Terminal High-Altitude Area Defense (THAAD)

Executive Summary

- The Terminal High Altitude Area Defense (THAAD) system successfully intercepted one unitary short-range target in the low endo-atmosphere in FY10.
- Another flight test event experienced a target failure and did not achieve its test objectives.
- In addition to delaying THAAD test objectives, the target failure also prompted the grounding of all air-launched targets within the Missile Defense Agency (MDA) test program. This was a necessary step to find the root cause of the problem, but it forced the THAAD program to further delay flight tests against longer-range targets.
- THAAD continued to make significant progress in executing the government ground test program, which is a critical component of the Army materiel readiness release process.
- THAAD completed a series of nine reduced-scale light-gas-gun tests to characterize the missile's lethality against missile payloads in FY10. This followed a series of nine lethality high-speed sled tests in FY08. THAAD also conducted lethality studies and analyses and ancillary lethality testing to support the THAAD lethality evaluation in FY10.
- A missile manufacturing problem delayed the materiel release decision for transitioning the first two THAAD fire units from the MDA to the Army until 2QFY11. This delay will allow the program to complete more testing before transition, but the program will still test significant additional capabilities after the materiel release decision.

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 short-range and medium-range theater ballistic missile threats to troops, military assets, and allied territories using hit-to-kill technology. Commanders will use the THAAD Kill Vehicle 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

- Lockheed Martin Missile and Fire Control – Dallas, Texas
- Lockheed Martin Space Systems Company – Sunnyvale, California
- Raytheon Integrated Defense Systems – Tewksbury, Massachusetts

Activity

- Flight Test THAAD Interceptor-11 (FTT-11) occurred in December 2009. This test was intended to be the first THAAD intercept of a complex separating short-range target, but a target failure aborted the test. The air-launched target deployed from the C-17 aircraft, but failed to ignite. The program conducted some simulated intercept events after the failed live event using the Sim-Over-Live Driver (SOLD). The MDA has added the objectives from FTT-11 to the upcoming flight test FTT-12.
- FTT-14 took place in June 2010. This test was a successful low endo-atmospheric intercept of a unitary short-range target at a high lead angle and in a high-dynamic-pressure environment. Patriot participated in the test with a radar and command and control element to test radar debris

mitigation software and exercise engagement coordination procedures and software. The program conducted additional simulated intercept events using SOLD after the live event to demonstrate mass raid capability against short-range ballistic missiles.
- The THAAD government ground test qualification program completed electromagnetic-environmental-effects testing for the missile, launcher, radar, and TFCC in FY10. Safety testing for the missile is on-going. The radar Prime Power Unit was the final THAAD component to complete mobility testing. The full THAAD system also completed a series of natural environments tests at the McKinley Climatic Laboratory at Eglin AFB, Florida. Most THAAD ground qualification testing is now complete, although a few significant events, including cold region regression testing at McKinley, are scheduled for FY11 and FY12.
- THAAD participated in two Aegis BMD flight test events, Japanese Flight Test Mission-3 (JFTM-3) in October 2009, and FTX-06 in November 2009. In JFTM-3, the THAAD radar observed three simple separating targets in three separate events. In FTX-06, the THAAD radar observed two simple separating targets in two events, and TFCC exchanged data with Aegis BMD. In a third event, the program used SOLD to inject simulated threats in the presence of a live complex separating target and to conduct simulated intercepts.
- THAAD completed its series of nine reduced-scale light-gas-gun tests to characterize the missile's lethality against threat payloads in November 2009. Those tests supplemented a series of nine full-scale high-speed sled tests completed in FY08. Throughout 2010, THAAD also conducted various first-principle hydrocode analyses and ancillary lethality testing to support its lethality evaluation. (Note: supplementary testing and analysis has continued into FY11.)
- The Army Operational Test Agency conducted a Force Development Experiment, collecting data on the soldiers' use of doctrine, tactics, techniques, and procedures, and a Limited User Test, focusing on the capabilities and limitations of the THAAD system, from January through June 2010.
- In 1QFY10, THAAD also participated in both the Juniper Cobra 10 war game and the Fast Contingency Analysis and Activation Team East-C hardware-in-the-loop test event. In January 2010, the THAAD radar participated in Flight Test Ground-based Interceptor-06 (FTG-06), a Ground-based Midcourse Defense intercept flight test, collecting radar data and observing the behavior of the intermediate-range target used in the test. THAAD also participated in a focused Ground Test Other-04a (GTX-04a) in March 2010 and Ground Test Integrated-04b (GTI-04b) in August 2010, using hardware-in-the-loop to demonstrate interoperability with other BMDS components in a variety of defense scenarios.

Assessment
- THAAD made progress in FY10, demonstrating in FTT-14 much of the functionality necessary for intercepting challenging low endo-atmospheric threats.
- The FTT-11 target failure and a tight schedule forced the Army to conduct the Limited User Test before SOLD could be fully accredited. This risk may result in an incomplete capability assessment or the need for additional testing depending on the successful completion of upcoming tests FTT-12, FTT-13, and FTT-24.
- THAAD's planned lethality test program, which was completed in FY10, provided lethality information against several types of threat payloads. The additional analyses and tests that THAAD conducted to address some remaining lethality data voids supported the characterization of THAAD lethality, but extant lethality knowledge gaps remain to be resolved.
- Problems with target quality continue to interrupt the progress of the THAAD test program. The FTT-11 target failure delayed THAAD test objectives, and also prompted the grounding of all air-launched targets within the MDA test program. While this was a necessary step to find and fix the root cause of the problem, it forced the THAAD program to rearrange upcoming tests, further delaying flight tests against longer-range targets. The MDA anticipates air-launched targets will be available again in late 4QFY11 or 1QFY12.
- A manufacturing problem with a missile component has delayed the Army's Materiel Release Review Board for THAAD from the end of FY10 to the end of 2QFY11. This delay will allow more testing to be completed before the system transitions to the Army. Some THAAD testing, however, will still take place after the Materiel Release Review Board, including flight testing against longer-range targets. The absence of such testing will limit the assessment of proven capabilities delivered to the Army.

Recommendations
- Status of Previous Recommendations. Although the MDA continues to make progress on the FY09 recommendation to consider additional light-gas gun or sled testing to address lethality data voids and gaps in knowledge, the recommendation will remain open until the lethality assessment is complete.
- FY10 Recommendations. None.