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

Executive Summary

- DOT&E submitted an FOT&E report on the Advanced Processing Build 2013 (APB-13) variant of the AN/BQQ-10 Acoustic Rapid Commercial Off-the-Shelf Insertion (A-RCI) sonar system on June 29, 2018. APB-13 is operationally effective for the anti-submarine warfare (ASW) mission against moderately quiet nuclear and diesel submarines. APB-13 is operationally suitable.
- The Navy commenced FOT&E of the APB-15 variant of the A-RCI sonar system in September 2018. The Navy expects to complete testing in FY19. DOT&E will submit an FOT&E report on the APB-15 variant in FY19.

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 ASW and submerged operations in the execution of all assigned submarine 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.).
- The AN/BQQ-10 A-RCI sonar system is an open-architecture system that includes staggered biennial software upgrades (APBs) and biennial hardware upgrades (Technical 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:
  - Interfaces 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, TB-29A, or TB-29A Reduced Length)

  - Processing capability that utilizes environmental data (e.g., water depth, bottom contour, sound velocity profiles, etc.) 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

Activity

- In June 2018, DOT&E submitted a classified FOT&E report on the APB-13 variant of the A-RCI sonar system.
- In April 2018, DOT&E approved a Test and Evaluation Master Plan covering the APB-15 variant of the A-RCI sonar system. The Navy has since completed the following operational testing of the APB-15 variant in accordance with DOT&E-approved test plans.
  - In June 2018, the Navy commenced in-lab comparison testing between variants APB-13 and APB-15 using real-world sonar recordings of non-U.S. submarines. Sonar recordings are played on each variant using 20 fleet operators to assess operator detection and classification metrics. The Navy expects to complete this testing in 1QFY19. This testing is conducted as combined developmental and operational testing.
  - In September 2018, the Navy completed 2 days of at-sea evaluation of APB-15 capability to support situational awareness in an environment with a large number of contacts.
- The Navy scheduled an APB-15 test event against a high-end, diesel electric submarine during the Rim of the Pacific Exercise. However, the event was canceled when the target

submarine became unavailable to support the test. The Navy continues to pursue fleet exercises as opportunities to obtain high-end, diesel electric submarine target services to test future APB capability.

• The Navy intends to complete remaining FOT&E test events for APB-15 in FY19, including 4 days of open ocean ASW search and cybersecurity evaluation.

Assessment

• The DOT&E FOT&E report dated June 29, 2018, concluded the following regarding performance:
  - APB-13 software is operationally effective for the ASW mission against moderately quiet nuclear and diesel submarines. Further, APB-13 demonstrated better performance than the previous APB-11 software and included modifications that reduce operator workload.
  - The Navy was not able to reschedule an evaluation of APB-13 capability to support situational awareness in a high-density contact management environment.

- APB-13 is operationally suitable. No significant issues related to reliability or operational availability were identified.
- Cybersecurity results that affect the systems operational effectiveness are included in the classified FOT&E report.

• Analysis of APB-15 test data is in progress and no preliminary assessment can be made. DOT&E intends to deliver an FOT&E report in FY19.

Recommendations

The Navy should:
1. Continue to pursue a high-end diesel submarine as a priority target for at-sea testing of future APBs.
2. Continue the use of in-lab comparison testing as a supplement to at-sea testing when assessing APB performance.
3. Address the recommendations in the DOT&E FOT&E report for the APB-13 variant of the A-RCI sonar system.