

Patriot Advanced Capability-3 (PAC-3)

Executive Summary

- The Army participated in the second and final Medium Extended Air Defense System (MEADS) Flight Test (FT) using three Patriot Advanced Capability-3 (PAC-3) Missile Segment Enhancement (MSE) missiles in November 2013. The missiles successfully engaged a short-range ballistic missile and aircraft target.
- The DOD decided not to field MEADS and concluded U.S. involvement in the design and development phase of the MEADS program in FY14.
- DOT&E approved the latest Patriot System Test and Evaluation Master Plan (TEMP) in December 2013.
- The Defense Acquisition Executive approved the PAC-3 MSE missile to enter low-rate initial production in 2QFY14.

System

- Patriot is a mobile air and missile defense system that counters missile and aircraft threats.
- The system includes the following:
 - C-band phased-array radars for detecting, tracking, classifying, identifying, and discriminating targets
 - Battalion and battery battle management elements
 - Communications Relay Groups and Antenna Mast Groups for communicating between battery and battalion assets
 - A mix of PAC-3 hit-to-kill missiles and PAC-2 blast fragmentation warhead missiles for negating missile and aircraft threats
- The newest version of the Patriot missile is the PAC-3 MSE. The PAC-3 MSE missile provides increased battlespace defense capabilities and improved lethality over prior configuration Patriot missiles.
- Earlier versions of Patriot missiles include the Patriot Standard missile, the PAC-2 Anti-Tactical Missile, the Guidance Enhanced Missile (GEM) family (includes the GEM-T and GEM-C missile variants intended to counter tactical ballistic missiles and cruise missiles, respectively),



- the PAC-3 (baseline), and the PAC-3 Cost Reduction Initiative variant.
- The DOD intended MEADS to replace the Patriot system. The DOD decided not to field MEADS and concluded U.S. involvement in the design and development phase of the MEADS program in FY14.

Mission

Combatant Commanders use the Patriot system to defend deployed forces and critical assets from missile and aircraft attack and to defeat enemy surveillance air assets (such as unmanned aerial vehicles) in all weather conditions, and in natural and induced environments.

Major Contractors

- Prime: Raytheon Company, Integrated Defense Systems – Tewksbury, Massachusetts
- PAC-3 Interceptors: Lockheed Martin Corporation, Missile and Fire Control – Dallas, Texas

Activity

- During MEADS FT-2 in November 2013 at White Sands Missile Range, New Mexico, two MSE interceptors engaged a short-range ballistic missile target and a third MSE interceptor engaged a full-scale aircraft target.
- DOT&E approved the latest Patriot System TEMP in December 2013. The Army conducted all testing in accordance with the DOT&E-approved TEMP.
- The PAC-3 MSE missile was approved to enter low-rate initial production in 2QFY14.
- The Army conducted fragment penetration phenomenology tests and planned high-explosive initiation tests to provide data for validation of PAC-3 lethality models.
- In September 2014, the Army conducted an MSE developmental lethality test against a ballistic missile warhead in preparation for live fire lethality testing in 2015 at the Holloman AFB high-speed test track.
- The Army planned to conduct the next Patriot operational test, the Post-Deployment Build-8 IOT&E, beginning

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in 2015, per the DOT&E-approved TEMP. However, this date is likely to slip to at least 2016 and a new TEMP is under development to reflect this change. The IOT&E will provide information to support the Patriot Full-Rate Production decision (including the MSE missile).

Assessment

- During MEADS FT-2, MEADS demonstrated the capability to detect, track, engage, intercept, and kill both a tactical ballistic missile target and a full-scale aircraft target with MSE missiles.
 - The first MSE missile in the ripple method of fire intercepted and killed the ballistic missile target at the planned altitude and range.
 - The second MSE missile performed nominally throughout its flight and properly self-destructed after the first MSE intercepted the target.
 - The third MSE missile intercepted and killed the full-scale aircraft target at the planned altitude and range.
- The MSE developmental lethality test in September 2014 at the Holloman AFB high-speed test track met the lethality objective.
- Patriot ground system reliability does not meet the threshold requirement because the radar performance was below threshold. The Project Office plans to replace the Patriot radar, but this is not scheduled to occur until after the IOT&E. The schedule is driving entry into the operational test prior to implementing the fix, and resources/funding are not available to implement the fix. Management has decided to accept the risk to the operational test assessment of not implementing the fix.
- Patriot training remains inadequate to prepare operators for complex Patriot engagements. Resources/funding are not available to fix this issue and management has decided to accept the risk to the operational test assessment.

Recommendations

- Status of Previous Recommendations. The Army satisfactorily addressed 14 of the previous 23 recommendations. The Army should continue to address the following recommendations:
 1. Conduct Patriot air and missile defense testing during joint and coalition exercises that include large numbers of different aircraft types, sensors, battle management elements, and weapons systems. Conduct Red Team penetration testing during these exercises to test Patriot cybersecurity.
 2. Conduct a Patriot flight test against an anti-radiation missile target to validate models and simulations.
 3. Improve Patriot training to ensure that Patriot operators are prepared to use the system in combat.
 4. Have Patriot participate with live missiles in Terminal High-Altitude Area Defense (THAAD) flight testing to determine Patriot-to-THAAD interoperability and the capability for Patriot to intercept tactical ballistic missile targets that are not intercepted by THAAD.
 5. Collect reliability data on Patriot systems in the field so that the Mean Time Between Critical Mission Failure can be calculated.
 6. Use test units for future Patriot operational tests that have operationally representative distributions in Soldier proficiency.
 7. Conduct future operational flight tests with unannounced target launches within extended launch windows.
 8. Improve Patriot radar reliability.
 9. Obtain the data required to validate GEM interceptor blast lethality in the Lethality Endgame Simulation.
- FY14 Recommendations. None.