Terminal High-Altitude Area Defense (THAAD)

Executive Summary

- The Terminal High-Altitude Area Defense (THAAD) system intercepted three short-range targets under varying intercept geometries in FY07 flight tests.
- THAAD began planning and execution of the Government Ground Test Program which is a critical component of the Army Materiel Readiness Release Process.
- THAAD executed five high-speed sled tests to characterize lethality against three different threat payloads in FY07.
- THAAD began initial integration testing into the Ballistic Missile Defense System (BMDS) in FY07 with Aegis Ballistic Missile Defense (BMD), Patriot, and the Command, Control, Battle Management, and Communications (C2BMC) system.
- Consolidating test objectives into fewer test events increased risk in the flight test program. The MDA intends to transition the first two fire units to the Army in FY10 and FY11.

System

- The THAAD ballistic missile defense system consists of five major components:
  - Missiles
  - Launchers
  - Radars designated AN/TPY-2 (TM) for Terminal Mode
  - THAAD Fire Control and Communications (TFCC)
  - Unique THAAD support equipment
- THAAD can accept target cues from the Aegis BMD, satellites, and other external theater sensors and command and control systems.

- THAAD will complement the lower-tier Patriot system and the upper-tier Aegis BMD system

Mission

U.S. Strategic Command intends to deploy and employ THAAD, a rapid response weapon system, to protect critical assets worldwide. THAAD is designed to destroy the full-range of theater ballistic missile threats to troops, military assets, and allied territories using hit-to-kill technology. Commanders can use the THAAD Kill Vehicle to intercept an incoming threat ballistic missile in the high endoatmosphere or exoatmosphere, minimizing the effects of weapons of mass destruction on battlefield troops and civilian populations.

Activity

- The program continued planning, testing, and qualifying THAAD ground and flight test components:
  - Flight Test THAAD-06 (FTT-06) took place in January 2007. THAAD successfully intercepted a threat-representative short-range unitary target in the high endoatmosphere. This was the first flight test at the Pacific Missile Range Facility in Hawaii.
  - FTT-07 occurred in April 2007. This test also resulted in a successful intercept of a threat-representative short-range unitary target, in the mid-endoatmosphere. This was the first THAAD flight test with BMDS integration. THAAD transmitted messages to the BMDS C2BMC system and an Aegis BMD hardware-in-the-loop facility.
  - FTT-05 was a missile characterization flight (no planned target), which took place in June 2007. This test demonstrated booster and kill vehicle performance in the high dynamic pressure environment of the low endoatmosphere.
  - FTT-08 occurred on October 26, 2007. This test was an intercept of a threat-representative short-range unitary target in the exoatmosphere. The missile was "heat conditioned" before the test to simulate operations in a hot environment. It was the third successful flight test at the Pacific Missile Range Facility.
  - Two radar data collection tests took place in March and July 2007, Radar Data Collection-1c (RDC-1c) and RDC-1d. In these tests, the MDA flew targets with characteristics of interest for radar observation in support of advanced discrimination algorithm development. Both targets had anomalies. RDC-1c deployed the re-entry vehicle at the wrong aspect angle due to reverse thrust motor failure, and

RDC-1d failed to achieve any desired target dynamics due to separation failure.
- Ground Test Other-02a (GTX-02a) in February 2007 used simulations to test the interaction between Aegis BMD, Ground-based Midcourse Defense (GMD), THAAD, Patriot, and other sensors and command and control interfaces.
- 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, and other sensors and command and control interfaces.
- Six high-speed sled tests using a lethality surrogate THAAD sled vehicle were conducted from December 2006 to October 2007. The THAAD program is using the test data to assess the lethality of THAAD against a variety of targets and to support the development and validation of simulation tools.
- Combined contractor/government electromagnetic environmental effects ground qualification testing began for the missile and launcher in July 2007. The MDA accomplished detailed planning for the rest of the government ground test qualification program, which begins in FY08.
- In June 2007, THAAD participated in Aegis BMD Flight Test Standard Missile-12 (FTM-12), exercising two-way communication and track exchange with an Aegis BMD cruiser (non-firing ship) during the test.

Assessment

- In FY07, THAAD made significant progress, with three successful intercept tests of threat-representative short-range targets under various intercept geometries and intercept altitudes. Flight tests against medium-range and more sophisticated short-range targets are scheduled for FY08 and FY09.
- The program expanded operational realism during THAAD flight tests by continuing to use warfighters to operate the THAAD radar, launcher, and fire control, and denying the soldiers detailed knowledge of launch times.
- THAAD began basic integration into BMDS-level testing, exercising one-way communication during FTT-07 and two-way communication during FTM-12. The program has demonstrated sending cues to both Aegis BMD and Patriot, but not for use in a live engagement. An opportunity is scheduled during FTT-10 in September 2008. THAAD also demonstrated the ability to provide the warfighter with a live common operating picture during FTT-08 by providing a Link-16 picture to the Pacific Command Joint Operations Center, the Pacific Air Operations Center, and the 94th Air and Missile Defense Command (AAMDC), as well as engagement status voice reporting to the 94th AAMDC.
- The MDA removed three flight tests from the flight test matrix during FY07 because of target development and production delays. The resulting flight test matrix can still exercise the majority of the THAAD battlespace and support the MDA's planned transition of two fire units to the Army in FY10 and FY11. Some redundancy and gradualness have been lost, introducing more risk to the program. The MDA must re-accomplish any subsequent flight test failure, which will delay the program.
- THAAD added two sled tests against a new target for FY08 in lieu of several lower-priority light-gas-gun tests.
- The MDA currently has no flight test program planned after 2009 even though THAAD capabilities will continue to evolve through spiral development.

Recommendations

- Status of Previous Recommendations. The DOT&E FY06 recommendation is still valid. Although the MDA restructured the THAAD flight test program to align with target delivery dates, offering additional target types, and improving the visibility of the targets requirements process, it has yet to confirm availability and prioritize timely delivery of targets with the necessary characteristics for the final two planned THAAD flight tests.
- FY07 Recommendations. None.