Congressional Research Service
Informing the legislative debate since 1914

Navy Virginia (SSN-774) Class Attack Submarine Procurement: Background and Issues for Congress

December 1, 2020

Congressional Research Service
https://crsreports.congress.gov
RL32418

CRS REPORT
Prepared for Members and
Committees of Congress

Summary

The Navy has been procuring Virginia (SSN-774) class nuclear-powered attack submarines (SSNs) since FY1998. The one Virginia-class boat that the Navy's original FY2021 budget submission requests for procurement in FY2021 would be the 33rd boat in the class. The Navy's FY2020 budget submission had projected that the Navy would request two Virginia-class boats in FY2021.

Virginia-class boats scheduled for procurement in FY2019-FY2023 are being procured under a multiyear procurement (MYP) contract. Most Virginia-class boats procured in FY2019 and subsequent years are to be built with the Virginia Payload Module (VPM), an additional, 84-foot-long, mid-body section equipped with four large-diameter, vertical launch tubes for storing and launching additional Tomahawk missiles or other payloads.

The Navy's original FY2021 budget submission estimates the procurement cost of the Virginia-class boat requested for procurement in FY2021 at $3,539.4 million (i.e., about $3.5 billion). The boat has received $915.7 million in prior-year "regular" advance procurement (AP) funding, and $289.0 million in prior-year Economic Order Quantity (EOQ) AP funding for components of boats being procured under the FY2019-FY2023 MYP contract. The Navy's original FY2021 budget submission requests the remaining $2,334.7 million needed to complete the boat's estimated procurement cost, as well as $1,473.8 million in "regular" AP funding for Virginia-class boats to be procured in future fiscal years and $427.4 million in EOQ AP funding for components of boats being procured under the FY2019-FY2023 MYP contract, bringing the total amount of procurement and AP funding requested for the program in FY2021 to $4,235.9 million (i.e., about $4.2 billion), excluding outfitting and post-delivery costs.

The FY2019-FY2023 MYP contract for the Virginia-class program includes a total of nine boats (in annual quantities of 2-2-1-2-2), with an option for adding a 10th boat. The contract allows for the 10th boat to be added in either FY2021 (which would make for a total procurement of two Virginia-class boats in FY2021) or a subsequent year. The Navy's FY2021 unfunded priorities list (UPL) reportedly lists the 10th boat as the Navy's top unfunded priority for FY2021 and states that fully funding this additional boat in FY2021 would require an additional $2.76 billion in funding.

Press reports in late November 2020 stated that the Trump Administration, as an 11th-hour amendment to the Navy's original FY2021 budget submission, had decided to request the procurement of a second Virginia-class boat in FY2021, and will work with Congress to identify offsets to the Department of Defense's FY2021 budget to pay for procuring a second Virginia-class boat in FY2021. The reported change in the number of Virginia-class boats that the Administration is requesting for procurement in FY2021 could increase by about $2.76 billion the combined amount of procurement and AP funding that the Administration is requesting for the Virginia-class program for FY2021. CRS as of December 1, 2020, had not received any documentation from the Administration detailing the exact changes to the Virginia-class program procurement and AP funding lines that would result from this reported change. Pending the delivery of that information from the administration, this CRS report continues to use the originally requested FY2021 procurement and AP funding figures for the Virginia-class program in its tables and narrative discussions.

Contents

Introduction 1
Background 1
U.S. Navy Submarines 1
U.S. SSN Force Levels 2
Current Force-Level Goal of 66 Boats within 355-Ship Plan 2
Potential New Force-Level Goal of 70 to 80 Boats within New Battle Force 2045 Plan 2
Force Level at End of FY2019 3
Projected Force Levels 3
U.S. SSN Classes 5
Los Angeles (SSN-688) Class 5
Seawolf (SSN-21) Class 5
Virginia (SSN-774) Class 5
Virginia-Class Procurement Program 5
Unit Procurement Cost 5
Annual Procurement Quantities 6
Multiyear Contracting 6
FY2019-FY2023 MYP Contract 7
Joint Production Arrangement 8
Integrated Enterprise Plan (IEP) 8
Schedule and Cost Performance 9
Virginia Payload Module (VPM) 10
Acoustic and Other Improvements 10
FY2021 Funding Request 11
Second Boat Included in Navy's FY2021 Unfunded Priorities List 11
Submarine Construction Industrial Base 12
SSN Deployments Delayed Due to Maintenance Backlogs 12
Issues for Congress 12
Potential Impact of COVID-19 Situation 12
Funding for Second Boat in FY2021 14
Industrial-Base Challenges of Building Both Virginia- and Columbia-Class Boats 15
Technical Risk in Virginia-Class Block V Design 17
Additional Issues 18
Classified Recommendations in December 2019 DOT&E Report 18
Problem with Hull Coating 18
Defective Parts Reported in 2016 18
Substandard Steel Reported in 2020 18
Legislative Activity for FY2021 20
Reported Late November Amendment to Budget to Request Second Boat in FY2021 20
Congressional Action on FY2021 Funding Request 21
FY2021 National Defense Authorization Act (H.R. 6395/S. 4049) 21
House 21
Senate 22
FY2021 DOD Appropriations Act (H.R. 7617/S. XXXX) 25
House 25
Senate 25

Figures

Figure 1. Virginia-Class Attack Submarine 6

Tables

Table 1. Projected SSN Force Levels 4
Table 2. Annual Numbers of Virginia-Class Boats Procured or Projected for Procurement 6
Table 3. Congressional Action on Original FY2021 Funding Request 21

Appendixes

Appendix A. Past SSN Force-Level Goals 26
Appendix B. Options for Funding SSNs 28
Appendix C. 2006 Navy Study on Options for Mitigating Projected Valley in SSN Force Level 30
Appendix D. SSN Deployments Delayed Due to Maintenance Backlogs 33

Contacts

Author Information 38

Introduction

This report provides background information and issues for Congress on the Virginia-class nuclear-powered attack submarine (SSN) program. The Navy's original FY2021 budget submission requests $4,235.9 million (i.e., about $4.2 billion) in procurement and advance procurement (AP) funding for the program.

Press reports in late November 2020 stated that the Trump Administration, as an 11th-hour amendment to the Navy's original FY2021 budget submission, had decided to request the procurement of a second Virginia-class boat in FY2021, and will work with Congress to identify offsets to the Department of Defense's (DOD's) FY2021 budget to pay for procuring a second Virginia-class boat in FY2021. CRS as of December 1, 2020, had not received any documentation from the Administration detailing the exact changes to the Virginia-class program procurement and AP funding lines that would result from this reported change. Pending the delivery of that information from the Administration, this CRS report continues to use the originally requested FY2021 procurement and AP funding figures for the Virginia-class program in its tables and narrative discussions.

Decisions that Congress makes on procurement of Virginia-class boats could substantially affect U.S. Navy capabilities and funding requirements, and the U.S. shipbuilding industrial base.

The Navy's Columbia (SSBN-826) class ballistic missile submarine program is discussed in another CRS report—CRS Report R41129, *Navy Columbia (SSBN-826) Class Ballistic Missile Submarine Program: Background and Issues for Congress*, by Ronald O'Rourke.

For an overview of the strategic and budgetary context in which the Virginia-class program and other Navy shipbuilding programs may be considered, see CRS Report RL32665, *Navy Force Structure and Shipbuilding Plans: Background and Issues for Congress*, by Ronald O'Rourke.

Background

U.S. Navy Submarines[1]

The U.S. Navy operates three types of submarines—nuclear-powered ballistic missile submarines (SSBNs),[2] nuclear-powered cruise missile and special operations forces (SOF) submarines (SSGNs),[3] and nuclear-powered attack submarines (SSNs). The SSNs are general-purpose

[1] In U.S. Navy submarine designations, SS stands for submarine, N stands for nuclear-powered, B stands for ballistic missile, and G stands for guided missile (such as a cruise missile). Submarines can be powered by either nuclear reactors or non-nuclear power sources such as diesel engines or fuel cells. All U.S. Navy submarines are nuclear-powered. A submarine's use of nuclear or non-nuclear power as its energy source is not an indication of whether it is armed with nuclear weapons—a nuclear-powered submarine can lack nuclear weapons, and a non-nuclear-powered submarine can be armed with nuclear weapons.

[2] The SSBNs' basic mission is to remain hidden at sea with their nuclear-armed submarine-launched ballistic missiles (SLBMs) and thereby deter a strategic nuclear attack on the United States. The Navy's SSBNs are discussed in CRS Report R41129, *Navy Columbia (SSBN-826) Class Ballistic Missile Submarine Program: Background and Issues for Congress*, by Ronald O'Rourke, and CRS Report RL31623, *U.S. Nuclear Weapons: Changes in Policy and Force Structure*, by Amy F. Woolf.

[3] The Navy's four SSGNs are former Trident SSBNs that have been converted (i.e., modified) to carry Tomahawk cruise missiles and SOF rather than SLBMs. Although the SSGNs differ somewhat from SSNs in terms of mission orientation (with the SSGNs being strongly oriented toward Tomahawk strikes and SOF support, while the SSNs are more general-purpose in orientation), SSGNs can perform other submarine missions and are sometimes included in

submarines that can (when appropriately equipped and armed) perform a variety of peacetime and wartime missions, including the following:

- covert intelligence, surveillance, and reconnaissance (ISR), much of it done for national-level (as opposed to purely Navy) purposes;
- covert insertion and recovery of SOF (on a smaller scale than possible with the SSGNs);
- covert strikes against land targets with the Tomahawk cruise missiles (again on a smaller scale than possible with the SSGNs);
- covert offensive and defensive mine warfare;
- anti-submarine warfare (ASW); and
- anti-surface ship warfare.

During the Cold War, ASW against Soviet submarines was the primary stated mission of U.S. SSNs, although covert ISR and covert SOF insertion/recovery operations were reportedly important on a day-to-day basis as well.[4] In the post-Cold War era, although ASW remained a mission, the SSN force focused more on performing the first three other missions listed above. With the shift in the strategic environment in recent years from the post-Cold War era to a new situation featuring renewed great power competition,[5] ASW against Russian and Chinese submarines has once again become a more prominent mission for U.S. Navy SSNs.

U.S. SSN Force Levels

Current Force-Level Goal of 66 Boats within 355-Ship Plan

The Navy's force-level goal, released in December 2016, is to achieve and maintain a 355-ship fleet, including 66 SSNs.

Potential New Force-Level Goal of 70 to 80 Boats within New Battle Force 2045 Plan

The Navy and Department of Defense (DOD) since 2019 have been working to develop a new force-level goal to replace the current 355-ship force-level goal. The conclusion of this work and the release of its results to Congress have been delayed repeatedly since late 2019. On October 6, 2020, then-Secretary of Defense Mark Esper provided some details on the Trump Administration's new Navy force-level goal, which it calls Battle Force 2045. This new force-level goal calls for achieving a fleet of more than 500 manned and unmanned ships by 2045, including 355 manned ships prior to 2035.[6]

---

counts of the projected total number of Navy attack submarines. The Navy's SSGNs are discussed in CRS Report RS21007, *Navy Trident Submarine Conversion (SSGN) Program: Background and Issues for Congress*, by Ronald O'Rourke.

[4] For an account of certain U.S. submarine surveillance and intelligence-collection operations during the Cold War, see Sherry Sontag and Christopher Drew with Annette Lawrence Drew, *Blind Man's Bluff* (New York: Public Affairs, 1998).

[5] For more on this shift, see CRS Report R43838, *A Shift in the International Security Environment: Potential Implications for Defense—Issues for Congress*, by Ronald O'Rourke.

[6] For more on the 355-ship plan and the Battle Force 2045 plan, see CRS Report RL32665, *Navy Force Structure and Shipbuilding Plans: Background and Issues for Congress*, by Ronald O'Rourke.

In his remarks, Esper stated that Battle Force 2045 would increase the SSN force-level goal to a figure of 70 to 80 boats, and that to help achieve this higher figure, the annual SSN procurement rate would be increased from the current level of about two boats per year to a new level of three boats per year as soon as possible. Esper stated

> Under our proposal, Battle Force 2045 will possess the following characteristics. First, [it is to include] a larger and more capable submarine force. The study [done to design Battle Force 2045] reached a clear consensus on the need to rapidly increase (our number) of attack submarines, the most survivable strike platform in a future great power conflict, to the range of 70 to 80 in the fleet.
>
> If we do nothing else, the Navy must begin building three Virginia class submarines a year as soon as possible.[7]

For a review of SSN force-level goals since the Reagan Administration, see **Appendix A**.

Force Level at End of FY2019

The SSN force included more than 90 boats during most of the 1980s, when plans called for achieving a 600-ship Navy including 100 SSNs. The number of SSNs peaked at 98 boats at the end of FY1987 and declined after that in a manner that roughly paralleled the decline in the total size of the Navy over the same time period. The 50 SSNs in service at the end of FY2018 included the following:

- 30 Los Angeles (SSN-688) class boats;
- 3 Seawolf (SSN-21) class boats; and
- 17 Virginia (SSN-774) class boats.

