Selected Acquisition Report (SAR)

RCS: DD-A&T(Q&A)823-362

Ballistic Missile Defense System (BMDS)

As of FY 2020 President's Budget

Defense Acquisition Management
Information Retrieval
(DAMIR)

Table of Contents

Sensitivity Originator 3
Schedule 3
Performance 3
Common Acronyms and Abbreviations for MDAP Programs 4
Program Information 6
Responsible Office 6
References 7
Mission and Description 8
Executive Summary 9
Threshold Breaches 13
Schedule 14
Performance 15
Track to Budget 16
Cost and Funding 22
Low Rate Initial Production 32
Foreign Military Sales 33
Nuclear Costs 35
Unit Cost 36
Cost Variance 39
Contracts 43
Deliveries and Expenditures 49
Operating and Support Cost 50

Sensitivity Originator

No originator information is available at this time.

Common Acronyms and Abbreviations for MDAP Programs

Acq O&M - Acquisition-Related Operations and Maintenance
ACAT - Acquisition Category
ADM - Acquisition Decision Memorandum
APB - Acquisition Program Baseline
APPN - Appropriation
APUC - Average Procurement Unit Cost
$B - Billions of Dollars
BA - Budget Authority/Budget Activity
Blk - Block
BY - Base Year
CAPE - Cost Assessment and Program Evaluation
CARD - Cost Analysis Requirements Description
CDD - Capability Development Document
CLIN - Contract Line Item Number
CPD - Capability Production Document
CY - Calendar Year
DAB - Defense Acquisition Board
DAE - Defense Acquisition Executive
DAMIR - Defense Acquisition Management Information Retrieval
DoD - Department of Defense
DSN - Defense Switched Network
EMD - Engineering and Manufacturing Development
EVM - Earned Value Management
FOC - Full Operational Capability
FMS - Foreign Military Sales
FRP - Full Rate Production
FY - Fiscal Year
FYDP - Future Years Defense Program
ICE - Independent Cost Estimate
IOC - Initial Operational Capability
Inc - Increment
JROC - Joint Requirements Oversight Council
$K - Thousands of Dollars
KPP - Key Performance Parameter
LRIP - Low Rate Initial Production
$M - Millions of Dollars
MDA - Milestone Decision Authority
MDAP - Major Defense Acquisition Program
MILCON - Military Construction
N/A - Not Applicable
O&M - Operations and Maintenance
ORD - Operational Requirements Document
OSD - Office of the Secretary of Defense
O&S - Operating and Support
PAUC - Program Acquisition Unit Cost

PB - President's Budget
PE - Program Element
PEO - Program Executive Officer
PM - Program Manager
POE - Program Office Estimate
RDT&E - Research, Development, Test, and Evaluation
SAR - Selected Acquisition Report
SCP - Service Cost Position
TBD - To Be Determined
TY - Then Year
UCR - Unit Cost Reporting
U.S. - United States
USD(AT&L) - Under Secretary of Defense (Acquisition, Technology and Logistics)
USD(A&S) - Under Secretary of Defense (Acquisition and Sustainment)

Program Information

Program Name
Ballistic Missile Defense System (BMDS)

DoD Component
DoD

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References

SAR Baseline (Planning Estimate)
National Security Presidential Directive (NSPD) - 23 dated December 16, 2002 (rescinded by Presidential Policy Directive (PPD) - 10) and PPD-10 dated July 26, 2011

Mission and Description

Mission and Description

To develop, test, and field an integrated, layered, ballistic missile defense system (BMDS) to defend the United States, its deployed forces, allies, and friends against all ranges of enemy ballistic missiles in all phases of flight.

Following guidance from the President, the Secretary of Defense approved the 2019 Missile Defense Review (MDR) Report (dated January 2019), which established the following principles and elements governing U.S. Missile Defense:

1. The U.S. homeland missile defense will stay ahead of rogue states' missile threats
2. The missile defense will defend U.S. forces deployed abroad and support the security of allies and partners
3. The United States will pursue new concepts and technologies
4. Comprehensive missile defense capabilities will support a broad, multi-layered approach to preventing and defeating missile attacks
5. Flexibility and adaptability will enable the United States to tailor its missile defense strategy to potential adversaries
6. Tighter offense-defense integration and interoperability will leverage the full range of assets available
7. A focus on the importance of space will provide a more effective, resilient, and adaptable missile defense posture

Executive Summary

Introduction

The Missile Defense Agency (MDA) remains committed to strengthening and expanding the defenses for our nation, deployed forces, allies, and international partners against increasingly capable missile threats. The missile defense program continues to support the warfighter and needs of the Combatant Commanders with the development, testing, deployment, integration and sustainment of interceptors, sensors, and the command, control, battle management and communications (C2BMC) system for the Ballistic Missile Defense System (BMDS). The program continues to invest in homeland and regional missile defense priorities and in advanced technology development and future capabilities to counter the proliferation of increasingly complex and diverse threats.

The threat environment is markedly more dangerous than in years past and demands a concerted U.S. effort to improve existing and future capabilities for both homeland and regional missile defense. Ballistic missile proliferation continues to grow as countries acquire a greater number of ballistic missiles, increasing their range, incorporating BMD countermeasures and making them more complex, survivable, reliable and accurate. New ballistic missile systems feature multiple independently targetable reentry vehicles (MIRV) and maneuverable reentry vehicles (MaRV), along with decoys and jamming devices.

However, hypersonic weapons are a greater challenge. To effectively deal with the maneuvering hypersonic threat, MDA needs to know what it is doing from launch to intercept. MDA does not have enough terrestrial sensors to view these threats along the entire flight path.

Russia and China are developing advanced cruise missiles and hypersonic missile capabilities that can travel at exceptional speeds (e.g., greater than Mach 5), low altitude, and unpredictable flight paths that challenge existing defensive systems and make them hard to target. North Korea has successfully tested its road-mobile Hwasong-13 and Hwasong-14 intercontinental ballistic missile, which could potentially hit portions of the United States. Additionally, Iran's progress in its space program could shorten its path to an ICBM.

In January 2019, the President of the United States (POTUS), introduced the 2019 Missile Defense Review (MDR), and outlined six missile defense priorities, which will be reflected in upcoming Defense Department budgets:

1. Continuation of the 20 additional ground-based interceptors (GBIs) initiated in FY 2018, which will bring the total to 64 emplaced GBIs. Currently 40 GBIs are at Fort Greely, Alaska, and four are at Vandenberg Air Force Base, California.

2. DOD will focus on developing new missile defense technologies, such as more powerful sensors and radars that will be deployed to detect missile launches and track them so countermeasures can be taken.

3. Besides protecting "all American cities" from ballistic missile attacks, DOD will develop an effective missile defense against emerging advanced cruise and hypersonic weapons.

4. A big part of future DOD budgets will reflect the importance of the space domain. It will play a role in both defense and offense and have the capability to terminate any missile launches from any type or place.

5. Bureaucratic obstacles that hinder speedy deployment of cutting-edge missile defense technologies will be eliminated.

6. The U.S. will work with allies on missile defense protection, such as prioritizing the sale of American missile defense and technologies so they can be defended as well. The U.S. will also share with them early warning and tracking to detect missile launches.

Highlights

The Ground-based Midcourse Defense (GMD) program will extend the Boeing Development and Sustainment Contract (DSC) through December 2023 (note: contract was definitized on March 22, 2019). The DSC extension includes delivery of a new missile field (MF) with 20 silos (MF-4) and two additional silos in the existing MF-1 at Fort Greely, AK. MDA is deferring the production of the 20 additional Ground Based Interceptors (GBIs) at this time due to the delay associated with not meeting the entrance criteria for the Redesigned Kill Vehicle (RKV) Critical Design Review (CDR).

MDA and Lockheed Martin successfully conducted the Final Design Review (FDR) of the Long Range Discrimination Radar (LRDR) on September 25, 2018. Completion of the FDR demonstrates that Lockheed Martin can begin production of the 5600 Sub-Array Suites that will comprise the two radar arrays.

In December 2018, MDA awarded Delivery Order #1 for the HDR-Hawaii radar, which will provide persistent midcourse discrimination, precision tracking, and hit assessment to support the defense of the homeland against long-range missile threats.

MDA rapidly satisfied a United States Force Korea (USFK) Commander's Joint Emergent Operational Need (JEON) requesting integration of the Lower Tier and Upper Tier missile defense systems to improve defensive capability through a more integrated and effective use of the systems available in theater. USFK missile defense assets are now linked directly to C2BMC via a more secure Extremely High Frequency Satellite Communications.

In May 2018, the Terminal High Altitude Area Defense (THAAD) program received approval to increase its interceptor ceiling by 119 for total of 554 interceptors.

MDA delivered the 7th THAAD battery to the U.S. Army. MDA also took delivery of an additional 58 interceptors for warfighter inventory. In addition, MDA delivered the THAAD Radar Skills Trainer to U.S. Army Air Defense School at Fort Sill, OK.

