, integration, activation, and fielding. The overall executing agent is the Defense Information Systems Agency (DISA) via an existing Memorandum of Agreement (MOA) with MDA.

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: 0603884C Ballistic Missile Defense Sensors

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
BMDS Radars (Sustainment)										
AN/TPY-2 #2 - Radar Ops., Manning, Depot Support, Site Maintenance, Superdome Maintenance, Training	SS/CPAF	Raytheon / MA	31,307	32,006	1Q	34,191	1Q	0	N/A	97,504
AN/TPY-2 #2 - Replenishment Spares; Repair and Replace	SS/CPAF	Raytheon / MA	0	6,654	1Q	4,093	1/4Q	0	N/A	10,747
AN/TPY-2 #2 - Site & Test Support	MIPR	USAENG, 35 MSG, OLE/ Various	1,262	1,706	1Q	0	N/A	0	N/A	2,968
AN/TPY-2 #2 - Fuel for Generators, Vehicles, and Security Equipment	MIPR	DES Center	600	3,387	1Q	3,590	N/A	0	N/A	6,977
AN/TPY-2 - Warfighter Support	MIPR	US Army/ AL	2,616	1,107	1Q	3,282	1Q	0	N/A	7,005
AN-TPY-2 #3 - Radar Ops., Manning, Depot Support, Site Maintenance, Superdome Maintenance, Training	SS/CPAF	Raytheon / MA	7,816	29,877	1Q	21,730	1/3Q	0	N/A	59,423
AN-TPY-2 #3 - Replenishment Spares; Repair and Replace, Site Depot Spares	SS/CPAF	Raytheon / MA	0	3,190	1Q	4,093	1Q	0	N/A	7,283
AN-TPY-2 #3 - Warfighter Support	MIPR	SMDC / AL	0	1,107	1/3Q	0	N/A	0	N/A	1,107
AN-TPY-2 - International Transportation	MIPR	TRANSCOM / CA	1,800	690	1Q	0	N/A	0	N/A	2,145
AN-TPY-2 #3 - Fuel (Generator, Vehicles, Security Equipment) Other Support		TBD	0	800	1/3Q	0	N/A	0	N/A	5,836
AN-TPY-2 #6 - Spares	SS/CPAF	Raytheon / MA	0	0	N/A	6,395	1/4Q	0	N/A	6,395

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: 0603884C Ballistic Missile Defense Sensors

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
EMR - Caretaker at Kwajalein	SS/CPAF	Raytheon, USAKA/ MA, AL	3,233	0	N/A	0	N/A	0	N/A	3,233
BMDSM Manager Support	MIPR	SMDC / AL	0	3,000	1/2Q	3,000	1Q	0	N/A	1,088
AN/TPY-2 #2 Replacement Generators	SS/CPAF	Raytheon/ MA	0	0	N/A	5,195	1Q	0	N/A	5,195
AN/TPY-2 #3 Replacement Generators	SS/CPAF	Raytheon/ MA	0	0	N/A	0	N/A	0	N/A	
AN/TPY-2 #6 - Radar Ops., Manning, Depot Support, Site Maintenance, Superdome Maintenance, Training	SS/CPAF	Raytheon/ MA	0	0	1/2Q	9,361	2/4Q	0	N/A	3,228
AN-TPY-2 #5 - Initial Spares (FUR#1)	SS/FPI	Raytheon/ MA	0	7,727	N/A	7,387	1Q	0	N/A	13,985
Fire Unit Radars Logistical Support	SS/FPI	Raytheon/ MA	0	7,762	N/A	10,652	1/4Q	0	N/A	18,414
AN/TPY-2 #3 - Site Facility Maintenance, Base Support Services, Comm Service	MIPR	US Military or Host Nation	0	1,931	1/2Q	2046	N/A	0	N/A	4,031
AN/TPY-2 #3 - Site Security		MDA-DOSS (Chenega)/ VA	428	0	N/A	0	N/A	0	N/A	428
AN/TPY-2 #2 Generator Support	MIPR	NSWC (MUSE Gen Refurb)/ CA	231	0	N/A	0	N/A	0	N/A	231
AN/TPY-2 Ops Support	MIPR	NORTHCOM	25	0	N/A	0	N/A	0	N/A	25
GBR-P Close-out (TH)	CPAF	Raytheon/ MA	3,642	0	N/A	0	N/A	0	N/A	3,642
AN/TPY-2 #1 Refurb	CPAF	Lockheed Martin/ AL	4,000	0	N/A	0	N/A	0	N/A	4,000

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: 0603884C Ballistic Missile Defense Sensors

