

P-8A Poseidon

Executive Summary

- The integrated test team is currently conducting 10 to 14 test flights of the P-8A Poseidon per week. This pace is greater than the eight test flights per week in the original test plan.
- The first production-representative test aircraft flew in June 2011.
- The P-8A cleared flight envelope does not currently allow for conduct of operationally realistic missions and maneuvering utilizing flight profiles required during the IOT&E.
- Priority 1 and 2 software problems should be closed before IOT&E. The current closure rate is not sufficient to have all the software problems resolved prior to the start of IOT&E in June 2012.
- The program completed limited LFT&E in FY11 and updated plans for a Live Fire Test series scheduled for late FY12 and early FY13.
- The Navy decided to provide the S-1 structural test article, a Live Fire test asset, to the Advanced Airborne Sensor program for development of that system. This decision delays planned FY12 LFT&E of the S-1 for the P-8A, and puts completion of LFT&E prior to the scheduled full-rate production date at risk. DOT&E is working with the program to resolve this scheduling problem.

System

- The P-8A Poseidon is the Navy's next generation maritime patrol aircraft that will replace the P-3C.
- The P-8A is based on the Boeing 737-800 aircraft, but uses the 737-900 extended-range wing.
- The P-8 is designed to carry and employ anti-ship missiles, air-to-surface weapons, torpedoes, sonobuoys, and other expendables.
- The P-8A onboard sensors include acoustics and electro-optic sensors.
- Survivability enhancement and vulnerability reduction features are incorporated into the P-8A design.
 - Susceptibility is reduced with an integrated Aircraft Survivability Equipment suite that consists of a radar warning receiver, chaff/flare dispenser, missile warning



system, directed infrared countermeasures, and an Electronic Warfare Management Unit to control the system. Radio frequency countermeasures are planned for spiral development, with installation provisions (including wiring and mounting pylons) incorporated into all production aircraft.

- Vulnerability is reduced through the addition of fuel tank inerting systems and fire protection systems for the vulnerable dry bays that surround aircraft fuel tanks.

Mission

Units equipped with the P-8 will perform a wide range of patrol missions, including:

- Armed anti-submarine warfare
- Armed anti-surface warfare
- Intelligence collection, processing, evaluation, and dissemination to Naval and joint forces
- Maritime and littoral reconnaissance

Major Contractor

Boeing Defense, Space, and Security – St. Louis, Missouri

Activity

- The integrated test team is currently conducting 10 to 14 test flights per week. This pace is greater than the eight test flights per week in the original test plan. At the beginning of the flight test program, the Navy conducted significantly less than the planned eight test flights per week due to limitations with test instrumentation.
- There are three flight test aircraft: T-1, T-2, and T-3.
 - The T-1 test aircraft is used for airworthiness testing; it is heavily instrumented, but does not have the mission systems (e.g. sensors) integrated onboard the aircraft. The primary purpose of the airworthiness testing with T-1

is to clear the entire flight envelope for safe operation. Flight testing of T-1 began in October 2009. As of September 28, 2011, the integrated test team conducted 118 test flights (428.9 flight test hours). Airworthiness testing has consisted of flutter, loads, and flying qualities testing. Data have been collected for 2,926 test points of the total 6,048 test points planned to complete the aircraft systems testing.