In January 2018, MDA accepted C2BMC Spiral 8.2-1 into the Northern Command (NORTHCOM) and Indo-Pacific Command (INDOPACOM) Operational Capacity Baseline and in December 2018, MDA accepted Spiral 8.2-3 with BOA 6.1 in United States European Command (USEUCOM) and United States Central Command (USCENTCOM) into the Operational Capacity Baseline.

In 2018 MDA began the development of a high-fidelity, all-digital, integrated, BMDS-level simulation. This effort will combine the best performance assessment models from across all BMDS elements into an integrated simulation. The all-digital simulation will be able to model full BMDS architectures and excursions that cannot be easily explored in ground tests or flight tests for a more thorough exploration of the BMDS performance space.

Testing

MDA continues to execute a robust and aggressive test program that demonstrates BMDS capabilities and provide confidence to Combatant Commanders. In 2018, MDA improved the confidence in missile defense and conducted five U.S.-only flight test events and five flight tests with international partners. MDA also completed seven system-level ground tests.

Finally, MDA participated in 35 multi-event exercises and wargames, which are critical to the Warfighter. Test highlights include:

Flight Tests

In April, MDA and the Army successfully detected and tracked a short range ballistic missile while demonstrating interoperability between Patriot and THAAD weapon systems through Automated Engagement Coordination with simulated engagement of a short range ballistic missile (SRBM). This test addressed the FY 2016 National Defense Authorization Act requirement to demonstrate interoperability and integration with Patriot.

Pacific Dragon 2018 (August 8, 2018): A Joint Ballistic Missile Defense interoperability exercise with Japan and Korea. Successfully conducted an intercept of a SRBM with a Standard Missile (SM)-3 Block IB Threat Upgrade missile by a

Japanese ship and crew.

Japan Flight Test Aegis Weapon System (JFTM)-05 (September 11, 2018): A Joint campaign with Japan supporting updated Japanese Aegis Weapon System. Successfully conducted an intercept of a short range ballistic missile with Standard Missile (SM)-3 Block IB Threat Upgrade from a Japanese ship and crew.

Flight Test Aegis Weapon System (FTM)-45 (October 26, 2018): The SM-3 Block IIA return to flight test successfully intercepted a medium range ballistic missile (MRBM) with a SM-3 Block IIA missile. This test informed the SM-Block IIA production decision.

Flight Test Integrated (FTI)-03 (December 10, 2018): Successfully intercepted an intermediate range ballistic missile (IRBM) utilizing the Aegis Weapon System's Engage-on-Remote (EOR) capability based on C2BMC system track with SM-3 Block IIA by Aegis Ashore. This operational test of the European Phased Adaptive Approach (EPAA) Phase 3 architecture supported a technical capability declaration.

Ground Tests

Ground Test Integrated (GTI)-18 Sprint 1 (April 9-13, 2018): Hardware-in-the-Loop test event supporting the United States Forces Korea Joint Emergent Operational Need Phase 2 assessment.

Ground Test (GT)-18 Sprint 2 (July 16-20, 2018): Hardware-in-the-Loop test event supporting Aegis Baseline 9.C2 with Sea Based Terminal (SBT) Increment 2 and Standard Missile (SM)-3 Blk IIA Engage on Remote (EoR) Operational Capacity Baseline (OCB) decision. GT-18 Sprint 2 was a strategic and theater/regional test event
that addresses the Defense of Homeland and Defense of United States Indo-Pacific Command (USINDOPACOM).

Ground Test (GT)-18 Sprint 3 (December 3, 2018 – January 18, 2018): Strategic and theater/regional Hardware-in-the-Loop (HWIL) test event featuring Defense of Homeland and Defense of USINDOPACOM. First Sprint of a two part series focused on N/I Operational Capacity Baseline (OCB) fielding decisions related to Increment 5 capabilities, BMDS Technical Baseline (TBL), and subsequent operational acceptance.

Ground Test Distributed (GTD)-07b (USEUCOM/USCENTCOM) (August 31 - September 14, 2018; October 22-25, 2018): System-level distributed test using the operational system of the European Phased Adaptive Approach Phase 3. This test supports an Operational Assessment (OA) of BMDS performance defending against short to intermediate ballistic missile attacks on USEUCOM and USCENTCOM. This test supports the Technical Capability Demonstrations (TCD) for the second Aegis Ashore site in EUCOM utilizing Aegis BMD BL 9.B2. This test also included a cyber-security test period to address cybersecurity requirements.

International Cooperation

Formidable Shield 2017 (October 14, 2017): 14 ships, 10 aircraft, and approximately 3,300 personnel from Belgium, Canada, Denmark, France, Germany, Italy, the Netherlands, Spain, the U.K., and the U.S., participated in a live-fire integrated air and missile defense scenario, defending against a ballistic missile targets as well as three anti-ship cruise missiles. During the collective self-defense scenario, the USS Donald Cook, DDG 75, successfully detected, tracked and intercepted an MRBM target with a SM-3 Block IB missile. FS-19 will take place in May 2019.

Arrow System Test (AST)-17 (January 22, 2019): The Israel Missile Defense Organization (IMDO) of the Directorate of the Defense Research and Development (DDR&D) at Israel's Ministry of Defense, together with MDA successfully completed a flight test of the Arrow-3 weapon system that is designed to defend against ballistic missiles outside of the atmosphere.

MDA participated in the world's largest international maritime exercises known as Rim of the Pacific (RIMPAC) with MQ-9 Remotely Piloted Aircraft carrying sensor packages. The sensors tracked multiple targets, including a cruise missile, which brings MDA a step closer to validating the value of the airborne sensor to the Integrated Air and Missile Defense fight.

The United Arab Emirates THAAD interceptor deliveries continue as scheduled.

The Kingdom of Saudi Arabia has submitted an FMS Letter of Offer and Acceptance on November 26, 2018 for seven

THAAD Batteries, 360 missile rounds, associated training and sustainment valued at $13.5 billion. MDA expects to deliver THAAD capability to the Kingdom by the end of 2024.

MDA facilitated the Government of Japan's decision to procure two Aegis Ashore (AA) systems. Japan subsequently selected an advanced capability solid state radar for installation on their AA systems. The multi-billion dollar hybrid FMS procurement will significantly increase the defense of Japan and protection of U.S. forces stationed in Japan.

BMD Technology Initiatives

A high priority / high payoff is developing advanced BMD technologies that can be integrated into the BMDS to adapt to future threat changes. Areas for technology investment include: persistent discrimination in the current and future BMDS sensor architecture, high power laser maturation, hypersonic defense weapon systems, hypersonic defense component technologies, and other advanced technology for high-risk/high-pay off breakthroughs. MDA's advanced technology investments are informed by capability gap assessments and focus on concepts that bring upgraded capability to the warfighter. The goal is to provide transformative capabilities that enable the future BMDS to keep pace with new and evolving threats.

MDA is currently working with the Defense Advanced Research Projects Agency (DARPA), the Services, and other offices within the DoD to define what a space architecture should look like. MDA is leveraging DARPA Blackjack's early experimentation to support the development of the Space Sensor Layer (SSL) objective system. These space-based sensors will be critical to the Warfighter's ability to address current and advanced threats.

MDA awarded a contract extension to the Airborne Tracking and Targeting System (ATTS) contract in September 2018 to continue the Electro-Optical and Infrared (EO/IR) flight test program. The program successfully completed 14 EO/IR target tracking CONUS/OCONUS tests and participated in longer flight durations of the MDA ATTS equipment while providing additional valuable tracking test data. The ATTS work will support the transition to the Advanced Sensor.

MDA awarded 21 Hypersonic Defense Weapon Systems (HDWS) concept definition contracts in Sep 2018 and completed the Final Concept Reviews in February 2019. Follow-on HDWS Concept Definition efforts will focus on the more viable contractor concepts to refine performance parameters and provide detailed cost data and schedules for future development and demonstration efforts. MDA is exploring kinetic and non-kinetic solutions for hypersonic defense.

MDA is cognizant of the growing cyber threat and continues to work aggressively to ensure the nation's missile defenses are resilient and able to operate in a highly contested cyber threat environment. MDA is progressively improving the cyber hygiene of the missile defense capabilities by ensuring the cybersecurity infrastructure has the latest security upgrades.

General

In accordance with direction from POTUS, and the 2019 MDR, MDA continues to work diligently to identify ways of strengthening missile defense capabilities, rebalancing homeland and theater defense priorities, and highlighting priority funding areas. MDA is employing an integrated approach addressing U.S. missile defense policy, strategy, and capabilities to counter the challenges of the emerging missile threat environment.

There are no significant software-related issues with the program at this time.

Threshold Breaches

APB Breaches		
Schedule		☐
Performance		☐
Cost	RDT&E	☐
	Procurement	☐
	MILCON	☐
	Acq O&M	☐
O&S Cost		☐
Unit Cost	PAUC	☐
	APUC	☐

Nunn-McCurdy Breaches		
Current UCR Baseline		
	PAUC	None
	APUC	None
Original UCR Baseline		
	PAUC	None
	APUC	None

Schedule

No schedule events exist for BMDS.

