Executive Summary
- In April 2019, DOT&E approved a Test and Evaluation Master Plan covering the Block V variant of the Virginia-class submarine. The Navy expects operational test of the Virginia-class Block V submarine in FY27.
- In July 2019, DOT&E submitted a classified FOT&E report on the Virginia-class Block III submarine. The Virginia-class Block III submarine is operationally effective and operationally suitable. The survivability of the Virginia-class Block III submarine is unchanged from Blocks I and II. The Large Aperture Bow (LAB) array is an effective replacement for the legacy spherical array, and the two Virginia Payload Tubes (VPTs) are an effective replacement for 12 legacy vertical launch tubes.

System
- The Virginia-class submarine is the Navy’s latest fast-attack submarine and is capable of targeting, controlling, and launching MK 48 torpedoes and Tomahawk land-attack missiles (TLAMs).
- The Navy is procuring Virginia-class submarines incrementally in a series of blocks; the block strategy is for contracting purposes, not necessarily to support upgrading capabilities.
  - Block I (hulls 1-4) and Block II (hulls 5-10) ships were built to the initial design of the Virginia class.
  - Block III (hulls 11-18) and Block IV (hulls 19-28) ships, starting with SSN 784, include the following affordability enhancements:
    ▪ A LAB array in place of the spherical array in the front of the ship
    ▪ Two large diameter VPTs replace the 12 vertical launch tubes; each payload tube is capable of storing and launching 6 TLAMs used in strike warfare missions
  - Block V and beyond will increase strike payload capacity from 12 to 40 TLAMs by adding a set of 4 Virginia Payload Modules in an amidships hull extension, capable of storing and launching 7 TLAMs each, as well as providing the potential to host future weapons and unmanned systems. The Navy also intends Block V to include acoustic enhancements and quieting improvements.

Mission
The Operational Commander will employ the Virginia-class Block III submarine to conduct open-ocean and littoral covert operations that support the following submarine mission areas:
- Strike warfare
- Anti-submarine warfare
- Intelligence, surveillance, and reconnaissance
- Mine warfare
- Anti-surface warfare
- Naval special warfare
- Battle group operations

Major Contractors
- General Dynamics Electric Boat – Groton, Connecticut
- Huntington Ingalls Industries, Newport News Shipbuilding – Newport News, Virginia

Activity
- In April 2019, DOT&E approved a Test and Evaluation Master Plan covering the Block V variant of the Virginia-class submarine. The Navy expects operational test of the Virginia-class Block V submarine in FY27.
- In July 2019, DOT&E submitted a classified FOT&E report on the Virginia-class Block III submarine.
- In FY19, the Navy completed two live fire test series that support a survivability assessment of the vessel to underwater shock events. Both test series will improve the confidence in the modeling and simulation (M&S) used to assess Virginia-class Block V survivability. These test series were conducted in accordance with DOT&E-approved test plans and included:
  - Shallow submergence underwater explosion testing to validate M&S predictions of the structural response of

Virginia 161
representative scaled Tube Stiffened Models (TSM) to underwater shock loading.
- Deep submergence underwater explosion tests to assess structural response of the TSMs to combined shock and pressure loading. This testing utilized explosive charges against TSMs inside a pressure vessel held at deep submergence pressures to build confidence in the ability of M&S tools to predict the onset of structural collapse at operational depths.

Assessment
- The DOT&E FOT&E report dated July 31, 2019, concluded the following regarding performance:
  - Virginia-class Block III submarine is operationally effective.
  - The LAB array is an effective replacement for the legacy spherical array and supports effective use of Virginia-class Block III submarine for anti-submarine warfare. The Virginia-class Block III submarine capability against diesel submarines remains unknown because submarine acoustic security restricts operational testing against real-world diesel submarines.
  - Two VPTs are an effective replacement for 12 legacy vertical launch tubes and support the effective use of Virginia-class Block III submarine for strike warfare.
  - Virginia-class Block III submarine is operationally suitable with no significant deficiencies identified with operational availability or reliability.
  - Cybersecurity results that affect operational effectiveness are in the classified FOT&E report.
  - Analysis of the Virginia-class Block III Vulnerability Assessment Report supplement identify that the modifications from Block I to Block III do not degrade the Virginia-class submarine’s ability to support fleet missions or survivability against operationally relevant threat engagements.

Recommendation
1. The Navy should address the 15 recommendations in the classified DOT&E FOT&E report.