- The T-2 test aircraft has the full mission equipment (e.g., sensors, onboard computers, aircrew workstations) integrated onboard. The primary purpose of testing with T-2 is to evaluate the performance of the onboard mission equipment such as the radar, acoustics system, and computers. Flight testing of T-2 began in June 2010. As of September 28, 2011, the integrated test team conducted 94 test flights (407.0 flight test hours). To date, flight testing has focused on testing the acoustics system and radar. Data have been collected for 855 test points out of the total 1,204 test points for mission systems testing.
 - The T-3 test aircraft has the full mission equipment onboard. The primary purpose of testing with T-3 is to ensure the safe separation of weapons and buoys from the aircraft. As such, the instrumentation onboard the T-3 includes a number of cameras to monitor the separation of weapons and sonobuoys launched from the aircraft. Flight testing of T-3 began in July 2010. As of September 28, 2011, the integrated test team conducted 73 test flights (304.3 flight test hours).
 - Three production-representative test aircraft (T-4, T-5, and T-6) will fly during the IOT&E in FY12. The first production-representative test aircraft, T-4, flew in June 2011.
 - As of September 28, 2011, the integrated test team has flown 25 test flights (102.0 flight test hours) using T-4.
 - The Navy is tracking system deficiencies discovered in all phases of integrated flight, ground, and laboratory testing. The P-8A Combined Reliability Board regularly reviews reliability data.
 - The Navy continues to use the Weapons System Integration Lab to test software upgrades, tactics, and interfaces with other systems such as the tactical/mobile ground station.
 - The Navy conducted three limited Live Fire Test series in FY11 to support the vulnerability assessment:
 - Simulated engine nacelle fire extinguishing performance testing in the presence of ballistic damage.
 - Ballistic testing of the P-8A In-Flight Refueling piping to assess vulnerabilities related to fire and explosion.
 - Fuel vapor sensor tests to evaluate the capabilities of sensors to detect the presence of explosive fuel mixtures in the lower lobe of the P-8A fuselage.
 - The Navy decided to provide the S-1 structural test article, a Live Fire test asset, to the Advanced Airborne Sensor program for development of that system, delaying planned FY12 LFT&E of the S-1 for the P-8A.
- Assessment**
- The integrated test team identified the following risk areas for entering and completing a successful IOT&E.
 - Currently, the P-8A has an operational flight envelope limit that precludes it from flying at a bank angle greater than 48 degrees when maneuvering. In order to fly operationally realistic tactics during anti-submarine warfare missions, the aircraft will have to fly maneuvers that require a bank angle of 53 degrees. The P-8A full flight envelope should be cleared for flight to conduct operationally realistic missions and maneuvering flight profiles during the IOT&E.
 - Priority 1 and 2 software problems that will affect IOT&E remain open. Although 92 percent of the priority 1 and 2 software problems have been closed, the current closure rate is not sufficient to have all the software problems resolved by the start of IOT&E. Priority 1 software problems prevent a mission-essential capability from being performed. Priority 2 software problems affect mission-essential capabilities, and there is no acceptable workaround for these problems onboard the P-8A. There are 369 priority 1 and 2 software problems as of September 21, 2011. Software problems discovered during the later stages of the integrated testing may not be fixed in the software version that is currently planned for IOT&E, and may require additional software upgrades prior to starting IOT&E to ensure the software is production-representative.
 - The immaturity of the mission systems degrades mission effectiveness and suitability. Reliability is currently below the system requirement due to discovery of software problems in the mission systems, such as the acoustics system, that prevent essential capabilities required of the systems.
 - Although the Navy is tracking reliability to date, the sample size (number of test hours) is still too small to fully assess whether the P-8A will meet its reliability, maintainability, and sustainment requirements. The current point-estimate reliability is 7.45 mean flight hours between mission aborts, compared to a system requirement of 11.7 hours.
 - The Navy is approximately two months behind schedule in collecting test point data based on their re-baselined schedule constructed in January 2011. The primary reasons for the delay have been early-on instrumentation problems on the test aircraft, shortfalls in mission systems maturity, unanticipated delays due to software and hardware upgrades, and delays in the engineering analysis of flight test data. The instrumentation problems experienced early in the flight test program have been resolved. The delay in collecting test point data will probably delay completing the airworthiness testing to clear the entire flight envelope for safe flight.
 - The horizontal tail pitch control is vulnerable to the armor piercing incendiary threats tested. The larger armor piercing

incendiary threat severed the horizontal tail pitch control, resulting in loss of aircraft flight control. However, the pitch control's cross-sectional area is small and surrounded by internal components that provide shielding against threats, thus its susceptibility to threats is small.

- The limited FY11 Live Fire Test series demonstrated that:
 - The engine nacelle fire extinguisher system is effective against fires in the presence of nacelle damage up to the specification level of ballistic projectile threats.
 - In-flight refueling plumbing does not significantly contribute to P-8 vulnerability to ballistic threats.
 - Fuel vapor sensors that will be installed in the P-8 to detect the presence of fuel leaking from tanks in the fuselage lower lobe were sufficiently sensitive to detect such leakage well before explosive mixtures could develop.
- The LFT&E program is adequate to assess the vulnerability and survivability of the P-8A. However, currently there is significant risk in completing LFT&E prior to full-rate production because the Navy has given the Advanced Airborne Sensor program priority for the Live Fire S-1 static test asset, delaying scheduled completion of P-8A LFT&E.

Recommendations

- Status of Previous Recommendations. In order to reduce the risk of an unsuccessful IOT&E, the Navy needs to resolve the FY10 recommendation to fix the system shortfalls discovered during the operational assessment that degrade the mission, have no operator workaround, and have no current corrective plan in place.
- FY11 Recommendations. The Navy:
 1. Should clear the P-8A operational flight envelope so that operationally realistic and representative missions can be flown during IOT&E.
 2. Should resolve all priority 1 and 2 software problems discovered during the integrated test phase before starting IOT&E.
 3. Must deliver the S-1 static test article for LFT&E earlier than the revised schedule in order to complete testing before the scheduled full-rate production date.

NAVY PROGRAMS