

SSN 774 *Virginia* Class

The *Virginia* class submarines will replace the aging fleet of *Los Angeles* (SSN 688) class submarines. *Virginia* is intended to be a submarine comparable in most respects to its immediate predecessor - the *Seawolf* - but in a more affordable configuration. The missions of *Virginia* 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. The SSN 774 was christened on August 16, 2003, and is undergoing dockside outfitting and testing. *Virginia* will start builder's trials in 2004.

Virginia will be capable of targeting, controlling and launching Mark 48 Advanced Capability torpedoes, mines, and Tomahawk missiles. 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 will be an improvement over legacy systems, providing full, high data rate interoperability with U.S. and allied forces. These characteristics support intelligence and strike capabilities.

The *Virginia* Class (SSN 774) submarine Non-Propulsion Electronics System was integrated outside of the ship's hull. Sonar displays and processors; Navigation and Combat Control Architecture; Data Distribution and Display, Electronic Support Measures, Onboard Team Trainer; Total Ship Monitoring; and Submarine Regional Warfare systems were all electronically integrated on a rafted system and inserted into the *Virginia* hull.

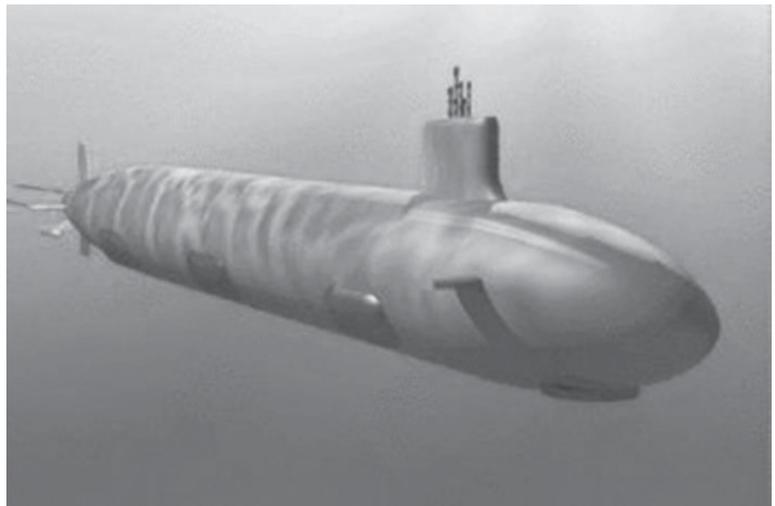
DOT&E recommended, and the Secretary of Defense approved, a waiver from full-up, system-level live fire testing of *Virginia* in accordance with Title 10, Section 2366. DOT&E approved the alternative LFT&E plan in June 1995. This plan includes shock qualification tests and analysis of components, surrogate underwater shock tests, a Total Ship Survivability Trial, a Full-Ship Shock Trial, as well as a series of vulnerability assessments.

The Office of the Director, Naval Nuclear Propulsion has cradle to grave responsibility for all aspects of nuclear propulsion plants. DOT&E has been briefed on the Naval Nuclear Propulsion processes for design and qualification of nuclear propulsion plants that power certain classes of U.S. Navy ships and was impressed with the thoroughness and complete understanding of the rationale behind operational requirements and specification. All other DOD programs would benefit from implementing similar processes to ensure the rationale behind the operational requirements and specifications are understood.

TEST & EVALUATION ACTIVITY

Developmental testing was conducted on the Light Weight Wide Aperture Array (LWWAA), a key *Virginia* class sensor for target localization. Technical problems required an investment to complete developmental testing to support shipboard installation. Hardware delivery problems limited LWWAA testing on the factory floor integration stimulator; however, shipboard testing is expected to begin during 1QFY04.

The Navy indicated intent to cancel the full-scale target acoustic strength trials for the *Virginia* class in favor of modeling and simulation (M&S). The *Seawolf* trials validated the acoustic M&S for the *Seawolf* class. Although M&S can supplement many aspects of full-scale acoustic target strength trials,



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NAVY PROGRAMS

DOT&E feels the model must be validated for the *Virginia* and that M&S cannot replace all full-scale tests.

The Navy's LFT&E program includes three separate Vulnerability Assessment Reports, a modified Total Ship Survivability Trial, component shock qualification testing for new/changed components, a variety of component and surrogate tests, and M&S. DOT&E witnessed component shock qualification tests and reviewed the results of completed component and surrogate testing.

TEST & EVALUATION ASSESSMENT

Indications are that the propulsor will not meet all performance design objectives for the *Virginia* class. The Navy has not indicated its plan to address this shortfall.

Developmental testing identified several LWWAA performance issues. The two most severe are channel-to-channel phase variations in the fiber optic signals and failure of the system to meet system cold-start time requirements. The phase variations erode the system signal processing gain, and the excessive start time will impact system suitability. Failure to meet system cold-start time requirements is a continuing problem often seen in commercial off-the-shelf systems. Correction of these problems will be verified during dockside testing to ensure the LWWAA will be reliable for the builder's trials and follow-on testing.

The Operation Test and Evaluation Force reported concerns regarding the linked issues of habitability, access, and damage control in the last two operational assessments. The most detrimental impact of poor habitability is on the damage control response to a major casualty, such as fire or flooding. Access to spaces outboard the berthing areas is extremely limited. These outboard spaces contain many high-pressure air and hydraulic lines, as well as electrical cables and water piping. Additionally, small passageways and lack of space in berthing areas limit the ability of the crew to evacuate from, and respond to, casualties from these crowded spaces.

The Navy chose the Voyage Manager System (VMS) as the new program of record to provide paperless navigation capability to VIRGINIA. The initiative to integrate VMS in *Virginia* does not support installation and testing of a paperless charting system until 2006. Consequently, *Virginia* will conduct all initial at-sea operations using paper charts and temporary plotting tables - an arrangement which the ship is not configured for that adversely affects habitability and navigation.