

AN/SQQ-89A(V)15 Integrated Undersea Warfare (USW) Combat System Suite

Executive Summary

- In December 2014, DOT&E submitted a classified Early Fielding Report on the Advanced Capability Build 2011 (ACB-11) variant. The report was submitted due to the installation of the ACB-11 variant on ships that deployed prior to IOT&E. From the data collected, DOT&E concluded the system demonstrated some capability to detect submarines and incoming U.S. torpedoes in deep water.
- Operational testing of the ACB-11 variant of the AN/SQQ-89A(V)15 Integrated Undersea Warfare Combat System Suite began in FY14 and is expected to conclude in FY17. The Navy completed at-sea testing in FY16 and is scheduled to complete the cybersecurity evaluation in FY17.

System

- AN/SQQ-89A(V)15 is the primary undersea warfare system used aboard U.S. Navy surface combatants to locate and engage threat submarines. AN/SQQ-89A(V)15 is an open architecture system that includes staggered biennial software upgrades (ACBs) and biennial hardware upgrades called Technology Insertions.
- AN/SQQ-89A(V)15 uses active and passive sonar to conduct anti-submarine warfare (ASW) search. The acoustic energy received is processed and displayed to enable operators to detect, classify, localize, and track threat submarines.
- AN/SQQ-89A(V)15 uses passive sonar (including acoustic intercept) to provide early warning of threat torpedoes.
- The Navy intends to improve sensor display integration and automation, reduce false alerts, and improve onboard training capability to better support operations within littoral regions against multiple sub-surface threats.
- The system consists of:
 - Acoustic sensors – hull-mounted array, Multi-Function Towed Array (MFTA) TB-37 including a towed acoustic intercept component, calibrated reference hydrophones, helicopter and/or ship-deployed sonobuoys.
 - Functional segments used for processing and displaying active, passive, and environmental data.
 - Interfaces with Aegis Combat System for MK 46 and MK 54 torpedo prosecution using surface vessel torpedo



HMA - Hull Mounted Array
MFTA - Multi-Function Towed Array

tubes, Vertical Launch Anti-Submarine Rocket, or MH 60R helicopters.

- The system is deployed on a DDG 51 class destroyer or CG 47 class cruiser.

Mission

- Theater Commanders use surface combatants with AN/SQQ-89A(V)15 to locate, monitor, and engage threat submarines.
- Maritime Component Commanders employ surface combatants with AN/SQQ-89A(V)15 as escorts to high-value units to protect against threat submarines during transit. Additionally, they use AN/SQQ-89A(V)15 to conduct area clearance and defense, barrier operations, and ASW support during amphibious assault.
- Unit Commanders use AN/SQQ-89A(V)15 to conduct ASW search, track, engage, and defense.

Major Contractor

Lockheed Martin Mission Systems and Training – Manassas, Virginia

Activity

- In December 2014, DOT&E submitted a classified Early Fielding Report for the ACB-11 variant of AN/SQQ-89A(V)15 Integrated Undersea Warfare Combat System Suite. The report was submitted due to the installation of the ACB-11 variant on ships that deployed prior to IOT&E.
- In September 2015, the Navy completed a formal study that identified capability gaps in currently available torpedo surrogates and presented an analysis of alternatives for specific investments to improve threat emulation ability. The Navy

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has since taken the following actions to address the identified capability gaps:

- The Navy received funding through an FY16 Resource Enhancement Project (REP) proposal and is currently in development of a threat-representative high-speed quiet propulsion system.
- The Navy submitted an FY17 REP proposal to develop a General Threat Torpedo (GTT) that is intended to expand upon the propulsion system under development and provide representation of threat torpedoes in both acoustic performance and tactical logic.
- The Commander, Operational Test and Evaluation Force continued IOT&E on the ACB-11 variant in March 2016. Testing was conducted in accordance with a DOT&E-approved test plan and included ASW transit search and area search operations using AN/SQQ-89A(V)15 onboard a DDG 51 class destroyer. Testing was conducted in conjunction with an Aegis Baseline 9C operational test event in the Pacific Missile Range Facility Operating Areas. Testing focused on ACB-11 capability to support submarine search in shallow water.
- Remaining ACB-11 operational testing is scheduled for March 2017 and will evaluate ACB-11 cybersecurity effectiveness.
- The Navy is reducing delays to MFTA repair by increasing spare MFTA inventory, implementing processes to expedite MFTA replacement on deployed ships, and investment in shipboard diagnostic capability. The Navy intends to further improve MFTA availability by increasing reliability and pre-placement of spare MFTAs in strategic locations.

Assessment

- The final assessment of ACB-11 is not complete, as testing will continue into FY17. DOT&E's classified Early Fielding Report and additional analysis conducted in FY16 suggest the following regarding performance:
 - The ACB-11 variant demonstrated some capability to localize and support prosecution of a threat submarine.
 - The ACB-11 variant does not meet program performance metrics for torpedo detection as assessed against U.S. exercise torpedoes. The Navy is incorporating system modifications in ACB-15 that are intended to improve torpedo detection capability. ACB-13 was determined to be too far in its development process to incorporate these modifications.
 - The ACB-11 variant is currently not suitable due to low operational availability. ACB-11 software reliability is

sufficient; however, significant delay in the repair of MFTA and MFTA handling gear resulted in extended periods of limited system capability. MFTA requires continued monitoring to validate effectiveness of Navy actions towards improving its availability. MFTA is the primary sensor for submarine detection and torpedo alertment.

- No assessment can be made against the smaller midget and coastal diesel submarines due to the Navy having no test surrogates to represent this prevalent threat.
- A representative threat torpedo surrogate is needed for adequate operational assessment of subsequent variants of AN/SQQ-89A(V)15 with improvement in torpedo alertment. The proposed development of the GTT will address many of the DOT&E concerns and is supported by DOT&E. However, the GTT's capability to support operational testing is further dependent upon future Navy decisions to procure a sufficient quantity of GTTs.
- Analysis of in-water testing and the remaining cybersecurity evaluation are expected to complete in FY17. DOT&E expects to submit an IOT&E report for AN/SQQ-89A(V)15 in FY17.

Recommendations

- Status of Previous Recommendations. The Navy has made some progress on the FY15 recommendations. However, the Navy should still:
 1. Develop and integrate high-fidelity trainers and realistic, in-water test articles to improve training and proficiency of operators in ASW search and track of threat submarines, including midget and coastal diesel submarines.
 2. Revisit system requirements to ensure that funded improvement in subsequent ACBs is supporting Navy objectives for ASW against current and imminent threat submarines.
 3. Address the four classified recommendations listed in the December 2014 Early Fielding Report.
- FY16 Recommendations. The Navy should:
 1. Schedule and complete dedicated IOT&E to assess cybersecurity vulnerabilities.
 2. Acquire sufficient quantity of GTT, when developed, to support evaluation of the next ACB that has modifications effecting torpedo recognition capability (detection and/or classification).