Notes

For schedule milestones see the Unclassified BMDS Accountability Report (BAR) and BAR Classified Annex scheduled for release 2Q FY 2019.

Performance

No performance characteristics exist for BMDS.

Notes

For performance characteristics see the Unclassified BMDS Accountability Report (BAR) and BAR Classified Annex scheduled for released 2Q FY 2019.

Track to Budget

RDT&E

Appn	BA	PE		
Defense-Wide	0400	04	0305103C	
	Project		**Name**	
	MDCS		Cyber Security Initiative	
Defense-Wide	0400	03	0603176C	
	Project		**Name**	
	MC71		BMDS Cyber Operations	
	MD40		Program-Wide Support	
	MD71		Advanced Concepts and Performance Assessments	
Defense-Wide	0400	03	0603177C	
	Project		**Name**	
	MC95		Cyber Operations	(Sunk)
	MD40		Program-Wide Support	(Sunk)
	MD95		Discrimination Sensor Technology	(Sunk)
	MT95		Discrimination Sensor Tech-Flight Test Execution	(Sunk)
Defense-Wide	0400	03	0603178C	
	Project		**Name**	
	MD40		Program-Wide Support	(Sunk)
	MD69		Directed Energy Research	(Sunk)
	MD72		Interceptor Technology	
Defense-Wide	0400	03	0603179C	
	Project		**Name**	
	MD40		Program Wide Support	(Sunk)
	MD73		Advanced C4ISR	(Sunk)
Defense-Wide	0400	03	0603180C	
	Project		**Name**	
	MD25		Advanced Technology Development	
	MD40		Program-Wide Support	
Defense-Wide	0400	03	0603274C	
	Project		**Name**	
	MD81		Special Programs - MDA Technology	(Sunk)
Defense-Wide	0400	03	0603294C	
	Project		**Name**	
	MD40		Program-Wide Support	
	MD85		Common Kill Vehicle Technology	
Defense-Wide	0400	04	0603881C	
	Project		**Name**	
	MC07		BMDS Cyber Operations	

	MD06		Patriot Advanced Capability-3 (PAC-3)	
	MD07		THAAD	
	MD40		Program Wide Support	
Defense-Wide	0400	04	0603882C	
	Project		**Name**	
	MC08		BMDS Cyber Operations	
	MD08		Ground Based Midcourse	
	MD40		Program Wide Support	
Defense-Wide	0400	04	0603884C	
	Project		**Name**	
	MC11		BMDS Cyber Operations	
	MD11		BMDS Radars	
	MD40		Program Wide Support	
	MD41		Homeland Defense Radar - Hawaii (HDR-H)	(Sunk)
Defense-Wide	0400	04	0603890C	
	Project		**Name**	
	MC30		BMDS Cyber Operations	
	MC31		Engineering Cyber Operations	
	MD24		System Engineering & Integration	
	MD28		Intelligence & Security	
	MD29		Advanced Threat Missile Defeat Technology	(Sunk)
	MD30		BMD Information Management Systems	
	MD31		Modeling & Simulation	
	MD32		Quality, Safety, and Mission Assurance	
	MD40		Program Wide Support	
	MT23		Enabling - Test	
Defense-Wide	0400	04	0603891C	
	Project		**Name**	
	MD27		Special Programs	
Defense-Wide	0400	04	0603892C	
	Project		**Name**	
	MC09		BMDS Cyber Operations	
	MD09		Aegis BMD	
	MD40		Program Wide Support	
	MG09		Aegis BMD SM-3 Development Articles	(Sunk)
	MM09		Aegis BMD SM-3 Development	
	MX09		Aegis BMD Development Support	
Defense-Wide	0400	04	0603893C	
	Project		**Name**	
	MC12		BMDS Cyber Operations	(Sunk)
	MD12		Space Tracking & Surveillance System (STSS)	(Sunk)
	MD40		Program Wide Support	(Sunk)
Defense-Wide	0400	04	0603895C	
	Project		**Name**	
	MD33		MD Space Exp Center (MDSEC)	(Sunk)

	MD40		Program Wide Support	(Sunk)
Defense-Wide	0400	04	0603896C	

Project	Name
MC01	BMDS Cyber Operations
MD01	Command & Control, Battle Management, Communications (C2BMC)
MD40	Program Wide Support
MT01	C2BMC Test
MX01	C2BMC Development Support

Defense-Wide	0400	04	0603898C	

Project	Name
MC03	BMDS Cyber Operations
MD03	Joint Warfighter Support
MD40	Program Wide Support
MT03	Joint Warfighter Support Test

Defense-Wide	0400	04	0603904C	

Project	Name
MC22	BMDS Cyber Operations
MD22	Missile Defense Integration & Operations Center (MDIOC)
MD40	Program Wide Support

Defense-Wide	0400	04	0603906C	

Project	Name
MD35	Regarding Trench

Defense-Wide	0400	04	0603907C	

Project	Name
MD40	Program Wide Support
MX46	Sea Based X-Band Radar Development Support

Defense-Wide	0400	04	0603913C	

Project	Name
MD20	Israeli Upper Tier
MD26	Israeli ARROW Program
MD34	Short Range Ballistic Missile Defense (SRBMD)

Defense-Wide	0400	04	0603914C	

Project	Name
MC04	BMDS Cyber Operations
MD04	BMDS Combined Test Center
MD40	Program Wide Support
MT04	BMDS Test Program

Defense-Wide	0400	04	0603915C	

Project	Name
MC05	BMDS Cyber Operations
MD40	Program Wide Support
MT05	BMDS Targets Program

Defense-Wide	0400	04	0604115C	

Project	Name
MC98	BMDS Cyber Operations
MD40	Program Wide Support
MD94	Neutral Particle Beam
MD98	Directed Energy Demonstrator Development
MD99	Discrimination Sensor Demonstrator Development
MT99	Technology Maturation Initiatives Test

Defense-Wide 0400 04 0604181C

Project	Name
MD29	Hypersonic Defense
MD40	Program-Wide Support

Defense-Wide 0400 04 0604672C

Project	Name
MD40	Program-Wide Support
MD41	Homeland Defense Radar (HDR) Hawaii

Defense-Wide 0400 04 0604673C

Project	Name	
MD40	Program-Wide Support	
MD41	Homeland Defense Radar - Hawaii (HDR-H)	(Sunk)
MD51	Pacific Radar (PAC Radar)	

Defense-Wide 0400 04 0604873C

Project	Name
MC96	Cyber Operations
MD40	Program Wide Support
MD96	Long Range Discrim Radar (LRDR)

Defense-Wide 0400 04 0604874C

Project	Name
MD40	Program Wide Support
MD97	Improved Homeland Defense (IHLD) Interceptors

Defense-Wide 0400 04 0604876C

Project	Name
MD40	Program Wide Support
MT07	THAAD Test

Defense-Wide 0400 04 0604878C

Project	Name
MD40	Program Wide Support
MT09	Aegis BMD Test

Defense-Wide 0400 04 0604879C

Project	Name
MD40	Program Wide Support
MT11	BMDS Radars Test

Defense-Wide 0400 04 0604880C

Project	Name

	MC68	BMDS Cyber Operations	
	MD40	Program-Wide Support	
	MD68	Aegis Ashore	
	MT68	Aegis Ashore Test	(Sunk)
Defense-Wide	0400 04	0604881C	
	Project	**Name**	
	MD09	SM-3 Block IIA Co-Development	(Sunk)
	MD40	Program-Wide Support	(Sunk)
	MT09	SM-3 Block IIA Co-Development Test	(Sunk)
Defense-Wide	0400 04	0604887C	
	Project	**Name**	
	MD40	Program Wide Support	
	MT08	Ground Based Midcourse Test	
Defense-Wide	0400 04	0604894C	
	Project	**Name**	
	MD40	Program-Wide Support	
	MD85	Multi Object Kill Vehicle	
Defense-Wide	0400 06	0605502C	
	Project	**Name**	
	MD45	Small Business Innovative Research	
Defense-Wide	0400 06	0606942C	
	Project	**Name**	
	MC39	Cyber Vulnerability	(Sunk)
Defense-Wide	0400 06	0901598C	
	Project	**Name**	
	MD38	Management Headquarters	
Defense-Wide	0400 04	1206893C	
	Project	**Name**	
	MC12	BMDS Cyber Operations	
	MD12	Space Tracking and Surveillance System (STSS)	
	MD40	Program-Wide Support	
Defense-Wide	0400 04	1206895C	
	Project	**Name**	
	MC33	Cyber Operations	
	MD33	MD Space Exp Center (MDSEC)	
	MD37	Space Sensor Layer	
	MD40	Program-Wide Support	

