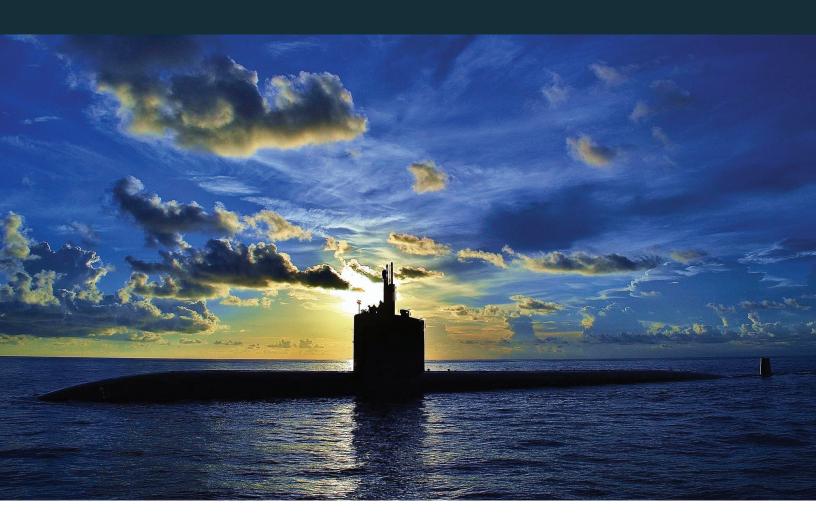# Acoustic Rapid Commercial-off-the-Shelf Insertion (A-RCI)

The Navy commenced operational test (OT) of Acoustic Rapid Commercial-off-the-Shelf Insertion (A-RCI) for Sonar Advanced Processor Build (APB) 17 and APB 19 in 2022. The Navy partially completed an in-lab test of APB 17 and APB 19, but no at sea testing or cyber survivability evaluation. The availability of fleet assets for OT has not supported a timely evaluation of the submarine sonar system.

SYSTEM DESCRIPTION

The AN/BQQ-10 A-RCI sonar system is a collection of hardware and software components that control, process, and present acoustic information from sonar arrays, as well as environmental data, to fleet operators on all Navy submarines. Operators use the presented information to attain tactical control and situational awareness in all mission sets. The system, capable of employing both passive and active sonar, sends information on threat submarines and other waterborne objects (surface ships, mines, bottom features, etc.) to the AN/BYG-1 Combat Control system to further develop and refine position and velocity estimates for contacts.

MISSION

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

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

PROGRAM

The A-RCI system is an Acquisition Category III post-milestone C program. The Navy staggers updates to the software and hardware of the system biennially; software upgrades are released via APBs and hardware upgrades via Technical Insertions. DOT&E approved the A-RCI APB 17 and 19 combined Test and Evaluation Master Plan (TEMP) on March 10, 2022.

Installation of the Large Vertical Array (LVA), a newly developed hull-mounted sensor, on *Ohio*-class submarines began in 2021. The Navy intends to back-fit LVA on approximately half of the Block III and Block IV *Virginia*-class submarines over the next decade. DOT&E is working with the Navy to update the APB 17 and 19 combined TEMP for the T&E of A-RCI integrated with LVA.

» MAJOR CONTRACTOR

- Lockheed Martin Maritime Systems and Sensors – Manassas, Virginia

TEST ADEQUACY

In January 2022, the Navy commenced in-lab operator testing of APB 17 and APB 19 using the Naval Undersea Warfare Center facilities in Newport, Rhode Island, and Fall River, Massachusetts, in accordance with a DOT&E-approved test plan. DOT&E was present to observe this testing event. However, completion of the test was delayed due to connectivity issues between these facilities, primarily stemming from the Newport, Rhode Island facility.

In FY21, the Navy obtained data during a 2-day fleet exercise with an allied nation's diesel submarine. These data contribute to the assessment of APB 19 capability and its support of anti-submarine warfare.

In FY22, the Navy scheduled an OT of a submarine with APB 19 operating in an area with a high density of surface ships to evaluate the capability of APB 19 to provide the crew with situational awareness, and a focus area of APB improvement. However, the Navy canceled the event when the submarine identified a conflict with a higher priority requirement. The Navy plans to reschedule this event as soon as practicable.

In FY22, the Navy intended to execute an in-lab integrated cyber survivability testing period for APB 19 followed by on-hull testing. The Navy canceled the testing due to software readiness issues and now expects to test in FY23-24. APB 17 is not tested because changes with an effect on cyber survivability were only in APB 19.

The Navy is significantly delayed in testing the APB 17 and APB 19 capabilities that have been installed on submarines commencing in August 2019 and November 2020, respectively. The availability of fleet assets for OT has not supported a timely evaluation of the submarine sonar system.

PERFORMANCE

» EFFECTIVENESS, SUITABILITY, AND SURVIVABILITY

Not enough data are available to provide preliminary assessments of APB 17 or APB 19 operational effectiveness, suitability, and survivability.

RECOMMENDATIONS

The Navy should:

1. Assess the integration of OT with fleet operations.

2. Complete OT of APB 17 and APB 19.

3. Complete an update to the A-RCI TEMP that includes the test strategy and resources to evaluate the integrated capability of A-RCI with LVA as installed on *Ohio*- and *Virginia*-class Block III/Block IV submarines.

4. Improve connectivity and reliability of the A-RCI lab consoles at the Newport, Rhode Island facility.