

## SEAWOLF SSN 21 CLASS ATTACK SUBMARINE AND AN/BSY-2 COMBAT SYSTEM



The *Seawolf* (SSN 21) Nuclear Attack Submarine is designed to rapidly deploy to hostile ocean areas and deny their use to the enemy, clear the way for strikes by other friendly forces, and engage and destroy enemy submarines, surface forces and land targets. Secondary missions are mine and special warfare. *Seawolf* is designed to be a quiet, fast, heavily armed, shock resistant, survivable submarine.

The AN/BSY-2 Submarine Combat System is designed to support SSN 21 in all mission areas. It is required to detect, classify, localize and track targets, platforms, and weapons by means of onboard active and passive sensors and with target information from other platforms and external detection systems. The combat control subsystem provides setting and control of weapons, over-the-horizon targeting, combat systems management, improved target motion analysis, piloting and navigation functions, and automatic contact correlation. It includes the weapon launch equipment for the MK 48 Advanced Capability torpedo and the Tomahawk Missile. Acoustic hardware includes a truncated 24 ft diameter spherical receive array, a 15 ft diameter hemisphere active transmit array, the Wide Aperture Array (WAA), a low frequency bow array, two towed arrays, and a mine detection and avoidance high frequency array.

### **BACKGROUND INFORMATION**

The *Seawolf* program began in 1982 and was approved for conceptual design in 1983. The preliminary design was authorized in 1983 and was completed in 1985. Approval for lead ship production was granted in 1988.

*Seawolf* began initial sea trials in July 1996. She demonstrated unprecedented speed during her first trial. Following delivery, *SEAWOLF* began acoustic trials, which were completed in November 1997. *Connecticut* (SSN 22) went to sea in 1998. The third and final *Seawolf* class submarine, *Jimmy Carter* (SSN 23), is under construction with delivery scheduled in FY04. *Jimmy Carter* will be uniquely outfitted with an additional hull section lengthening the ship for special missions and R&D projects.

The *Seawolf* LFT&E plan included a 1/4 scale Shock Model Test Vehicle that underwent underwater shock and hull whipping. Shock tests were conducted in the A/B-1 shock test vehicle in 1995 with shock testing of a surrogate Main Propulsion Unit (MPU) and the Wide Aperture Array (WAA) sonar fairing. A series of underwater shock tests of major hull penetrations and related components was

conducted using the Navy's A/B-1 test fixture at the Aberdeen Test Center in 1998-1999. Other testing of smaller hull penetrations has been performed using the Navy's Full Scale Section (FSS-5 and FSS-8) shock test vehicles and Paddlewheel shock test fixture. Extensive shock qualification testing of *Seawolf* internal vital components has been accomplished using Floating Shock Platforms (test barges) and standard Navy shock test machines. As of October 2001, approximately 5,852 of 6,509 *Seawolf* components had been shock qualified. The LFT&E Plan for *Seawolf* featured a full ship shock test (FSST) of the completed ship. This was not accomplished due to legislative action that specifically prohibited the Navy from expending funds to perform the FSST.

## **TEST & EVALUATION ACTIVITY**

DOT&E approved Change 1 to Revision 4 to the TEMP in October 2000. This change aligned initial and follow-on operational testing consistent with agreements reached between the Navy and DOT&E. This realignment has supported the Navy's desire to deploy *Seawolf* as soon as possible by initially testing only those mission profiles that *Seawolf* is expected to use during her initial deployment. Other mission profiles, including Battlegroup Operations and Special Warfare will be tested before the ship is employed tactically in those mission profiles. Follow-on operational testing and evaluation (FOT&E) will also be needed to assess planned propulsor and sonar improvements.

The *Seawolf* OPEVAL was completed in FY01. Warm water and cold water testing was performed by USS *Seawolf*. Minefield testing was conducted by USS *Connecticut*. USS *Connecticut* then deployed for five weeks to the Arctic and surfaced at the North Pole in June 2001. In September 2001, USS *Connecticut* completed a test of the missile strike capability while performing as launch platform for a Cruise Missile Program Operational Test Launch.

As required by the TEMP LFT&E strategy, the Navy prepared a *Seawolf* (SSN 21) Class Vulnerability Assessment Report (VAR) that provides an overall assessment of vulnerability to threat weapons that may be encountered in combat. The VAR was completed in January 2001; but due to the lack of an FSST, DOT&E's LFT&E evaluation may not provide a complete ship survivability picture.

## **TEST & EVALUATION ASSESSMENT**

In 2001, progress was made in several deficiency areas pointed out by OPTEVFOR's 1999 Operational Assessment, the most significant being in weapon launch, handling and storage. These are no longer major concerns as demonstrated by the operations of the USS *Connecticut*, which had many updates installed during her Post Shakedown Availability (PSA). Progress was also demonstrated on Covertness and Detection. At the completion of OPEVAL in 2001, tactical development was continuing to be developed.

The *Seawolf* (SSN 21) Class VAR addresses the LFT&E issues and provides an overall assessment of vulnerability to threat weapons that may be encountered in combat. LFT&E issues addressed include the ship's vulnerability to torpedoes and mines and the ship's ability to perform its mission after exposure to specified levels of underwater shock intensity. The VAR applies to both SSN 21 and SSN 22, but it does not apply to SSN 23 because it is a much different ship.

The Navy's VAR was largely based on component and subsystem tests and analyses. But the Navy cannot fully address all the agreed upon LFT&E issues without completing the FSST. This leaves

the overall *Seawolf* LFT&E program as incomplete because major aspects of ship survivability remain unknown. The data voids will impact DOT&E's independent *Seawolf* vulnerability assessment.

The *Jimmy Carter* (SSN 23) design is substantially different from the *Seawolf* (SSN 21) configuration, with upgrades that may significantly affect survivability. In addition to lengthening the hull by approximately 100 feet and adding nearly 2,500 tons displacement, other modifications include changes to the pressure hull, adding a dry deck shelter, inserting an ocean interface section as well as installation of numerous new systems that should be shock qualified. Therefore, in December 1999, DOT&E designated *Jimmy Carter* as a covered product improvement program on the LFT&E oversight list. DOT&E emphasized the need for a new TEMP, including a new LFT&E strategy to the Assistant Secretary of the Navy Research, Development, and Acquisition (ASN (RDA)) in July 2000. The Navy has resisted this designation and requirement claiming that 100 additional feet of hull, new mission, and 2,500 tons of displacement and approximately \$1 billion cost, although a major product improvement, do not significantly affect ship survivability.

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