Projected Force Levels

Table 1 shows the Navy's projection of the number of SSNs over time if the Navy's FY2020 30-year shipbuilding plan were fully implemented. As can be seen in the table, the FY2020 30-year shipbuilding plan would achieve the Navy's 66-boat SSN force-level goal by FY2048.

As also shown in the table, the number of SSNs is projected to experience (relative to a previous Navy SSN force-level goal of 48 boats) a valley or trough from the mid-2020s through the early 2030s, reaching a minimum of 42 boats (i.e., 24 boats, or about 36%, less than the current 66-boat force-level goal) in FY2027-FY2028. This projected valley is a consequence of having procured a relatively small number of SSNs during the 1990s, in the early years of the post-Cold War era. Some observers are concerned that this projected valley in SSN force levels could lead to a period of heightened operational strain for the SSN force, and perhaps a period of weakened conventional deterrence against potential adversaries such as China.[8] The projected SSN valley

[7] Department of Defense, "Secretary Of Defense Remarks at CSBA [Center for Strategic and Budgetary Assessments] on the NDS [National Defense Strategy] and Future Defense Modernization Priorities," transcript of remarks, October 6, 2020.

[8] China has taken note of the valley. The November 2014 edition of a Chinese military journal, for example, includes an article with a passage that translates as follows:

> ... in 2028, the [U.S. Navy] force of nuclear attack submarines will fall from the current number of 55 down to 41 boats. Some are concerned about whether this force level can meet the requirements of the Asia-Pacific rebalance."
>
> (Lyle Goldstein, "Evolution of Chinese Power Projection Capabilities," presentation to Center for a New American Security (CNAS) roundtable discussion, September 29, 2016, slide 7 of 41.)

was first identified by CRS in 1995 and has been discussed in CRS reports and testimony every year since then. As one measure for mitigating this valley, the Navy's FY2020 budget submission proposes to refuel and extend the service life of two older Los Angeles (SSN-688) class submarines. The Navy states that this could be followed by refuelings and service life extensions for up to five more Los Angeles-class SSNs that would be funded in fiscal years beyond the FY2020-FY2024 Future Year Defense Plan (FYDP).[9]

Table 1. Projected SSN Force Levels

As shown in Navy's FY2020 30-Year (FY2020-FY2049) Shipbuilding Plan

Fiscal year	Annual procurement quantity	Projected number of SSNs	Force level relative to current 66-boat goal	
			Number of ships	Percent
20	3	52	-14	-21%
21	2	53	-13	-20%
22	2	52	-14	-21%
23	2	51	-15	-23%
24	2	47	-19	-29%
25	2	44	-22	-33%
26	2	44	-22	-33%
27	2	42	-24	-36%
28	2	42	-24	-36%
29	2	44	-22	-33%
30	2	46	-20	-30%
31	2	48	-18	-27%
32	2	49	-17	-26%
33	2	51	-15	-23%
34	2	53	-13	-20%
35	2	54	-12	-18%
36	2	56	-10	-15%
37	2	58	-8	-12%
38	2	57	-9	-14%
39	2	58	-8	-12%
40	2	59	-7	-11%
41	2	59	-7	-11%
42	2	61	-5	-8%
43	2	61	-5	-8%
44	2	62	-4	-6%
45	2	63	-3	-5%
46	2	64	-2	-3%
47	2	65	-1	-2%
48	2	66	—	—
49	2	67	+1	+2%

Source: Table prepared by CRS based on Navy's FY2020 30-year shipbuilding plan. Percent figures rounded to nearest percent.

[9] U.S. Navy, *Report to Congress on the Annual Long-Range Plan for Construction of Naval Vessels for Fiscal Year 2020*, February 2018, p. 6. For background information on a study initiated by the Navy in 2006 for mitigating the valley in the SSN force levels projected for the 2020s and 2030s, see **Appendix C**.

U.S. SSN Classes

Los Angeles (SSN-688) Class

A total of 62 Los Angeles-class submarines, commonly called 688s, were procured between FY1970 and FY1990 and entered service between 1976 and 1996. They are equipped with four 21-inch diameter torpedo tubes and can carry a total of 26 torpedoes or Tomahawk cruise missiles in their torpedo tubes and internal magazines. The final 31 boats in the class (SSN-719 and higher) were built with an additional 12 vertical launch system (VLS) tubes in their bows for carrying and launching another 12 Tomahawk cruise missiles. The final 23 boats in the class (SSN-751 and higher) incorporate further improvements and are referred to as Improved Los Angeles class boats or 688Is. As of the end of FY2019, 32 of the 62 boats in the class had been retired.

Seawolf (SSN-21) Class

The Seawolf class was originally intended to include about 30 boats, but Seawolf-class procurement was stopped after three boats as a result of the end of the Cold War and associated changes in military requirements and defense spending levels. The three Seawolf-class submarines are the *Seawolf* (SSN-21), the *Connecticut* (SSN-22), and the *Jimmy Carter* (SSN-23). SSN-21 and SSN-22 were procured in FY1989 and FY1991 and entered service in 1997 and 1998, respectively. SSN-23 was originally procured in FY1992. Its procurement was suspended in 1992 and then reinstated in FY1996. It entered service in 2005. Seawolf-class submarines are larger than Los Angeles-class boats or previous U.S. Navy SSNs.[10] They are equipped with eight 30-inch-diameter torpedo tubes and can carry a total of 50 torpedoes or cruise missiles. SSN-23 was built to a lengthened configuration compared to the other two ships in the class.[11]

Virginia (SSN-774) Class

The Navy has been procuring Virginia-class SSNs (see **Figure 1**) since FY1998; the first entered service in October 2004.

The Virginia-class design was developed to be less expensive and better optimized for post-Cold War submarine missions than the Seawolf-class design. The baseline Virginia-class design is slightly larger than the Los Angeles-class design[12] but incorporates newer technologies, including technologies used in the Seawolf-class design.

Virginia-Class Procurement Program

Unit Procurement Cost

Most Virginia-class boats to be procured in FY2019 and subsequent years are to be built to a lengthened configuration that includes the Virginia Payload Module (see discussion below) and generally have an estimated unit procurement cost in the Navy's FY2020 budget submission of roughly $3.4 billion.

[10] Los Angeles-class boats have a beam (i.e., diameter) of 33 feet and a submerged displacement of about 7,150 tons. Seawolf-class boats have a beam of 40 feet. SSN-21 and SSN-22 have a submerged displacement of about 9,150 tons.

[11] SSN-23 is 100 feet longer than SSN-21 and SSN-22 and has a submerged displacement of 12,158 tons.

[12] The baseline Virginia-class design has a beam of 34 feet and a submerged displacement of 7,800 tons.

Figure 1. Virginia-Class Attack Submarine

Source: U.S. Navy file photo accessed by CRS on January 11, 2011, at http://www.navy.mil/search/display.asp?story_id=55715.

Annual Procurement Quantities

Table 2 shows annual numbers of Virginia-class boats procured from FY1998 (the lead boat) through FY2020, the number requested for procurement in FY2021 under the Navy's original FY2021 budget submission, and the numbers projected for procurement in FY2022-FY2025 under the FY2022-FY2025 Future Years Defense Plan (FYDP).

Table 2. Annual Numbers of Virginia-Class Boats Procured or Projected for Procurement

FY98	FY99	FY00	FY01	FY02	FY03	FY04	FY05	FY06	FY07	FY08	FY09	FY10	FY11
1	1	0	1	1	1	1	1	1	1	1	1	1	2
FY12	**FY13**	**FY14**	**FY15**	**FY16**	**FY17**	**FY18**	**FY19**	**FY20**	***FY21***	***FY22***	***FY23***	***FY24***	***FY25***
2	2	2	2	2	2	2	2	2	*1*	*2*	*2*	*2*	*2*

Source: Table prepared by CRS based on U.S. Navy data.

Multiyear Contracting

With the exception of a single Virginia-class boat procured in FY2003, all Virginia-class boats have been procured or are to be procured under multiyear contracting, meaning either a block buy contract or multiyear procurement (MYP) contract:[13]

[13] For more on block buy contracting and MYP contracting, see CRS Report R41909, *Multiyear Procurement (MYP)*

- The first four Virginia-class boats, known as the Block I boats, were procured in FY1998-FY2002 under a block buy contract covering those years.[14] This was the first instance of block buy contracting—the mechanism of a block buy contract was essentially created for procuring the first four Virginia-class boats.
- The Virginia-class boat procured in FY2003 fell between the FY1998-FY2002 block buy contract noted above and the FY2004-FY2008 MYP contract noted below, and was contracted for separately.
- The five Virginia-class boats procured FY2004-FY2008, known as the Block II boats, were procured under an MYP contract covering those years.
- The eight Virginia-class boats procured in FY2009-FY2013, known as the Block III boats, were procured under an MYP contract covering those years.
- The 10 Virginia-class boats procured in FY2014-FY2018, known as the Block IV boats, were procured under an MYP contract covering those years.
- The Virginia-class boats being procured in FY2019-FY2023, known as the Block V boats, are to be procured under an MYP contract covering those years.

FY2019-FY2023 MYP Contract

Table 2 shows a total of nine Virginia-class boats scheduled for procurement under the FY2019-FY2023 MYP contract. The Navy's FY2020 budget submission had stated that the Navy was negotiating an MYP contract for 10 Virginia-class boats during these years. On this basis, observers anticipated that the FY2019-FY2023 Virginia-class MYP contract would include a total of 10 or perhaps even 11 boats.

In early November 2019, however, the Navy confirmed to reporters that, after lengthy negotiations with the program's prime contractor, General Dynamics, the two sides had reached an agreement for an MYP contract including nine Virginia-class boats with an option for a 10th.

The Navy awarded the contract—a fixed-price incentive fee (FPIF) MYP contract—on December 2, 2019. The contract includes nine Virginia-class boats (eight of which are to be built with the Virginia Payload Module, or VPM (see discussion below), plus an option for a 10th boat that would also be built with the VPM. The contract also includes a 10th shipset of supplier-made components, so that if the option for the 10th boat is exercised, the ship can be constructed in a timely manner. The option for the 10th boat can be awarded any time during the contract's five-year period.[15]

and Block Buy Contracting in Defense Acquisition: Background and Issues for Congress, by Ronald O'Rourke.

[14] For a discussion of block buy contracting, see CRS Report R41909, *Multiyear Procurement (MYP) and Block Buy Contracting in Defense Acquisition: Background and Issues for Congress*, by Ronald O'Rourke and Moshe Schwartz. The FY1998-FY2002 Virginia-class block buy contract was the first instance of block buy contracting—the mechanism of a block buy contract was essentially created for procuring the first for Virginia-class boats.

[15] For press reports about the contract, see, for example, Megan Eckstein, "Navy Awards $22B Contract to Electric Boat, Newport News Shipbuilding for 9 Block V Virginia Subs," *USNI News*, December 2, 2019; David B. Larter, "US Navy Awards Largest-Ever Shipbuilding Contract to Electric Boat for New Attack Submarines," *Defense News*, December 2, 2019; Rich Abott, "Navy Awards Largest Contract Ever, $22.2 Billion For 9 Block V Virginia Subs," *Defense Daily*, December 2, 2019.

Joint Production Arrangement

Virginia-class boats are built jointly by General Dynamics' Electric Boat Division (GD/EB) of Groton, CT, and Quonset Point, RI—the program's prime contractor—and Huntington Ingalls Industries' Newport News Shipbuilding (HII/NNS), of Newport News, VA. The arrangement for jointly building Virginia-class boats was proposed to Congress by GD/EB, HII/NNS, and the Navy, and agreed to by Congress in 1997, as part of Congress's action on the Navy's budget for FY1998, the year that the first Virginia-class boat was procured.[16] A primary aim of the arrangement was to minimize the cost of building Virginia-class boats at a relatively low annual rate in two shipyards (rather than entirely in a single shipyard) while preserving key submarine-construction skills at both shipyards.

Under the arrangement, GD/EB builds certain parts of each boat, HII/NNS builds certain other parts of each boat, and the yards have taken turns building the reactor compartments and performing final assembly of the boats. The arrangement has resulted in a roughly 50-50 division of Virginia-class profits between the two yards and preserves both yards' ability to build submarine reactor compartments (a key capability for a submarine-construction yard) and perform submarine final-assembly work.[17]

Integrated Enterprise Plan (IEP)

Under a plan it calls the Integrated Enterprise Plan (IEP), the Navy plans to build Columbia-class ballistic missile submarines jointly at GD/EB and HII/NNS, with most of the work going to GD/EB. (The IEP was previously called the Submarine Unified Build Strategy, or SUBS.) As part of this plan, the Navy plans to adjust the division of work on the Virginia-class attack submarine program so that HII/NNS would receive a larger share of the final-assembly work for that program than it has received in the past.[18]

---

[16] See Section 121 of the FY1998 National Defense Authorization Act (H.R. 1119/P.L. 105-85 of November 18, 1997).