Procurement

Appn	BA	PE	
Defense-Wide	0300 01	0208866C	
	Line Item	**Name**	
	MD07	THAAD	

MD08	Ground Based Midcourse	
MD09	Aegis BMD	
MD11	BMDS AN/TPY-2 Radars	
MD20	Arrow Upper Tier	(Sunk)
MD26	Arrow 3 Upper Tier System	
MD34	Short Range Ballistic Missile Defense (SRBMD)	
MD73	Aegis Ashore Phase III	
MD83	Iron Dome	
MD90	Aegis BMD Hardware and Software	
MD97	Improved Homeland Defense (HLD) Interceptors	(Sunk)

MILCON

Appn	BA	PE		
Defense-Wide	0500 01	0603882C		
	Project	**Name**		
	21000673	Redundant Communications Building		
	D1700653	Missile Defense Cmplx Switchgear Facility, Ft. Greely, AK	(Sunk)	
	D1900679	Missile Field #1 Expansion	(Sunk)	
	MDA67400	Missile Field #4	(Sunk)	
Defense-Wide	0500 01	0603884C		
	Project	**Name**		
	00000676	Pacific Radar Complex, Phase 1		
Defense-Wide	0500 02	0603890C		
	Project	**Name**		
	17999902	Unspecified Minor Construction	(Sunk)	
	18999902	Unspecified Minor Construction	(Sunk)	
	19999902	Unspecified Minor Construction	(Sunk)	
Defense-Wide	0500 03	0603890C		
	Project	**Name**		
	19999903	Planning and Design	(Sunk)	
Defense-Wide	0500 02	0603890C		
	Project	**Name**		
	20999902	Worldwide Unspecified Minor Construction		
Defense-Wide	0500 03	0603890C		
	Project	**Name**		
	20999903	Planning and Design		
Defense-Wide	0500 02	0603890C		
	Project	**Name**		
	21999902	Worldwide Unspecified Minor Construction		
Defense-Wide	0500 03	0603890C		
	Project	**Name**		
	21999903	Planning and Design		
Defense-Wide	0500 01	0603890C		

	Project	Name	
	22000675	Pacific IDT	
Defense-Wide	0500 02	0603890C	
	Project	**Name**	
	22999902	Worldwide Unspecified Minor Construction	
Defense-Wide	0500 03	0603890C	
	Project	**Name**	
	22999903	Planning and Design	
Defense-Wide	0500 02	0603890C	
	Project	**Name**	
	23999902	Worldwide Unspecified Minor Construction	
Defense-Wide	0500 03	0603890C	
	Project	**Name**	
	23999903	Planning and Design	
Defense-Wide	0500 02	0603890C	
	Project	**Name**	
	24999902	Worldwide Unspecified Minor Construction	
Defense-Wide	0500 03	0603890C	
	Project	**Name**	
	24999903	Planning and Design	
Defense-Wide	0500 01	0603914C	
	Project	**Name**	
	D1700662	Test Support Facility	(Sunk)
	D2200672	Consolidated Test Center	
Defense-Wide	0500 01	0604673C	
	Project	**Name**	
	D2100671	Homeland Defense Radar (HDR) - Hawaii	
Defense-Wide	0500 03	0604873C	
	Project	**Name**	
	17999903	Planning and Design	(Sunk)
Defense-Wide	0500 01	0604873C	
	Project	**Name**	
	D1900659	Long Range Discrimination Radar Cmplx, Clear AFS, AK, Ph 2	(Sunk)

Cost and Funding

Cost Summary

Total Acquisition Cost							
Appropriation	BY $M			BY 2002 $M	TY $M		
	SAR Baseline Planning Estimate	Current APB Objective/Threshold		Current Estimate	SAR Baseline Planning Estimate	Current APB Objective	Current Estimate
RDT&E	44740.1	--	--	132658.6	47217.1	--	161878.0
Procurement	0.0	--	--	19046.0	0.0	--	25984.9
Flyaway	--	--	--	19046.0	--	--	25984.9
Recurring	--	--	--	19046.0	--	--	25984.9
Non Recurring	--	--	--	0.0	--	--	0.0
Support	--	--	--	0.0	--	--	0.0
Other Support	--	--	--	0.0	--	--	0.0
Initial Spares	--	--	--	0.0	--	--	0.0
MILCON	0.0	--	--	1886.6	0.0	--	2687.8
Acq O&M	0.0	--	--	0.0	0.0	--	0.0
Total	44740.1	--	--	153591.2	47217.1	--	190550.7

Cost Notes

For Major Defense Acquisition Programs, DoD requires an APB at program initiation. The APB establishes cost, quantity, schedule, and performance parameters that form the basis for unit cost reporting under 10 U.S.C. Sec. 2433. As a single integrated system of systems, the BMDS does not have an APB. In response to other statutory requirements, however, Missile Defense Agency provides the Congress with an annual BMDS Accountability Report (BAR), which includes schedule, technical, operational capacity, resource, and contract baselines that guide development of ballistic missile defense capabilities. The BAR includes unit cost baselines for key assets (e.g. Ground-Based Interceptors and AN/TPY-2 radars) comprising the BMDS.

Total Quantity			
Quantity	SAR Baseline Planning Estimate	Current APB	Current Estimate
RDT&E	0	0	0
Procurement	0	0	0
Total	0	0	0

Quantity Notes

Quantities of Key BMDS Assets (grouped by appropriation, total buys from FY 2002-24):

Edit Main Menu

Program	Component	RDT&E	Proc
Terminal High Altitude Area Defense (THAAD)	Batteries	2	5
	Interceptors	50	624
Aegis	SM-3 Block IA	79	71
	SM-3 Block IIA	17	74
	SM-3 Block IB	21	484
Ground-Based Midcourse Defense (GMD)	Ground-Based Interceptors (GBIs)	58	20
Sensors	AN/TPY-2	7	5

Cost and Funding

Funding Summary

Appropriation Summary									
FY 2020 President's Budget / December 2018 SAR (TY$ M)									
Appropriation	Prior	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	To Complete	Total
RDT&E	122184.7	7248.7	7369.6	6742.9	6256.7	6139.6	5935.8	0.0	161878.0
Procurement	14619.3	2572.4	1493.8	1671.0	1834.7	1971.3	1822.4	0.0	25984.9
MILCON	1207.0	198.2	45.5	306.6	483.0	52.0	395.5	0.0	2687.8
Acq O&M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PB 2020 Total	138011.0	10019.3	8908.9	8720.5	8574.4	8162.9	8153.7	0.0	190550.7
PB 2019 Total	136414.3	9415.5	8865.8	8726.4	8757.8	8342.2	0.0	0.0	180522.0
Delta	1596.7	603.8	43.1	-5.9	-183.4	-179.3	8153.7	0.0	10028.7

Quantity Summary										
FY 2020 President's Budget / December 2018 SAR (TY$ M)										
Quantity	Undistributed	Prior	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	To Complete	Total
Development	0	0	0	0	0	0	0	0	0	0
Production	0	0	0	0	0	0	0	0	0	0
PB 2020 Total	0	0	0	0	0	0	0	0	0	0
PB 2019 Total	0	0	0	0	0	0	0	0	0	0
Delta	0	0	0	0	0	0	0	0	0	0

Cost and Funding

Annual Funding By Appropriation

Annual Funding 0400 | RDT&E | Research, Development, Test, and Evaluation, Defense-Wide							
Fiscal Year	Quantity	TY $M					
		End Item Recurring Flyaway	Non End Item Recurring Flyaway	Non Recurring Flyaway	Total Flyaway	Total Support	Total Program
2002	--	--	--	--	--	--	6618.8
2003	--	--	--	--	--	--	6446.3
2004	--	--	--	--	--	--	7566.8
2005	--	--	--	--	--	--	8826.7
2006	--	--	--	--	--	--	7690.3
2007	--	--	--	--	--	--	9382.8
2008	--	--	--	--	--	--	8655.3
2009	--	--	--	--	--	--	8411.9
2010	--	--	--	--	--	--	6945.9
2011	--	--	--	--	--	--	7406.7
2012	--	--	--	--	--	--	6809.2
2013	--	--	--	--	--	--	5867.3
2014	--	--	--	--	--	--	5731.0
2015	--	--	--	--	--	--	5645.2
2016	--	--	--	--	--	--	6219.7
2017	--	--	--	--	--	--	6201.2
2018	--	--	--	--	--	--	7759.6
2019	--	--	--	--	--	--	7248.7
2020	--	--	--	--	--	--	7369.6
2021	--	--	--	--	--	--	6742.9
2022	--	--	--	--	--	--	6256.7
2023	--	--	--	--	--	--	6139.6
2024	--	--	--	--	--	--	5935.8
Subtotal	--	--	--	--	--	--	161878.0

