Aegis Ballistic Missile Defense (BMD)

Executive Summary

- Aegis Ballistic Missile Defense (BMD) intercepted one short-range unitary target and one medium-range separating target during FY07 tests. One planned engagement against a short-range low-exoatmospheric unitary target failed due to improperly entered fire control parameters. To date, the Aegis BMD program has conducted 12 successful flight tests out of 14 attempts.
- Aegis BMD demonstrated simultaneous BMD and ship self-defense capabilities.
- Aegis BMD demonstrated long-range surveillance and track (LRS&T) capability and interoperability with the Ballistic Missile Defense System (BMDS) and the Terminal High-Altitude Area Defense (THAAD) system during multiple exercises in FY07.
- Continuing involvement of operational testers and warfighters in flight tests has proven valuable in planning and conducting operationally-realistic tests and in exposing operational design and training issues.

System

- Aegis BMD is a highly-mobile, 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.
  - Computer program modifications to the AN/SPY-1 radar allow LRS&T of long-range ballistic missiles.
  - A modified Aegis vertical launcher system stores and fires the new, larger Standard Missile-3 (SM-3) Block IA.
  - The SM-3 Block IA design delivers a maneuverable kinetic warhead to an intercept point in the upper atmosphere or in space.
- Aegis BMD is capable of autonomous missile defense operations and can accept external cues and tracks over tactical data links.
- Aegis BMD can cue other BMDS sensors through tactical data links.

Mission

The Navy can accomplish three missions using Aegis BMD:

- Provide forward-deployed radar capabilities to enhance defense against long-range ballistic missile threats
- Provide all short- to long-range ballistic missile threat data to the Command, Control, Battle Management, and Communications system for dissemination to U.S. Strategic Command and U.S. Pacific Command to ensure situational awareness
- Defend deployed forces and allies from short- and medium-range theater ballistic missiles

Activity

- In FY07, the Aegis BMD test program continued to assess engagement and LRS&T capabilities. The program continued the combined Developmental Test/Operational Test (DT/OT) phase of testing that will support the transition of the Aegis BMD Block 04 system to the Navy in FY08.
- The Aegis BMD program completed two successful intercept flight tests, Flight Test Standard Missile-11 (FTM-11) Event 4 (following an unsuccessful FTM-11 Event 3 early in FY07) and FTM-12. In the unsuccessful December 2006 test, the SM-3 Block IA interceptor failed to fire against a low-exoatmospheric unitary target due to incorrectly set fire control parameters. In April 2007, the program conducted a re-test of the December event. In that test (FTM-11 Event 4), the Aegis BMD program successfully completed a near-simultaneous engagement of a short-range ballistic missile target with an SM-3 Block IA and an aerial target with an SM-2 Block IIIA interceptor.
- During FTM-12 (June 2007), Aegis BMD successfully intercepted a medium-range, simple separating target using the SM-3 Block IA.
- During FTM-12 (June 2007), Aegis BMD conducted simulated firings against two short-range ballistic missile targets in the air at the same time, demonstrating the capacity to perform a near-simultaneous engagement of two BMD targets.

