

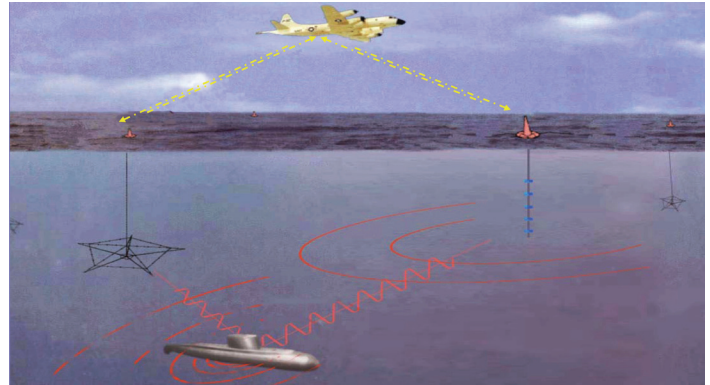
## Multi-Static Active Coherent (MAC) System

### Executive Summary

- DOT&E placed the Multi-Static Active Coherent (MAC) program on oversight in 2012. MAC will be the primary wide-area acoustic search system for the P-8A; without it, P-8A has limited large-area Anti-Submarine Warfare (ASW) search capability.
- The Navy conducted developmental testing in 2012; the Navy plans to begin operational testing in early FY13.

### System

- The MAC system is an active sonar system composed of two types of buoys (source and receiver) and an acoustic processing software suite. It is employed by the Navy's maritime patrol aircraft (P-3Cs and eventually P-8As) to search for and locate threat submarines in a variety of ocean conditions.
- MAC is an upgrade to the Navy's current Improved Extended Echo Ranging (IEER) system, which employs non-coherent sources to produce loud sounds that reflect off submarine targets; these echoes are then detected by receiver buoys. MAC employs the same receiver buoys, but uses new coherent source buoys that enables multiple pings, optimized waveforms, and various ping durations, none of which the legacy IEER system provided.
- The Navy intends to initially employ MAC on P-3Cs in a limited set of acoustic environments. Future increments of MAC will be employed on P-8A and in a wider variety of acoustic ocean environments in order to span the operational envelope of threat submarine operations.



- MAC is expected to have fewer effects on marine mammals and the environment than the legacy IEER system.
- MAC will be the primary wide-area acoustic search system for the P-8A.

### Mission

The Navy intends for P-3C and P-8A crews equipped with MAC to support the search, detect, and localization phases of the ASW mission. MAC is particularly focused on large-area active acoustic searches for threat submarines.

### Major Contractors

- Lockheed Martin Corporation – Manassas, Virginia
- Sparton Electronics Florida, Inc. – De Leon Springs, Florida
- Ultra Electronics, Undersea Sensor Systems Incorporated (USSI) – Columbia City, Indiana

### Activity

- DOT&E placed the MAC program on oversight in 2012. The Navy intends MAC to be a primary system for the successful ASW mission performance of the Maritime Patrol P-3 aircraft and the new P-8A aircraft. Because of technical difficulties integrating multi-static active wide-area ASW search systems, the Navy deferred the P-8A Maritime Patrol aircraft's wide-area search requirements and deferred this testing on P-8A.
- MAC achieved Milestone C in March 2012. DOT&E did not approve the program's Test and Evaluation Master Plan (TEMP) since it was written prior to DOT&E's oversight; however, DOT&E accepted the current Navy TEMP as adequate for MAC's IOT&E. An update to the TEMP is required to plan for future MAC upgrades and for the implementation of MAC on the P-8A.
- The program conducted developmental and integrated testing on P-3C aircraft in the summer of 2012; DOT&E is evaluating the data collected.
- The Navy reported the Active System Performance Estimate Computer Tool (ASPECT)/Multi-static Planning Acoustics Toolkit (MPACT) used for MAC mission planning inaccurately predicts MAC search probability of detection. The Navy also reported that the current aircraft system's tactical mission software for determining the position of the Air Deployable Active Receiver sonobuoys and aircraft Mark-on-Top tactical procedures were not sufficient to maintain geographically accurate sonobuoy locations throughout the MAC search field. The sonobuoy location inaccuracy is caused by the variable currents and resulting buoy drift rates encountered in the large ocean search field. In October 2012, the Navy waived these deficient conditions for the MAC IOT&E.
- The Navy will begin MAC operational testing on P-3C aircraft in early FY13. The Navy began test planning for the integration of MAC onto P-8A as well as planning for the testing of a future upgrade to the MAC system in late FY12.

## Assessment

- Based on the limited developmental testing data available to date, the reliability of the buoys and the software appear to be meeting developmental test requirements. The Navy and DOT&E will evaluate final configuration changes to the system during IOT&E.
- The IOT&E will not fully examine the capability of MAC across all operational conditions, operational environments, and target types; additional testing is necessary once MAC is integrated onto P-8A operational systems to examine performance under other conditions. Additional testing is also required to examine planned system upgrades.
- The inaccurate ASPECT/MPACT probability of detection prediction tool used for MAC and the inaccurate sonobuoy locating systems will likely affect the MAC system's mission performance and the ability of the system to accurately locate submarine targets. These inaccuracies could result in operators installing a MAC search field that is not optimized based on the environmental conditions for detecting the target in the required search area. The buoy location inaccuracies will affect the crew's ability to efficiently and accurately locate the

target. Additional testing is required to assess the impact of these waived conditions.

- Based on the initial scope of the system's capabilities, the planned IOT&E will allow an assessment of MAC performance in some threat areas and against nuclear submarine targets. DOT&E requires future testing to determine performance against diesel electric submarine targets and in the variety of threat environmental conditions where the Navy intends to employ the MAC system.

## Recommendations

- Status of Previous Recommendations. This is the first annual report for this program.
- FY12 Recommendation.
  1. Update the MAC TEMP to include sufficient testing in other operational conditions, operational environments, and against diesel-electric submarines. The TEMP should include planned testing on both P-3C and P-8A.