

MK 54 Lightweight Torpedo and Upgrades including: High Altitude Anti-Submarine Warfare (ASW) Weapon Capability (HAAWC)

Executive Summary

- The Navy demonstrated the capability of the MK 54 Mod 1 lightweight torpedo to hit a stationary submarine surrogate during a set-to-hit test event. The set-to-hit test event was a developmental test that integrated operational test objectives.
- In May 2019, the Navy tested five High Altitude Anti-Submarine Warfare (ASW) Weapon Capabilities (HAAWCs) in a developmental test that integrated operational test objectives. HAAWC is likely to meet its accuracy requirement for payload delivery; however, data are insufficient to assess operational effectiveness and suitability. The Navy expects to complete IOT&E of HAAWC in FY20.

System

MK 54 Lightweight Torpedo

- The MK 54 lightweight torpedo is the most capable ASW weapon used by U.S. surface ships, fixed-wing aircraft, and helicopters.
- The Navy delivers incremental improvements of the MK 54 that include hardware and software modifications:
 - The MK 54 Mod 1 is in test. The MK 54 Mod 1 includes a new sonar array that provides higher resolution than previous MK 54 variants. Software modifications exploit the additional capability provided by the new sonar array. The MK 54 Mod 1 uses Advanced Processor Build 5 (APB 5) software that shares many components with the APB 5 variant of the MK 48 heavyweight torpedo. The MK 54 Mod 1 torpedo is not approved for the Vertical Launched Anti-submarine rocket (VLA).
 - The MK 54 Mod 2 is expected to deliver in FY26. The MK 54 Mod 2 will have a new propulsion system and warhead. The MK 54 Mod 2 is not compatible with the current VLA or HAAWC systems.
- The current MK 54 Mod 0 and MK 54 Mod 0 Block Upgrade variants support the VLA.

HAAWC

- HAAWC provides an adapter wing-kit that allows aircrews to drop an MK 54 from a P-8A Multi-mission Maritime



Aircraft from higher than traditional altitudes. The wing-kit glides the MK 54 to a water entry point directed by the P-8A combat system.

Mission

Commanders employ naval surface ships and aircraft equipped with the MK 54 torpedo to conduct ASW:

- For offensive purposes, when deployed by surface ships with VLA capability, ASW aircraft, and ASW helicopters
- For defensive purposes, when deployed by surface ships with surface vessel torpedo tubes capability

Major Contractors

- Raytheon Integrated Defense Systems – Tewksbury, Massachusetts
- Progeny Systems Corporation – Manassas, Virginia
- Boeing Company – St. Charles, Missouri

Activity

MK 54 Mod 1 Torpedo

- In March 2019, the Navy conducted set-to-hit testing of the MK 54 Mod 1 torpedo against a surrogate submarine target. The Navy conducted this test event as a developmental test

with integrated operational test objectives; the test was in accordance with a DOT&E-approved data collection plan.

- In June 2019, the Navy conducted an in-lab evaluation of the survivability of the MK 54 Mod 1 torpedo against

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an attack from a cyber-threat in accordance with a DOT&E-approved test plan. The Navy conducted this evaluation in conjunction with the current variant of the MK 48 APB 5 heavyweight torpedo.

HAAWC

- In May 2019, the Navy deployed five HAAWCs from a P-8A. The Navy conducted this test event as a developmental test with integrated operational test objectives; the test was in accordance with a DOT&E-approved data collection plan.
 - Four HAAWCs carried an MK 54 surrogate (weight and shape of an MK 54) to assess the accuracy of HAAWC payload delivery.
 - One HAAWC carried an exercise MK 54 Mod 0 to assess both the accuracy of HAAWC payload delivery and any effect that HAAWC delivery has on MK 54 reliability.
- In September 2019, the Navy canceled a test event, planned for October 2019, due to contractual and technical issues that prevented delivery of sufficient test assets.

MK 54 Mod 1 Torpedo and HAAWC

- The MK 54 Mod 1 torpedo program and the HAAWC program have planned a combined test event in April 2020 that will meet test objectives for each program.

Assessment

MK 54 Mod 1 Torpedo

- The MK 54 Mod 1 demonstrated capability to close and hit a stationary set-to-hit submarine surrogate after the MK 54 Mod 1 successfully acquires the target.
- DOT&E has insufficient data to make a preliminary assessment on the MK 54 Mod 1 torpedo capability to

search and acquire threat submarines. The Navy expects to complete operational testing of the MK 54 Mod 1 torpedo in FY21.

- The Navy's effort to combine the cybersecurity evaluations of the MK 54 Mod 1 lightweight torpedo and the MK 48 Mod 7 APB 5 heavyweight torpedo provided test efficiencies without affecting the level of test of either system.
- The Navy has no lightweight torpedo in development that is approved for VLA.

HAAWC

- Although DOT&E has insufficient data to make a preliminary assessment of operational effectiveness and suitability, the five HAAWC deployments show promising results that the HAAWC will meet its accuracy requirement for payload delivery. No data are available against responsive submarine targets and only one sample provides MK 54 torpedo reliability following HAAWC deployment; the Navy expects to complete operational testing of HAAWC in FY20.

MK 54 Mod 1 Torpedo and HAAWC

- The Navy and DOT&E have agreed to reduce the overall test article requirements of the 2 programs by 12 HAAWCs with MK 54 Mod 1 torpedoes by combining test events for the 2 programs. This represents a cost savings of over \$3 Million for the test and evaluation of these systems and provides all required data.

Recommendations

None.