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
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.