[17] The joint production arrangement is a departure from prior U.S. submarine construction practices, under which complete submarines were built in individual yards. The joint production arrangement is the product of a debate over the Virginia-class acquisition strategy within Congress, and between Congress and DOD, that occurred in 1995-1997 (i.e., during the markup of the FY1996-FY1998 defense budgets). The goal of the arrangement is to keep both GD/EB and HII/NNS involved in building nuclear-powered submarines, and thereby maintain two U.S. shipyards capable of building nuclear-powered submarines, while minimizing the cost penalties of using two yards rather than one to build a submarine design that is being procured at a relatively low annual rate. The joint production agreement cannot be changed without the agreement of both GD/EB and HII/NNS.

[18] Key elements of IEP include the following:

- GD/EB is to be the prime contractor for designing and building Columbia-class boats;
- HII/NNS is to be a subcontractor for designing and building Columbia-class boats;
- GD/EB is to build certain parts of each Columbia-class boat—parts that are more or less analogous to the parts that GD/EB builds for each Virginia-class attack submarine;
- HII/NNS is to build certain other parts of each Columbia-class boat—parts that are more or less analogous to the parts that HII/NNS builds for each Virginia-class attack submarine;
- GD/EB is to perform the final assembly on all 12 Columbia-class boats;
- as a result of the three previous points, the Navy estimates that GD/EB would receive an estimated 77%-78% of the shipyard work building Columbia-class boats, and HII/NNS would receive 22%-23%;
- GD/EB is to continue as prime contractor for the Virginia-class program, but to help balance out projected submarine-construction workloads at GD/EB and HII/NNS, the division of work between the two yards for building Virginia-class boats is to be adjusted so that HII/NNS would perform the final assembly on a greater number of Virginia-class boats than it would have under a continuation of the current Virginia-class division of work (in which final assemblies are divided more or less evenly between the two shipyards); as a

Schedule and Cost Performance

Earlier Record

As noted in CRS testimony in 2014,[19] the Virginia (SSN-774) class attack program was cited as an example of a successful acquisition program. The program received a David Packard Excellence in Acquisition Award from DOD in 2008. Although the program experienced cost growth in its early years that was due in part to annual procurement rates that were lower than initially envisaged and challenges in restarting submarine production at Newport News Shipbuilding,[20] the lead ship in the program was delivered within four months of the target date that had been established about a decade earlier, and until recently, ships had been delivered largely on cost and ahead of schedule.[21]

More-Recent Reported Delays Relative to Targeted Delivery Dates

Beginning in March and April 2019, it was reported that GD/EB, HII/NNS, and their supplier firms were experiencing challenges in meeting scheduled delivery times as the Virginia-class program transitions over time from production of two "regular" Virginia-class boats per year to two VPM-equipped boats per year. As a result of these challenges, it was reported, the program has experienced months-long delays in efforts to build boats relative to their targeted delivery dates.[22] A November 4, 2019, press report stated that "the most recent Virginia-class boat, the Delaware, was delivered by Huntington Ingalls Newport News nearly nine months behind

consequence, HII/NNS would receive a greater share of the total work in building Virginia-class boats than it would have under a continuation of the current division of work.

See Richard B. Burgess, "Submarine Admirals: 'Unified Build Strategy' Seeks Affordability for Future Sub Fleet," *Seapower*, July 8, 2016; Julia Bergman, "Congressmen Visit EB A Day After It Is Named Prime Contractor for Ohio Reaplcement Program," *The Day (New London)*, March 29, 2016; Sydney J. Freedberg Jr., "Ohio Replacement Plan Is Good News For Electric Boat," *Breaking Defense*, March 29, 2016; Robert McCabe, "Newport News Shipbuilding's Share of Virginia-Class Submarine Deliveries to Grow," *Virginian-Pilot (Newport News)*, March 29, 2016; Valerie Insinna, "GD Electric Boat Chosen To Take Lead Role for Ohio Replacement Sub," *Defense Daily*, March 30, 2016: 1-3; Hugh Lessig, "Navy: More Submarine Work Coming to Newport News Shipyard," *Military.com*, March 30, 2016. See also Statement of the Honorable Sean J. Stackley, Assistant Secretary of the Navy (Research, Development and Acquisition), and Vice Admiral Joseph P. Mulloy, Deputy Chief of Naval Operations for Integration of Capabilities and Resources, and Lieutenant General Robert S. Walsh, Deputy Commandant, Combat Development and Integration & Commanding General, Marine Corps Combat Development Command, before the Subcommittee on Seapower and Projection Forces of the House Armed Services Committee on Department of the Navy Seapower and Projection Forces Capabilities, February 25, 2016, p. 12.

[19] See Statement of Statement of Ronald O'Rourke, Specialist in naval Affairs, Congressional Research Service, before the House Armed Services Committee on Case Studies in DOD Acquisition: Finding What Works, June 24, 2014, p. 4.

[20] See Statement of Ronald O'Rourke, Specialist in National Defense, Congressional Research Service, before the House Armed Services Committee Subcommittee on Seapower and Expeditionary Forces Hearing on Submarine Force Structure and Acquisition Policy, March 8, 2007, Table 10 on pp. 14-15.

[21] For discussions of recent exceptions, see Christopher P. Cavas, "US Navy Submarine Program Loses Some of Its Shine," *Defense News*, March 13, 2017; David B. Larter, "Virginia-Class Attack Sub Delivers late As US Navy Aims to Get Program Back on Course," *Defense News*, June 26, 2018.

[22] See, for example, Government Accountability Office, *Columbia Class Submarine[:] Overly Optimistic Cost Estimate Will Likely Lead to Budget Increases*, GAO-19-497, April 2019, pp. 20-23; David B. Larter, "Late Is the New Normal for Virginia-Class Attack Boats," *Defense News*, March 20, 2019; Megan Eckstein, "Navy: Lack of Submarine Parts Slowing Down Maintenance, New Construction," *USNI News*, March 26, 2019. See also David B. Larter, "The US Navy, Seeking Savings, Shakes Up Its Plans for More Lethal Attack Submarines," *Defense News*, April 3, 2019.

schedule, which is later than the four-to-seven month delays the Navy predicted earlier in the year."[23]

Virginia Payload Module (VPM)

The Navy plans to build most Virginia-class boats procured in FY2019 and subsequent years with the Virginia Payload Module (VPM), an additional, 84-foot-long, mid-body section equipped with four large-diameter, vertical launch tubes for storing and launching additional Tomahawk missiles or other payloads. The VPM's vertical launch tubes are to be used to store and fire additional Tomahawk cruise missiles or other payloads, such as large-diameter unmanned underwater vehicles (UUVs).[24] The 4 additional launch tubes in the VPM could carry a total of 28 additional Tomahawk cruise missiles (7 per tube),[25] which would increase the total number of torpedo-sized weapons (such as Tomahawks) carried by the Virginia-class design from about 37 to about 65—an increase of about 76%.[26]

Building Virginia-class boats with the VPM is intended to compensate for a sharp loss in submarine force weapon-carrying capacity that will occur with the retirement in FY2026-FY2028 of the Navy's four Ohio-class cruise missile/special operations forces support submarines (SSGNs).[27] Each SSGN is equipped with 24 large-diameter vertical launch tubes, of which 22 can be used to carry up to 7 Tomahawks each, for a maximum of 154 vertically launched Tomahawks per boat, or 616 vertically launched Tomahawks for the four boats. Twenty-two Virginia-class boats built with VPMs could carry 616 Tomahawks in their VPMs.

The Navy's FY2021 budget submission shows that Virginia-class boats with the VPM generally have estimated recurring unit procurement costs of roughly $3.4 billion. The joint explanatory statement for the FY2014 DOD Appropriations Act (Division C of H.R. 3547/P.L. 113-76 of January 17, 2014) required the Navy to submit biannual reports to the congressional defense committees describing the actions the Navy is taking to minimize costs for the VPM.[28]

Acoustic and Other Improvements

In addition to the VPM, the Navy is introducing acoustic and other improvements to the Virginia-class design that are intended to help maintain the design's superiority over Russian and Chinese submarines.[29]

---

[23] David B. Larter, "US Navy to Slash the Number of Virginia-Class Attack Subs in Long-Delayed Block V Contract," *Defense News*, November 4, 2019.

[24] For an illustration of the VPM, see http://www.gdeb.com/news/advertising/images/VPM_ad/VPM.pdf, which was accessed by CRS on March 1, 2012.

[25] Michael J. Conner, "Investing in the Undersea Future," *U.S. Naval Institute Proceedings*, June 2011: 16-20.

[26] A Virginia-class SSN can carry about 25 torpedoes in its four horizontal torpedo tubes and associated torpedo room, and an additional 12 Tomahawk cruise missiles (which are torpedo-sized) in its bow-mounted vertical lunch tubes, for a total of about 37 torpedo-sized weapons. Another 28 Tomahawks in four mid-body vertical tubes would increase that total by about 76%.

[27] Michael J. Conner, "Investing in the Undersea Future," *U.S. Naval Institute Proceedings*, June 2011: 16-20.

[28] See PDF page 239 of 351 of the joint explanatory statement for Division C of H.R. 3547.

[29] For press reports discussing these improvements, see Kris Osborn, "The Navy Wants to Turn Its Nuclear Attack Submarines Into 'Spy' Ships," *National Interest*, May 28, 2018; Kris Osborn, "Navy Launches Most High-Tech & Stealthy Attack Sub Ever," *Scout Warrior*, November 18, 2017; Megan Eckstein, "Navy Considering Mid-Block Virginia-Class Upgrades, SSGN Construction in Late 2030s," *USNI News*, November 2, 2017; Zachary Cohen, "US Launches 'Most Advanced' Stealth Sub Amid Undersea Rivalry," *CNN*, October 26, 2017; Franz-Stefan Gady, "US Navy Christens Most Advanced Attack Sub Ever," *The Diplomat*, October 17, 2017; Douglas Ernst, "Navy Christens

FY2021 Funding Request

Original FY2021 Budget Submission

The Navy's original FY2021 budget submission estimates the procurement cost of the Virginia-class boat requested for procurement in FY2021 at $3,539.4 million (i.e., about $3.5 billion). The boat has received $915.7 million in prior-year "regular" advance procurement (AP) funding, and $289.0 million in prior-year Economic Order Quantity (EOQ) AP funding for components of boats being procured under the FY2019-FY2023 MYP contract. The Navy's original FY2021 budget submission requests the remaining $2,334.7 million needed to complete the boat's estimated procurement cost, as well as $1,473.8 million in "regular" AP funding for Virginia-class boats to be procured in future fiscal years and $427.4 million in EOQ AP funding for components of boats being procured under the FY2019-FY2023 MYP contract, bringing the total amount of procurement and AP funding requested for the program in FY2021 to $4,235.9 million (i.e., about $4.2 billion), excluding outfitting and post-delivery costs.

Reported Late November Amendment to Budget to Request a Second Boat in FY2021

Press reports in late November 2020 stated that the Trump Administration, as an 11th-hour amendment to the Navy's original FY2021 budget submission, had decided to request the procurement of a second Virginia-class boat in FY2021, and will work with Congress to identify offsets to DOD's FY2021 budget to pay for procuring a second Virginia-class boat in FY2021.[30] The reported change in the number of Virginia-class boats that the Administration is requesting for procurement in FY2021 could increase by about $2.76 billion the combined amount of procurement and advance procurement (AP) funding that the administration is requesting for the Virginia-class program for FY2021. CRS as of December 1, 2020, had not received any documentation from the Administration detailing the exact changes to the Virginia-class program procurement and AP funding lines that would result from this reported change. Pending the delivery of that information from the Administration, this CRS report continues to use the originally requested FY2021 procurement and AP funding figures for the Virginia-class program in its tables and narrative discussions.

Second Boat Included in Navy's FY2021 Unfunded Priorities List

The Navy's FY2021 unfunded priorities list (UPL) reportedly lists a second Virginia-class boat (which would be the 10th boat under the FY2019-FY2023 Virginia-class MYP contract) as the Navy's top unfunded priority for FY2021, and states that fully funding this additional boat in

---

Its 'Most Advanced' Attack Submarine Ever," *Washington Times*, October 16, 2017; Dave Majumdar, "Stealth and Armed to the Teeth: US Navy's Big Plan for Submarine Dominance," *National Interest*, July 9, 2016; Kris Osborn, "'Acoustic Superiority': US Navy's Secret Submarine Plan to Dominate the Seas," *National Interest*, June 20, 2016; Dave Majumdar, "This Is How the U.S. Navy's Submarine Force Dominates the World's Oceans," *National Interest*, May 17, 2016; Megan Eckstein, "Submarines To Become Stealthier Through Acoustic Superiority Upgrades, Operational Concepts," *USNI News*, March 1, 2016.

[30] Roxana Tiron, "White House Backs Adding Second Attack Sub to Expand Navy (2)," *Bloomberg Government*, November 25, 2020; Caitlin McFall, "Trump Administration Planning to Ask US Congress to Fund Two Virginia-class Attack Submarines in 2021," *Fox News*, November 26, 2020; Rich Abott, "Trump Administration Reverses, Asks For Second FY '21 Virginia-Class Submarine," *Defense Daily*, November 30, 2020; Aidan Quigley, "Trump Administration Reverses Course, Asks for Second Virginia-Class Submarine in FY-21," *Inside Defense*, November 30, 2020.