- During FTM-12 (June 2007), Aegis BMD collected data for the Block 06 BMD signal processor and enhanced discrimination algorithm development.
- Aegis BMD conducted an intercept test of a medium-range target during FTM-11a in August 2007. The mission provided an opportunity to demonstrate the "SM-3 Engage on AN/SPY-1" Engagement Sequence Group using the Aegis BMD 3.6 Weapon System.
- During FTM-13 in November 2007, the program successfully conducted a live near-simultaneous multiple engagement of two short-range unitary targets using an SM-3 Block IA salvo of two missiles.
- In FY07, Aegis BMD participated in several flight and ground tests to assess Aegis BMD functionality and interoperability with and in support of the BMDS.
  - Ground Test Distributed-01 (GTD-01) in November 2006 demonstrated BMDS operational functionality, connectivity, and interoperability. Dockside simulators were used on two Aegis BMD ships, in addition to simulators at two Naval Surface Warfare Center locations.
  - Ground Test Other-02a (GTX-02a) in February 2007 used simulations to test the interaction between Aegis BMD, THAAD, Patriot, and other sensors and command and control interfaces.
  - Flight Test Other-02 (FTX-02) in March 2007 employed two Aegis BMD ships, which tracked a long-range ballistic missile target with countermeasures. Aegis BMD demonstrated key steps of Launch on Tactical Data Information Link (TADIL) functionality in support of FTM-14, which will take place in 3QFY08. Aegis BMD LRS&T data was also used to cue Sea-Based X-band Radar, thus testing aspects of interoperability with the Ground-based Midcourse Defense (GMD) mission.
  - Ground Test Integrated-02 (GTI-02) in September 2007 used hardware-in-the-loop systems to test the interaction between Aegis BMD, GMD, THAAD, Patriot, AN/TPY-2, Space-Based Infrared System, C2BMC nodes, demonstrating BMDS operational functionality, connectivity, and interoperability in the Missile Defense System Exerciser architecture.
  - In March and August 2007, Aegis BMD tracked an intercontinental ballistic missile during two Air Force tests, Glory Trip-193 and -195.

Assessment

- In FY07, Aegis BMD flight testing continued to demonstrate the capability to engage short-range unitary and medium-range simple separating ballistic missile targets. In 14 attempts to date, Aegis BMD successfully intercepted eight of 10 short-range unitary targets, three of three medium-range simple-separating targets, and one of one targets presenting a complex scene. Training and a software change should prevent a repeat of the FTM-11 Event 3 failure in the future.
- Aegis BMD demonstrated the multi-warfare version of the Aegis BMD combat system in a live testing event. Though not thoroughly stressing, the test event demonstrated some level of capability for simultaneous ship self-defense and BMD functionality.
- An SM-3 Block IA interceptor equipped with a fully capable divert system on the kinetic warhead was flown for the first time during flight tests in FY07; however, flight tests to date have not yet exercised the full range of divert system pulse modes.
- Test events in FY07 further demonstrated the utility of the unitary version of the Aegis Readiness Assessment Vehicle (ARAV-A) target as an affordable target for tracking and intercept tests for some mission scenarios. Further efforts should be made to collect the necessary data on the simple separating ARAV, the ARAV-B, to determine the viability of its use in operationally realistic scenarios.
- The Aegis BMD program continues to assess its interoperability with and support of the BMDS. In FY07, the Aegis BMD flight test program incorporated other BMDS elements and components. Aegis BMD participation during Glory Trip events in FY07 and past years has provided valuable data toward assessing Aegis BMD LRS&T capability in support of GMD. To date, Aegis BMD has yet to participate in a GMD flight test as a real-time contributor to the development of a GMD weapon task plan.
- The Aegis BMD program continues to include a good degree of operational realism in its flight test program. In FY07, Aegis BMD continued the combined DT/OT test phase, during which the Navy Operational Test Agency will evaluate the operational performance of the Block 04 system to support its transition to the Navy. Aegis BMD benefits from the active participation of the operational test and warfighter communities, as their recommendations are incorporated in system design modifications; tactics, techniques, and procedures; fleet training; and follow-on flight missions.

Recommendations

- Status of Previous Recommendations. The program addressed four of the five DOT&E recommendations from previous annual reports. The remaining FY05 recommendation for Aegis BMD to provide real-time support to GMD weapons task plan development has been moved to GMD since GMD determines whether Aegis BMD track data is used.
- FY07 Recommendation.
  1. The Aegis BMD should continue to collect test data on reliability, availability, maintainability, and other relevant data to adequately assess the suitability of the system. The adequacy of the Navy's regular crew manning, training procedures, and fleet material condition to support the BMD mission is of particular importance to Aegis BMD.