

Aegis Ballistic Missile Defense (BMD)

Executive Summary

- Aegis Ballistic Missile Defense (BMD) intercepted one separating ballistic missile target in a Japanese Aegis BMD flight test in FY10 and one in early FY11.
- The Aegis BMD program remains in a phase of FOT&E for the 3.6.1 system with Standard Missile-3 (SM-3) Block IA interceptors.
- Aegis BMD continued to explore interoperability with the Terminal High Altitude Area Defense (THAAD) and other BMDS elements during ground testing and live-target tracking exercises in FY10.
- Hardware-in-the-loop ground testing demonstrated potential Aegis BMD capability to contribute to theater-level defense missions spanning a range of ballistic missile defense scenarios.
- Aegis BMD continued early developmental testing of the next-generation Aegis BMD system in FY10. Performance during live-target tracking exercises and simulated engagements demonstrated select next-generation capabilities.

System

- Aegis BMD is a sea-based missile defense system that employs the multi-mission shipboard Aegis Weapon System, with new radar and missile capabilities to engage ballistic missile threats. Capabilities of Aegis BMD include:
 - Computer program modifications to the AN/SPY-1 radar, which allow long-range surveillance and track (LRS&T) of ballistic missiles of all ranges.
 - A modified Aegis Vertical Launcher System, which stores and fires the SM-3 Block IA and modified SM-2 Block IV interceptors.
 - SM-3 Block IA interceptors, which use a maneuverable kinetic warhead to accomplish midcourse engagements.
 - Modified SM-2 Block IV interceptors, which provide the capability to engage short-range ballistic missile targets in the terminal phase of flight.
- Aegis BMD is capable of autonomous missile defense operations and can send or receive cues to or from other Ballistic Missile Defense System (BMDS) sensors through tactical data links.

Activity

- The Aegis BMD program continued to assess engagement capabilities for the midcourse defense mission during the ongoing FOT&E phase of test and evaluation for the Aegis BMD 3.6.1 software load with SM-3 Block IA interceptors. This follows the completed combined developmental/



Mission

The Navy can accomplish three missions using Aegis BMD:

- Provide forward-deployed radar capabilities to enhance defense against ballistic missile threats of all ranges
- Provide all short- to long-range ballistic missile threat data to the Command, Control, Battle Management, and Communications (C2BMC) system for dissemination to Combatant Commanders' headquarters to ensure situational awareness
- Defend deployed forces and allies from short- and medium-range theater ballistic missiles

Major Contractors

- Lockheed Martin Maritime Systems & Sensors – Moorestown, New Jersey
- Raytheon Missile Systems – Tucson, Arizona

operational test phase that supported the transition of the Aegis BMD 3.6 system to the Navy in October 2008. Concurrently, the program is developing the Aegis BMD 4.0.1 system, which includes the SM-3 Block IB interceptor.

