Mark 48 Mods

The fleet baseline Advanced Capability (ADCAP) Torpedo is the Mark 48 Mod 5. A 1995 upgrade, the Mark 48 Mod 6, features an improved guidance and control section and a torpedo propulsion upgrade. A follow-on version of the Mark 48 Mod 6 guidance and control hardware, called the Advanced Common Torpedo Guidance and Control Box (ACOT-GCB), will be introduced in FY05 in order to replace obsolete components. ACOT-GCB parts will be incorporated into the next-generation torpedo, the Mark 48 Mod 7 Common Broadband Advanced Sonar System (CBASS), planned to start testing in FY05. The CBASS torpedo is being developed as part of a cooperative program between the United States and Australia.

Several software builds are currently under oversight. Block III upgrade is the final tactical software upgrade to the Mark 48 Mod 5. Block IV extends Block III capabilities and applies them to the Mark 48 Mod 6 weapon. The more sophisticated CBASS software follows the Block IV. In lieu of future Block upgrades, the program plans to employ a series of advanced processor builds (APBs) to both the Mod 6 and CBASS weapons as a more flexible means of introducing software changes. APB testing will begin in FY04. For future software development, DOT&E supports the flexibility of the APB approach, but insists upon complete and rigorous testing of all upgrades.

The Mod 6 ADCAP testing addressed open issues from previous OT&E in FY95. DOT&E assessed the Mod 6 ADCAP to be both operationally effective and suitable in the FY96 report. Although reliability was below the threshold, DOT&E identified the Mod 6 ADCAP as producing much better total performance against the expected threat than the Mod 5 ADCAP.

Follow-on test and evaluation (FOT&E) on the Block IV software was completed in FY00. DOT&E determined that Block IV was not operationally effective because it did not provide the shallow water performance improvements originally promised.

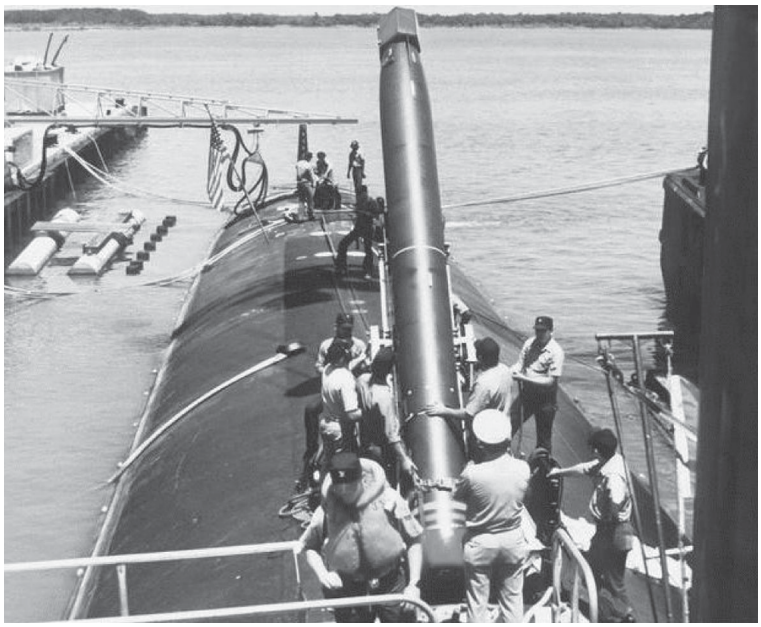
TEST & EVALUATION ACTIVITY

There was no dedicated operational testing in FY03, but the Navy did conduct numerous ADCAP torpedo exercises. These included four Prospective Commanding Officer exercises, one of which was conducted jointly with the Royal Australian Navy.

The Navy conducted an under-ice exercise (ICEX) for developmental testing of ice-related torpedo software improvements in the Arctic in April 2003. *USS Connecticut* (SSN-22) fired Mark 48 exercise torpedoes using suspended targets and itself as the target.

The Navy conducted a double ship sinking exercise (SINKEX) in the Pacific against two retired U.S. destroyers in August 2003. The SINKEX consisted of firing two Mark 48 exercise torpedoes (one Mod 5 and one Mod 6) and two Mark 48 warshot torpedoes (one Mod 5 and one Mod 6).

DOT&E participated in the drafting and review of the Test and Evaluation Master Plan revisions for the ACOT-GCB, CBASS, and APB programs. The Navy plans an operational test for APB in FY04 and CBASS in FY05. For ACOT-GCB, which is designed to deliver the same



An Advanced CapabilityTorpedo being loaded on a Los Angeles *class submarine.*

performance as the legacy Mod 6 hardware, DOT&E supports plans to test the two guidance and control sections side-by-side in the Navy's Weapons Analysis Facility hardware-in-the-loop simulator. The simulated data will be supplemented with a limited set of in-water confidence tests. The verification, validation, and accreditation of the Weapons Analysis Facility will be a significant project in FY04.

TEST & EVALUATION ASSESSMENT

The Block IV Verification of Correction of Deficiencies (VCD) testing, conducted in 2002, consisted of a small number of exercise torpedo firings at shallow water sites near Maui, Hawaii, and Southern California. The VCD focused on technical issues affecting torpedo performance, rather than overall operational effectiveness. In February 2003, Navy testers issued a VCD report stating that neither the technical nor operational level performance provided conclusive evidence that the original deficiency had been corrected. The fact that the test was not conducted at the same site as the FY00 operational test, raised concerns regarding the impact of acoustic conditions on the validity of the VCD results. Despite the shortcomings, Navy testers recommended fleet release based on the improved deep-water performance of the Block IV.

The 2003 ICEX did not feature operationally realistic firings against a valid target, but did provide a demonstration of the Mark 48 Mod 6 ADCAP's ability to perform reliably in the Arctic environment.

During the 2003 SINKEX, the two exercise weapons ran as planned, but the two warshots did not; the Navy is investigating whether this was due to reliability problems or other causes. In the last few years, the Navy has experienced some unsuccessful, incomplete, or otherwise ambiguous results in its SINKEX program, raising concerns regarding the warshot inventory performance and reliability. Torpedo reliability, as described in previous Annual Reports, remains an ongoing concern. These failures highlight the overall problem of ADCAP reliability, which continues to run in cycles and identifies a need for more Navy investment in its torpedo SINKEX program. Work force reductions at the weapon's depots may also threaten the fleet's ability to process weapons quickly and accurately.

The new level of cooperation between the U.S. Navy and the Royal Australian Navy provided valuable opportunities for training and testing, particularly against diesel-electric submarines. However, some torpedo performance questions remain unresolved due to inadequate T&E resources and funding provided by the Navy. For open-ocean shallow water exercises, the tested torpedo's internal monitoring equipment is the only source of data, resulting in post-run analysis biases and errors. Development of a mobile test range, or other independent instrumentation, is necessary to alleviate shallow water testing shortfalls. As a more permanent solution, given the high priority of the diesel submarine threat, an instrumented shallow water test range in a threat representative environment would help hasten maturation of littoral Submarine Warfare tactics and torpedo performance improvement in shallow water. The cumbersome nature of open ocean torpedo firings, coupled with seasonal marine mammal habitat restrictions at many locations, has significantly lengthened development cycle times. Navy funding support for a viable instrumented shallow water test range is needed.