Annual Funding 0400 | RDT&E | Research, Development, Test, and Evaluation, Defense-Wide							
Fiscal Year	Quantity	BY 2002 $M					
		End Item Recurring Flyaway	Non End Item Recurring Flyaway	Non Recurring Flyaway	Total Flyaway	Total Support	Total Program
2002	--	--	--	--	--	--	6496.7
2003	--	--	--	--	--	--	6238.0
2004	--	--	--	--	--	--	7320.1
2005	--	--	--	--	--	--	8432.1
2006	--	--	--	--	--	--	7078.7
2007	--	--	--	--	--	--	8350.7
2008	--	--	--	--	--	--	7655.5
2009	--	--	--	--	--	--	7195.8
2010	--	--	--	--	--	--	5901.4
2011	--	--	--	--	--	--	6223.6
2012	--	--	--	--	--	--	5636.8
2013	--	--	--	--	--	--	4718.8
2014	--	--	--	--	--	--	4497.0
2015	--	--	--	--	--	--	4343.1
2016	--	--	--	--	--	--	4733.0
2017	--	--	--	--	--	--	4669.6
2018	--	--	--	--	--	--	5722.0
2019	--	--	--	--	--	--	5288.7
2020	--	--	--	--	--	--	5223.0
2021	--	--	--	--	--	--	4685.2
2022	--	--	--	--	--	--	4262.1
2023	--	--	--	--	--	--	4100.2
2024	--	--	--	--	--	--	3886.5
Subtotal	--	--	--	--	--	--	132658.6

Annual Funding 0300 | Procurement | Procurement, Defense-Wide							
Fiscal Year	Quantity	TY $M					
		End Item Recurring Flyaway	Non End Item Recurring Flyaway	Non Recurring Flyaway	Total Flyaway	Total Support	Total Program
2009	--	--	206.6	--	206.6	--	206.6
2010	--	--	835.7	--	835.7	--	835.7
2011	--	--	1070.8	--	1070.8	--	1070.8
2012	--	--	1347.2	--	1347.2	--	1347.2
2013	--	--	1464.2	--	1464.2	--	1464.2
2014	--	--	1785.2	--	1785.2	--	1785.2
2015	--	--	1757.2	--	1757.2	--	1757.2
2016	--	--	1489.2	--	1489.2	--	1489.2
2017	--	--	1610.4	--	1610.4	--	1610.4
2018	--	--	3052.8	--	3052.8	--	3052.8
2019	--	--	2572.4	--	2572.4	--	2572.4
2020	--	--	1493.8	--	1493.8	--	1493.8
2021	--	--	1671.0	--	1671.0	--	1671.0
2022	--	--	1834.7	--	1834.7	--	1834.7
2023	--	--	1971.3	--	1971.3	--	1971.3
2024	--	--	1822.4	--	1822.4	--	1822.4
Subtotal	--	--	25984.9	--	25984.9	--	25984.9

Annual Funding 0300 | Procurement | Procurement, Defense-Wide							
Fiscal Year	Quantity	BY 2002 $M					
		End Item Recurring Flyaway	Non End Item Recurring Flyaway	Non Recurring Flyaway	Total Flyaway	Total Support	Total Program
2009	--	--	174.6	--	174.6	--	174.6
2010	--	--	703.9	--	703.9	--	703.9
2011	--	--	892.1	--	892.1	--	892.1
2012	--	--	1106.0	--	1106.0	--	1106.0
2013	--	--	1165.5	--	1165.5	--	1165.5
2014	--	--	1388.3	--	1388.3	--	1388.3
2015	--	--	1337.9	--	1337.9	--	1337.9
2016	--	--	1123.2	--	1123.2	--	1123.2
2017	--	--	1201.9	--	1201.9	--	1201.9
2018	--	--	2227.0	--	2227.0	--	2227.0
2019	--	--	1846.1	--	1846.1	--	1846.1
2020	--	--	1041.0	--	1041.0	--	1041.0
2021	--	--	1141.7	--	1141.7	--	1141.7
2022	--	--	1229.0	--	1229.0	--	1229.0
2023	--	--	1294.5	--	1294.5	--	1294.5
2024	--	--	1173.3	--	1173.3	--	1173.3
Subtotal	--	--	19046.0	--	19046.0	--	19046.0

Annual Funding 0500 | MILCON | Military Construction, Defense-Wide	
Fiscal Year	TY $M Total Program
2002	8.2
2003	24.9
2004	24.4
2005	22.3
2006	4.9
2007	0.8
2008	--
2009	18.2
2010	96.7
2011	1.2
2012	71.9
2013	138.7
2014	188.1
2015	28.3
2016	181.8
2017	193.6
2018	203.0
2019	198.2
2020	45.5
2021	306.6
2022	483.0
2023	52.0
2024	395.5
Subtotal	2687.8

Annual Funding 0500 | MILCON | Military Construction, Defense-Wide	
Fiscal Year	**BY 2002 $M**
	Total Program
2002	7.9
2003	23.7
2004	23.2
2005	21.0
2006	4.4
2007	0.7
2008	--
2009	15.3
2010	80.9
2011	1.0
2012	58.2
2013	108.4
2014	142.5
2015	21.0
2016	133.6
2017	139.9
2018	142.4
2019	137.5
2020	30.7
2021	202.5
2022	312.7
2023	33.0
2024	246.1
Subtotal	1886.6

Low Rate Initial Production

There is no LRIP for this program.

Foreign Military Sales

Country	Date of Sale	Quantity	Total Cost $M	Description
United Kingdom	12/12/2018	0	1.9	FMS Case UK-I-ZAA. Technical Assistance Case defining system performance requirements for BMDDR/C2BMC to include Site Survey Assessment & Foreign Liaison Officer.
Saudi Arabia	11/26/2018	360	5363.4	FMS Case SR-I-WIC. THAAD Interceptors.
Saudi Arabia	11/26/2018	7	7891.4	FMS Case SR-I-WIB. Seven THAAD batteries, one training battery, and associated equipment, facilities, and services.
Japan	10/22/2018	0	12.0	FMS Case JA-P-QCH: Standard Missile-3 (SM-3) Follow-On Technical Support (FOTS). No major deliveries.
Japan	7/10/2018	0	0.4	FMS Case JA-I-UAB. USG Technical Assistance in support of Integrated Air & Missile Defense (IAMD) Exercise Resilient Shield 2019.
Finland	4/3/2018	0	0.9	FMS Case FI-I-YAA. Technical Assistance for an Integrated Air Defense Information Study (IADIS).
Japan	3/15/2018	0	0.4	FMS Case JA-P-QDM: Airborne Long Distance Observation Sensor System (ALOSS-AIRBOSS2) Participation in Japanese Flight Test Mission-05 (JFTM-05). No major deliveries.
Japan	2/22/2018	0	24.8	FMS Case JA-P-QDS: Aegis Ashore Technical Assistance and Support. No major deliveries.
Japan	12/1/2017	4	133.3	FMS Case JA-P-ATB: SM-3 Block (BLK) IIA All Up Rounds (AURs) and Support. Major deliveries: Three (3) Tactical AURs and one (1) Flight Test Round (FTR).
Japan	11/24/2017	0	8.8	FMS Case: JA-P-QAG: Standard Missile-3 (SM-3) Follow-On Technical Support (FOTS). No major deliveries.
Japan	10/27/2017	0	0.2	FMS Case JA-P-QDN: Aegis Ashore Site Survey. No major deliveries.
Japan	8/8/2017	0	0.4	FMS Case JA-I-UAA: USG Technical Assistance in support of the Integrated Air and Missile Defense (IAMD) Exercise Fleet Synthetic Training – Joint (FST-J). Deliveries:Technical services to support "Resilient Shield" 2018.
Japan	3/15/2017	6	10.3	FMS Case JA-P-CRT: SM-3 Block (BLK) IA components and spare parts with support and services. Deliveries: Two (2) MK72 Rocket Motor Boosters, one (1) Third Stage Rocket Motor (TSRM), and three (3) Nosecones.
Japan	12/1/2016	0	10.6	FMS Case JA-P-FYW: SM-3 technical assistance including BLK IIA maintenance concepts and Intermediate Level Maintenance Facility (ILMF) and magazine design and review, BLK IA spares and consumables, life-cycle, recertification, follow-on

