

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

Executive Summary

- In FY16, the Navy completed the P-8A Data Storage Architecture Upgrade (DSAU)/Verification of Correction of Deficiencies (VCD) FOT&E. DOT&E's May 2016 P-8A DSAU/VCD operational test report concluded that the DSAU modification provided an effective data transfer and storage architecture to replace legacy system components. The modification effectively reduced the number of data transfer and media recording devices without introducing new system deficiencies. The associated Fleet Release 35 operational flight software successfully corrected seven previously identified system deficiencies. These corrections provided marginal improvements to system performance and user interfaces that affect the mission areas of anti-submarine warfare (ASW); intelligence, surveillance, and reconnaissance (ISR); and aircraft mobility.
- The Navy delayed the P-8A Engineering Change Proposal (ECP) 2 OT&E, originally planned for early FY16, until 1QFY17 due to developmental ASW software deficiencies. This operational test period includes: re-evaluation of the P-8A wide-area ASW search capability with the Multi-static Active Coherent (MAC) Phase I sensor system; complete re-evaluation of the P-8A ISR mission, including both imagery and signals intelligence capabilities; evaluation of air-to-air refueling; cybersecurity assessment; and evaluation of additional AGM-84 Harpoon employment modes. Operational testers will also collect reliability, maintainability, and availability data during this test period to re-evaluate P-8A fleet operational availability with a fully mature logistics support system in place. The ECP 2 OT&E will be the most extensive P-8A operational test conducted since the 2012 P-8A IOT&E.
- The Navy continues to delay the development of the MAC system and MAC tactics for deep water and convergence zone acoustic environments. Thus, even after fielding ECP-2, the P-8A will not have an effective wide area acoustic ASW search capability in many threat ocean areas.
- In April 2016, USD(AT&L) approved a revised Navy P-8A acquisition strategy which incorporated all P-8A Increment 3 capability requirements into the baseline P-8A program. These capabilities will now be developed and delivered as a series of ECPs designated as ECPs 4 through 7. They include implementation of significant open system architecture changes, ASW capability enhancements, communication system upgrades, radar and electronic signal sensor upgrades, and AGM-84 Harpoon 2+ anti-ship missile integration. Navy development of a comprehensive Test and Evaluation Master Plan (TEMP) and test schedule for the new P-8A ECP capability releases has been delayed due to evolving capability requirements, potential budget reductions, and schedule uncertainties. TEMP development activities are



currently behind schedule to support the start of ECP 4 testing in 2QFY17.

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 is replacing 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. Sensor systems also provide tactical situational awareness information for dissemination to fleet forces and ISR information for exploitation by the joint intelligence community.
- The P-8A carries MK 54 torpedoes and the AGM-84D Block 1C Harpoon anti-ship missile system to engage submarine and maritime surface targets.
- 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 expected threat systems. Fuel tank inerting and fire protection systems reduce aircraft vulnerability.
- The Navy is integrating the MAC sensor system into the P-8A to provide a wide-area, active ASW search capability.
- Planned future upgrades include the addition of the High Altitude ASW Weapon Capability (HAAWC), AGM 84 Harpoon II+, MAC wide-area ASW search enhancements,

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signals intelligence sensors, and advanced mission system architectures and processing upgrades.

Mission

- Theater Commanders primarily use units equipped with the P-8A MMA to conduct ASW operations including the detection, identification, tracking, and destruction of submarine targets.
- Additional P-8A maritime patrol missions include:
 - ASW operations to detect, identify, track, and destroy enemy surface combatants or other maritime targets

- ISR operations to collect and disseminate imagery and signals information for exploitation by the joint intelligence community
- Command, control, and communication operations to collect and disseminate tactical situation information to fleet forces
- Identification and precise geolocation of targets ashore to support fleet strike warfare missions