FY2021 would require an additional $2.76 billion in funding.[31] The Navy believes the industrial base has the capacity to take on the additional work associated with building the 10th boat.[32]

Submarine Construction Industrial Base

U.S. Navy submarines are built by GD/EB and HII/NNS. These are the only two shipyards in the country capable of building nuclear-powered ships. GD/EB builds submarines only, while HII/NNS also builds nuclear-powered aircraft carriers and is capable of building other types of surface ships.

In addition to GD/EB and HII/NNS, the submarine construction industrial base includes hundreds of supplier firms, as well as laboratories and research facilities, in numerous states. Much of the total material procured from supplier firms for the construction of submarines comes from sole-source suppliers. For nuclear-propulsion component suppliers, an additional source of stabilizing work is the Navy's nuclear-powered aircraft carrier construction program.[33] In terms of work provided to these firms, a carrier nuclear propulsion plant is roughly equivalent to five submarine propulsion plants. Much of the design and engineering portion of the submarine construction industrial base is resident at GD/EB; additional portions are resident at HII/NNS and some of the component makers.

SSN Deployments Delayed Due to Maintenance Backlogs

In recent years, a number of the Navy's SSNs have had their deployments delayed due to maintenance backlogs at the Navy's four government-operated naval shipyards (NSYs), which are the primary facilities for conducting depot-level maintenance work on Navy SSNs. Delays in deploying SSNs can put added operational pressure on other SSNs that are available for deployment. For additional background information on this issue, see **Appendix D**.

Issues for Congress

Potential Impact of COVID-19 Situation

One issue for Congress concerns the potential impact of the COVID-19 situation on the execution of U.S. military shipbuilding programs, including the Virginia-class program. A September 14, 2020, press report states

> Despite the coronavirus pandemic taking its toll on submarine construction at Newport News Shipbuilding, as the company president announced last month, the shipyard and the crew of the future Montana (SSN-794) have been working hard to keep the Virginia-class attack sub on track to deliver to the fleet next year.
>
> The Navy christened Montana over the weekend in the first-ever all-virtual christening ceremony at Newport News Shipbuilding, where ship sponsor and former Interior

[31] See, for example, David B. Larter, "Here's the $5.4 Billion of Stuff the US Navy Says It Wants But Didn't Fit in Its FY21 Budget Request," *Defense News*, February 21, 2020; Ben Werner, "Second Virginia Attack Boat Tops Navy's Fiscal Year 2021 Unfunded Priorities List," *USNI News*, February 20, 2020.

[32] Source: Navy briefing on its proposed FY2021 budget, February 11, 2020.

[33] For more on this program, see CRS Report RS20643, *Navy Ford (CVN-78) Class Aircraft Carrier Program: Background and Issues for Congress*, by Ronald O'Rourke.

Secretary Sally Jewell was among the only people by the boat when she bashed a bottle of sparkling wine against the hull to christen it.

Montana began construction in April 2015 and is expected to deliver to the Navy late next year. After its christening over the weekend, the boat will be moved into the water in the coming weeks for final construction activities and to eventually conduct testing and trials. Due to delays in SSN construction, this float-off is taking place a few months later than originally planned—though a company official told USNI News they are confident they can keep to the late 2021 planned delivery.

Last month, Mike Petters, the CEO of parent company Huntington Ingalls Industries, told investors that the Virginia-class submarine construction line was bearing a disproportionate amount of the impact of COVID-19-related delays and disruptions at the Virginia shipyard, due to how the Navy asked the yard to prioritize resources.

"What happens is, when you're at less than full attendance, you start moving people from one area to another, and you start trying to make sure that you are focused on getting the right skills onto the right place. And so I think that's unique to Newport News, I think that dealing with commissioned ships and deployable assets is a unique challenge for them in this environment," he said, referencing the fact that Newport News Shipbuilding is also conducting repairs and mid-life overhauls on aircraft carriers and submarines in addition to building new ones.

"At the beginning of this process, working with the Navy to try to make sure we prioritized deployable ships, and then unit deliveries, that starts to move around the priorities in the business a little bit," he said about how resources were being applied to keep some programs on schedule and choose where delays are more acceptable.

During a pre-christening media day, Vice President of Virginia-Class Submarine Construction Jason Ward told USNI News that the next SSN behind Montana, the future New Jersey, is where the yard is seeing the effects of COVID and reprioritizing people and materials that may be in short supply due to the pandemic….

"Right behind [Montana], Newport News is working on New Jersey, where the next major milestone is focused on pressure hull complete. And that's where we're focused on making sure we are working within the confines of our new environment with COVID. I'm really pleased to report that the number of shipbuilders that have supported this construction production line has continued to understand their essential working criteria and have adapted very strongly to the new protocols that we've put in place to socially distance and to keep our shipbuilders safe, which is really the first and primary objective when the pandemic came upon us in March."…

During the media event, marine painter Sheniqua Johnson said all employees were required to wear masks and social distance when they could, and that the shipyard had been generous in providing hand sanitizer, cleaning wipes and disinfectant sprays so that everyone could keep their workplaces germ-free.

Richard Mattheisen, a pipefitter foreman, said during the event that COVID "slowed us down, just like it slowed everybody else down; just like always, we found a way to come through it here."

"Submarines are tight quarters, so it's so hard to social distance here. So we started doing things like on top of the masks we also wear a plastic shield over our face, almost like we use double eye protection when we grind. So we started doing that, and hanging curtains between people working together, just because it's such tight quarters on submarines," he said, noting that there were slowdowns in the beginning of the pandemic but that his team has picked up the pace once they found the right workarounds to get the job done while keeping everyone safe and healthy.

> Asked what it was like to be caught between the fleet, which always wants more submarines as fast as it can get them, and the shipyard, which is balancing delays at the yard due to suppliers running behind and employees being out on leave due to the pandemic, [Montana Commanding Officer Capt. Michael] Delaney said, "I would be lying to say that we're full-throttle here amidst COVID. I have actually been very impressed [with] how the shipyard and ship's force and the Navy in general has dealt with the COVID pandemic here. We've had to take lots of measures to mitigate that, between temperature checks, we've divided our training times so that we're in smaller groups throughout the day. So while there have been some challenges that we've had to work around, the resiliency of our sailors and our shipyard workers have pretty much weathered the storm and been able to continue to make progress and successfully as close as we can drive towards the schedule of getting this ship ready for sea."[34]

For additional discussion of this issue, see CRS Report RL32665, *Navy Force Structure and Shipbuilding Plans: Background and Issues for Congress*, by Ronald O'Rourke.

Funding for Second Boat in FY2021

Another issue for Congress is whether to provide funding for procuring a second Virginia-class boat in FY2021 (which would be the 10th boat under the MYP contract).

As noted earlier, press reports in late November 2020 stated that the Trump Administration, as an 11th-hour amendment to the Navy's original FY2021 budget submission, had decided to request the procurement of a second Virginia-class boat in FY2021, and will work with Congress to identify offsets to DOD's FY2021 budget to pay for procuring a second Virginia-class boat in FY2021. The reported change in the number of Virginia-class boats that the Administration is requesting for procurement in FY2021 could increase by about $2.76 billion the combined amount of procurement and advance procurement (AP) funding that the administration is requesting for the Virginia-class program for FY2021. CRS as of December 1, 2020, had not received any documentation from the Administration detailing the exact changes to the Virginia-class program procurement and AP funding lines that would result from this reported change. Pending the delivery of that information from the administration, this CRS report continues to use the originally requested FY2021 procurement and AP funding figures for the Virginia-class program in its tables and narrative discussions.

Supporters of adding funding for the procurement of a second Virginia-class boat in FY2021 could argue that it is the top item on the Navy's FY2021 Unfunded Priorities List (UPL), that some observers have identified attack submarines as particularly important for countering China's improving naval capabilities,[35] that procuring a second Virginia-class boat in FY2021 could help the Navy to more quickly recover from the projected valley or trough in SSN force levels and achieve the Navy's 66-boat SSN force-level objective, that the Navy believes the industrial base has the capacity to take on the additional work associated with a 10th boat, and that adding a second Virginia-class boat in FY2021 could improve production economies of scale in the Virginia-class program and provide better support for supplier firms, including firms involved in making nuclear propulsion components for Navy ships.[36]

---

[34] Megan Eckstein, "Attack Sub Montana Christened at Newport News, As Yard Tries Keeping to Schedule Despite COVID," *USNI News*, September 14, 2020.

[35] For discussion of China's naval modernization effort and U.S. Navy responses to that effort, see CRS Report RL33153, *China Naval Modernization: Implications for U.S. Navy Capabilities—Background and Issues for Congress*, by Ronald O'Rourke.

[36] For a news report discussing the final point, see Ben Werner, "Nuclear Reactor Builder Warns of Loss if Navy Buys Single Virginia Attack Boat in FY '21," *USNI News*, February 25, 2020.

Opponents of adding funding for the procurement of a second Virginia-class boat in FY2021 could argue that adding a 10th boat to the FY2019-FY2023 Virginia-class MYP contract could stress the submarine industrial base, particularly in the context of FY2021 being the year that the Navy wants to also start building the first Columbia-class ballistic missile submarine (see next section), that there may be more cost-effective uses for the additional $2.76 billion that would be needed to fully fund the second boat, including other items on the unfunded lists of the Navy and the other services, and that the FY2019-FY2023 MYP contract already contains funding for a 10th shipset of Virginia-class supplier-made components, the purpose of which is to help provide stability for key component makers.

Industrial-Base Challenges of Building Both Virginia- and Columbia-Class Boats

Another potential issue for Congress concerns the potential industrial-base challenges of building both Virginia- and Columbia-class boats at the same time. Along with continued production of Virginia-class SSNs, the Navy in FY2021 is to also begin building Columbia-class ballistic missile submarines (SSBNs). Observers have expressed concern about the industrial base's capacity for building both Virginia- and Columbia-class boats without encountering bottlenecks or other production problems in one or both of these programs. Concerns about the ability of the submarine construction industrial base to execute an eventual procurement rate of two VPM-equipped Virginia-class boats and one Columbia-class boat per year have been heightened by recent reports of challenges faced by the two submarine-construction shipyards (GD/EB and HII/NNS), as well as submarine component supplier firms in meeting scheduled delivery times for Virginia-class boats as the Virginia-class program transitions over time from production of two "regular" Virginia-class boats per year to two VPM-equipped boats per year.[37] Potential oversight questions for Congress include the following:

- Do the Navy and the submarine builders agree on the question of the capacity of the industrial base to support various potential Virginia- and Columbia-class workloads?
- What steps are the Navy, the submarine builders, and submarine supplier firms taking to bring the capacity of the industrial base more into alignment with desired submarine procurement rates? What are the costs of these steps, and what portion of these costs will be borne by the government?

[37] See, for example, Government Accountability Office, *Columbia Class Submarine[:] Overly Optimistic Cost Estimate Will Likely Lead to Budget Increases*, GAO-19-497, April 2019, pp. 20-23; David B. Larter, "Late Is the New Normal for Virginia-Class Attack Boats," *Defense News*, March 20, 2019; Megan Eckstein, "Navy: Lack of Submarine Parts Slowing Down Maintenance, New Construction," *USNI News*, March 26, 2019; David B. Larter, "The US Navy, Seeking Savings, Shakes Up Its Plans for More Lethal Attack Submarines," *Defense News*, April 3, 2019; Anthony Capaccio, "U.S. Navy Sub Firepower Upgrade Delayed by Welding Flaws," *Bloomberg*, August 13, 2019; Paul McLeary, "Weld Problems Spread To Second Navy Sub Program," *Breaking Defense*, August 14, 2019; David B. Larter, "Questions About US Navy Attack Sub Program Linger as Contract Negotiations Drag," *Defense News*, August 16, 2019; Emma Watkins, "Will the U.S. Navy Soon Have a Missile-Tube Problem?" *National Interest*, August 19, 2019; David B. Larter, "As CNO Richardson Departs, US Submarine Builders Face Pressure," *Defense News*, August 22, 2019; David B. Larter, "After a Leadership Shakeup at General Dynamics, a Murky Future for Submarine Building," *Defense News*, October 28, 2019; Rich Abott, "Navy Says Virginia Sub Delays Due To Faster Production Rate," *Defense Daily*, November 6, 2019.

