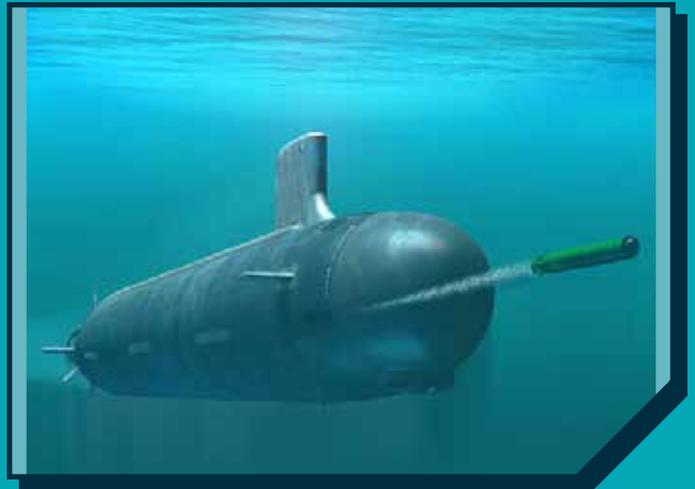


Mk 48 Torpedo Modifications

Based on the demonstrated performance in IOT&E, completed in September 2021, the Mk 48 torpedo with Advanced Processor Build 5 (APB 5) software is operationally effective and suitable. The APB 5 torpedo provides additional capability to acquire surface ships while maintaining the previously demonstrated performance when acquiring submarines. The APB 5 torpedo is vulnerable in a cyber-contested environment.

In November 2020, the Navy started FOT&E of the next torpedo variant, the APB 5+ torpedo. Limited availability of test assets to support FOT&E presents a risk of significant delay to APB 5+ initial operational capability.



System Description

The Mk 48 heavyweight torpedo is the only anti-submarine and the primary anti-surface ship weapon used by U.S. submarines and designed to defeat all threat surface ships and submarines in all ocean environments.

The latest improvement to the Mk 48 torpedo, the APB 5, is intended to improve the torpedo's ability to detect and classify threat submarine and surface ships. A follow-on improvement, APB 5+, is intended to transfer targeting functions from the submarine combat system to the torpedo, improve the operator interface with the torpedo, and provide the torpedo with higher data exchange rates.

Program

The Mk 48 heavyweight torpedo was first fielded in 1972. The current, Mk 48 Mod 7 torpedo variant, a shared development effort with the Royal Australian Navy, is an Acquisition Category III program, first fielded in 2008. The Navy has since made improvements to the Mk 48 Mod 7 through incremental APB software releases that may include minor hardware updates (e.g., upgraded processors and modified interfaces).

The Navy started APB 5 IOT&E of Mk 48 Mod 7 torpedoes in August 2018 with focus on Anti-Submarine Warfare (ASW) performance. This allowed the Navy to declare early operational capability in May 2019 and deliver upgraded ASW capability for use against submarines and surface ships.

In 2020, the Navy started developmental testing of APB 5+. The Navy intends to submit the APB 5+ update to the TEMP for DOT&E approval in 1QFY22. The APB 5+ in-water FOT&E is scheduled for FY22. Limited availability of test assets to support FOT&E presents a risk of significant delay to APB 5+ initial operational capability.

Major Contractor

Lockheed Martin Sippican Inc. – Marion, Massachusetts.

Test Adequacy

In September 2021, the Navy concluded the APB 5 IOT&E that started in 2018, resulting in 193 total at-sea torpedo firings as compared to the planned 127. Specifically, in FY21, the Navy completed six at-sea torpedo firings and 216 torpedo-simulated engagements in the Environment Centric Weapons Analysis Facility (ECWAF). While the Navy executed 66 more at-sea torpedo firings than planned, the Navy did not conduct the planned number of at-sea torpedo firings under certain specified conditions due to: 1) limited availability of submarines to support testing in test locations with desired environmental conditions, 2) prioritization of Fleet events that limited data collection in some scenarios, and 3) prioritization of free-play events. While testing was not conducted in accordance with DOT&E-approved test plans, sufficient data were collected to assess operational effectiveness, suitability, and survivability of the APB 5 torpedo in most scenarios. The Navy committed to collecting data in untested scenarios in future test events since limited data from at-sea torpedo firings in a specific ocean environment could affect the validation of the ECWAF. The Navy intends to conduct at-sea torpedo firings in the required ocean environment during the APB 5+ torpedo FOT&E in FY22. If the Navy is able to accredit the ECWAF as a representative test environment against both surface ships and submarines, at-sea torpedo firings for a follow-on variant, APB 6, could decrease by approximately 50 percent.

The Navy is upgrading mobile countermeasure surrogates to better emulate modern threat countermeasures and may defer APB 5 countermeasure testing to APB 6 torpedo testing, when this new test capability is expected to be available.

The Navy also conducted two integrated (developmental and operational) test events for the APB 5+ torpedo in November 2020 and March 2021 in accordance with a DOT&E-approved data collection plan.

Performance

Effectiveness

Preliminary analysis suggests the new APB 5 tactics provide operationally significant effectiveness against surface ships while maintaining previous performance using legacy tactics. Anti-Submarine Warfare tactics improved performance against some combinations of scenarios and environments. A final assessment of APB 5 torpedo operational effectiveness will be published in a classified IOT&E report in 2QFY22.

Not enough data is yet available to provide a preliminary assessment of the APB 5+ torpedo operational effectiveness. The integrated test events thus far demonstrated that APB 5+ torpedo has simplified operator control of the torpedo.

Suitability

The APB 5 torpedo is operationally suitable demonstrating adequate reliability, availability, and maintainability.

Not enough data are yet available to provide a preliminary assessment of the APB 5+ torpedo operational suitability.

Survivability

APB 5 is vulnerable in a cyber-contested environment. Specific vulnerabilities and their effect on warfighting capability will be published in the classified APB 5 torpedo IOT&E report in 2QFY22.

Recommendations

The Navy should:

1. Address the recommendations in the classified 2019 DOT&E Early Fielding Report.
2. Complete development and validation of surface ship models in the ECWAF to support the operational assessment of the APB 6 torpedo.
3. Collect torpedo performance data with upgraded surrogate countermeasures, in APB 6 testing.
4. Ensure the availability of test assets to complete the APB 5+ FOT&E and support the initial operational capability.