

## P-8A Poseidon Multi-Mission Maritime Aircraft (MMA)

### Executive Summary

- The Navy delayed the P-8A IOT&E from February 2012 to September 2012 to develop and test a series of mission system software improvements intended to correct significant radar, electro-optical/infrared (EO/IR) sensor, Electronic Support Measures (ESM), and communications system performance deficiencies identified during developmental testing.
- In August 2012, the Navy completed development of Operational Flight Program (OFP) Release 9.3 and approved it as the IOT&E software baseline. Developmental test results indicate that OFP Release 9.3 improved system performance, particularly for the ESM sensor. However, it did not resolve a number of other deficiencies that could degrade operational effectiveness for all P-8A missions. These deficiencies pose a high risk to operational effectiveness, particularly in the Intelligence, Surveillance, and Reconnaissance (ISR); Command, Control, and Communication; and Joint Interoperability mission areas. Unresolved sensor performance deficiencies also affect the primary Anti-Submarine Warfare (ASW) mission.
- P-8A ASW sonobuoy acoustic processing and torpedo carriage/release systems continued to mature during developmental test events, despite recurring system stability and reliability problems.
- The Navy's decision to waive P-8A wide-area acoustic search requirements for IOT&E and defer integration of a multi-static active acoustic capability until at least FY14 will limit ASW mission effectiveness in the near-term. In order to achieve full ASW mission capability on the P-8A aircraft, the Navy will have to complete future integration of the Multi-Static Active Coherent broad area acoustic system on the aircraft. P-8A airframe and aircraft subsystem maturity improved during developmental test events. Remaining weather, take-off, and flight envelope restrictions will not significantly affect mission operations. However, main tank fuel overheating during ground and low-level flight will limit ASW operations in hot weather environments.
- P-8A system reliability approached the minimum operational requirement of 11.7 Mean Flight Hours Between Operational Mission Failure during the OFP Release 9.3 developmental test phase just prior to IOT&E. While promising, this reliability assessment was inconclusive due to the small number of operating hours observed with OFP Release 9.3 installed. The IOT&E results will provide a more complete assessment of system reliability.
- The P-8A live fire test program completed an initial assessment of P-8A vulnerabilities for a range of ballistic projectiles. DOT&E requires completion of remaining vulnerability test events on the S-1 static test article to support completion of the P-8A IOT&E report in advance of the July 2013 Full-Rate Production decision.



- The Navy did not release the P-8A On-Board Inert Gas Generating System (OBIGGS) for operational testing due to serious system design deficiencies discovered during developmental testing. The program is currently evaluating design changes and will conduct further developmental testing in late FY12 and early FY13.

### System

- The P-8A Poseidon Multi-mission Maritime Aircraft (MMA) design is based on the Boeing 737-800 aircraft with significant modifications to support Navy maritime patrol mission requirements. It will replace the P-3C Orion.
- The P-8A incorporates an integrated sensor suite that includes radar, electro-optical, and electronic signal detection sensors to detect, identify, locate, and track surface targets. An integrated acoustic sonobuoy launch and monitoring system detects, identifies, locates, and tracks submarine targets. The P-8A carries Mk 54 torpedoes and is currently integrating the AGM-84 Harpoon missile system to engage identified submarine and surface targets. Sensor systems also provide tactical situational awareness information for dissemination to the fleet and ISR information for exploitation by the joint intelligence community.
- The P-8A aircraft incorporates aircraft survivability enhancement and vulnerability reduction systems. An integrated infrared missile detection system, flare dispenser, and directed infrared countermeasure system is designed to improve survivability against infrared missile threats. On and off-board sensors and datalink systems are used to improve tactical situational awareness of radio frequency missile threat systems. Fuel tank inerting and fire protection systems reduce aircraft vulnerability.

