Patriot Advanced Capability-3 (PAC-3)

Executive Summary

- The coronavirus (COVID-19) pandemic delayed the start of the Post-Deployment Build (PDB)-8.1 Developmental Test and Evaluation from June 2020 to a projected date of March 2021, and the PDB-8.1 Limited User Test (LUT) from June 2021 to a projected date of March 2022.
- The Missile Defense Agency (MDA) and the Army conducted Flight Test Patriot Weapon System (FTP)-27 Event 2 (E2) in February 2020 to test Patriot's capability to launch on Terminal High-Altitude Area Defense (THAAD) data.
- The MDA and the Army successfully conducted FTP-27 E1 in October 2020 to demonstrate an extended ground range intercept exercising Patriot launch on remote (LOR) using THAAD data.

System

The Patriot weapon system is a mobile air and missile defense system that includes C-band phased-array radars for detecting, tracking, classifying, identifying, and discriminating targets; battalion and battery battle management elements; and a mix of the Patriot Advanced Capability (PAC)-3 and Missile Segment Enhancement (MSE) hit-to-kill interceptors and PAC-2 blast fragmentation warhead interceptors for negating missile and aircraft threats.

Mission

Combatant Commanders use the Patriot system to defend deployed forces and critical assets (point defense) from missile and aircraft attack and to defeat enemy surveillance air assets in all weather conditions.

Major Contractors

- Prime: Raytheon Company, Integrated Defense Systems – Tewksbury, Massachusetts (ground system and Patriot Advanced Capability-2 and prior generation interceptor variants)
- PAC-3 and MSE interceptors and PAC-3 Command and Launch System: Lockheed Martin Corporation, Missile and Fire Control – Grand Prairie, Texas

Activity

- The Army conducted a cybersecurity assessment in April 2019 that focused on Internet Protocol interfaces. Non-Internet Protocol interfaces have not yet been evaluated.
- The Army conducted flight testing in accordance with the DOT&E-approved Patriot System Test and Evaluation Master Plan, and the MDA conducted testing in accordance with the DOT&E-approved Integrated Master Test Plan, as affected by the COVID-19 pandemic.
- The MDA and Army conducted Developmental Test Flight Test Other (FTX)-39 in October 2019 using PDB-8.0.6 software to demonstrate a simulated engagement against a short-range ballistic missile (SRBM) to test Patriot's capability to launch on THAAD data.
- The COVID-19 pandemic delayed the start of the PDB-8.1 Developmental Test and Evaluation from June 2020 to a projected date of March 2021. The Army had intended to start the next Patriot operational test, the PDB-8.1 LUT, in June 2021, but it rescheduled the LUT to start in March 2022.
- The MDA and the Army conducted FTP-27 E2 in February 2020 at White Sands Missile Range, New Mexico. During this developmental flight test, THAAD detected and tracked an SRBM target and passed data to Patriot, which launched two MSE interceptors on remote track data at the target.
- The MDA conducted Ground Test Integrated (GTI)-20 Sprint 2 in June 2020 to examine potential Patriot MSE launch-on-THAAD capabilities within the Ballistic Missile Defense System architecture.
- The Army corrected their missile software update process and demonstrated the corrected process in preparations for a Qatar Foreign Military Sales program flight tests in June 2020, and FTP-27 E1 in October 2020. Preflight ground testing

procedures have been updated to detect any similar errors in the future.
- The MDA and Army conducted developmental flight test FTP-27 E1 in October 2020 at White Sands Missile Range, New Mexico, to demonstrate Patriot LOR capability.

Assessment
- The MDA and Army declared FTX-39 a no-test when the test target went off course soon after launch and range safety destroyed the target prior to the THAAD radar acquiring it. The MDA and Army intended to track the target using a THAAD radar and pass that data to Patriot, but not launch MSE interceptors, as a risk reduction test event.
- The MSE seekers in FTP-27 E2 did not enter target acquisition during endgame, which resulted in both interceptors missing the target. The cause of this failure was an error in a new missile software update process that the Army used for the first time. Pre-flight laboratory runs did not discover the error because those runs used a different missile software update process.
- GTI-20 Sprint 2 represented Patriot with the Battalion Simulation (BnSim). The Army was still developing BnSim at the time of test execution. The operational testers concluded that BnSim currently lacks sufficient maturity to meet operational test requirements and enable performance assessments during MDA ground tests. As a result, the operational testers considered GTI-20 Sprint 2 a developmental test. The testers were able to collect limited developmental data for the Patriot LOR capability. Patriot M&S continues to develop and improve, but remains insufficient to support quantitative effectiveness and lethality assessments.
- During FTP-27 E1, THAAD detected and tracked an SRBM target and passed the tracking data to Patriot. Patriot launched two MSE interceptors. Patriot successfully intercepted the target using the remote track data to achieve an extended ground range engagement.

Recommendations

The Army should:
1. Assess the Patriot radar and other non-Internet Protocol-based systems, such as the launchers and Antenna Mast Group during the PBD 8.1 LUT.
2. Continue to develop/improve BnSim to eliminate the current shortfall and support ground testing needs.