

Patriot Advanced Capability-3 (PAC-3)

Executive Summary

- The Army conducted Patriot Advanced Capability-3 (PAC-3) lethality high-speed sled testing in May 2015 through June 2015, and testing of lethality enhancements from July 2015 through October 2015.
- The Army began the Patriot Post-Deployment Build-8 (PDB-8) developmental T&E in July 2015.

System

- Patriot is a mobile air and missile defense system that counters missile and aircraft threats.
- The system includes the following:
 - C-band multi-function phased-array radars for detecting, tracking, classifying, identifying, and discriminating targets and supporting the guidance functions
 - Battalion and battery battle management elements
 - Communications Relay Groups and Antenna Mast Groups for communicating between battery and battalion assets
 - A mix of Patriot PAC-3 hit-to-kill missiles and PAC-2 blast fragmentation warhead missiles for negating missile and aircraft threats
- The newest version of the PAC-3 missile under development is the PAC-3 Missile Segment Enhancement (MSE). The MSE 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), the PAC-3 (baseline), and the PAC-3 Cost Reduction Initiative variant.

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 (ground system and PAC-2 and prior generation missiles)
- PAC-3, Cost Reduction Initiative, and MSE Missiles: Lockheed Martin Corporation, Missile and Fire Control – Grand Prairie, Texas

Activity

- The Army conducted high-speed sled testing of the MSE missile against two threat sub-munition warheads at the High-Speed Sled Test Track in May 2015 through June 2015, at Holloman Air Force Base, New Mexico.
- The Army began the PDB-8 developmental T&E in July 2015, at White Sands Missile Range, New Mexico. The ground portion of this testing concluded in October 2015, with developmental flight testing scheduled for November 2015, December 2015, March 2016, and July 2016.
- The Army conducted testing of the MSE Lethality Enhancer titanium fragments against Composition B explosive to validate Jacobs-Roslund equations from July 2015 through October 2015, at Army Research Laboratory, Maryland. These equations predict when a high-explosive initiation should occur within a warhead impacted by fragments.
- The Army plans to conduct the next Patriot operational test, the PDB-8 IOT&E, beginning in September 2016. This IOT&E will provide information to support the Patriot Full-Rate Production decision (including the MSE missile).
- The Army conducted all testing in accordance with a DOT&E-approved test plan.

FY15 ARMY PROGRAMS

Assessment

- Problems previously discovered during the PDB-7 Limited User Test (LUT), if not corrected during PDB-8 development, could adversely affect PDB-8 effectiveness, suitability, or survivability. These problems, the details of which can be found in the classified April 2013 Patriot PDB-7 LUT report, include:
 - Patriot performance against some threats improved compared to PDB-6.5, but there were degradations in performance against other threats. Patriot had some effectiveness shortfalls.
 - Patriot ground system reliability did not meet the threshold requirement, but would have if the Patriot radar achieved its allocated reliability goal.
 - Patriot ground system maintainability did not meet the threshold requirement.
 - Patriot training remained inadequate to prepare operators for complex Patriot engagements. This was true during the PDB 6.5 and PDB-6 LUTs as well.
 - Patriot experienced some survivability and cybersecurity shortfalls.
 - The MSE high-speed sled test data are being analyzed to validate lethality models of MSE lethality against the tested targets.
 - The lethality enhancer contribution to MSE lethality against air-breathing targets is to be determined. The requirement for additional sled testing is contingent upon the results of simulations of air-breathing target engagements throughout the MSE battlespace.
 - Data analysis for the PDB-8 DTE is ongoing.
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 joint 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 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 operational 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 missile blast lethality in the Lethality End Game Simulation.
- FY15 Recommendations. None.

Recommendations

- Status of Previous Recommendations. The Army satisfactorily addressed 14 of the previous 23 recommendations. The Army should continue to address the following recommendations: