

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

Executive Summary

- The Navy conducted a combined test event for the MK 54 Mod 1 lightweight torpedo and High Altitude Anti-Submarine Warfare (ASW) Weapon Capability (HAAWC). The Navy completed 13 HAAWC deployments that mutually supported MK 54 Mod 1 test objectives. Combining these two test events saved the Navy approximately \$6.2 Million in test resources.
- The Navy intends to complete the IOT&Es for MK 54 Mod 1 and HAAWC in FY21. DOT&E will submit IOT&E reports after testing is completed for each system.

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 (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 an Early Operational Capability 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 deploy a 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

- In December 2019, the Navy concluded that the MK 54 Mod 1 torpedo was ready for operational testing.
- The Navy collected MK 54 Mod 1 torpedo performance data from 18 exercise torpedo firings. The Navy conducted

the following events in accordance with DOT&E-approved test plans:

- In December 2019, the Navy conducted a dedicated operational test event at the Jacksonville Shallow Water Test Range off the coast of Florida. However, the

FY20 NAVY PROGRAMS

submarine providing target support received higher priority tasking early in event execution; therefore, the Navy only obtained data from 1 of 21 planned torpedo firings.

- In May 2020, the Navy demonstrated capability to launch the MK 54 Mod 1 from a surface vessel torpedo tube with one torpedo firing.
- In September 2020, the Navy conducted a combined test event for evaluation of MK 54 Mod 1 and HAAWC at the Pacific Missile Range Facility in Hawaii. Thirteen torpedoes used HAAWC and 3 torpedoes used traditional aircraft release against a submarine to support all MK 54 Mod 1 assessment objectives. The Navy deferred the event from its originally planned April 2020 execution due to the coronavirus (COVID-19) pandemic. Deferral of this test event caused a follow-on test event for MK 54 Mod 1 to shift from FY20 to FY21.
- The Navy intends to complete IOT&E in FY21.

HAAWC

- In August 2020, the Navy concluded that HAAWC was ready for operational testing.
- The Navy collected HAAWC flight performance data on 17 HAAWC firings. The Navy conducted the following events in accordance with DOT&E-approved test plans:
 - From January through February 2020, the Navy deployed two HAAWCs with MK 54 surrogates (weight and shape of an MK 54) for placement accuracy data.
 - In September 2020, the Navy conducted 15 HAAWC deployments during the previously identified combined test event with MK 54 Mod 1.
 - Thirteen HAAWC deployments successfully released a MK 54 Mod 1 torpedo and will support both HAAWC flight and MK 54 Mod 1 torpedo performance data.

- Two HAAWC deployments with MK 54 Mod 1 torpedoes experienced flight failures and did not successfully release the torpedo; these deployments provide HAAWC reliability data only.
- The Navy intends to complete HAAWC IOT&E in FY21.

Assessment

MK 54 Mod 1

- DOT&E has insufficient data to make a preliminary assessment on the MK 54 Mod 1 torpedo capability to search and acquire threat submarines. DOT&E will submit a classified IOT&E report for MK 54 Mod 1 after completion of testing.
- The combined test event for MK 54 Mod 1 and HAAWC was an effective and efficient use of test resources. The Navy conducted 13 HAAWC deployments against a submarine to support the objectives of each test program. The combined test event saved the Navy approximately \$6.2 Million in test resources.

HAAWC

- Analysis of HAAWC firing data is in progress. DOT&E cannot make a preliminary assessment of operational effectiveness and suitability; however, HAAWC capability to deliver its torpedo payload is likely to meet its accuracy requirement based on data collected from 2019 and early 2020.
- DOT&E will submit a classified IOT&E report for HAAWC after the completion of testing.

Recommendation

1. The Navy should determine and correct the root causes of the two HAAWC flight failures as soon as feasible.