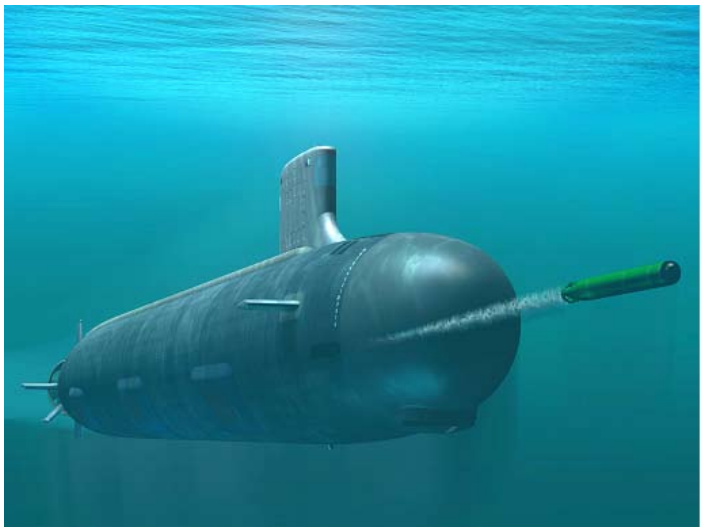
Mk 48 Advanced Capability (ADCAP) Torpedo Mods

Executive Summary

- Mk 48 Advanced Common Torpedo Guidance and Control Box (ACOT-GCB) completed operational testing in January 2006. The Mk 48 ACOT-GCB torpedo performance is equivalent to the Mk 48 Advanced Capability (ADCAP) Mod 6 torpedo.
- The Mk 48 Common Broadband Advanced Sonar System (CBASS) torpedo successfully completed shallow water operational testing in May 2006. The torpedo's shallow water performance is equivalent to the Mk 48 ADCAP Mod 6 torpedo.
- Deep-water Anti-Submarine Warfare (ASW) and Anti-Surface Warfare (ASUW) performance remains to be verified by operational testing.

System

- The Mk 48 ADCAP torpedo is the primary anti-submarine and anti-surface ship weapon for the submarine force.
- Mk 48 ADCAP torpedo mods are a series of hardware and software upgrades to the Mk 48 torpedo.
- Mk 48 Mod 4, Mod 5, Mod 6, and Mod 6 ACOT-GCB are fielded torpedoes.
- Mk 48 ACOT-GCB replaces obsolete Mod 6 hardware and rewrites the software allowing for an open architecture torpedo design to allow future software upgrades.
- Mk 48 ACOT-GCB is designed to have the same performance as the Mk 48 Mod 6.
- Mk 48 CBASS upgrades the Mk 48 ACOT-GCB with new sonar to improve torpedo effectiveness through future software upgrades. Mk 48 CBASS is a co-development program with the Australian Navy.
- Future software upgrades called Advanced Processor Builds (APB) are planned to improve torpedo performance.



Mission

The Submarine Force employs the Mk 48 ADCAP torpedo as a long-range, heavy weight weapon:

- For destroying surface ships or submarines
- In both deep-water open-ocean and shallow-water littoral environments

Activity

- The Navy completed ACOT-GCB side-by-side comparison testing with the Fleet baseline Mk 48 Mod 6 torpedo using the accredited Weapons Analysis Facility (WAF) simulation and at-sea operational testing in January 2006. The Commander, Operational Test and Evaluation Force (COMOPTEVFOR) reported the ACOT-GCB performance was equivalent to the Mk 48 Mod 6 torpedo.
- DOT&E approved a change to the Mk 48 CBASS Test and Evaluation Master Plan on February 24, 2006. This change restructured the CBASS operational evaluation, dividing it into two parts.
  - The first phase consisted of in-water firings to evaluate the weapon's shallow-water performance and supported a production decision for CBASS modernization kits.
  - The second phase used the WAF simulation to conduct a side-by-side comparison of CBASS to the legacy Mk 48 Mod 6. This test was designed to ensure that CBASS did not degrade baseline performance in deep-water anti-submarine and anti-surface warfare scenarios.
  - Together the in-water and WAF testing would support an Initial Operating Capability decision.
- The Navy conducted shallow-water combined developmental and operational testing of the Mk 48 CBASS torpedo with the Australian Navy in December 2005. The Navy conducted dedicated shallow-water operational testing in the Gulf of Mexico in March 2006. In May 2006, COMOPTEVFOR reported CBASS performance as equivalent to the Mk 48 Mod 6 in shallow water. COMOPTEVFOR is waiting for additional in-water verification and validation torpedo firings to complete their accreditation of the WAF to support side-by-side comparison testing. Accreditation and WAF testing should complete in early 2007.
- The Navy approved initial production of Mk 48 CBASS warshot torpedoes in June 2006.

- The Navy fielded the Mk 48 CBASS without completing the WAF simulation deep water operational testing required by the Test and Evaluation Master Plan in November 2006.
- The Navy conducted a successful Mk 48 ADCAP Mod 6 warshot Sink Exercise in July 2006.

Assessment

- Mk 48 ACOT-GCB WAF side-by-side comparison tests with Mk 48 ADCAP Mod 6 appear to be adequate when validated by in-water testing. In-water firings were essential for adequate torpedo testing and evaluation, especially for resolving suitability. It was only through at-sea testing that a critical hardware design flaw was identified. The flaw led to the inadvertent erasure of program memory modules, resulting in a dud weapon. This has been corrected and verified in testing. DOT&E agrees with the Navy's evaluation that the torpedo's performance in shallow-water is equivalent to the Mk 48 Mod 6 torpedo.
- CBASS in-water test results indicate CBASS has similar shallow-water performance relative to the legacy Mk 48 Mod 6 torpedo. However, the original 1998 CBASS Operational Requirements Document (ORD) demanded a considerable effectiveness improvement in more challenging scenarios. The Navy revised the ORD in 2002, requiring that the first phase of CBASS merely match current Mod 6 performance. As noted in DOT&E's 2001 Annual Report, the Mk 48 Mod 6 did not meet its own requirements thresholds. Thus, the effectiveness goal set for the CBASS operational test was modest. In addition, the operational test was conducted at two sites, which were known to be acoustically less challenging than previous tests. Overall, current CBASS performance does not appear to be measurably better or worse than that of the Mk 48 Mod 6 weapon.
- Mk 48 ADCAP performance has remained relatively stagnant for more than a decade, despite multiple hardware and software upgrades. The Navy now hopes to achieve ambitious effectiveness improvements with CBASS delivering full capability by the end of the decade via a software APB process.
- In response to two Mk 48 ADCAP failures during a 2003 Ship Sink Exercise, the Navy conducts annual warshot test firings to verify the inventory. Three torpedoes were successfully fired in 2005, while only one of four scheduled tests was conducted in 2006. This program needs to continue to verify performance of the inventory of torpedoes.

Recommendations

- Status of Previous Recommendations.
  The FY05 #1 and FY05 #2 recommendations remain valid. The Navy should continue to address reducing test delays and improve the WAF simulations.
- FY06 Recommendations. The Navy should:
  1. Provide necessary resources for testing and lay out a credible plan to achieve effectiveness improvements with CBASS, delivering full capability by the end of the decade via an APB software upgrade process.
  2. Begin planning to provide appropriate threat emulation to ensure adequate testing. The CBASS requirements document specifies the need for new threat resources (surrogate countermeasures, conventional submarines, etc.) to test future software upgrades.