Regarding the second bullet point above, a November 7, 2019, press report states

> The Navy and submarine builders General Dynamics Electric Boat and Newport News Shipbuilding are executing a recovery plan to get Block IV Virginia-class submarine production back on track, after the last five submarines in Block III delivered late.
>
> The Virginia-class program had previously been held up as a model of efficient procurement, as the boats were delivering on-cost and on-schedule—or at times beating cost and schedule—and former Navy Secretary Ray Mabus grew to joke about the program as having a punch-card rewards program to get 10 subs for the price of nine. Delivery times also dropped from 84 months to 72 and then to 66, on their way down to 60 months for Block IV.
>
> But as the program moved from building one a year to two a year, the subs stopped delivering on time.
>
> "The way we build our submarines, there's four super modules [that make up each boat]: two built at EB, two built at Newport News. From their module perspective, they have to deliver a module (one of each kind) every six months. And you look the entire fabrication, from the pipe shop to pre-fab to sub-modules to modules, when you're at that cadence of two per year, every part of that assembly line must be on cadence. At the pre-fab, at the sub-module, the footprint, the people, the tools, the procedures. So what we learned is, if you get out of cadence in any part of that step, you're going to impact final assembly and test. So that's what happened," Rear Adm. David Goggins, the program executive officer for submarines, said in response to a USNI News question during a question-and-answer session at the Naval Submarine League's annual symposium.
>
> "So the companies have put together a recovery plan. We have the metrics. And the key thing is getting back to cadence across the entire production line, from the pipe shop, pre-fab, sub-modules, modules and final assembly and test. Our plan has us getting back to cadence by the end of next year," he said.
>
> Speaking to USNI News after the event, Goggins said that Newport News Shipbuilding had expanded its footprint at its Virginia shipyard to try to keep up with the higher workload, which wouldn't be sustainable in the long-run as the shipyard also begins work on the upcoming Columbia-class ballistic missile submarine program.
>
> "At Newport News they expanded to additional footprint, and now the key thing is, over the next year and a half, through the end of next year, is getting those modules completed on schedule," Goggins told USNI News.
>
> "So by the end of next year, we're back to cadence and using the planned footprint with the planned resources to go execute module deliveries."
>
> He said metrics are in place to ensure the company is on track to meet this goal. Asked if any significant hurdles remain, he said, "they need to go execute the plan. They have the people, they have the footprint, they have the tooling; they just have to go execute, which they're doing today."
>
> Tom Plante, the director of strategic planning for Electric Boat, told USNI News during a September visit to the Connecticut shipyard that some of the vendors were unable to keep up with the faster pace of shipbuilding, either sending parts late or sending parts with deficiencies that had to be later ripped out of modules and replaced.
>
> "We were challenged to meet our schedules in Block IV, and some of that is program execution, some of that is ripples caused by [continuing resolutions] and funding and plus-ups," Plante said.
>
> "If we get off that rhythm, if we get off that cadence, that causes these ripples, and it takes multiple ships to work through that. If you have a supply problem—non-conforming material comes in and I've got to stop, I've got to go assess, I've got to rip things out, I've

> got to re-do things—then that all adds time and cost to construction execution by shipbuilders."
>
> Goggins said Wednesday [November 6] that it would be important to keep the recovery plan on track and get the Virginia production line under control so problems don't spill over and affect the Columbia class of SSBNs.
>
> "The key thing is getting back to cadence across the entire production line, and that is needed to ensure the success of the Columbia program, which is key," the rear admiral said.
>
> Despite the challenge keeping up with the faster delivery schedule, Goggins said the Virginia-class submarines have been delivering at ever-higher quality. The future Delaware (SSN-791) completed its sea trials on Oct. 10 and delivered on Oct. 25 and was the highest-quality sub delivered to date, according to the Board of Inspection and Survey (INSURV) report, Goggins said.[38]

Technical Risk in Virginia-Class Block V Design

Another potential issue for Congress concerns technical risk in the design for Block V version of the Virginia-class submarine—the version to be procured during the FY2019-FY2023 Virginia-class MYP contract. A June 2020 Government Accountability Office (GAO) report—the 2020 edition of GAO's annual report surveying DOD major acquisition programs—stated the following regarding the Block V version of the Virginia-class design:

> **Current Status**
>
> In December 2019, the Navy awarded a multiyear contract valued at approximately $22 billion for construction of nine VCS Block V submarines, with options for three more. According to program officials and a Navy report, Block IV construction challenges stemming from poor Navy oversight and an optimistic schedule made it difficult for the Navy to negotiate the Block V contract in line with initial plans.
>
> The Navy plans for all of Block V to include acoustic superiority improvements, and VPM will be added starting with the second Block V sub. Program officials said that the Block V design will differ from Block IV by approximately 20 percent. The program office previously planned to largely complete basic and functional designs for VPM by construction start. However, the shipbuilders are currently behind schedule. The program now plans to complete 75 percent of the basic and functional design by construction start—compared to the 86 percent it initially planned—despite having an additional 6 months due to contract award delays. This lag in design progress is partly due to shipbuilders' challenges in using a new software design tool. The Columbia class program (CLB) has already experienced challenges converting its design into instructions to build the CLB. If the VCS starts construction prior to maturing its design, it will place itself at greater risk of cost growth and schedule delays.
>
> The Navy and its shipbuilders will also face challenges in simultaneously building Block V while starting construction on the CLB in 2021. The Navy and shipbuilders will need to manage staffing and other resources across both programs. Program officials said that the CLB is a higher Navy priority, which could mean delays to the Block V to keep the CLB on schedule.
>
> **Program Office Comments**

[38] Megan Eckstein, "Navy, Sub Builders Have Recovery Plan to Get Virginia Attack Boat deliveries Back on Schedule," *USNI News*, November 7, 2019. See also Megan Eckstein, "Sub Builders Confident Young Workforce Can Keep Virginia Attack Boats On track," *USNI News*, December 3, 2019.

> We provided a draft of this assessment to the program office for review and comment. The program office provided technical comments, which we incorporated where appropriate. The program office stated that poor Block IV construction performance is improving. It said that the focus is now on modular outfitting followed by final assembly and test. The program office stated that completing 75 percent of the VPM design prior to starting construction will be adequate to build the first hull within cost and schedule. The program said shipbuilders and the VCS and CLB programs are actively working to minimize any impacts stemming from CLB construction start.[39]

Additional Issues

Classified Recommendations in December 2019 DOT&E Report

Another oversight issue for Congress concerns 15 classified recommendations for the Virginia-class program mentioned in a December 2019 report from DOD's Director, Operational Test and Evaluation (DOT&E)—DOT&E's annual report for FY2019.[40]

Problem with Hull Coating

Another issue for Congress concerns a problem with the hull coating used on Virginia-class boats that was first reported years ago, and then again 2017[41] and 2019.[42]

Defective Parts Reported in 2016

Another issue for Congress concerns three Virginia-class boats that were reported in 2016 to have been built with defective parts, and the operational and cost implications of this situation.[43]

Substandard Steel Reported in 2020

Another issue for Congress concerns substandard steel used for building Navy submarines going back decades. A June 15, 2020, press report stated

> For decades, the Navy's leading supplier of high-strength steel for submarines provided subpar metal because one of the company's longtime employees falsified lab results — putting sailors at greater risk in the event of collisions or other impacts, federal prosecutors said in court filings Monday.
>
> The supplier, Kansas City-based Bradken Inc., paid $10.9 million as part of a deferred prosecution agreement, the Justice Department said. The company provides steel castings that Navy contractors Electric Boat and Newport News Shipbuilding use to make submarine hulls.

---

[39] Government Accountability Office, D*efense Acquisitions Annual Assessment[:] Drive to Deliver Capabilities Faster Increases Importance of Program Knowledge and Consistent Data for Oversight*, GAO-20-439, June 2020, p. 149.

[40] Department of Defense, Director, Operational Test & Evaluation, *FY2019 Annual Report*, December 2019, p. 162.

[41] See William Cole, "Navy Subs Still Show Issue with Stealth Coating," *Military.com*, March 6, 2017.

[42] See James Clark, "Whistleblower Accuses Largest US Military Shipbuilder of Putting 'American Lives at Risk' by Falsifying Tests on Submarine Stealth Coating," *Task & Purpose*, October 3, 2019.

[43] For press reports discussing this issue, see David Larter, "Secret Weld: How Shoddy Parts Disabled A $2.7 Billion Submarine," *Navy Times*, March 28, 2016; Sydney J. Freedberg Jr., "Welding Problems Fixed For Virginia Subs; Carter Tours Electric Boat," *Breaking Defense*, May 24, 2016; and David Larter, "Attack Sub Minnesota Rejoins Fleet After Parts Fiasco," *Navy Times*, June 4, 2016.

Bradken in 2008 acquired a foundry in Tacoma, Washington, that produced steel castings for the Navy. According to federal prosecutors, Bradken learned in 2017 that the foundry's director of metallurgy had been falsifying the results of strength tests, indicating that the steel was strong enough to meet the Navy's requirements when in fact it was not.

Prosecutors say the company initially disclosed its findings to the Navy but then wrongfully suggested that the discrepancies were not the result of fraud. That hindered the Navy's investigation into the scope of the problem as well as its efforts to remediate the risks to its sailors, prosecutors said.

"Bradken placed the Navy's sailors and its operations at risk," Seattle U.S. Attorney Brian Moran said in a news release. "Government contractors must not tolerate fraud within their organizations, and they must be fully forthcoming with the government when they discover it."

There is no allegation in the court documents that any submarine parts failed, but Moran said the Navy had incurred increased costs and maintenance to ensure the subs remain seaworthy. The government did not disclose which subs were affected.

The foundry's director of metallurgy, Elaine Thomas, 66, of Auburn, Washington, was charged criminally with one count of major fraud against the United States. Thomas, who worked in various capacities at the lab for 40 years, was due to make an initial appearance in federal court June 30. Her attorney, John Carpenter, declined to comment.

The criminal complaint said investigators were able to compare internal company records with test results that Thomas certified. The analysis showed that she fabricated the results of 240 productions of steel, representing nearly half of the high-yield steel Bradken produced for Navy submarines — often toughness tests conducted at negative-100 degrees Fahrenheit, the complaint said.

When a special agent with the Department of Defense's Criminal Investigative Service confronted her with falsified results dating back to 1990, she eventually conceded that the results were altered — "Yeah, that looks bad," the complaint quoted her as saying. She said she may have done it because she believed it was "a stupid requirement" that the test be conducted at such a cold temperature, the complaint said.

Investigators said the fraud came to light when a metallurgist being groomed to replace Thomas upon her planned 2017 retirement noticed some suspicious results. The company said it immediately fired Thomas.

"While the company acknowledges that it failed to discover and disclose the full scope of the issue during the initial stages of the investigation, the government has recognized Bradken's cooperation over the last eighteen months to be exceptional," the company said in an emailed statement. "Bradken has a long history of proudly serving its clients, and this incident is not representative of our organization. We deeply regret that a trusted employee engaged in this conduct."

Bradken agreed to take steps that include increased oversight over the lab, fraud protections and changes to the foundry's management team. If Bradken complies with the requirements outlined in the deferred prosecution agreement, the government will dismiss the criminal fraud charge against it after three years.[44]

[44] Gene Johnson (Associated Press), "Feds Say Company Provided Subpar Steel for US Navy Subs," *Defense News*, June 15, 2020.

A June 19, 2020, press report states

> Sailors underway on submarines with steel from a company that pleaded guilty to providing the Navy with fraudulent materials aren't at risk, the service's top acquisition official told reporters on Thursday [June 18].
>
> Assistant Secretary of the Navy for Research, Development and Acquisition James Geurts said the Navy had evaluated the potential risks for suspect steel that was used to build Navy submarines from a Washington state foundry owned by Bradken, Inc.
>
> "We have done the work to understand any potential risk, and believe we have mitigated any potential risk for our in-service submarines," Geurts said in response to a question to USNI News.
>
> "It did cost us some time to go do the exploration to make sure that we were comfortable with the safety of our sailors."…
>
> Guerts said the Navy also evaluated submarines under construction for problems derived from the steel.
>
> "We have done a sweep of any material that was in the queue for new construction submarines. That's a little easier because it isn't in the submarine yet, and we're confident in the material for any of the new construction submarines," he said.
>
> "We are working closely with the company and have instituted additional audits and inspections in reviewing with them and Electric Boat to ensure that we won't have a repeat of this."
>
> The foundry continues to make steel castings for both Electric Boat and Newport News.
>
> Both companies said they are working to maintain the quality of the materials from Bradken.[45]

Legislative Activity for FY2021

Reported Late November Amendment to Budget to Request Second Boat in FY2021

As noted earlier, press reports in late November 2020 stated that the Trump Administration, as an 11th-hour amendment to the Navy's original FY2021 budget submission, had decided to request the procurement of a second Virginia-class boat in FY2021, and will work with Congress to identify offsets to DOD's FY2021 budget to pay for procuring a second Virginia-class boat in FY2021. The reported change in the number of Virginia-class boats that the Administration is requesting for procurement in FY2021 could increase by about $2.76 billion the combined amount of procurement and advance procurement (AP) funding that the Administration is requesting for the Virginia-class program for FY2021. CRS as of December 1, 2020, had not received any documentation from the Administration detailing the exact changes to the Virginia-class program procurement and AP funding lines that would result from this reported change. Pending the delivery of that information from the administration, this CRS report continues to use the originally requested FY2021 procurement and AP funding figures for the Virginia-class program in its tables and narrative discussions.

[45] Sam LaGrone, "Navy Has 'Mitigated' Risk of Suspect Steel From Company in Federal Fraud Case," USNI News, June 19, 2020. See also Julia Bergman, "Submarine Supplier Mishaps Lead to Call for Hearing," *New London Day*, June 16 (updated June 17), 2020.

