

## Terminal High-Altitude Area Defense (THAAD)

### Executive Summary

- The Missile Defense Agency (MDA) has completed development of Terminal High-Altitude Area Defense (THAAD) 1.0, which includes fundamental capability against short- and medium-range ballistic missiles, and the Conditional Materiel Release of the first two THAAD fire units. Development of the more advanced THAAD capability (Release 2.0) is scheduled through FY18.
- The THAAD system successfully intercepted a medium-range ballistic missile target for the first time in October 2012. In addition, THAAD intercepted one medium-range ballistic missile target while simultaneously engaging debris from a second medium-range ballistic missile target that had been intercepted by the Aegis Ballistic Missile Defense (BMD) element during an operational test in September 2013.
- Eight of the 39 Conditional Materiel Release conditions imposed on the first two THAAD batteries have been closed. Fixes and testing of the remaining conditions are scheduled through 2017.
- THAAD reliability and maintainability measures are still fluctuating greatly between test events, indicating system immaturity with respect to consistent reliability and maintainability growth.

### System

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

### Activity

- The MDA conducted testing during FY13 in accordance with the DOT&E-approved Integrated Master Test Plan.
- The combined developmental/operational Flight Test, Integrated-01 (FTI-01) in October 2012 included a THAAD engagement against a medium-range target for the first time. The test evaluated interoperability between THAAD; Aegis BMD; Patriot; Command and Control, Battle Management, and Communications; and AN/TPY-2 Forward-Based Mode elements with multiple live targets.



- THAAD is intended to 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. Commanders will use the THAAD to intercept an incoming threat ballistic missile in the endo-atmosphere or exo-atmosphere, limiting the effects of weapons of mass destruction on battlefield troops and civilian populations.

### Major Contractors

- Prime: Lockheed Martin Corporation, Missile and Fire Control – Dallas, Texas
- AN/TPY-2 Radar (TM): Raytheon Company, Integrated Defense Systems – Tewksbury, Massachusetts

## Assessment

- In FY13, MDA realigned THAAD capability deliveries such that THAAD 1.0 is a baseline capability delivery and THAAD 2.0 contains advanced capability development. As such, the MDA has completed THAAD 1.0 development, which includes fundamental capability against short- and medium-range ballistic missiles with initial discrimination capability, interoperability with other BMDS elements, and Conditional Materiel Release of the first THAAD fire units.
- THAAD 2.0 work continues, which includes improving THAAD performance in a high debris environment, advanced discrimination algorithms, improved engagement coordination with Patriot and Aegis BMD, the ability to initiate THAAD engagements using sensor data from other BMDS sources, and other upgrades. THAAD 2.0 development is scheduled through FY18.
- The THAAD system successfully intercepted one medium-range target during the FTI-01 mission.
  - This test demonstrated positive performance in a significantly different portion of the battlespace than previous missions with increased ground range, interceptor flight time, and closing velocity, as well as new target re-entry vehicle characteristics.
  - Mission software reporting of the operational capability of the system components was insufficient to assess the status of the equipment. Specific instances of incorrect and inconsistent reporting were observed during testing and some critical faults were not relayed through the system at all.
  - THAAD experienced interoperability problems such as data latency with Aegis BMD messages (because the primary network connection was unavailable) and track correlation concerns with the AN/TPY-2 (TM) radar.
- The initial assessment from the FTO-01 test mission indicated that THAAD intercepted one medium-range ballistic missile target while simultaneously engaging the debris from the second medium-range ballistic missile target that had been intercepted by the Aegis BMD element. This engagement sequence was by test mission design. Full assessment of FTO-01 test mission data with respect to the effectiveness, suitability, and interoperability of THAAD is ongoing.
- The Conditional Materiel Release of the first two THAAD batteries in February 2012 included 39 conditions that need to be resolved before a Full Materiel Release could be granted. The THAAD Project Office and the Army continue to address these conditions. In addition to the four conditions that were closed in FY12, an additional four have been closed in FY13 (verification of technical manuals, procedures for a post-launch launcher inspection, verifying capability against medium-range targets, and procedures and equipment to measure soil density for emplacement). Fixes and testing of remaining conditions are scheduled through 2017.
- Comparing the reliability and maintainability data from FTI-01 to the results from the Reliability Confidence Test in July 2011

and the Flight Test THAAD-12 (FTT-12) in October 2011 shows that reliability and maintainability measures are still fluctuating greatly between test events. This indicates that the THAAD system may not be mature enough to exhibit consistent reliability growth. The additional reliability and maintainability data from FTO-01 will help determine any emerging trends.

## Recommendations

- Status of Previous Recommendations. The classified DOT&E February 2012 THAAD and AN/TPY-2 Radar Operational and Live Fire Test and Evaluation Report contained seven recommendations in addition to and not associated with the 39 Conditional Materiel Release conditions established. The MDA should continue to address the three classified recommendations (Effectiveness #2, Effectiveness #5, and Survivability #4) and the following remaining four:
  1. The MDA and the Army should reassess the required spares and tools (including their quantities) that should be onsite with the battery based on all available reliability and maintainability data (Suitability #5). An assessment of the proper number of spares is ongoing and is scheduled to complete in FY14.
  2. The MDA and the Army should define duties related to THAAD at the brigade level. Until a battalion is established for THAAD, it should also define duties and training for THAAD battery personnel on any required battalion-level duties (Suitability #10). This recommendation has been addressed, although DOT&E does not concur with the response. The Army has assigned the two fielded THAAD batteries to an existing Army battalion. This battalion currently lacks a comprehensive understanding of THAAD requirements, which significantly reduces the THAAD batteries' effectiveness by forcing them to assume typical higher headquarters responsibilities for personnel, logistics, plans, and operations.
  3. The MDA and the Army should implement equipment redesigns and modifications identified during natural environment testing to prevent problems seen in testing (Suitability #11). During FTO-01, a total radar power failure was observed to be caused by a connector that was missing a gasket, which allowed water to enter a sealed area. Periodic inspection of all gaskets was a recommendation from the natural environment testing.
  4. The MDA and the Army should conduct electronic warfare testing and analysis (Survivability #3). This recommendation remains open. Some preliminary testing was conducted during FY13, but additional testing is required.
- FY13 Recommendation.
  1. The THAAD Program Office should reassess their reliability and maintainability growth planning curve.