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

Executive Summary
- Operational testing of the Advanced Capability Build 2011 (ACB-11) variant began in FY14 and is expected to conclude in FY16. However, the Navy has not yet scheduled all required IOT&E events. The Navy completed limited, at-sea testing in FY15 in conjunction with two fleet-training events.
- In December 2014, DOT&E submitted a classified Early Fielding Report on 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. From the data collected, DOT&E concluded the system demonstrated some capability to detect submarines and incoming U.S. torpedoes in deep water. However, no data were available to assess its capability in shallow water, an area of significant interest due to the prevalence of submarines operating in littoral regions. Also, no data were available to assess performance against threat torpedoes.

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 biennial software upgrades (Advanced Capability Builds) and hardware upgrades called Technology Insertions every four years.
- 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 array, calibrated reference hydrophone, helicopter, and/or ship-deployed sonobuoys
  - Functional segments used for processing and displaying active, passive, and environmental data

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

Consoles | MH-60R | SQS-53C/HMA | TB-37/MFTA

  - Interfaces with Aegis Combat System for MK 46 and MK 54 torpedo prosecution using surface vessel torpedo tubes, Vertical Launch Anti-Submarine Rocket, or SH-60B/MH-60R helicopters
- The system is deployed on a DDG 51 class destroyer or CG 47 class cruiser.

Mission
- 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.
- Maritime Component Commanders use surface combatants with AN/SQQ-89A(V)15 to conduct area clearance and defense, barrier operations, and ASW support during amphibious assault.
- Theater Commanders use surface combatants with AN/SQQ-89A(V)15 to locate and monitor threat submarines in theater.
- Unit Commanders use AN/SQQ-89A(V)15 to support defense against incoming threat torpedoes.

Major Contractor
Lockheed Martin Mission Systems and Training – Manassas, Virginia

Activity
- In January 2013, DOT&E sent a memorandum to the Assistant Secretary of the Navy (Research, Development, and

Acquisition) outlining the need for a threat torpedo surrogate to support operational testing of the AN/SQQ-89A(V)15 and

requesting the Navy's plan to address this need. In June 2015, DOT&E sent a follow-up memorandum that reiterated the need for adequate torpedo surrogates in operational testing and identified that DOT&E is still waiting for the Navy's plan.
- 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.
- The Commander, Operational Test and Evaluation Force continued IOT&E on the ACB-11 variant in May 2015. 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 the following two fleet events:
  - Ship ASW Readiness and Evaluation Measurement 180 exercise in the Western Pacific that included search opportunities against a diesel submarine.
  - Submarine Command Course 44 Anti-Surface Warfare events at the Navy's Atlantic Undersea Test and Evaluation Center.
- In September 2015, the Navy completed a formal study to identify capability gaps in currently available torpedo surrogates and present an analysis of alternatives for specific investments to improve threat emulation ability.
- The Navy has not yet scheduled the remaining IOT&E events. Remaining ACB-11 operational testing is needed to understand ASW detection capability in shallow water (generally defined as water that is less than 100 fathoms in depth), an environment that was a focus for system improvement.

Assessment
- The final assessment of ACB-11 is not complete, as testing is expected to continue into FY16. DOT&E's classified Early Fielding Report and additional analysis conducted in FY15 suggest the following regarding performance:
  - The ACB-11 variant meets program performance metrics for submarine detection and classification in deep-water environments.
  - The ACB-11 variant demonstrated some capability to localize and support prosecution of a threat submarine in deep water.
  - The ACB-11 variant does not meet program performance metrics for torpedo detection as assessed against U.S. exercise torpedoes.
  - The ACB-11 variant is currently not suitable due to low operational availability. ACB-11 software reliability is sufficient; however, hardware failures resulted in significant periods of limited system capability. Extensive

logistic delays, particularly with the repair of the MFTA, are the primary cause of low operational availability. MFTA repair, achieved by replacing the ship's array with a spare MFTA when the ship is in port, was delayed by fleet inventory and positioning of spare arrays
  - 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.
- The Navy study on threat torpedo surrogates confirmed DOT&E's concerns that current torpedo surrogates have significant gaps in threat representation for operational testing and the study provided recommendations for improving current threat torpedo emulation. However, the Navy has yet to provide its plan to provide realistic torpedo surrogates to effectively characterize AN/SQQ-89A(V)15 performance in future operational tests. Improved torpedo surrogate capability is required to adequately evaluate future ACB variants.
- Analysis of the few completed IOT&E events in shallow water indicates that the ACB-11 variant has some capability to detect submarines in shallow water. However, the fleet exercises either did not support the necessary ranges to assess detection against system requirements or an exercise limitation excluded the use of the MFTA.

Recommendations
- Status of Previous Recommendations. The Navy is making progress and should continue to address all previous recommendations. Specific concerns include:
  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. Pre-position spare TB-37 MFTA and spare MFTA modules at appropriate forward-operating ports to minimize logistic delays.
- FY15 Recommendations. The Navy should:
  1. Schedule and complete dedicated IOT&E to characterize ACB-11 operational performance in shallow water and assess cybersecurity vulnerabilities.
  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.
  4. Develop and execute a plan to provide representative torpedo surrogates before evaluation of the next ACB development that is focused on torpedo recognition capability (detection and/or classification).