				technical, security, and weapon system services and support. No major deliveries.
Japan	9/1/2016	0	8.8	FMS Case JA-P-FYF: Technical Assistance and support to define the interface between the Japan Aerospace Defense Ground Environment (JADGE) and Japan Aegis Ballistic Missile Defense (BMD). No major deliveries.
Japan	3/22/2016	1	77.3	FMS Case JA-P-ASK: Japan Flight Test Mission-05 (JFTM-05). Deliveries: One (1) SM-3 BLK IB Flight Test Round (FTR).
South Korea	12/24/2015	0	0.6	FMS Case KS-I-YOA: International Simulation (I-SIM) software and training. Deliveries: No major deliveries.
Japan	12/1/2015	0	6.1	FMS Case JA-P-FWV: SM-3 (FOTS), Spares and Equipment. No major deliveries.
Japan	12/1/2015	0	12.5	FMS Case JA-P-FXU: (SM-3) Cooperative Development (SCD) (FTM) Execution. No major deliveries.
Japan	6/1/2015	0	8.0	FMS Case JA-P-FXY: SCD Pre-Flight Readiness Test (PFRT) for (TSRM). No major deliveries.
Japan	1/2/2015	0	2.8	FMS Case JA-P-FUN: Insensitive Munition (IM) Inspection and Testing of SM-3 BLK IIA Second Stage Rocket Motors (SSRMs) and TSRMs. No major deliveries.
Saudi Arabia	12/14/2014	0	12.0	FMS Case SR-I-WIA: United States Government (USG) technical assistance. No major deliveries.
Japan	11/3/2014	0	3.8	FMS Case JA-P-FVE: ILMF security support and services. No major deliveries.
Japan	11/3/2014	0	5.3	FMS Case JA-P-FUV: SM-3 FOTS and Return, Repair, Reshipment (RRR) of SM-3 All Up Rounds (AURs). No major deliveries.
United Arab Emirates	12/25/2011	2	5202.2	FMS Case AE-B-UAF: Two Terminal High Altitude Area Defense (THAAD) Batteries, consisting of 192 interceptors, 2 Army Navy/Transportable Radar Surveillance Model 2 (AN/TPY-2) Radars, 12 Launchers, 8 Missile Round Pallets, 7 Multifunctional Information Distribution System (MIDS) Terminals, 4 AMMPS, 10 PR4G TRC-9105 Radios, 6 PR4G TRC-9301C Radios, various tactical vehicles, trucks, training aids & devices, spare parts, training, government and contractor technical assistance, Tracking Exercise, books & publications, and repair & return. [Quantity is 2 batteries]
United Arab Emirates	4/30/2010	0	13.8	FMS Case AE-B-UAE: Technical Assistance & Site Survey. Line closure activities are occurring for applicable lines. No major deliveries.
Japan	3/22/2010	2	20.0	FMS Case JA-P-FON: SM-3 BLK IA Spares and RRR. Deliveries: One (1) SM-3 Kinetic Warhead (KW); One (1) MK72 Rocket Motor Booster.
Japan	9/11/2008	0	12.1	FMS Case JA-P-FQV: SM-3 BLK IA Spares. No major deliveries.

Netherlands	8/31/2006	0	18.7	FMS Case NE-P-GLK: BMD Sensor Integration Study (SIS). No major deliveries.

Notes

Nuclear Costs

None

Unit Cost

Current UCR Baseline and Current Estimate (Base-Year Dollars)			
Item	BY 2002 $M Current UCR Baseline	BY 2002 $M Current Estimate (Dec 2018 SAR)	% Change
Program Acquisition Unit Cost			
Cost	--	153591.2	
Quantity	--	0	
Unit Cost	--	--	--
Average Procurement Unit Cost			
Cost	--	19046.0	
Quantity	--	0	
Unit Cost	--	--	--

For Major Defense Acquisition Programs, DoD requires an APB at program initiation. The APB establishes cost, quantity, schedule, and performance parameters that form the basis for unit cost reporting under 10 U.S.C. Sec. 2433. As a single integrated system of systems, the BMDS does not have an APB. In response to other statutory requirements, however, Missile Defense Agency provides the Congress with an annual BMDS Accountability Report (BAR), which includes schedule, technical, test, operational capacity, resource, and contract baselines that guide development of ballistic missile defense capabilities. The BAR includes unit cost baselines for key assets (e.g. Ground-Based Interceptors and AN/TPY-2 radars) comprising the BMDS.

APB Unit Cost History					
Item	Date	BY 2002 $M		TY $M	
		PAUC	APUC	PAUC	APUC
Original APB	N/A	N/A	N/A	N/A	N/A
APB as of January 2006	N/A	N/A	N/A	N/A	N/A
Revised Original APB	N/A	N/A	N/A	N/A	N/A
Prior APB	N/A	N/A	N/A	N/A	N/A
Current APB	N/A	N/A	N/A	N/A	N/A
Prior Annual SAR	Dec 2017	N/A	N/A	N/A	N/A
Current Estimate	Dec 2018	N/A	N/A	N/A	N/A

SAR Unit Cost History

Current SAR Baseline to Current Estimate (TY $M)									
PAUC Planning Estimate	Changes								PAUC Current Estimate
	Econ	Qty	Sch	Eng	Est	Oth	Spt	Total	
0.000	--	--	--	--	--	--	--	--	0.000

A PAUC Unit Cost History is not available, since no Initial PAUC Estimate had been calculated due to a lack of defined quantities.

Current SAR Baseline to Current Estimate (TY $M)									
Initial APUC Planning Estimate	Changes								APUC Current Estimate
	Econ	Qty	Sch	Eng	Est	Oth	Spt	Total	
0.000	--	--	--	--	--	--	--	--	0.000

An APUC Unit Cost History is not available, since no Initial APUC Estimate had been calculated due to a lack of defined quantities.

SAR Baseline History				
Item	SAR Planning Estimate	SAR Development Estimate	SAR Production Estimate	Current Estimate
Milestone A	N/A	N/A	N/A	N/A
Milestone B	N/A	N/A	N/A	N/A
Milestone C	N/A	N/A	N/A	N/A
IOC	N/A	N/A	N/A	N/A
Total Cost (TY $M)	47217.1	N/A	N/A	190550.7
Total Quantity	0	N/A	N/A	0
PAUC	N/A	N/A	N/A	N/A

Cost Variance

Summary TY $M				
Item	RDT&E	Procurement	MILCON	Total
SAR Baseline (PlanningRDTE Estimate)	47217.1	--	--	47217.1
Previous Changes				
Economic	-235.0	-82.8	-26.2	-344.0
Quantity	--	+15.0	--	+15.0
Schedule	-1018.7	-124.7	--	-1143.4
Engineering	+52915.9	-1296.1	-31.8	+51588.0
Estimating	-3292.2	+535.9	+2000.5	-755.8
Other	--	--	--	--
Support	--	--	--	--
Subtotal	+48370.0	-952.7	+1942.5	+49359.8
Current Changes				
Economic	+277.8	+66.0	+10.2	+354.0
Quantity	--	--	--	--
Schedule	-82.7	-182.9	-267.2	-532.8
Engineering	+380.1	--	--	+380.1
Estimating	+138.9	+1467.2	+67.6	+1673.7
Other	--	--	--	--
Support	--	--	--	--
Subtotal	+714.1	+1350.3	-189.4	+1875.0
Adjustments	+65576.8	+25587.3	+934.7	+92098.8
Total Changes	+114660.9	+25984.9	+2687.8	+143333.6
CE - Cost Variance	161878.0	25984.9	2687.8	190550.7
CE - Cost & Funding	161878.0	25984.9	2687.8	190550.7

Summary BY 2002 $M				
Item	RDT&E	Procurement	MILCON	Total
SAR Baseline (PlanningRDTE Estimate)	44740.1	--	--	44740.1
Previous Changes				
Economic	--	--	--	--
Quantity	--	+12.8	--	+12.8
Schedule	-941.4	-91.5	--	-1032.9
Engineering	+44369.7	-977.2	-24.3	+43368.2
Estimating	-3291.0	+377.8	+1431.8	-1481.4
Other	--	--	--	--
Support	--	--	--	--
Subtotal	+40137.3	-678.1	+1407.5	+40866.7
Current Changes				
Economic	--	--	--	--
Quantity	--	--	--	--
Schedule	-57.8	-141.9	-171.9	-371.6
Engineering	+261.5	--	--	+261.5
Estimating	+186.9	+1027.3	+45.4	+1259.6
Other	--	--	--	--
Support	--	--	--	--
Subtotal	+390.6	+885.4	-126.5	+1149.5
Adjustments	+47390.6	+18838.7	+605.6	+66834.9
Total Changes	+87918.5	+19046.0	+1886.6	+108851.1
CE - Cost Variance	132658.6	19046.0	1886.6	153591.2
CE - Cost & Funding	132658.6	19046.0	1886.6	153591.2

Previous Estimate: December 2017

Cost Variance Notes

Note: Below are the Adjustments from the current and prior SARs reflecting the inclusion of another year of funding since the prior submission.

