

# AN/BQQ-10 Acoustic Rapid Commercial Off-the-Shelf Insertion (A-RCI) Sonar

## Executive Summary

- DOT&E submitted a classified FOT&E report on the Advanced Processing Build 2011 (APB-11) variant of the AN/BQQ-10 Acoustic Rapid Commercial Off-the-Shelf Insertion (A-RCI) sonar system in November 2015.
- The Navy commenced FOT&E on the APB-13 variant of the AN/BQQ-10 A-RCI sonar system with an evaluation of the cybersecurity capability and in-lab comparison testing between APB-11 and APB-13. At-sea operational testing of APB-13 is expected to complete in FY17.

## System

- The AN/BQQ-10 A-RCI sonar system is the undersea sensing system utilized by U.S. submarines. It uses active and passive sonar to conduct anti-submarine warfare (ASW) and submerged operations in the execution of all submarine assigned missions. Acoustic energy is processed and displayed to enable operators to detect, classify, localize, and track threat submarines and other waterborne objects (surface ships, mines, bottom features, etc.).
- AN/BQQ-10 A-RCI sonar system is an open architecture system that includes biennial software upgrades (APBs) and quadrennial hardware upgrades (Technology Insertions). These upgrades are intended to maintain an advantage in acoustic detection of threat submarines.
- The AN/BQQ-10 A-RCI sonar system consists of:
  - Interface to submarine acoustic sensors to include the spherical array or large aperture bow array, hull array, wide aperture array, conformal array, high-frequency array, and two towed arrays (i.e., the fat line array consisting of the TB-16 or TB-34, and the thin line array consisting of the TB-23 or TB-29).
  - Processing capability that utilizes environmental data (i.e., water depth, bottom contour, sound velocity profiles, etc.)

## Activity

- In November 2015, DOT&E submitted a classified FOT&E report on the APB-11 variant of the AN/BQQ-10 A-RCI sonar system.
- In July 2016, the Navy conducted cybersecurity testing on the APB-13 variant of the AN/BQQ-10 A-RCI sonar system in accordance with a DOT&E-approved test plan.
- In August 2016, the Navy commenced in-lab comparison testing between variants APB-11 and APB-13 of the AN/BQQ-10 A-RCI sonar system using recorded data. Data are being collected during a combined developmental and operational test event in accordance with a DOT&E-approved



and received acoustic energy on all acoustic sensors and displays the processed data in a way that supports operator search, detection, classification, and localization/track of contacts of concern or contacts of interest.

## Mission

The Operational Commander will employ submarines equipped with the AN/BQQ-10 A-RCI sonar system to:

- Search for, detect, and track submarine and surface vessels in open-ocean and littoral sea environments
- Search for, detect, and avoid mines and other submerged objects
- Covertly conduct intelligence, surveillance, and reconnaissance
- Covertly conduct Naval Special Warfare missions
- Perform under-ice operations

## Major Contractor

Lockheed Martin Maritime Systems and Sensors – Manassas, Virginia

data collection plan. The Navy will supplement its operational assessment with in-lab comparison testing for environments that are not available for at-sea testing. An operational test of APB-13 at-sea performance will commence in FY17.

## Assessment

- In the November 2015 classified FOT&E report, DOT&E determined that the APB-11 variant of the AN/BQQ-10 A-RCI sonar system's overall mission performance remains unchanged from previous assessments and further observed an

improvement in system reliability. The report concluded the following regarding performance:

- For ASW, APB-11 passive sonar capability is effective against older classes of submarines in some environments, but is not effective in all environments or against modern threats. Despite an unchanged overall assessment, APB-11 demonstrated improved operator performance metrics over previous APB variants.
- APB-11 is not effective in supporting operator situational awareness and contact management in areas of high contact density; however, platforms equipped with a Light Weight Wide Aperture Array demonstrated improved performance over previous APB variants.
- APB-11 cybersecurity is not effective and remains unchanged from previous variants.
- APB-11 is operationally suitable.
- Analysis of the APB-13 cybersecurity testing is ongoing and results will be reported in FY17.
- In-lab comparison testing between APB-11 and APB-13 will continue into FY17. DOT&E can make no preliminary assessment due to testing being incomplete.
- Due to the biennial software and quadrennial hardware development cycle, the Navy generates and approves the requirements documents and Test and Evaluation Master Plans in parallel with APB development and installation. As a result, the fleet assumes additional risk, since most operational testing is not completed before the system is initially deployed.

## Recommendations

- Status of Previous Recommendations. The Navy made progress in addressing four of five recommendations outlined in DOT&E's classified FOT&E report on APB-11, dated November 12, 2015. Six significant recommendations remain outstanding from previous DOT&E reports. The significant unclassified recommendations are:
  1. Re-evaluate the use of the current time difference between system and operator detection times as the ASW Key Performance Parameter for a more mission-oriented metric to accurately characterize system effectiveness.
  2. Evaluate the covertness of the high-frequency sonar during a future submarine-on-submarine test.
  3. Determine the performance of the AN/BQQ-10 A-RCI sonar system in detecting near surface mines.
  4. Evaluate AN/BQQ-10 A-RCI metrics to improve performance under varying environmental conditions and to focus on earlier and longer range operator detection.
  5. Perform an ASW event against a high-end, diesel-electric, hunter-killer submarine at least with the other APB variants (i.e., APB-11 and again in APB-15) of the AN/BQQ-10 A-RCI sonar system and upon introduction of new wet end sensor or software capabilities improving ASW mission capability.
- FY16 Recommendations. None.