# NAVY PROGRAMS

## Mission

- Theater Commanders primarily use units equipped with the P-8A MMA to conduct Anti-Submarine Warfare. P-8A units detect, identify, track, and destroy submarine targets.
- Additional P-8A maritime patrol missions include:
  - Anti-Surface Warfare operations to detect, identify, track, and destroy enemy surface combatants or other shipping targets.
  - Maritime and littoral ISR operations to collect and disseminate imagery and signals information for exploitation by the joint intelligence community.
  - Collection and dissemination of tactical situation information to improve the fleet common operational picture.
  - Identification and precise geo-location of targets ashore to support fleet strike warfare missions.

## Major Contractor

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

## Activity

- The Navy delayed the P-8A IOT&E from February 2012 to September 2012 to develop and test a series of mission system software improvements intended to correct significant radar, EO/IR sensor, ESM, and communications system performance deficiencies identified during developmental testing.
- From May 2012 to September 2012, Navy operational testers conducted a series of pre-IOT&E integrated developmental and operational test events using production-representative test aircraft and interim OFP software releases to evaluate P-8A deployment capabilities and assess evolving aircraft and mission system maturity. These events also provided additional flight crew and maintenance training experience in preparation for IOT&E. Major integrated test events included:
  - Joint Warrior fleet exercise conducted with the United Kingdom and other NATO countries in April 2012. Test crews completed 6 missions totaling 36.3 flight hours during this exercise.
  - U.S.–Australian fleet exercise in Australia in June 2012. Operational test crews completed 6 missions totaling 24.8 flight hours during this exercise.
  - Rim of the Pacific fleet exercise in Hawaii in July 2012. Operational test crews completed 20 missions totaling 102.2 flight hours during this exercise.
  - Mk 54 torpedo tests at the Atlantic Underwater Test Center in May 2012, Cape Cod Atlantic test areas in August 2012, and Hawaii Pacific test ranges in September 2012.
- In August 2012, the Navy completed development of OFP Release 9.3 and approved it for use in IOT&E. This release addressed some of the most serious sensor performance and communications system deficiencies identified during earlier testing.
- The Navy entered IOT&E beginning with participation in the U.S. Pacific Command Valiant Shield exercise in early September 2012. The Navy plans to complete IOT&E in December 2012. The Navy is conducting testing in accordance with the DOT&E-approved test plan.
- The P-8A live fire test program completed ballistic testing of P-8A emergency oxygen bottles on a surrogate Boeing 737 test aircraft in March 2012. The program also completed an evaluation of wing fuel tank tolerance against threat-induced hydrodynamic ram damage in September 2012.
- The Navy completed an initial flight test of the missile warning system, flare dispenser, and directed infrared countermeasures system against simulated infrared threats. The program is planning to conduct additional hardware-in-the-loop testing of these systems in early FY13 to complete required live fire and operational test requirements.

## Assessment

- Developmental test results indicate P-8A airframe and aircraft subsystem maturity continued to improve as the developmental test program progressed. Remaining aircraft weather, take-off, and flight envelope restrictions should not significantly affect mission operations and are on track for resolution prior to P-8A operational deployment. However, developmental testing identified main tank fuel overheating during ground and low-level flight operations as a serious deficiency that will limit ASW mission on-station time in hot weather environments.
- Developmental test results indicate that OFP Release 9.3 improved system performance, particularly for the ESM sensor. However, it did not resolve a number of other deficiencies that could seriously degrade operational effectiveness for all P-8A missions. These deficiencies pose a high risk to operational effectiveness, particularly in the ISR; Command, Control, and Communication; and Joint Interoperability mission areas:
  - Common Data Link and International Maritime Satellite data transfer deficiencies that prevent reliable transmission of synthetic aperture radar (SAR) and EO/IR imagery intelligence products to operational users
  - Ineffective voice satellite communications systems that prevent transmission and receipt of mission critical information
  - SAR high-resolution image quality problems that degrade imagery intelligence capabilities
  - Radar pointing errors that prevent effective SAR imagery collection for some littoral/land targets

