

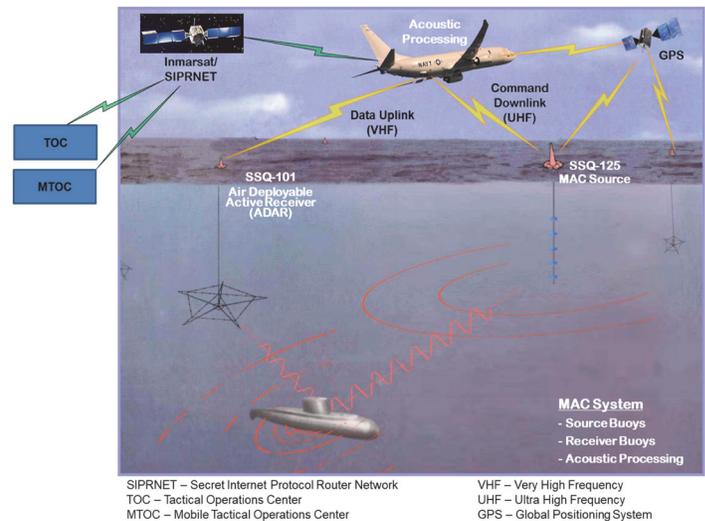
Multistatic Active Coherent (MAC) System

Executive Summary

- In FY19, DOT&E and the Navy agreed to end the FOT&E of the submarine search capability provided by the Engineering Change Proposal (ECP) 2 and ECP 4 upgrades to the P-8A Poseidon Multi-Mission Aircraft using the Multistatic Active Coherent (MAC) Phase 1 system. The Navy completed 11 of 32 planned FOT&E flights in accordance with DOT&E-approved test plans. To augment the analysis, DOT&E used data collected by fleet squadrons during anti-submarine warfare (ASW) exercises and operations conducted from FY15-19.
- FOT&E and fleet data were adequate to assess the operational effectiveness and suitability of the improved P-8A ASW capability. Cybersecurity FOT&E, completed in FY17, was adequate to assess the ECP 2 P-8A's ability to sustain MAC ASW missions in a cyber-contested environment.
- DOT&E issued an FOT&E report on the ECP 2 and ECP 4 P-8A equipped with the MAC Phase 1 system in September 2020.
 - FOT&E demonstrated that operator decision aids improved operator detection performance in some environments.
 - The MAC system continues to provide an effective wide-area ASW search capability in some operational environments, but it does not meet program requirements for all test environments.
 - Cybersecurity testing of the P-8A aircraft (only conducted with ECP 2 upgrades) identified high priority areas for improvement.

System

- The MAC system is an active sonar system composed of two types of sonobuoys: source (i.e., transmitter) (AN/SSQ-125) sonobuoy, and receiver (AN/SSQ-101) sonobuoy, and an acoustic processing and aircraft mission computer software suite. It is employed by the Navy's maritime patrol aircraft (P-3Cs and P-8As) to search for and locate threat submarines in a variety of ocean conditions.
- The MAC sensor system is the latest version of the Navy's Active Extended Echo Ranging (EER) airborne wide-area ASW active sonar search systems. To improve ASW search performance in shallow water and open ocean, the MAC system uses the new coherent source (AN/SSQ-125) sonobuoy that enables multiple pings, optimized waveforms, and various ping durations, none of which were available in the legacy Improved EER (IEER) system.
- Since fielding the MAC Phase 1 system in 2015, the Navy has enhanced the MAC software to improve operator analysis



tools and improved the MAC sonobuoys (source and receiver). The Navy continues to develop the MAC Phase 2 system to improve the capability in a wider variety of acoustic ocean environments in order to span the operational envelope of threat submarine operations.

- To plan MAC missions, the Navy updated the Active System Performance Estimate Computer Tool (ASPECT)/Multistatic Planning Acoustics Toolkit previously used to plan IEER system missions.
- MAC is the primary wide-area acoustic search system for the P-8A aircraft.
- ECP 2 upgrade consisted of operator decision aid tools to the MAC system, and ECP 4 further improved these tools.

Mission

P-8A crews equipped with MAC perform the search, detection, and localization phases of the ASW mission. MAC is particularly focused on large-area active acoustic searches for threat submarines.

Major Contractors

- Boeing Defense, Space, and Security – St. Louis, Missouri
 - Boeing Huntington Beach, California
 - Boeing Kent, Washington
- Lockheed Martin – Manassas, Virginia
- Sparton Electronics Florida, Inc. – De Leon Springs, Florida
- Ultra Electronics, Undersea Sensor Systems Incorporated (USSI) – Columbia City, Indiana

FY20 NAVY PROGRAMS

Activity

- In September 2020, DOT&E issued a classified FOT&E report for MAC Phase 1 integrated on P-8A aircraft with ECP 2 and ECP 4 upgrades. DOT&E augmented its analysis of MAC FOT&E results with data collected by fleet squadrons during anti-submarine warfare (ASW) exercises and operations conducted from FY15-19.
- The Navy is developing the MAC Phase 2 system to improve submarine detection and wide-area ASW search performance and is upgrading the P-8A network architecture.

Assessment

- The MAC Phase 1 system continues to provide an effective wide-area ASW search capability in some operational environments. However, the system does not meet program requirements in all test environments. P-8A operator decision aids, which the Navy introduced with ECP 2 and ECP 4 upgrades improved operator detection performance in some environments. Additional information is detailed in the

classified September 2020 DOT&E FOT&E report on the MAC Phase 1 system.

- The MAC system remains operationally suitable when installed on the P-8A Poseidon aircraft with ECP 2 and ECP 4 upgrades. Operational reliability and availability of the MAC source sonobuoy met Navy requirements during FOT&E, but MAC source sonobuoy reliability was slightly less than the Navy requirement during fleet exercises and operations.
- Cybersecurity testing of the P-8A aircraft (only conducted with ECP 2 upgrades) identified high-priority areas for improvement. The September 2020 DOT&E MAC FOT&E report includes specific test results and recommendations.

Recommendation

1. The Navy should continue efforts to address the recommendations in DOT&E's classified FOT&E report associated with the P-8A aircraft, mission systems, and MAC Phase 1 system.