

VIRGINIA (SSN 774) CLASS ATTACK SUBMARINE



Virginia will replace the aging fleet of *Los Angeles* (SSN 688) Class submarines. It is intended to be a submarine comparable in most respects to its immediate predecessor, the *Seawolf* but in a more affordable configuration. It is designed to rapidly deploy to militarily important 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. *Virginia* will have a broad range of missions packaged in a quiet, heavily armed, survivable submarine. These include Covert Strike Warfare, Anti-Submarine Warfare, Covert Intelligence Collection/Surveillance, Covert Indication and Warning and Electronic Warfare, Anti-Surface Ship Warfare, Special Warfare, Covert Mine Warfare, and Battle Group Support.

Virginia is required to be capable of targeting, controlling and launching MK 48 ADCAP torpedoes, mines, and Tomahawk missiles from anywhere in the ocean. Its sonar capability is expected to be similar to *Seawolf*'s, and its electronic support suite and combat control system represent improvements over legacy systems. The external communications system is required to be an improvement over *Seawolf* and legacy systems, providing full, high data rate interoperability with U.S. and allied forces. These characteristics provide intelligence and strike capabilities.

BACKGROUND INFORMATION

The Milestone I DAB approved *Virginia* to enter Phase I in August 1994. To support Milestone II, a thorough Early Operational Assessment of *Virginia* was conducted, concluding that *Virginia* was potentially operationally effective. The Milestone II DAB approved *Virginia* to enter Phase II in June 1995.

The *Virginia* sonar program, known as AN/BQQ-10 Acoustic Rapid COTS Insertion (A-RCI), uses COTS technology to upgrade submarine sonars. Current upgrades are for the SSN 688 class submarines, and will later include *Trident* SSBNs, *Seawolf*, and *Virginia*. After Phases III and IV operational tests are completed in FY02, the A-RCI program will continue to upgrade its sonars through (approximately annual) software and/or hardware upgrades. The AN/BQQ-10 series sonar is planned to progress to a common COTS architecture for all U.S. submarine sonars by 2005-2007.

DOT&E recommended, and the Secretary of Defense approved, a waiver from full-up, system-level live fire testing of *Virginia* in accordance with Title 10, Section 2366. DOT&E approved the

alternative LFT&E plan submitted in lieu of full-up, system-level testing in June 1995. This plan includes shock qualification tests and analysis of components, surrogate underwater shock tests, a Total Ship Survivability Trial (TSST), a Full Ship Shock Trial, as well as a series of vulnerability assessments.

TEST & EVALUATION ACTIVITY

Revision C of the TEMP was signed in March 2001. Because the test program extends so far into the future, DOT&E directed that the TEMP must be updated in FY03 before the scheduled Dockside and Builder's Trials begin to address: (1) any performance shortfalls and associated corrective actions from testing encountered prior to sea trials; (2) changes needed to the test scenarios to reflect updated threat information; (3) lessons learned from *Seawolf* and BSY-2 operational testing; and (4) testing from the *Virginia* lead ship pre-planned product improvements, including follow-on technology insertions.

This TEMP revision includes a move of the Full Ship Shock Test (FSST) and Total Ship Survivability Trial (TSST) from Hull 1 (SSN 774) to Hull 2 (SSN775), which DOT&E agreed to, based on the Navy's input that this move would improve overall scheduling stability without impacting the Milestone III decision. Both SSN 774 and 775 will be used for TECHEVAL/OPEVAL. It also added a Critical Operational Issue to address Information Assurance. The TEMP update also revised several Critical Technical Parameters (CTP's) and developed CTPs on Compatibility, Interoperability and Integration.

In August 2001, DOT&E approved the concept of testing by OPTEVFOR at the Command and Control System Module (CCSM) Off-hull Assembly and Test Site or COATS facility. The COATS land-based operational test (OT-IIB) is proposed to assess the potential operational effectiveness and suitability of the *Virginia*-class SSN combat system. The basic test plan involves the use of the On-Board Team Trainer and simulation/stimulation (SIM/STIM) systems to create scenarios that will allow for the examination of combat system integration.

Technical testing to improve the acoustic performance of the *Virginia* propulsor development continued throughout the year. The *Virginia* program has opted for a different propulsor design than that used on the *Seawolf* class, hoping to take advantage of hydro-acoustical and propulsor technological advances evolved since the original *Seawolf* design. More details are in the classified report.

The third and final *Virginia* class Operational Assessment (OA) by COMOPTEVFOR was completed in December 2001. The latest OA (which ended for data gathering on September 2001) will not have the latest propulsor results. The latest propulsor data will be evaluated by OPTEVFOR along with the results of the COATS testing in Spring 2002.

The Navy continued its vulnerability assessment work and prepared Update II of the Vulnerability Assessment Report (VAR), which was completed in July 2001. DOT&E is reviewing this new VAR Update and will provide comments to the Navy. DOT&E has continued to participate in *Virginia* LFT&E Senior Working Group meetings and TSST Planning Group meetings to reach resolution of earlier VAR comments, participate in TSST planning, and provide insight as well as oversight on Navy plans for other planned LFT&E activities. DOT&E also continued to witness component shock qualification tests, and review with the Navy the results of completed Live Fire component and surrogate tests. As with *Seawolf*, there is a deficiency in the LFT&E plan for *Virginia* regarding survivability data in the propulsion system. The Director, Naval Nuclear Propulsion Systems

and DOT&E have engaged to draft a memorandum of agreement that provides sufficient information for DOT&E to perform its statutory requirement to assess the survivability of the entire ship.

TEST & EVALUATION ASSESSMENT

An FY97 OA concluded that the *Virginia* design should lead to a potentially operationally effective submarine. The OA identified three high and six moderate risk areas. Many of the issues identified during the FY97 OA were the results of programmatic decisions to scope back efforts or eliminate capabilities factored into the original estimates of the *Virginia* performance baseline.

The Navy has evaluated six damage scenarios for the detail design VAR using linear extrapolation from physics-based design-level shock analyses in local environments to 10 percent above the design level. The assessment at this level of shock intensity resulted in very limited damage and few lessons learned. The Navy is proposing a “Meaningful Drill Concept” for the post-delivery TSST with damage scenarios that are to be tied back to the six shot lines. DOT&E has questions about how the Navy will simulate realistic propulsion plant damage in the TSST scenarios. DOT&E is continuing to work with the Navy to resolve these issues.

DOT&E has other LFT&E concerns: (1) the approach for Verification, Validation, and Accreditation (VV&A) of LFT&E computer models has not been described; (2) the extrapolated Ship Shock Test results to higher shock intensity levels for use in the assessment of *Virginia*'s vulnerability to underwater shock has not been described; and (3) *Virginia*'s ability to surface after exposure to an underwater burst at the hull integrity shock factor level may not be assessed.

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