Major Contractor

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

Activity

- In FY16, the Navy completed the P-8A DSAU/VCD FOT&E. This test evaluated improvements in ASW and ISR mission data loading and storage following the DSAU modification. This test event also included testing to verify corrections for nine previously identified weapons bay, electronic signal collection, Information Assurance, and avionics integration deficiencies, as well as a system-level cybersecurity assessment. DOT&E released the P-8A DSAU Operational Test Report in May 2016.
- The Navy developed improvements to the P-8A acoustic system, the Active System Performance Estimate Computer Tool, and the MAC program that were designed to improve ASW capability. The Navy updated MAC search tactics in shallow water environmental areas and continues to develop the tactics and MAC system upgrades for deeper ocean areas.
- The Navy delayed the P-8A ECP 2 OT&E, originally planned for early FY16, until 1QFY17 due to developmental ASW software deficiencies. This test will evaluate P-8A wide-area ASW search capability with the MAC Phase I sensor system; P-8A ISR capabilities, including both imagery and signals intelligence collection; air-to-air refueling; cybersecurity; and additional AGM-84D Block 1 Harpoon missile employment modes. Operational testers will also collect reliability, maintainability, and availability data during this test period to re-evaluate P-8A fleet operational availability with a fully mature logistics support system in place.
- Contractor and government developmental testing of HAAWC system capability to employ sonobuoys and the MK 54 torpedo from the P-8A at medium to high altitudes is in progress. As a result of increased program cost estimates and reduced funding, the Navy transferred resource sponsor organizational responsibilities within the Navy staff and is currently revising performance thresholds in the HAAWC draft Capabilities Development Document. The HAAWC program has not yet developed a comprehensive test strategy and does not have an approved TEMP.
- In April 2016, USD(AT&L) approved a revised Navy P-8A acquisition strategy which incorporated all P-8A Increment 3 capability requirements into the baseline P-8A program. These capabilities will now be developed and delivered as a

- series of ECPs designated as ECPs 4 through 7. They include implementation of significant open system architecture changes, ASW capability enhancements, communication system upgrades, radar and electronic signal sensor upgrades, and AGM-84 Harpoon 2+ anti-ship missile integration. The Navy is currently working to develop a revised P-8A TEMP to define the developmental and operational test strategy for this new series of ECPs. Per the approved P-8A acquisition strategy, the Navy should submit a revised P 8A TEMP for DOT&E approval prior to the start of ECP 4 testing in 2QFY17. Tentative test schedules include a series of ECP operational test events in FY18, FY19, FY21, and FY22 to support the incremental release of new P-8A capabilities.
- The Navy completed the second lifetime of fatigue and durability testing on P-8A full-scale test aircraft in FY15 and conducted extended lifetime testing in FY16. Teardown and final analysis of the full-scale fatigue test aircraft will occur when the extended life testing is completed in FY17. Residual strength testing on both the full-scale test article and horizontal stabilizer was also completed in FY16. Main and nose landing gear subassemblies completed the equivalent of three lifetimes of fatigue testing in FY15, followed by landing gear post-test teardown and analysis in FY16.

Assessment

- DOT&E's May 2016 P-8A DSAU/VCD operational test report concluded that the DSAU modification provided an effective data transfer and storage architecture to replace legacy system components. The modification effectively reduced the number of data transfer and media recording devices without introducing new system deficiencies. The associated Fleet Release 35 operational flight software successfully corrected seven previously identified system deficiencies and partially corrected one additional deficiency. These corrections provide marginal improvements to system performance and user interfaces that affect ASW, ISR, and aircraft mobility mission areas. These improvements do not significantly alter previous assessments of overall P-8A mission capabilities.
- The P-8A DSAU/VCD FOT&E cybersecurity test events identified a collection of exploitable P-8A cybersecurity

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vulnerabilities. Based on the results of this test, DOT&E recommended that the Navy conduct a more comprehensive P-8A cybersecurity test to include end-to-end cyber-attack and response threads for the complete P-8A system-of-systems, including maintenance support systems, Tactical Mobile mission planning and support systems, and physical access points to P-8A integrated workstations. The Navy is planning to include an expanded cybersecurity test event as part of the FY17 P-8A ECP 2 OT&E.