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
SBX Sustainment		Vanguard	560	0	N/A	0	N/A	0	N/A	560
SBX Sustainment	CPAF	Boeing/ AL	970	0	N/A	0	N/A	0	N/A	970
AN/TPY-2 CLS	CPAF	Raytheon/ MA	11,830	0	N/A	0	N/A	0	N/A	11,830
GBR-P Caretaker	SS/CPAF	Raytheon/ CA	0	0	N/A	3,000	1Q	0	N/A	3,000
BMDS Radars Communications (Sustainment)										
AN/TPY-2 - Communications O&S	CPAF	Lockheed Martin Team/ VA	0	13,066	1Q	11,121	1Q	0	N/A	24,187
AN/TPY-2 Comms O&S Support	MIPR	DISA/ VA	0	4,995	1Q	2,780	1Q	0	N/A	7,775
Radar Site Security										
AN/TPY-2 #2 Site Security		MDA-DOSS/ VA	1,420	0	N/A	0	N/A	0	N/A	1,420
AN/TPY-2 #3 Site Security		MDA-DOSS/ VA	321	0	N/A	0	N/A	0	N/A	35,655
Upgraded Early Warning Radars (Beale, Fylingdales, COBRA DANE)										
UEWR - Exercise Option/Simulator Tester	SS/CPAF	Boeing / AL	8,424	2,100	1Q	0	N/A	0	N/A	8,424
UEWR Sustainment/CD S/W Upgrade	SS/MIPR	Patrick AFB/ FL	4,485	0	1Q	0	N/A	0	N/A	4,485
Common UEWR/CD Sustainment, TOO Support	SS/CPAF	Boeing / AL	50,921	0	4Q	0	N/A	0	N/A	50,921
Common SPA Sustainment	SS/CPAF	Raytheon / MA	0	3,000	1Q	0	N/A	0	N/A	3,000

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: 0603884C Ballistic Missile Defense Sensors

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
Common Mission Software Sustainment	MIPR	MDA/SNU / MA	0	5,013	1Q	6,343	1Q	0	N/A	11,356
COBRA DANE Sustainment	SS/CPAF	OGA / Boeing / Raytheon / MA	0	7,600	1Q	8,191	1Q	0	N/A	15,791
Government Support	MIPR	850 ELSG/KD (UEWR/CD Program Office)/ MA	8,916	8,500	1Q	10,221	1Q	0	N/A	27,637
UEWR Information Assurance		TBD	0	0	N/A	532	1Q	0	N/A	532
Thule Sustainment	SS/CPAF	Raytheon / MA	0	0	N/A	3,192	1Q	0	N/A	3,192
CD Object Class		DMEA	1,249	0	N/A	0	N/A	0	N/A	1,249
Subtotal Product Development			146,056	145,218		160,395		0		451,669

Remarks

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: 0603884C Ballistic Missile Defense Sensors

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
Subtotal Support Costs										

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
Subtotal Test and Evaluation										

Remarks

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										

Remarks

Project Total Cost			146,056	145,218		160,395		0		451,669

Remarks

Missile Defense Agency (MDA) Exhibit R-4 Schedule Profile	Date: May 2009
APPROPRIATION/BUDGET ACTIVITY: **RDT&E, DW/04 Advanced Component Development and Prototypes (ACD&P)**	R-1 NOMENCLATURE: **0603884C Ballistic Missile Defense Sensors**

Fiscal Year	2008				2009				2010				2011				2012				2013				2014				2015			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Operation & Sustainment																																
Initiate Transition of Beale & Fylingdales Radars to USAF				▲																												
Transfer COBRA DANE to USAF						▲																										
Air Force Acceptance of VCN-2 (Beale, Fylingdales, Thule)									△																							

Legend

▲	Significant Event (complete)	△	Significant Event (planned)
★	Milestone Decision (complete)	☆	Milestone Decision (planned)
◆	Element Test (complete)	◇	Element Test (planned)
▼	System Level Test (complete)	▽	System Level Test (planned)
▲—▲	Complete Activity	△—△	Planned Activity

Missile Defense Agency (MDA) Exhibit R-4A Schedule Detail	Date: May 2009
APPROPRIATION/BUDGET ACTIVITY: **RDT&E, DW/04 Advanced Component Development and Prototypes (ACD&P)**	R-1 NOMENCLATURE: **0603884C Ballistic Missile Defense Sensors**

Schedule Profile	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015
Operation & Sustainment								
Initiate Transition of Beale & Fylingdales Radars to USAF	4Q							
Transfer COBRA DANE to USAF		2Q						
Air Force Acceptance of VCN-2 (Beale, Fylingdales, Thule)			1Q					

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: **0603884C Ballistic Missile Defense Sensors**

COST ($ in Thousands)	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015
ZX40 Program-Wide Support	6,485	24,525	35,107					
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	6,485	24,525	35,107	
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: May 2009
APPROPRIATION/BUDGET ACTIVITY: RDT&E, DW/04 Advanced Component Development and Prototypes (ACD&P)	R-1 NOMENCLATURE: 0603884C Ballistic Missile Defense Sensors

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 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 0603897C BMD Hercules	51,387	55,764	48,186						
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.