SAR	$ Then Year				$ Base Year 2002			
Submission	RDT&E	Proc	MILCON	Total	RDT&E	Proc	MILCON	Total
Dec 2009-15	46,833.8	20,723.4	159.5	**67,716.7**	34,822.0	15,629.0	113.7	**50,564.7**
Jun 2016	6,142.2	1,555.1	188.9	**7,886.2**	4,187.5	1,050.7	123.5	**5,361.7**
Dec 2017	6,665.0	1,486.4	190.8	**8,342.2**	4,494.6	985.7	122.3	**5,602.6**
Dec 2018	5,935.8	1,822.4	395.5	**8,153.7**	3,886.5	1,173.3	246.1	**5,305.9**
Total	**65,576.8**	**25,587.3**	**934.7**	**92,098.7**	**47,390.6**	**18,838.7**	**605.6**	**66,834.9**

RDT&E	$M	
Current Change Explanations	Base Year	Then Year
Revised escalation indices. (Economic)	N/A	+277.8
Delayed the Redesigned Kill Vehicle (RKV) two years from FY 2021 to FY 2023. (Schedule)	+370.7	+539.3
Delayed the Pacific Radar from FY 2024 to FY 2026. (Schedule)	-428.5	-622.0
Added funding for Phase 1 of Neutral Particle Beam effort. (Engineering)	+261.5	+380.1
Revised estimate for the BMDS Test Program. (Estimating)	+691.7	+983.4
Added funding to support the United States Forces Korea Joint Emergent Operational Need. (Estimating)	+552.8	+764.9
Congressional adds in FY 2018-FY 2019 and other adds for Laser Scaling and other Directed Energy efforts. (Estimating)	+351.6	+497.0
Congressional adds in FY 2018 for Israeli Programs. (Estimating)	+197.9	+268.4
Added funding for outfitting Combined Test Center -1. (Estimating)	+85.4	+126.7
Congressional add in FY 2019 for Hypervelociity-Ballistic missile tracking system and other Space adjustments. (Estimating)	+70.0	+96.1
FY 2019 Congressional adds for AN/TPY-2 radar improvements. (Estimating)	+41.1	+56.3
Refined cost estimates and other miscellaneous adjustments. (Estimating)	+47.7	+26.6
Reduced Multi Object Kill Vehicle program to a limited technology development and concept studies program. (Estimating)	-1004.1	-1442.8
Transferred RKV manufacturing to Procurement. (Estimating)	-363.0	-536.9
Decreased funding for Special Programs. (Estimating)	-191.7	-282.0
FY 2018-FY2019 Congressional and other reductions to Aegis Weapon System Software development. (Estimating)	-179.6	-258.2
Transferred funding for Ground-based Midcourse Defense missile field components, obsolescence, and Launch Support Services to Procurement. (Estimating)	-104.1	-148.7
Adjustment for current and prior escalation. (Estimating)	-8.8	-11.9
RDT&E Subtotal	+390.6	+714.1

Procurement	$M	
Current Change Explanations	Base Year	Then Year
Revised escalation indices. (Economic)	N/A	+66.0
Delayed the Redesigned Kill Vehicle (RKV) two years from FY 2021 to FY 2023. (Schedule)	-141.9	-182.9
Transferred RKV manufacturing from RDT&E. (Estimating)	+356.9	+536.9
Congressional adds in FY 2018 for Israeli Programs. (Estimating)	+211.5	+290.0
Added funding for additional SM-3 Block IB/IIA missiles. (Estimating)	+202.8	+287.1
Additional THAAD interceptors. (Estimating)	+182.7	+248.0
Transferred funding for Ground-based Midcourse Defense missile field components, obsolescence, and Launch Support Services from RDT&E. (Estimating)	+102.3	+148.7
Refined cost estimates and other miscellaneous adjustments. (Estimating)	-26.6	-40.3
Adjustment for current and prior escalation. (Estimating)	-2.3	-3.2
Procurement Subtotal	+885.4	+1350.3

MILCON	$M

Current Change Explanations	Base Year	Then Year
Revised escalation indices. (Economic)	N/A	+10.2
Accelerated Combined Test Center 1 from FY 2023 to FY 2022. (Schedule)	+65.7	+97.9
Delayed the Pacific Radar from FY 2024 to FY 2026. (Schedule)	-237.6	-365.1
Funding added for the Redundant Communications Building. (Estimating)	+34.9	+52.8
Refined cost estimates and other miscellaneous adjustments. (Estimating)	+10.4	+14.7
Adjustment for current and prior escalation. (Estimating)	+0.1	+0.1
MILCON Subtotal	-126.5	-189.4

Contracts

Contract Identification

Appropriation: RDT&E

Contract Name: Development and Sustainment Contract

Contractor: The Boeing Co., Missile Defense Systems

Contractor Location: 499 Boeing Blvd., SW
Huntsville, AL 35824-3001

Contract Number: HQ0147-12-C-0004

Contract Type: Cost (CR), Cost Plus Fixed Fee (CPFF), Cost Plus Incentive Fee (CPIF), Cost Plus Award Fee (CPAF), Fixed Price Incentive(Firm Target) (FPIF)

Award Date: December 30, 2011

Definitization Date: December 30, 2011

Contract Price							
Initial Contract Price ($M)			Current Contract Price ($M)			Estimated Price At Completion ($M)	
Target	Ceiling	Qty	Target	Ceiling	Qty	Contractor	Program Manager
2816.8	2816.8	N/A	10561.3	10561.3	N/A	10572.9	10566.7

Target Price Change Explanation

The difference between the Initial Contract Price Target and the Current Contract Price Target is due to the development options and change proposals exercised (identified in prior SARs). The $4,424 million increase since the 2017 SAR was primarily driven by the Authority to Proceed (ATP) on the Development and Sustainment Contract extension executed on January 31, 2018 and the definitization of the Redesigned Kill Vehicle (RKV) change order executed on May 11, 2018.

Contract Variance		
Item	Cost Variance	Schedule Variance
Cumulative Variances To Date (12/31/2018)	-144.0	-133.3
Previous Cumulative Variances	-103.7	-32.0
Net Change	-40.3	-101.3

Cost and Schedule Variance Explanations

The unfavorable net change in the cost variance is due to RKV Product Development. Major drivers include test delays, design rework, material expediting, increased software related efforts, and Critical Design Review slip.

The unfavorable net change in the schedule variance is due to C2 Booster Avionics Spares, Integration Assembly & Test, and Multi-Mode 2/3 Stage Booster Software.

Contract Identification

Appropriation: RDT&E

Contract Name: SM-3 Technology Development of Block IB/IA Missiles

Contractor: Raytheon Missile Systems

Contractor Location: PO Box 11337
1151 East Hermans Rd
Tucson, AZ 85745-1337

Contract Number: HQ0276-11-C-0002

Contract Type: Cost Plus Award Fee (CPAF), Cost Plus Incentive Fee (CPIF)

Award Date: January 15, 2011

Definitization Date: March 15, 2011

Contract Price							
Initial Contract Price ($M)			Current Contract Price ($M)			Estimated Price At Completion ($M)	
Target	Ceiling	Qty	Target	Ceiling	Qty	Contractor	Program Manager
594.0	N/A	N/A	693.0	N/A	N/A	674.0	684.0

Target Price Change Explanation

The difference between the Initial Contract Price Target and the Current Contract Price Target is due to Flight Test Support, continued verification of technology insertion, discrimination improvement and service life extension.

Contract Variance		
Item	Cost Variance	Schedule Variance
Cumulative Variances To Date (12/31/2018)	+12.0	-2.0
Previous Cumulative Variances	+14.0	0.0
Net Change	-2.0	-2.0

Cost and Schedule Variance Explanations

The unfavorable net change in the cost variance is due to cost that was incurred for which performance cannot yet be claimed until exit criteria is achieved.

The unfavorable cumulative schedule variance is due to hardware and software delays. The variance is negligible and there is no impact to the program.

Notes

A Period of Performance extension to complete discrimination improvements is in work and will extend Earned Value reporting through June 30, 2019.

Contract Identification

Appropriation: RDT&E

Contract Name: THAAD Advanced Capability Development

Contractor: Lockheed Martin Corporation

Contractor Location: 4800 Bradford Drive NW
Huntsville, AL 35805-1930

Contract Number: HQ0147-12-D-0001

Contract Type: Cost Plus Fixed Fee (CPFF), Firm Fixed Price (FFP), Cost Plus Incentive Fee (CPIF), Cost Plus Award Fee (CPAF), Firm Fixed Price Level of Effort Term (FFPLOE)

Award Date: February 01, 2012

Definitization Date: February 01, 2012

Contract Price							
Initial Contract Price ($M)			Current Contract Price ($M)			Estimated Price At Completion ($M)	
Target	Ceiling	Qty	Target	Ceiling	Qty	Contractor	Program Manager
961.2	N/A	N/A	1735.0	N/A	N/A	1735.0	1735.0

Target Price Change Explanation

The difference between the Initial Contract Price Target and the Current Contract Price Target is due to the major efforts executed to include Joint Emergent Operational Need (JEON) efforts for Testbed and Launcher Upgrades, Radar Digital Signal Injection System (RDSIS), System Power Architecture (SPA), Packaged Threat Products (PTP), PATRIOT Launch on Remote Trade Study, acceleration of Software Build 4.0 to 3.2 (THAAD Remoted Launcher), PATRIOT Advanced Capability Version Three with Missile Segment Enhancement (PAC-3 MSE), and THAAD MSE Integration. Award for PAC-3 MSE Ground Test Unit. Other efforts executed in this timeframe included Test Engineering Services Task Instructions, Flight Test THAAD (FTT)-23, five new production obsolescence risk mitigation tasks including Mission Computer Redesign, and four new technical studies for THAAD Table Top Trainer, Technical Data Package Update, Missile Interface Module Redesign, Launcher Stowage Box Redesign, Remoted THAAD Fire Control and Communications Workstations, and Dual Monitor Development.

