

SSN 774 *Virginia* Class Submarine

Executive Summary

- The *Virginia* class submarine completed IOT&E in April 2009. The Navy issued its Operational Test Report in June 2009 and DOT&E issued its Beyond Low-Rate Initial Production (BLRIP) report to Congress in November 2009. The program plans to conduct a Milestone III full-rate production decision in December 2009.
- The IOT&E was adequate to assess most *Virginia* mission areas, with the following exceptions:
 - *Virginia*'s ability to conduct Special Warfare Operations, Arctic Operations, and Anti-Submarine Warfare against diesel-electric submarines remain outstanding test requirements.
 - Additional testing is required to fully assess *Virginia*'s Intelligence and Reconnaissance capabilities and *Virginia*'s Anti-Surface Ship Warfare capabilities.
- *Virginia* is an effective and suitable replacement for the *Los Angeles* class submarine. The *Virginia* does not provide all the mission capabilities at the level required by the Operational Requirements Documents.
- Operational and Live Fire testing demonstrated that the *Virginia* class submarine is survivable in most expected threat environments.
- *Virginia* class performance is very dependent on the performance of separately-managed sub-systems that are integrated into *Virginia*'s Non-Propulsion Electronics Systems (NPES). These sub-systems were often not designed to meet or did not demonstrate the ability to meet *Virginia*'s requirements. Versions of many of these systems are also used on *Los Angeles* class submarines.

System

The *Virginia* class submarine is the replacement for the aging fleet of *Los Angeles* class submarines. The *Virginia* class:

- Is designed to be capable of targeting, controlling, and launching Mk 48 Advanced Capability torpedoes, Tomahawk cruise missiles, and future mines
- Is designed to have sonar capability similar to the *Seawolf* submarine class with improvements to the electronic support suite and combat control systems
- Has a new design propulsion plant incorporating proven components from previous submarine classes



- Utilizes a modular design and significant commercial off-the-shelf computer technologies and hardware intended to allow for rapid and cost-effective technology refresh cycles

Mission

The Maritime Mission Commander will employ the *Virginia* class submarine to enable open-ocean and littoral covert operations in support of the following submarine mission areas:

- Strike warfare
- Anti-Submarine Warfare (ASW)
- Intelligence, Surveillance, and Reconnaissance (ISR); Indications and Warnings; and Electronic Warfare
- Anti-Surface Ship Warfare
- Special Operations Force warfare
- Mine warfare
- Battle Group Operations

Prime Contractors

- General Dynamics Electric Boat, Groton, Connecticut
- Northrop Grumman Shipbuilding Newport News, Newport News, Virginia

Activity

- The Navy completed IOT&E of the *Virginia* class submarine in April 2009. Testing met the intent of the DOT&E-approved operational test plan. Because of material problems onboard the test ship, bad weather in the planned test areas, and

schedule conflicts with target surrogates and test assets, the Navy had to reschedule several IOT&E events and use alternate venues. This extended the test period and led to some events being delayed until follow-on operational testing.

NAVY PROGRAMS

- The Navy's Operational Test Agency, Commander, Operational Test and Evaluation Force (COTF), issued its IOT&E report of *Virginia* in June 2009. COTF evaluated *Virginia* as effective and suitable.
- The Navy completed Live Fire testing on the *Virginia*, including 99 percent of required component shock qualification testing, by FY09.
- DOT&E issued a BLRIP report on November 12, 2009. This report was classified and included a limited distribution version to comply with the Navy's special security rules for submarine data.
- DOT&E approved a new *Virginia* Test and Evaluation Master Plan, Revision F in November 2009 to detail follow-on developmental and operational testing plans. Future testing of the *Virginia* class submarine will address:
 - Modernization of the *Virginia* submarine's NPES
 - Design changes planned for the third block of submarines
 - Operational testing not completed in IOT&E
 - Verification of the correction of deficiencies uncovered in IOT&E
- The program plans to conduct a Milestone III full-rate production decision in December 2009.

Assessment

- Because Navy security rules prohibit operating the *Virginia* in the vicinity of foreign SSKs, the Navy finished IOT&E without testing the *Virginia* class submarine against this primary threat of record. However, DOT&E found that sufficient information from testing the *Los Angeles* variant of *Virginia*'s sonar systems against allied SSKs exists to assess *Virginia*'s ASW search capability.
- The DOT&E's classified BLRIP report concluded the following:
 - ASW testing was marginally adequate during the IOT&E. In several cases, unusually favorable acoustic conditions or a noisy target diminished operational realism. Additional testing is required in this mission area, including testing with SSKs to fully evaluate *Virginia*'s capability against this important threat. DOT&E has requested the Navy propose alternate methods to comply with their security restrictions and support this effort.
 - The Navy conducted adequate testing to assess mission performance in Strike Operations, Anti-Surface Ship Warfare attack, Battle Group Support Operations, Minefield Avoidance operations, and Special Operations with the Lock-out Trunk.
 - The Navy did not conduct adequate testing to assess *Virginia*'s ability to search for surface ships in various environments or to fully assess portions of the ISR mission.
 - The Navy conducted several tests to evaluate *Virginia*'s covertness (ability to be detected). Most of these tests were adequate for assessing the areas examined; however, additional testing is required in other areas.
- DOT&E's classified BLRIP report on *Virginia*'s performance for all testing conducted concludes the following:
 - *Virginia* is an effective, suitable, and survivable replacement for the *Los Angeles* submarine with improvements in acoustic and electromagnetic covertness.
 - *Virginia*'s operational effectiveness is dependent on the mission conducted. *Virginia* is effective for conducting Strike Operations, minefield avoidance operations, Battle Group Support, and Anti-Surface Ship Warfare attack (in most scenarios).
 - *Virginia* is effective for conducting ASW against the majority of submarines in benign and moderate acoustic environments. *Virginia* is not effective in more harsh acoustic environments or against the newer threats of record.
 - *Virginia* is effective for conducting some limited ISR missions depending on the intelligence collection requirements; however, additional testing is required.
 - *Virginia* was not fully evaluated for the Special Warfare mission, but has the potential to use the installed Lock-Out Trunk for SOF operations once the Navy certifies *Virginia* for diver oxygen recompression and storage of Special Warfare equipment and ordinance. Further testing is required to evaluate *Virginia*'s capability with the Dry Deck Shelter and the Advanced SEAL Delivery System's replacement.
 - *Virginia* is operationally suitable. However, the reliability of several key engineering plant components, NPES equipment, Government Furnished Equipment, and the Photonics Mast need improvement.
 - Operational and Live Fire testing demonstrated that the *Virginia* class submarine is survivable in most expected threat environments. Details of the survivability assessment are classified and contained in the combined BLRIP report.
- *Virginia*'s mission performance was found to be highly dependent on smaller acquisition programs that make up the *Virginia* NPES and weapons. The performance requirements or demonstrated performance of some NPES components do not support meeting *Virginia*'s requirements. The Acoustic Rapid Commercial Off-the-Shelf Insertion for Sonar AN/BQQ-10 sonar, the TB-29 series towed array, the AN/BLQ-10 Electronics Support Measures and the Mk 48 Advanced Capability torpedo are examples of systems with known performance limitations or reliability problems that affected *Virginia*'s performance during IOT&E.

Recommendations

- Status of Previous Recommendations. The Navy has not addressed one FY06 or the three FY08 recommendations.
- FY09 Recommendation.
 1. The Navy should implement the recommendations in the DOT&E BLRIP report and the COTF IOT&E Report.