BALLISTIC MISSILE DEFENSE SYSTEMS

- The Aegis BMD program conducted one intercept mission in FY10 and one in early FY11:
 - In October 2009 during Japanese Flight Test Mission 3 (JFTM-3), a Japanese Aegis BMD destroyer using an SM-3 Block IA interceptor successfully intercepted a medium-range separating target.
 - The JFTM-3 campaign also included two tracking events with separating ballistic missile targets and an anti-air warfare event.
 - In October 2010 during JFTM-4, a Japanese Aegis BMD destroyer using an SM-3 Block IA interceptor successfully intercepted a medium-range separating target following a no-notice target launch.
 - The JFTM-4 campaign also included two tracking events with separating ballistic missile targets. One of these events was a cued engagement by a US 3.6.1 Aegis BMD destroyer.
 - An Aegis BMD cruiser with an engineering load of 4.0.1 software participated during the JFTM-3 and JFTM-4 firing missions and tracking events and conducted simulated engagements.
- In FY10, Aegis BMD participated in several BMDS system flight and ground tests to assess Aegis BMD functionality and interoperability with the BMDS.
 - Aegis BMD participated in Juniper Cobra 10 war game in October 2009.
 - Fast Contingency Analysis and Activation Team East-C, conducted in October and November 2009, was a hardware-in-the-loop and distributed ground test designed to assess system level capability to provide theater-level defense against a variety of ballistic missile threats. Participants included the Aegis BMD laboratory in Moorestown, New Jersey, as well as representations of theater-level defense systems such as THAAD, AN/TPY-2, and C2BMC.
 - Flight Test Other-06 Events 1 through 4, conducted in October and November 2009, consisted of a series of tracking exercises to support developmental testing of the new Aegis BMD 4.0.1 system. In Events 2 and 3, an Aegis BMD 4.0.1 (engineering load) cruiser exercised long-range surveillance and track functionality and conducted a simulated engagement against separating ballistic missile targets. Also, during Events 2 and 3, Aegis BMD and THAAD performed data exchange to test interoperability between the two systems. In Event 4, the Aegis BMD 4.0.1 cruiser conducted a simulated engagement against a complex short-range ballistic missile target, while exercising new radar-frequency discrimination algorithms.
 - During Performance Assessment-09 in November and December 2009, the MDA utilized a digital representation of the Aegis Weapon System (version 3.6.1), along with digital representations of other BMDS elements, to examine the interactions and performance of the BMDS system for a wide range of scenarios and threats.
 - Ground Test Other-04a in March 2010 used hardware-in-the-loop simulations to demonstrate the

ability of the BMDS to engage short-, medium-, and intermediate-range ballistic missile threats in regional defense missions. The test used Aegis BMD 3.6.1 hardware-in-the-loop simulators at three laboratory sites (Pt. Loma, California; Moorestown, New Jersey; Dahlgren, Virginia). Other participants included THAAD, Patriot, Israeli Arrow Weapon System, AN/TPY-2, and C2BMC.

- Ground Test Integrated-04b in August 2010 demonstrated BMDS operational functionality, connectivity, and interoperability in engagements against short-, medium-, and intermediate-range and intercontinental ballistic missile threats. The test used Aegis BMD hardware-in-the-loop simulators at three laboratory sites (Dahlgren, Virginia; Moorestown, New Jersey; Pt. Loma, California).

Assessment

- In FY10, Aegis BMD flight testing continued to demonstrate the capability to engage medium-range separating ballistic missile targets in the midcourse phase with SM-3 Block IA interceptors.
- The Aegis BMD program has not conducted a live intercept engagement against a ballistic missile target with the longer range expected as part of the new Phased Adaptive Approach to missile defense in Europe. The program plans to use such a target for Flight Test Standard Missile Interceptor-15 (FTM-15) in FY11.
- The successful intercepts of ballistic missile targets with SM-3 Block IA interceptors during JFTM-3 and JFTM-4 increase confidence in the reliability of the interceptor following the FY09 failure during the Japanese Aegis BMD flight test, JFTM-2.
- Aegis BMD and THAAD inter-element data transfer over tactical links continues to mature. Also, Aegis BMD continues to show increasing interoperability with other BMDS elements, as demonstrated in recent ground testing. However, Aegis BMD has not yet tested launch-on-remote capability in a live intercept mission, though the system plans to exercise this capability during FTM-15 in FY11. Also, Aegis BMD has not yet demonstrated cued engagement capability against medium-to intermediate-range ballistic missiles in a live intercept test.
- The next-generation Aegis BMD system (version 4.0.1) has demonstrated select new capabilities during recent live-target tracking exercises and simulated engagements. Development of that system continues, leading up to the first intercept mission with an SM-3 Block IB interceptor in FY11.

Recommendations

- Status of Previous Recommendations. The program addressed the single recommendation from FY09.
- FY10 Recommendation.
 1. The MDA should demonstrate the Aegis BMD capability to conduct cued and launch-on-remote engagements in live intercept missions against medium- to intermediate-range ballistic missiles.