Contract Variance		
Item	Cost Variance	Schedule Variance
Cumulative Variances To Date (12/31/2018)	+12.3	-3.1
Previous Cumulative Variances	+1.4	-2.9
Net Change	+10.9	-0.2

Cost and Schedule Variance Explanations

The favorable net change in the cost variance is due to the Electronic Protection/Objective Debris Mitigation/Remote Launcher, labor efficiencies, and Regional Capability performance improvement.

The unfavorable net change in the schedule variance is due to the Launcher Testbed and the THAAD Fire Control/Communications (TFCC) Testbed. The variance is negligible and there is no impact to the program.

Notes

There were no contract ceiling adjustments from January 2018 through December 2018. Contract Justification and Approval (J&A) was modified and approved to allow for the International Engineering Services Plan (IESP) Fair Share Program to be executed on the contract.

Contract Identification

Appropriation: RDT&E
Contract Name: Long Range Discrimination Radar (LRDR)
Contractor: Lockheed Martin
Contractor Location: 199 Borton Martin Road
Moorestown, NJ 08057
Contract Number: HQ0147-16-C-0011
Contract Type: Fixed Price Incentive(Firm Target) (FPIF)
Award Date: October 21, 2015
Definitization Date: October 21, 2015

Contract Price							
Initial Contract Price ($M)			Current Contract Price ($M)			Estimated Price At Completion ($M)	
Target	Ceiling	Qty	Target	Ceiling	Qty	Contractor	Program Manager
667.6	732.0	N/A	701.2	767.9	N/A	772.9	772.9

Target Price Change Explanation

The difference between the Initial Contract Price Target and the Current Contract Price Target is due to additional scope incorporated on the contract and the Government's share of the unfavorable Variance At Complete (VAC). MDA added scope to align with the DoD Chief Information Officer (CIO) guidance on timing. This capability will be part of LRDR Configuration 1 delivered in BMDS Increment 6.

Contract Variance		
Item	Cost Variance	Schedule Variance
Cumulative Variances To Date (12/31/2018)	-28.9	-16.4
Previous Cumulative Variances	0.0	-1.6
Net Change	-28.9	-14.8

Cost and Schedule Variance Explanations

The unfavorable cumulative cost variance is due to the unexpected growth of the site construction contract, the Auxiliary Power Group cabinet production costs and the additional unplanned effort to complete the Key Test Events to demonstrate Technology Readiness Level 7.

The unfavorable net change in the schedule variance is due to delays in Sub Array Suite low rate manufacturing, and delays in Front End Electronics Array Frame Panel Production. The schedule risk assessment indicates an on-time completion of contract efforts. To date, the prime contractor completed all Major Milestones on schedule.

Notes

The program remains on schedule for initial fielding of the LRDR at Clear Air Force Station, Alaska, in CY 2020.

Contract Identification

Appropriation: RDT&E
Contract Name: SM-3 Block IB Missiles
Contractor: Raytheon Missile Systems
Contractor Location: PO Box 11337
1151 East Hermans Rd
Tucson, AZ 85745-1337
Contract Number: HQ0276-15-C-0005
Contract Type: Firm Fixed Price (FFP), Fixed Price Incentive(Firm Target) (FPIF)
Award Date: April 30, 2015
Definitization Date: December 18, 2015

Contract Price							
Initial Contract Price ($M)			Current Contract Price ($M)			Estimated Price At Completion ($M)	
Target	Ceiling	Qty	Target	Ceiling	Qty	Contractor	Program Manager
559.0	N/A	N/A	1794.0	N/A	N/A	1150.0	1180.0

Target Price Change Explanation

The difference between the Initial Contract Price Target and the Current Contract Price Target is due to the award of additional Missile Production CLINs supporting FY 2016 and FY 2017.

Contract Variance		
Item	Cost Variance	Schedule Variance
Cumulative Variances To Date (12/31/2018)	+29.0	-74.0
Previous Cumulative Variances	--	--
Net Change	+29.0	-74.0

Cost and Schedule Variance Explanations

The favorable cumulative cost variance is due to Tucson Factory Support for FY 2015 and FY 2016 All-Up-Rounds (AUR) work ramping up slower than planned. The majority of this will be consumed as the FY 2016 AUR work progresses and is captured in the Estimate At Completion (EAC).

The unfavorable cumulative schedule variance is due to continued schedule delays with Orbital ATK (OA) Third Stage Rocket Motors (TSRMs). OA's largest sub-tier supplier, Honeywell, stopped production due to a technical issue with the bond stack which is causing TSRM deliveries to fall further behind. It is also driven by late delivery of Throttleable Divert Attitude Control System (TDACS) on FY 2016, which are not anticipated to meet contractual baseline dates but continue to deliver to the recovery schedule.

Notes

This is the first time this contract is being reported.

Contract Identification

Appropriation: RDT&E
Contract Name: Aegis Ballistic Missile Defense (BMD)
Contractor: Lockheed Martin - Rotary and Mission Systems (RMS)
Contractor Location: 199 Borton Martin Road
Moorestown, NJ 08057
Contract Number: HQ0276-10-C-0001
Contract Type: Cost Plus Incentive Fee (CPIF), Cost Plus Award Fee (CPAF)
Award Date: October 01, 2009
Definitization Date: October 01, 2009

Contract Price							
Initial Contract Price ($M)			Current Contract Price ($M)			Estimated Price At Completion ($M)	
Target	Ceiling	Qty	Target	Ceiling	Qty	Contractor	Program Manager
443.0	N/A	N/A	2757.0	N/A	N/A	2315.0	2348.0

Target Price Change Explanation

The difference between the Initial Contract Price Target and the Current Contract Price Target is due to the award of additional BMD CLINs and Technical Instructions (TIs) over the life of the contract.

Contract Variance		
Item	Cost Variance	Schedule Variance
Cumulative Variances To Date (12/31/2018)	+46.0	-8.0
Previous Cumulative Variances	--	--
Net Change	+46.0	-8.0

Cost and Schedule Variance Explanations

The favorable cumulative cost variance is due to efficiencies in the development and certification of BMD software builds over the life of this contract.

The unfavorable cumulative schedule variance is due to delays with Baseline 5.4 and BMD 6 development efforts. These schedule delays will be recovered as the development efforts complete over the next nine months, recovery efforts are not likely to impact cost.

Notes

This is the first time this contract is being reported.

Deliveries and Expenditures

Deliveries				
Delivered to Date	Planned to Date	Actual to Date	Total Quantity	Percent Delivered
Development	0	0	0	--
Production	0	0	0	--
Total Program Quantity Delivered	0	0	0	--

Expended and Appropriated (TY $M)			
Total Acquisition Cost	190550.7	Years Appropriated	18
Expended to Date	130430.1	Percent Years Appropriated	78.26%
Percent Expended	68.45%	Appropriated to Date	148030.3
Total Funding Years	23	Percent Appropriated	77.69%

The above data is current as of March 11, 2019.

Operating and Support Cost

Cost Estimate Details

Date of Estimate:

Source of Estimate:

Quantity to Sustain:

Unit of Measure:

Service Life per Unit:

Fiscal Years in Service:

The Missile Defense Agency (MDA) is predominately a research and development organization that is responsible for the development and fielding of several subsystems that comprise the BMDS. MDA works with the Services to transition subsystems as they mature, allowing MDA to return to focusing on its core research mission. Although MDA does budget for a subsystem's BMDS unique mission costs leading up to transition, it does not capture the Service's portion of the cost. Therefore, since the MDA portion does not represent the entire operating and support cost of each subsystem, MDA does not report these in the SAR.

Sustainment Strategy

None

Antecedent Information

None

Annual O&S Costs BY2002 $M		
Cost Element	**BMDS**	**No Antecedent (Antecedent)**
Unit-Level Manpower	0.000	0.000
Unit Operations	0.000	0.000
Maintenance	0.000	0.000
Sustaining Support	0.000	0.000
Continuing System Improvements	0.000	0.000
Indirect Support	0.000	0.000
Other	0.000	0.000
Total	--	--

Item	Total O&S Cost $M			
	BMDS			No Antecedent (Antecedent)
	APB Objective/Threshold		Current Estimate	
Base Year	N/A	N/A	N/A	N/A
Then Year	N/A	N/A	N/A	0.0

O&S Cost Variance

Category	BY 2002 $M	Change Explanations
Prior SAR Total O&S Estimates - Dec 2017 SAR	0.0	
Programmatic/Planning Factors	0.0	
Cost Estimating Methodology	0.0	
Cost Data Update	0.0	
Labor Rate	0.0	
Energy Rate	0.0	
Technical Input	0.0	
Other	0.0	
Total Changes	0.0	
Current Estimate	0.0	

Disposal Estimate Details

Date of Estimate:

Source of Estimate:

Disposal/Demilitarization Total Cost (BY 2002 $M):