Congressional Action on FY2021 Funding Request

Table 3 summarizes congressional action on the Navy's original FY2021 budget funding request for the Virginia-class program.

Table 3. Congressional Action on Original FY2021 Funding Request

Millions of dollars, rounded to nearest tenth, under Navy's original FY2021 budget submission

	Request under original FY2021 budget submission	Authorization			Appropriation		
		HASC	SASC	Conf.	HAC	SAC	Conf.
Virginia class procurement	2,334.7	4,630.7	2,260.3		4,603.2	2,334.7	
Virginia class advance procurement (AP)	1,901.2	2,173.2	2,373.2		2,173.2	2,373.2	
(Quantity)	*(1)*	*(2)*	*(1)*		*(2)*	*(1)*	
TOTAL	**4,235.9**	**6,803.9**	**4,633.5**		**6,776.4**	**4,707.9**	

Source: Table prepared by CRS based on Navy's original FY2021 budget submission, committee and conference reports, and explanatory statements on FY2021 National Defense Authorization Act and FY2021 DOD Appropriations Act.

Notes: HASC is House Armed Services Committee; **SASC** is Senate Armed Services Committee, **SAC** is Senate Appropriations Committee, **HAC** is House Appropriations Committee, **Conf.** is conference agreement.

FY2021 National Defense Authorization Act (H.R. 6395/S. 4049)

House

The House Armed Services Committee, in its report (H.Rept. 116-442 of July 9, 2020) on H.R. 6395, recommended the funding levels and ship quantity shown in the HASC column of **Table 3**. Regarding these recommended funding levels and the recommended ship quantity, H.Rept. 116-442 states

> *Virginia-class submarine*
>
> The budget request included $2.33 billion for one Virginia-class submarine. The committee was discouraged to see that the second submarine that had been previously planned and was reflected in the fiscal year 2020 budget, was no longer included in the budget request despite clear direction from Congress in the National Defense Authorization Act for Fiscal Year 2020 (Public Law 116–92). This not only conflicts with years of testimony from combatant commanders, not only deepens the gap between the projected fleet size versus the requirement, but it also puts the Department of Defense's highest priority procurement program, the Columbia-class ballistic missile submarine, at additional risk. Due to the nature of the multiyear procurement contract, the true impact of not funding the second Virginia-class submarine in fiscal year 2021 will not be realized until 2023, at a time when both shipyards are reaching a peak in their hiring in order to support the construction of the first Columbia-class submarine. A decline in Virginia-class work during that period will likely have a dramatic impact on the Columbia program due to the hiring agreements that were previously negotiated between the labor unions and the two shipyards. The committee believes that all measures should be taken to avoid any disruptions to the Columbia-class

> submarine program, which has consumed all schedule margin and is still at great risk of achieving its required first strategic patrol date.
>
> Therefore, the committee recommends $4.43 billion, an increase of $2.1 billion, for a second Virginia-class submarine. (Page 21)

H.Rept. 116-442 also states

> *Submarine Supplier Development*
>
> The committee recognizes that the submarine supply base lost approximately 12,000 suppliers since the end of the Cold War. Material provided by the submarine industrial base is planned to grow by more than 200 percent over the next 5 years, after more than two decades of nurturing a fragile industrial base where 75 percent of funding for supplier material was awarded to single or sole-source suppliers. Congress authorized and appropriated funding in fiscal year 2019 and fiscal year 2020 and provided flexible authorities supporting submarine industrial base expansion and stability initiatives. In fiscal year 2019, the Navy identified 324 suppliers as execution-critical and has been conducting assessments of the health and readiness of those suppliers. In the 2020 assessment, the number of critical suppliers has grown to 350, of which 61 have been identified as challenged to meet future demand. The committee believes that continued investment in supplier development will reduce material lead times and improve the ability of the submarine industrial base to meet challenging construction schedules at higher rates of production. Therefore, the committee encourages the Secretary of the Navy to include supplier development funding in future budget requests until the number of challenged suppliers has been significantly reduced. (Pages 19-20)

H.Rept. 116-442 also states

> *SSN(X) future propulsion and power requirements*
>
> The committee supports the efforts of the Navy to develop a new class of attack submarine capable of meeting future threats posed by near peer competitors through the end of the century. The Next Generation Attack Submarine, SSN(X), will counter threats posed by peer adversary submarines, future unmanned underwater vehicles, and emerging persistent threats to U.S. undersea supremacy that already utilize the benefits of electric propulsion. Critical to the success of the Next Generation Attack Submarine is the ability to combine stealth and speed while maintaining the power needed to operate future sensors and weapons to prosecute undersea warfare. The Navy's prior investments and advancements achieved in the Columbia class program have led to a superior quiet acoustic propulsion system capable of meeting current and future threats while also providing the power architecture and flexibility needed to enable future weapons and sensors. The committee supports efforts by the Navy to seek designs and technologies that will provide the future SSN(X) with greater warfighting capabilities combined with total reduced costs through leveraging prior investments from the Columbia class program. The committee encourages the Navy to balance superior technological capability with affordability by evaluating non-developmental electric power and propulsion solutions. These solutions have demonstrated superior quiet operational capabilities and lethality and will ensure the future SSN(X) can meet the essential operational and mission requirements within an accelerated submarine build cycle. (Page 47)

Senate

The Senate Armed Services Committee, in its report (S.Rept. 116-236 of June 24, 2020) on S. 4049, recommended the funding levels and ship quantity shown in the SASC column of **Table 3**. The recommended reduction of $74.4 million in procurement funding is for "Unjustified cost growth." The recommended increase of $472.0 million in advance procurement (AP) funding is

for "Long lead material for option ship." (Page 458) Regarding these recommended funding levels and the recommended ship quantity, S.Rept. 116-236 states

> ***Virginia-class submarines***
>
> The budget request included $2.3 billion in line number 5 of Shipbuilding and Conversion, Navy (SCN), for procurement of Virginia-class submarines.
>
> The committee notes unjustified unit cost growth in plans ($25.0 million), modular mast ($8.8 million), propulsor ($25.6 million), and command, control, communications and information ($15.0 million) systems.
>
> Therefore, the committee recommends a decrease of $74.4 million in line number 5 of SCN.
>
> ***Virginia-class submarine advance procurement***
>
> The budget request included $1.9 billion in line number 6 of Shipbuilding and Conversion, Navy (SCN), for Virginia-class submarine advance procurement.
>
> The committee notes that on December 2, 2019, the Navy awarded a contract modification to procure 9 Virginia-class submarines in fiscal years 2019 through 2023, as authorized by section 124 of the National Defense Authorization Act for Fiscal Year 2018 (Public Law 115–91). This contract includes an option for one additional submarine.
>
> The committee supports preserving the option to procure 10 Virginia-class attack submarines in fiscal years 2019 through 2023. The committee understands that construction on this additional submarine would not begin until March 2024, that the typical procurement funding profile for Virginia-class submarines consists of 2 years of advance procurement followed by 1 year of full funding procurement, and that $272.0 million is the minimum amount of additional advance procurement funding required in fiscal year 2021.
>
> The committee supports utilizing a typical procurement funding profile and believes doing so would also provide additional time to more fully assess previous concerns of Navy officials regarding the ability of the submarine industrial base to build 10 Virginia-class submarines, with 9 having the Virginia Payload Module in this time frame.
>
> Additionally, as noted in the Senate report accompanying S. 1790 (S. Rept. 116–48) of the National Defense Authorization Act for Fiscal Year 2020, the committee still has insufficient clarity on the Navy's intentions regarding a significant Virginia-class submarine design change, which could occur in the same time frame.
>
> The committee recognizes that this additional submarine was the Chief of Naval Operations' top unfunded priority for fiscal year 2021. If this level of support continues, the committee expects the Navy to budget accordingly in its fiscal year 2022 future years defense program submission.
>
> Therefore, the committee recommends an increase of $472.0 million in line number 6 of SCN. (Pages 30-31)

Section 1025 of S. 4049 as reported by the committee states (emphasis added)

> SEC. 1025. SENSE OF CONGRESS ON ACTIONS NECESSARY TO ACHIEVE A 355-SHIP NAVY.
>
> It is the sense of Congress that to achieve the national policy of the United States to have available, as soon as practicable, not fewer than 355 battle force ships—
>
> (1) the Navy must be adequately resourced to increase the size of the Navy in accordance with the national policy, which includes the associated ships, aircraft, personnel, sustainment, and munitions;

(2) **across fiscal years 2021 through 2025, the Navy should start construction on not fewer than**—

(A) 12 Arleigh Burke-class destroyers;

(B) **10 Virginia-class submarines**;

(C) 2 Columbia-class submarines;

(D) 3 San Antonio-class amphibious ships;

(E) 1 LHA-class amphibious ship;

(F) 6 John Lewis-class fleet oilers; and

(G) 5 guided missile frigates;

(3) new guided missile frigate construction should increase to a rate of between two and four ships per year once design maturity and construction readiness permit;

(4) the Columbia-class submarine program should be funded with additions to the Navy budget significantly above the historical average, given the critical single national mission that these vessels will perform and the high priority of the shipbuilding budget for implementing the National Defense Strategy;

(5) stable shipbuilding rates of construction should be maintained for each vessel class, utilizing multi-year or block buy contract authorities when appropriate, until a deliberate transition plan is identified; and

(6) prototyping of potential new shipboard sub systems should be accelerated to build knowledge systematically, and, to the maximum extent practicable, shipbuilding prototyping should occur at the subsystem-level in advance of ship design.

S.Rept. 116-232 also states

Submarine Construction Workforce Training Pipeline

The budget request included $9.2 million in Research, Development, Test, and Evaluation (RDT&E), Defense-wide, for PE 67210D8Z Industrial Base Analysis and Sustainment Support.

The committee notes that, over the next decade, the submarine shipbuilding industry must hire at least 18,000 new skilled workers to support the production of the Columbia-class ballistic missile submarine and the continued construction of the Virginia-class submarine. The submarine industry has worked closely with State and local governments, community colleges, high schools, and community-based non-profits for the past several years to establish new training pipelines to support these increased hiring needs.

Thus far, such pipeline training programs have placed nearly 2,500 people in submarine industry jobs. The committee notes that additional funding will increase the throughput of these pipelines and expand them into additional States to more adequately respond to the hiring demand.

Therefore, the committee recommends an increase of $20.0 million in RDT&E, Defense-wide, for PE 67210D8Z for increasing the submarine construction workforce training pipeline. (Page 124)

FY2021 DOD Appropriations Act (H.R. 7617/S. XXXX)

House

The House Appropriations Committee, in its report (H.Rept. 116-453 of July 16, 2020) on H.R. 7617, recommended the funding levels and ship quantity shown in the HAC column of **Table 3**. The recommended net increase of $2,268.520 million includes recommended decreases for "Universal modular mast excess funds" ($4.449 million), "Propulsor excess funds" ($12.809 million), and "Hardware excess funds" ($10.222 million), and an increase of $2,296.0 million for "Program increase—one additional submarine." (Page 184) The recommended increase of $272.0 million for advance procurement (AP) funding is for "Program increase—one additional submarine." (Page 184)

Senate

The Senate Appropriations Committee, in the explanatory statement for S. XXXX that the committee released on November 10, 2020, recommended the funding levels shown in the SAC column of **Table 3**. The recommended increase of $472.0 million for Virginia-class advance procurement (AP) is for "Program increase: Advance procurement for additional Virginia Class Submarine." (Page 114)

The explanatory statement for the bill released by the committee on November 10, 2020, states

> VIRGINIA Class Submarines.—The fiscal year 2021 President's budget request includes $4,235,880,000 for the procurement of a single VIRGINIA Class submarine [VCS] as part of a nine-ship Block V multi-year procurement [MYP] contract that was awarded on December 2, 2019. The Committee notes that the contract includes options for one additional VCS in fiscal years 2021, 2022, or 2023. The Committee further notes that the Block V contract award represents a change to the Navy's acquisition strategy for Block V VCS from fiscal years 2018 and 2019, when the Navy requested and was authorized by the Congress MYP authority for 10-ship Block V VCS acquisition. The Committee is aware of challenges and schedule delays in ongoing construction of the previously awarded 10-ship Block IV VCS program, but also believes that repeated adjustments to acquisition and funding strategies negatively impact the submarine industrial base and its suppliers. The Committee is concerned that the Navy continues to inject programmatic, acquisition, and fiscal uncertainty into the VCS program, which will likely have detrimental effects on the acquisition of the COLUMBIA Class. The Committee recommends an additional $472,000,000 in advance procurement for a potential tenth Block V VCS and directs that none of these funds may be obligated and expended until the Assistant Secretary of the Navy (Research, Development and Acquisition) provides an update to the congressional defense committees on the Navy's submarine enterprise management and acquisition plans, to include progress updates of VCS Block IV performance against established metrics and cost impacts. (Page 117)

Appendix A. Past SSN Force-Level Goals

This appendix summarizes attack submarine force-level goals since the Reagan Administration (1981-1989).