- The Navy's FY17 P-8A ECP 2 OT&E evaluates significant new P-8A capabilities, including wide-area ASW search with the MAC Phase I sensor system, air-to-air refueling, and additional AGM-84 Harpoon employment modes. It also includes a complete re-evaluation of P-8A imagery and signals intelligence collection capabilities. This will be the most extensive P-8A operational test conducted since the 2012 P-8A IOT&E.
 - The Navy did not complete the development of MAC capability or MAC tactics for wide-area active ASW search in deep or Convergence Zone acoustic environments; therefore, the P-8A ECP-2 OT&E will only evaluate improvements to the MAC Phase I system in shallow and littoral environments. Thus, the P-8A does not have the full wide-area acoustic ASW capability required by the baseline Capability Development Document.
 - The Navy continues to develop and test corrective actions for 106 open system deficiencies identified as operationally significant during previous test periods. The ECP 2 OT&E test plan includes events to verify corrective actions for 37 of these deficiencies. During this test, operational testers will also collect reliability, maintainability, and availability data during this test period to re-evaluate P-8A fleet operational availability with a fully mature logistics support system in place.
- The Navy continued ECP-2 testing to evaluate improvements to the P-8A's acoustic and MAC software and employment tactics in representative littoral shallow water environments. The Navy continues to develop tactics and system improvements to use the MAC system in deeper water ASW environments. A higher source level active buoy is undergoing developmental testing; when combined with new tactics and MAC software improvements, it could improve and expand the current ECP-2 ASW capability. Once the new MAC source buoy is completed and fielded, a re-evaluation of the MAC capability will be required. This testing will be included in the updated P-8A TEMP.
- The Navy's contractor testing of the HAAWC MK 54 weapon delivery capability is progressing. The contractor completed

two successful test flights in FY16. The P-8A program conducted initial testing to verify the HAAWC captive carriage, buffet load margins, and safe separation.

- The Navy delayed development of a comprehensive test strategy and schedule for the new P-8A ECPs 4 through 7 (formerly the P-8A Increment 3 program) due to evolving capability requirements, potential budget reductions, and schedule uncertainties. Development of a revised P-8A TEMP is necessary to ensure that test resources are defined and available to support development of P-8A open system architecture changes, enhanced ASW capabilities, communication system upgrades, radar and electronic signal sensor upgrades, and AGM-84 Harpoon 2+ anti-ship missile integration. Navy TEMP development activities are currently behind schedule to support the start of ECP 4 testing in 2QFY17.
- The Navy completed landing gear fatigue test assembly data analysis with no significant findings. Teardown of the full-scale aircraft fatigue test article will occur when all extended life test events are complete. The program continues to review the full-scale test article data to refine fleet airframe inspection requirements and depot repair procedures to ensure the airframe meets the intended 25-year design life. To date, no significant long term structural problems have been identified.

Recommendations

- Status of Previous Recommendations. The Navy made progress on all three FY15 recommendations. The Navy completed P-8A ECP 1 OT&E to evaluate initial P-8A MAC wide-area search capabilities. The program also initiated TEMP development for the new P-8A ECPs 4 through 7 capability enhancements (formerly P-8A Increment 3). The Navy also verified correction of 7 previously identified system deficiencies in FY16 and planned verification of an additional 37 (of 106 remaining) system deficiencies in FY17.
- FY16 Recommendations. The Navy should:
 1. Submit a comprehensive P-8A TEMP for DOT&E approval covering new P-8A ECPs 4 through 7 and MAC system improvements prior to the start of ECP 4 testing in FY17.
 2. Continue to implement corrective actions for the significant number of operationally significant system deficiencies identified in previous P-8A operational test reports and conduct additional follow-on operational tests to verify improved mission capabilities.
 3. Conduct a comprehensive P-8A cybersecurity evaluation to include complete end-to-end cyber-attack and response threads for the P-8A aircraft and key mission support systems.

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