

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 of the AN/SQQ-89A(V)15 Integrated Undersea Warfare (USW) Combat System Suite 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 is expected to conclude in FY18. The final test event, a cybersecurity evaluation, was scheduled three times in FY17, but the tests were deferred because the test platforms were not available due to operational commitments or unplanned maintenance requirements. DOT&E will submit a classified FOT&E report in FY18 upon completion of the system's cybersecurity evaluation.

System

- The AN/SQQ-89A(V)15 is an integrated USW combat system that is deployed on *Ticonderoga*-class cruisers and *Arleigh Burke*-class destroyers. It is composed of the sensors, processors, displays, and weapons controls to detect, classify, localize, and engage threat submarines and alert on threat torpedoes. It is an open-architecture system that includes staggered biennial software upgrades (ACBs) and biennial hardware upgrades (Technical Insertions).
 - Acoustic sensors include a 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 process and display active, passive, and environmental data.
- The AN/SQQ-89A(V)15 interfaces with the Aegis Combat System to prosecute threat submarines using MK 46 and MK 54 torpedoes from surface vessel torpedo tubes, Vertical Launch Anti-Submarine Rockets, or MH 60R helicopters.



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

- 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.

Mission

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

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 the AN/SQQ-89A(V)15 Integrated USW 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 that

highlighted specific investments necessary to improve threat emulation capabilities. The Navy 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 developing a threat-representative, high-speed quiet propulsion system.

FY17 NAVY PROGRAMS

- The Navy submitted an FY17 REP proposal to develop a General Threat Torpedo (GTT) to further develop the aforementioned propulsion system by accurately representing threat torpedoes in both acoustic performance and tactical logic. The GTT project was recently funded and incorporates the remaining development and test of the threat-representative, high-speed quiet propulsion system project.
 - The Navy's Operational Test and Evaluation Force (OPTEVFOR) 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 an *Arleigh Burke*-class destroyer. OPTEVFOR conducted testing in conjunction with an Aegis Baseline 9C operational test event at the Pacific Missile Range Facility, Barking Sands, Hawaii. The testing focused on ACB-11's capability to support submarine search in shallow water.
 - The remaining ACB-11 operational testing involves an evaluation of the system's cybersecurity effectiveness. The Navy scheduled the cybersecurity evaluation three times in FY17, but all events were deferred due to test platform operational commitments or maintenance requirements. Testing is expected to occur in FY18.
 - In December 2017, DOT&E approved the ACB-13 Test and Evaluation Master Plan (TEMP).
- reliability is sufficient, but significant delays repairing the MFTA and MFTA handling gear resulted in extended periods of limited system capability. The MFTA system requires continued supervision to ensure that the Navy's availability improvement plan remains on track. MFTA is the dominant sensor for submarine detection and torpedo alertment.
- No assessment can be made against operationally relevant midget and coastal diesel submarine threats because the Navy does not have any test surrogates that accurately represent these platforms.
 - Preliminary analysis of in-water data collected subsequent to the DOT&E Early Fielding Report of FY16 indicates that ACB-11 has the capability to detect and classify a U.S. submarine in shallow water and supports *Arleigh Burke*-class destroyers' capability to translate this detection into an ASW prosecution using its organic assets.
- A representative threat torpedo surrogate is needed to adequately assess future AN/SQQ-89A(V)15 variants. GTT development will address many DOT&E concerns, but the GTT capability to support operational testing depends on future Navy decisions to procure a sufficient quantity of GTTs. Additionally, the GTT depends upon the successful development of the high-speed quiet propulsion system that has been significantly delayed due to performance problems and cost overruns.

Assessment

- The final assessment of AN/SQQ-89A(V)15 variant ACB-11 is not complete, as testing will continue into FY18. DOT&E will provide a classified IOT&E final report in FY18, following the cybersecurity test event. The report will include an assessment of all test limitations. Preliminary results from the DOT&E classified Early Fielding Report and additional analysis conducted in FY17 showed the following:
 - The ACB-11 variant demonstrated the capability to detect and localize submarines in deep water, but demonstrated limited capability to translate a submarine detection to a prosecution.
 - The ACB-11 variant does not meet the Navy's 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. The system's software

Recommendations

- Status of Previous Recommendations. The Navy has made some progress on prior 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 supports Navy objectives for ASW against current and future threat submarines.
 3. Schedule and complete dedicated IOT&E to assess cybersecurity vulnerabilities.
 4. Complete development of the threat-representative, high-speed quiet propulsion system and acquire sufficient GTTs to support evaluation of the next ACB that has modifications affecting torpedo recognition capability (detection and/or classification).
 5. Address two additional classified recommendations listed in the December 2014 Early Fielding Report.
- FY17 Recommendations. None.