The Reagan-era plan for a 600-ship Navy included an objective of achieving and maintaining a force of 100 SSNs.

The George H. W. Bush Administration's proposed Base Force plan of 1991-1992 originally called for a Navy of more than 400 ships, including 80 SSNs.[46] In 1992, however, the SSN goal was reduced to about 55 boats as a result of a 1992 Joint Staff force-level requirement study (updated in 1993) that called for a force of 51 to 67 SSNs, including 10 to 12 with Seawolf-level acoustic quieting, by the year 2012.[47]

The Clinton Administration, as part of its 1993 Bottom-Up Review (BUR) of U.S. defense policy, established a goal of maintaining a Navy of about 346 ships, including 45 to 55 SSNs.[48] The Clinton Administration's 1997 QDR supported a requirement for a Navy of about 305 ships and established a tentative SSN force-level goal of 50 boats, "contingent on a reevaluation of peacetime operational requirements."[49] The Clinton Administration later amended the SSN figure to 55 boats (and therefore a total of about 310 ships).

The reevaluation called for in the 1997 QDR was carried out as part of a Joint Chiefs of Staff (JCS) study on future requirements for SSNs that was completed in December 1999. The study had three main conclusions:

- "that a force structure below 55 SSNs in the 2015 [time frame] and 62 [SSNs] in the 2025 time frame would leave the CINC's [the regional military commanders-in-chief] with insufficient capability to respond to urgent crucial demands without gapping other requirements of higher national interest. Additionally, this force structure [55 SSNs in 2015 and 62 in 2025] would be sufficient to meet the modeled war fighting requirements";
- "that to counter the technologically pacing threat would require 18 Virginia class SSNs in the 2015 time frame"; and

[46] For the 80-SSN figure, see Statement of Vice Admiral Roger F. Bacon, U.S. Navy, Assistant Chief of Naval Operations (Undersea Warfare) in U.S. Congress, House Armed Services Committee, Subcommittee on Seapower and Strategic and Critical Materials, *Submarine Programs*, March 20, 1991, pp. 10-11, or Statement of Rear Admiral Raymond G. Jones Jr., U.S. Navy, Deputy Assistant Chief of Naval Operations (Undersea Warfare), in U.S. Congress, Senate Armed Services Committee, Subcommittee on Projection Forces and Regional Defense, *Submarine Programs*, June 7, 1991, pp. 10-11.

[47] See Richard W. Mies, "Remarks to the NSL Annual Symposium," *Submarine Review*, July 1997, p. 35; "Navy Sub Community Pushes for More Subs than Bottom-Up Review Allowed," *Inside the Navy*, November 7, 1994, pp. 1, 8-9; *Attack Submarines in the Post-Cold War Era: The Issues Facing Policymakers*, op. cit., p. 14; Robert Holzer, "Pentagon Urges Navy to Reduce Attack Sub Fleet to 50," *Defense News*, March 15-21, 1993, p. 10; Barbara Nagy, " Size of Sub Force Next Policy Battle," *New London Day*, July 20, 1992, pp. A1, A8.

[48] Secretary of Defense Les Aspin, U.S. Department of Defense, *Report on the Bottom-Up Review*, October 1993, pp. 55-57.

[49] Secretary of Defense William S. Cohen, U.S. Department of Defense, *Report of the Quadrennial Defense Review*, May 1997, pp. 29, 30, 47.

- "that 68 SSNs in the 2015 [time frame] and 76 [SSNs] in the 2025 time frame would meet all of the CINCs' and national intelligence community's highest operational and collection requirements."[50]

The conclusions of the 1999 JCS study were mentioned in discussions of required SSN force levels, but the figures of 68 and 76 submarines were not translated into official DOD force-level goals.

The George W. Bush Administration's report on the 2001 QDR revalidated the amended requirement from the 1997 QDR for a fleet of about 310 ships, including 55 SSNs. In revalidating this and other U.S. military force-structure goals, the report cautioned that as DOD's "transformation effort matures—and as it produces significantly higher output of military value from each element of the force—DOD will explore additional opportunities to restructure and reorganize the Armed Forces."[51]

DOD and the Navy conducted studies on undersea warfare requirements in 2003-2004. One of the Navy studies—an internal Navy study done in 2004—reportedly recommended reducing the attack submarine force level requirement to as few as 37 boats. The study reportedly recommended homeporting a total of nine attack submarines at Guam and using satellites and unmanned underwater vehicles (UUVs) to perform ISR missions now performed by attack submarines.[52]

In March 2005, the Navy submitted to Congress a report projecting Navy force levels out to FY2035. The report presented two alternatives for FY2035—a 260-ship fleet including 37 SSNs and 4 SSGNs, and a 325-ship fleet including 41 SSNs and 4 SSGNs.[53]

In May 2005, it was reported that a newly completed DOD study on attack submarine requirements called for maintaining a force of 45 to 50 boats.[54]

In February 2006, the Navy proposed to maintain in coming years a fleet of 313 ships, including 48 SSNs.

Although the Navy's ship force-level goals have changed repeatedly in subsequent years, the figure of 48 SSNs remained unchanged until December 2016, when the Navy released a force-level objective for achieving and maintaining a force of 355 ships, including 66 SSNs.

[50] Department of Navy point paper dated February 7, 2000. Reprinted in *Inside the Navy*, February 14, 2000, p. 5.

[51] U.S. Department of Defense, *Quadrennial Defense Review*, September 2001, p. 23.

[52] Bryan Bender, "Navy Eyes Cutting Submarine Force," *Boston Globe*, May 12, 2004, p. 1; Lolita C. Baldor, "Study Recommends Cutting Submarine Fleet," *NavyTimes.com*, May 13, 2004.

[53] U.S. Department of the Navy, *An Interim Report to Congress on Annual Long-Range Plan for the Construction of Naval Vessels for FY 2006*. The report was delivered to the House and Senate Armed Services and Appropriations Committees on March 23, 2005.

[54] Robert A. Hamilton, "Delegation Calls Report on Sub Needs Encouraging," *The Day (New London, CT)*, May 27, 2005; Jesse Hamilton, "Delegation to Get Details on Sub Report," *Hartford (CT) Courant*, May 26, 2005.

Appendix B. Options for Funding SSNs

This appendix presents information on some alternative profiles for funding the procurement of SSNs. These alternatives include but are not necessarily limited to the following:

- **two years of advance procurement (AP) funding followed by full funding**—the traditional approach, under which there are two years of AP funding for the SSN's long-leadtime components, followed by the remainder of the boat's procurement funding in the year of procurement;
- **one year of AP funding followed by full funding**—one year of AP funding for the SSN's long-leadtime components, followed by the remainder of the boat's procurement funding in the year of procurement;
- **full funding with no AP funding (single-year full funding, aka point-blank full funding)**—full funding of the SSN in the year of procurement, with no AP funding in prior years;
- **incremental funding**—partial funding of the SSN in the year of procurement, followed by one or more years of additional funding increments needed to complete the procurement cost of the ship; and
- **advance appropriations**—a form of full funding that can be viewed as a legislatively locked in form of incremental funding.[55]

Navy testimony to Congress in early 2007, when Congress was considering the FY2008 budget, suggested that two years of AP funding are required to fund the procurement of an SSN, and consequently that additional SSNs could not be procured until FY2010 at the earliest.[56] This testimony understated Congress's options regarding the procurement of additional SSNs in the near term. Although SSNs are normally procured with two years of AP funding (which is used primarily for financing long-leadtime nuclear propulsion components), Congress can procure an SSN without prior-year AP funding, or with only one year of AP funding. Consequently, Congress at that time had the option of procuring an additional SSN in FY2009 and/or FY2010.

Single-year full funding has been used in the past by Congress to procure nuclear-powered ships for which no prior-year AP funding had been provided. Specifically, Congress used single-year full funding in FY1980 to procure the nuclear-powered aircraft carrier CVN-71, and again in FY1988 to procure the CVNs 74 and 75. In the case of the FY1988 procurement, under the Administration's proposed FY1988 budget, CVNs 74 and 75 were to be procured in FY1990 and FY1993, respectively, and the FY1988 budget was to make the initial AP payment for CVN-74. Congress, in acting on the FY1988 budget, decided to accelerate the procurement of both ships to

[55] For additional discussion of these funding approaches, see CRS Report RL32776, *Navy Ship Procurement: Alternative Funding Approaches—Background and Options for Congress*, by Ronald O'Rourke.

[56] For example, at a March 1, 2007, hearing before the House Armed Services Committee on the FY2008 Department of the Navy budget request, Representative Taylor asked which additional ships the Navy might want to procure in FY2008, should additional funding be made available for that purpose. In response, Secretary of the Navy Donald Winter stated in part: "The Virginia-class submarines require us to start with a two-year advanced procurement, to be able to provide for the nuclear power plant that supports them. So we would need to start two years in advance. What that says is, if we were able to start in '08 with advanced procurement, we could accelerate, potentially, the two a year to 2010." (Source: Transcript of hearing.) Navy officials made similar statements before the same subcommittee on March 8, 2007, and before the Senate Armed Services Committee on March 29, 2007.

FY1988, and fully funded the two ships that year at a combined cost of $6.325 billion. The ships entered service in 1995 and 1998, respectively.[57]

The existence in both FY1980 and FY1988 of a spare set of Nimitz-class reactor components was not what made it possible for Congress to fund CVNs 71, 74, and 75 with single-year full funding; it simply permitted the ships to be built more quickly. What made it possible for Congress to fund the carriers with single-year full funding was Congress's constitutional authority to appropriate funding for that purpose.

Procuring an SSN with one year of AP funding or no AP funding would not materially change the way the SSN would be built—the process would still encompass two or three years of advance work on long-leadtime components, and an additional five or six years or so of construction work on the ship itself. The outlay rate for the SSN could be slower, as outlays for construction of the ship itself would begin one or two years later than normal, and the interval between the recorded year of full funding and the year that the ship enters service would be longer than normal.

Congress in the past has procured certain ships in the knowledge that those ships would not begin construction for some time and consequently would take longer to enter service than a ship of that kind would normally require. When Congress procured two nuclear-powered aircraft carriers (CVNs 72 and 73) in FY1983, and another two (CVNs 74 and 75) in FY1988, it did so in both cases in the knowledge that the second ship in each case would not begin construction until some time after the first.

[57] In both FY1988 and FY1980, the Navy had a spare set of Nimitz (CVN-68) class nuclear propulsion components in inventory. The existence of a spare set of components permitted the carriers to be built more quickly than would have otherwise been the case, but it is not what made the single-year full funding of these carriers possible. What made it possible was Congress's authority to appropriate funds for the purpose.

Appendix C. 2006 Navy Study on Options for Mitigating Projected Valley in SSN Force Level

This appendix presents background information on a study initiated by the Navy in 2006 for mitigating the valley in the SSN force levels projected for the 2020s and 2030s. The study was completed in early 2007 and briefed to CRS and CBO on May 22, 2007.[58] At the time of the study, the SSN force was projected to bottom out at 40 boats and then recover to 48 boats by the early 2030s. Principal points in the Navy study (which cite SSN force-level projections as understood at that time) include the following:

- The day-to-day requirement for deployed SSNs is 10.0, meaning that, on average, a total of 10 SSNs are to be deployed on a day-to-day basis.[59]
- The peak projected wartime demand is about 35 SSNs deployed within a certain amount of time. This figure includes both the 10.0 SSNs that are to be deployed on a day-to-day basis and 25 additional SSNs surged from the United States within a certain amount of time.[60]
- Reducing Virginia-class shipyard construction time to 60 months—something that the Navy already plans to do as part of its strategy for meeting the Virginia-class cost-reduction goal (see earlier discussion on cost-reduction goal)—will increase the size of the SSN force by two boats, so that the force would bottom out at 42 boats rather than 40.[61]
- If, in addition to reducing Virginia-class shipyard construction time to 60 months, the Navy also lengthens the service lives of 16 existing SSNs by periods ranging from 3 months to 24 months (with many falling in the range of 9 to 15 months), this would increase the size of the SSN force by another two boats, so that the force would bottom out at 44 boats rather than 40 boats.[62] The total cost of

[58] Navy briefing entitled, "SSN Force Structure, 2020-2033," presented to CRS and CBO on May 22, 2007.

[59] The requirement for 10.0 deployed SSNs, the Navy stated in the briefing, was the current requirement at the time the study was conducted.

[60] The peak projected wartime demand of about 35 SSNs deployed within a certain amount of time, the Navy stated, is an internal Navy figure that reflects several studies of potential wartime requirements for SSNs. The Navy stated that these other studies calculated various figures for the number of SSNs that would be required, and that the figure of 35 SSNs deployed within a certain amount of time was chosen because it was representative of the results of these other studies.

[61] If shipyard construction time is reduced from 72 months to 60 months, the result would be a one-year acceleration in the delivery of all boats procured on or after a certain date. In a program in which boats are being procured at a rate of two per year, accelerating by one year the deliveries of all boats procured on or after a certain date will produce a one-time benefit of a single year in which four boats will be delivered to the Navy, rather than two. In the case of the Virginia-class program, this year might be around 2017. As mentioned earlier in the discussion of the Virginia-class cost-reduction goal, the Navy believes that the goal of reducing Virginia-class shipyard construction time is a medium-risk goal. If it turns out that shipyard construction time is reduced to 66 months rather than 60 months (i.e., is reduced by 6 months rather than 12 months), the size of the SSN force would increase by one boat rather than two, and the force would bottom out at 41 boats rather than 42.