# NAVY PROGRAMS

- EO/IR sensor cross-cue errors and inoperative auto-track modes that significantly increase sensor operator workload
- Non-standard imagery metadata formats that prevent joint intelligence exploitation of P-8A imagery intelligence products
- Ineffective ESM Specific Emitter Identification subsystem that does not reliably collect and identify emitter signatures to enable identification of specific hostile targets
- Radar track-while-scan deficiencies that degrade P-8A and fleet situational awareness
- P-8A ASW sonobuoy launch, positioning, and acoustic processing systems continued to mature during developmental test events, despite recurring system stability and reliability problems. Unresolved radar, EO/IR, and ESM sensor performance deficiencies also affect ASW mission operations. Excessive ESM system interference and bleed over onto ASW operator displays frequently preclude ESM operation during ASW operations. In addition, developmental test events included few ASW search and detect events against operationally realistic submarine targets, which increases the potential for discovery of additional deficiencies during IOT&E.
- The Navy decision to waive P-8A wide-area acoustic search requirements for IOT&E and defer integration of a multi-static active acoustic capability until at least FY14 will limit ASW mission effectiveness in the near-term. Future integration of the Multi-Static Active Coherent broad area acoustic system will be required to achieve full ASW mission capabilities.
- Developmental test results indicate that P-8A torpedo release and water impact point accuracies meet operational requirements. Complete end-to-end torpedo employment effectiveness will be assessed during IOT&E events. However, inadequate weapons bay heating systems currently restrict torpedo carriage altitudes and combat mission radius in cold weather environments. The program is planning to develop and test system design changes to improve weapons bay heating in FY13, prior to operational fielding.
- P-8A system reliability improved significantly during the final OFP Release 9.3 developmental test phase prior to IOT&E, approaching the minimum operational requirement of 11.7 Mean Flight Hours Between Operational Mission Failure. While promising, this pre-IOT&E reliability assessment was inconclusive due to the small number of operating hours observed with OFP Release 9.3 installed. Most P-8A mission reliability failures are directly attributable to system software deficiencies. Hardware reliability exceeded the 1.25 Mean Flight Hour Between Operational Mission Failure requirement throughout the developmental and integrated test phases.
- The P-8A live fire test program completed an initial assessment of P-8A vulnerabilities for a range of ballistic projectiles. DOT&E requires completion of remaining vulnerability test events on the S-1 static test article to support completion of the P-8A IOT&E report in advance of the July 2013 Full-Rate Production (FRP) decision. The current S-1 test schedule supports a live fire vulnerability assessment in 3QFY13, but with little margin for additional delay prior to the planned July 2013 FRP decision.
- The Navy did not release the P-8A OBIGGS for operational testing during IOT&E due to serious system design deficiencies discovered during developmental testing. The program is currently implementing design changes and has begun further developmental testing, which will continue into FY13. This system is a critical P-8A survivability feature that maintains inert fuel tank environments to improve ballistic projectile protection.

## Recommendations

- Status of Previous Recommendations. The Navy made progress on all FY11 recommendations. Developmental testing cleared the P-8A operational flight envelope to support IOT&E operational flight profiles. The program realigned S-1 live fire test schedules to support completion of testing prior to the FRP decision. The Navy corrected many, but not all, mission critical software deficiencies during the FY12 extended developmental test period leading to IOT&E.
- FY12 Recommendations. The Navy should:
  1. Accelerate correction of the remaining unresolved radar, EO/IR, ESM, and communications/data transfer deficiencies and conduct operational testing to verify software fix effectiveness.
  2. Correct weapons bay heating and main tank fuel overheating hardware deficiencies and conduct testing to verify unrestricted flight envelopes in cold and hot weather environments.
  3. Closely monitor progress of live fire vulnerability and OBIGGS test events to ensure completion and data delivery in time to support DOT&E's P-8A IOT&E report and FRP Decision.
  4. Complete Test and Evaluation Master Plan development and test planning for P-8A Increment 1 FOT&E events and the series of P-8A Increment 2 developmental and operational tests scheduled to begin in FY14.