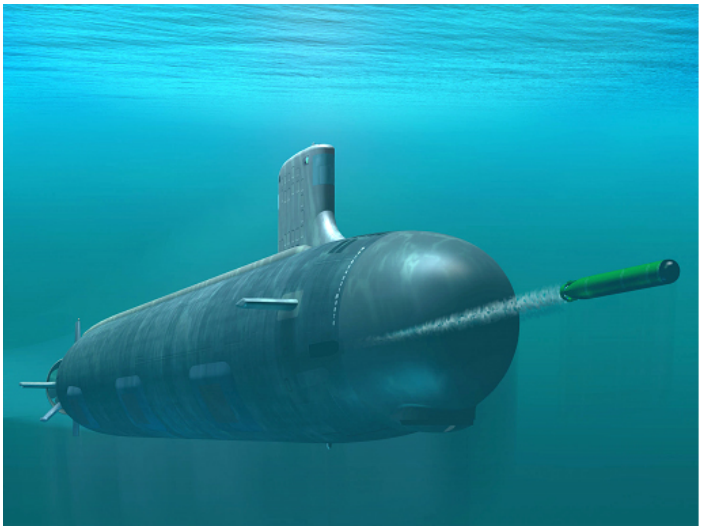
Mk 48 Advanced Capability (ADCAP) Torpedo Mods

Executive Summary
- Operational testing of the Mk 48 Mod 7 Common Broadband Advanced Sonar System (CBASS) Phase I torpedo is complete and DOT&E issued a classified Beyond Low-Rate Production (BLRIP) Report in January 2008. Testing was adequate and found CBASS torpedo's performance was equivalent to the current Mk 48 Advanced Capability (ADCAP) Mod 6 torpedo.
- The Royal Australian Navy successfully conducted the first CBASS warshot Sinking Exercise in July 2008.
- The Navy is incorporating some Mk 48 Mod 7 CBASS software features into the Mk 48 Mod 6 torpedo. Initial operational testing started in September 2007 and will continue through early FY09.

System
- The Mk 48 ADCAP torpedo is the primary anti-submarine warfare and anti-surface ship warfare weapon used by U.S. submarines.
- Mk 48 ADCAP torpedo mods are a series of hardware and software upgrades to the Mk 48 torpedo.
- Mk 48 Mod 5, Mod 6, Mod 6 Advanced Common Torpedo - Guidance and Control Box (ACOT-GCB), and Mod 7 CBASS Phase I are fielded torpedoes.
- The Mk 48 Mod 6 ACOT-GCB replaces obsolete Mod 6 hardware and rewrites the software permitting an open architecture torpedo design to allow future software upgrades. The Navy designed the Mk 48 Mod 6 ACOT-GCB to have the same performance as the Mk 48 Mod 6.
- The Mk 48 Mod 6 Spiral 1 torpedo is the last planned software upgrade to the Mk 48 Mod 6. This upgrade uses software algorithms from the CBASS to improve shallow-water performance.
- Mk 48 Mod 7 CBASS upgrades the Mk 48 ACOT-GCB with a new sonar designed to improve torpedo effectiveness through future software upgrades, identified by phase and spiral numbers. Phase 1 torpedoes deliver the initial hardware and software; Phase 2 torpedoes are required to deliver full capability. The Navy fielded CBASS Phase 1; Phase 2 is in development.
- CBASS is a co-development program with the Royal Australian Navy.



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

Prime Contractor
- Raytheon

Activity
- DOT&E issued a classified BLRIP report on the effectiveness and suitability of the Mk 48 Mod 7 CBASS Phase I torpedo in January 2008.
- The Navy conducted shallow-water OT&E of the Mk 48 Mod 6 Spiral 1 torpedo in September 2007. The Navy conducted in-water regression testing in conjunction with fleet training events in November 2007, February 2008, May 2008, and October 2008. DOT&E approved a test plan change in June 2008, to allow some regression testing to occur in the Weapons Analysis Facility (WAF) hardware-in- the-loop simulator at the Naval Undersea Warfare Center in Newport, Rhode Island. The WAF regression testing occurred in June 2008.
- The Royal Australian Navy submarine, HMAS WALLER successfully conducted the first CBASS Sinking Exercise during the 2008 Rim of the Pacific (RIMPAC) exercise in July 2008. HMAS WALLER is the first Australian submarine converted to employ the AN/BYG-1 Combat Control System and the CBASS torpedo.

- The Navy completed development of an initial Test and Evaluation Master Plan (TEMP) to cover the Mk 48 CBASS Phase 2 torpedo. The TEMP is in the final review cycle.
- The Navy began software development and developmental testing of CBASS Phase 2 software without completing a TEMP update to cover the developmental and operational testing.

Assessment

- The Navy conducted adequate operational testing of the Mk 48 CBASS Phase 1 torpedo in 2006 and 2007 in accordance with the DOT&E-approved TEMP and test plan. In the Mk 48 CBASS Phase I BLRIP report, DOT&E concluded that the torpedo's performance is similar to the legacy Mk 48 ADCAP Mod 6 torpedo. Like the Mk 48 Mod 6, the CBASS torpedo did not meet all performance thresholds; however, the CBASS torpedo is effective in many Anti-Submarine Warfare and Anti-Surface Warfare environments. The CBASS torpedo is not effective in certain environments against modern submarine threats. The Mk 48 CBASS torpedo is operationally suitable. However, while the Navy successfully upgraded and replaced obsolete torpedo hardware, the desired performance improvements have been marginal. A detailed evaluation is contained in DOT&E's classified BLRIP report.
- The Navy incorporated some CBASS software algorithms into the Mk 48 Mod 6 Spiral 1 torpedo in an attempt to improve in-water torpedo performance in challenging shallow-water scenarios. Initial in-water testing in September 2007 demonstrated the performance was below thresholds. Regression testing of Spiral 1 will continue through early FY09 to confirm that the software changes do not degrade legacy Mk 48 Mod 6 performance.
- Due to the high demand for limited fleet assets, the low fleet priority assigned to developmental and operational testing and the Navy's need to reduce total cost, Navy testers attempt to combine testing events with fleet training events in order to accomplish operational testing. Although an appropriate combination of testing and training appears to be the efficient use of fleet assets, significant advance coordination and planning with the fleet trainers is necessary to ensure an adequate event is conducted that will meet the needs of both the trainers and the testers. Combining testing and training can also result in inadequate or excessively long test periods as has occurred with the Mk 48 ADCAP Spiral 1 torpedo test – over one year to complete regression testing.
- The successful sinking of an inactivated destroyer by an Australian submarine using a CBASS torpedo, in July 2008, was the first warshot test for the CBASS torpedo. This process is essential for verifying performance of the Fleet's warshot torpedoes.
- The current threats of record and threat environments require that the Navy develop systems as well as the ability to operate and fight in littoral and in shallow-water environments. Concerns about submarine safety and the lack of adequate shallow-water ranges impact the realism of operational test and training events and increase the complexity and time required to execute the events.

Recommendations

- Status of Previous Recommendations. The Navy has made progress in addressing four of the five previous recommendations. The FY07 recommendation to include a combat system test perspective in achieving mission success of target detection through target kill has not been implemented.
- FY08 Recommendation.
  1. The Navy should develop shallow-water test and training areas and modernize the exercise torpedo locating and recovery systems.