[62] The Navy study identified 19 existing SSNs whose service lives currently appear to be extendable by periods of 1 to 24 months. The previous option of reducing Virginia-class shipyard construction time to 60 months, the Navy concluded, would make moot the option of extending the service lives of the three oldest boats in this group of 19, leaving 16 whose service lives would be considered for extension.

extending the lives of the 16 boats would be roughly $500 million in constant FY2005 dollars.[63]

- The resulting force that bottoms out at 44 boats could meet the 10.0 requirement for day-to-day deployed SSNs throughout the 2020-2033 period if, as an additional option, about 40 SSN deployments occurring in the eight-year period 2025-2032 were lengthened from six months to seven months. These 40 or so lengthened deployments would represent about one-quarter of all the SSN deployments that would take place during the eight-year period.
- The resulting force that bottoms out at 44 boats could not meet the peak projected wartime demand of about 35 SSNs deployed within a certain amount of time. The force could generate a total deployment of 32 SSNs within the time in question—3 boats (or about 8.6%) less than the 35-boat figure. Lengthening SSN deployments from six months to seven months would not improve the force's ability to meet the peak projected wartime demand of about 35 SSNs deployed within a certain amount of time.
- To meet the 35-boat figure, an additional four SSNs beyond those planned by the Navy would need to be procured. Procuring four additional SSNs would permit the resulting 48-boat force to surge an additional three SSNs within the time in question, so that the force could meet the peak projected wartime demand of about 35 SSNs deployed within a certain amount of time.
- Procuring one to four additional SSNs could also reduce the number of seven-month deployments that would be required to meet the 10.0 requirement for day-to-day deployed SSNs during the period 2025-2032. Procuring one additional SSN would reduce the number of seven-month deployments during this period to about 29; procuring two additional SSNs would reduce it to about 17, procuring three additional SSNs would reduce it to about 7, and procuring four additional SSNs would reduce it to 2.

[63] The Navy stated that the rough, order-of-magnitude (ROM) cost of extending the lives of 19 SSNs would be $595 million in constant FY2005 dollars, and that the cost of extending the lives of 16 SSNs would be roughly proportional.

The Navy added a number of caveats to these results, including but not limited to the following:

- The requirement for 10.0 SSNs deployed on a day-to-day basis is a current requirement that could change in the future.
- The peak projected wartime demand of about 35 SSNs deployed within a certain amount of time is an internal Navy figure that reflects recent analyses of potential future wartime requirements for SSNs. Subsequent analyses of this issue could result in a different figure.
- The identification of 19 SSNs as candidates for service life extension reflects current evaluations of the material condition of these boats and projected use rates for their nuclear fuel cores. If the material condition of these boats years from now turns out to be worse than the Navy currently projects, some of them might no longer be suitable for service life extension. In addition, if world conditions over the next several years require these submarines to use up their nuclear fuel cores more quickly than the Navy now projects, then the amounts of time that their service lives might be extended could be reduced partially, to zero, or to less than zero (i.e., the service lives of the boats, rather than being extended, might need to be shortened).
- The analysis does not take into account potential rare events, such as accidents, that might force the removal of an SSN from service before the end of its expected service life.[64]
- Seven-month deployments might affect retention rates for submarine personnel.

[64] In January 2005, the Los Angeles-class SSN *San Francisco* (SSN-711) was significantly damaged in a collision with an undersea mountain near Guam. The ship was repaired in part by transplanting onto it the bow section of the deactivated sister ship *Honolulu* (SSN-718). (See, for example, Associated Press, "Damaged Submarine To Get Nose Transplant," *Seattle Post-Intelligencer*, June 26, 2006.) Prior to the decision to repair the *San Francisco*, the Navy considered the option of removing it from service. (See, for example, William H. McMichael, "Sub May Not Be Worth Saving, Analyst Says," *Navy Times*, February 28, 2005; Gene Park, "Sub Repair Bill: $11M," *Pacific Sunday News (Guam)*, May 8, 2005.)

Appendix D. SSN Deployments Delayed Due to Maintenance Backlogs

This appendix presents additional background information on delays in SSN deployments due to a backlog in SSN maintenance at the Navy's four government-operated naval shipyards (NSYs), which are the primary facilities for conducting depot-level maintenance work on Navy SSNs. Delays in deploying SSNs can put added operational pressure on other SSNs that are available for deployment. A September 22, 2020, press report stated

> It has been five years since the attack submarine Boise returned from its last patrol, and this whole time she has been waiting on some loving care and attention in the shipyards.
>
> On Monday [September 21], the check cleared for roughly $351.8 million that covers the initial planning and work as part of her overhaul at Huntington Ingalls Newport News Shipbuilding where she has been in dry dock since earlier this year. Another contract covering the full engineering overhaul is in negotiations, according to Naval Sea System Command spokesperson Colleen O'Rourke,[65] work that will include significant maintenance on the nuclear propulsion system and modernization upgrades.
>
> The running tab on Boise so far is $355 million, with advanced planning money already awarded, according to the Defense Department contract announcement. The work under this contract is scheduled to wrap up in May 2023, eight years after the sub left the operational fleet.
>
> While Boise could be wrapped up by 2023—the overhaul was initially scheduled for 25 months—it's possible the repairs could take longer, O'Rourke said.
>
> The bill will be paid out of 2020 Operations & Maintenance funding, according to the contract announcement.
>
> Boise has been something of a cause célèbre among congressional leaders, who have pointed to the ship's long wait to enter the shipyard as emblematic of the Navy's struggle with maintenance delays. The issue with attack submarines has been complicated, because while that work would typically be done in the public shipyards, those have been backed up with aircraft carriers and the Ohio-class ballistic missile subs.
>
> Some of the Navy's problems will resolve themselves after ballistic missile subs are refueled, said Bryan Clark, a retired submarine officer and analyst with the Center for Strategic and Budgetary Assessments, in a 2019 interview.
>
> "The big factor here is that attack submarines are last in line when it comes to maintenance," Clark explained then. "And that maintenance is done in the public yards, both the refueling and non-refueling overhauls. So that's why you see submarines like Boise who have been waiting a long time to get in, because carriers had a lot of maintenance backlog.
>
> "And working through that backlog pushed SSBN refuelings back, and that in turn pushed attack subs to the end of the line. Now that they are working through the carrier backlog and the SSBN refueling is now largely completed, that's going to mean the attack submarines can be brought back into the public shipyards. So that's a structural issue that's going to work itself out."
>
> But other aspects of the Navy's quest to dig out of the submarine backlog are thornier and will require the service to make long-term commitments to private shipyards, Clark said. One of the main issues with assigning attack subs to private shipyards is that they are not

[65] Colleen O'Rourke is no relation to Ronald O'Rourke.

> necessarily set up as maintenance shops: They're more so built and organized as new construction yards.
>
> Naval Sea Systems Command acknowledged as much in a statement to the Virginian Pilot as part of a story on the delays of Columbus and Helena, which the command attributed to "the workforce's inexperience in conducting submarine maintenance, which differs greatly from new construction."…
>
> In an interview with USNI News, former Naval Sea Systems Command head Vice Adm. Thomas Moore said he thought Boise would go better than previous attempts at maintaining attack boats in private shipyard.
>
> "I think we are well-positioned on Boise, certainly way better than we were on Helena and Columbus, when we learned so many lessons the hard way," Moore said. "They hadn't done submarine work in 10 years, and I think we underestimated how they had atrophied in that skill set. I think they did as well.
>
> "And the other thing is, I think we recognized that we probably put too much on their plate, with multiple [maintenance] availabilities [i.e., ship maintenance projects] on their plate at one time."[66]

An August 2020 GAO report on maintenance delays on aircraft carriers and submarines stated

> The Navy's four shipyards completed 38 of 51 (75 percent) maintenance periods late for aircraft carriers and submarines with planned completion dates in fiscal years 2015 through 2019, for a combined total of 7,424 days of maintenance delay. For each maintenance period completed late, the shipyards averaged 113 days late for aircraft carriers and 225 days late for submarines.

Maintenance Delays at Navy Shipyards for Fiscal Years 2015 through 2019

Aircraft Carriers
- 8 of 18 on time
- 1,128 days of maintenance delay

Submarines
- 5 of 33 on time
- 6,296 days of maintenance delay

Source: GAO analysis of Navy data (text); U.S. Navy/T. Nguyen (aircraft carrier); U.S. Navy/D. Amodo (submarine). | GAO-20-588

> Unplanned work and workforce factors—such as shipyard workforce performance and capacity (having enough people to perform the work)—were the main factors GAO identified as causing maintenance delays for aircraft carriers and submarines. The Navy frequently cited both factors as contributing to the same days of maintenance delay. Unplanned work—work identified after finalizing maintenance plans—contributed to more than 4,100 days of maintenance delays. Unplanned work also contributed to the Navy's 36 percent underestimation of the personnel resources necessary to perform maintenance. The workforce factor contributed to more than 4,000 days of maintenance delay on aircraft carriers and submarines during fiscal years 2015 through 2019.
>
> The Navy has taken steps but has not fully addressed the unplanned work and workforce factors causing the most maintenance delays. First, the Navy updated planning documents to improve estimates and plans to annually update these data, but knowing whether changes improve results may take several years. Second, the Navy has consistently relied on high levels of overtime to carry out planned work. GAO's analysis found that high overtime among certain production shops, such as painting or welding, averaged from 25 to 32 percent for fiscal years 2015 through 2019, with peak overtime as high as 45 percent. Furthermore, shipyard officials told us that production shops at all four shipyards are

[66] David B. Larter, "The Hapless Attack Sub Boise Could Return to the Fleet in 2023 After 8 Years Sidelined," *Defense News*, September 22, 2020.

> working beyond their capacity. Overtime at such rates has been noted as resulting in diminished productivity. Third, the Navy initiated the Shipyard Performance to Plan initiative in the fall of 2018 to address the unplanned work and workforce factors, but it has not yet developed 13 of 25 planned metrics that could improve the Navy's understanding of the causes of maintenance delays. In addition, the Shipyard Performance to Plan initiative does not include goals, milestones, and a monitoring process along with fully developed metrics to address unplanned work and workforce weaknesses. Without fully developing metrics and implementing goals, action plans, milestones, and a monitoring process, the shipyards are not likely to address unplanned work and workforce weaknesses and the Navy is likely to continue facing maintenance delays and reduced time for training and operations with its aircraft carriers and submarines.[67]

A May 26, 2020, press report stated

> After years of struggling to conduct attack submarine maintenance—with the four public naval shipyards prioritizing SSN work last, behind a backlog of ballistic-missile sub and aircraft carrier work, and private shipyards finding it tough to resume submarine repair work after years of only doing new construction—the Navy appears back on track for its SSN maintenance, the head of Naval Sea Systems Command told USNI News.
>
> The move of attack submarine USS Boise (SSN-764) to the dry dock at Newport News Shipbuilding in Virginia is the most visible sign of things moving in the right direction, after the sub has been sitting pier side at nearby Norfolk Naval Shipyard for more than four years waiting for maintenance to begin.
>
> The Navy had previously hoped to get Boise into Newport News as early as 2018, but the private yard struggled with its first two Los Angeles-class SSN maintenance periods—for USS Helena (SSN-725) and USS Columbus (SSN-762)—and didn't have the room for the sub or the workforce to start working on it. As Boise lingered, it became a focal point in the discussion about a lack of repair capacity and a backup of work at the four public naval shipyards.
>
> But, NAVSEA Commander Vice Adm. Tom Moore told USNI News, the Navy is moving into a new era of on-time submarine maintenance….
>
> Moore told USNI News in an interview last week that "I think we are well-positioned on Boise, certainly way better than we were on Helena and Columbus, when we learned so many lessons the hard way: that, one, they hadn't done submarine work in 10 years, and I think we underestimated how they had atrophied in that skill set, and I think they did as well; and the other thing is, I think we recognized that we probably put too much on their plate, with multiple availabilities on their plate at one time." …
>
> Moore said that Electric Boat likely won't be a provider of submarine maintenance for much longer–aside from an availability for USS Hartford (SSN-768) that starts in November 2021, the Connecticut yard will have its hand full with construction of Columbia-class SSBNs and Block V Virginia-class SSNs. Moore said it's important to get the sub repair capability reconstituted at Newport News Shipbuilding so that one private yard can serve as part of the SSN repair community….
>
> Moore acknowledged that the bulk of the Navy's problems in recent years was that its four public shipyards, tasked with maintaining nuclear-powered submarines and aircraft carriers, did not have the capacity to keep up with demand….
>
> If the plan can be executed, Moore said the anticipated work at Norfolk Naval Shipyard matches the workforce capacity, meaning there should be no more backlog….

[67] Government Accountability Office, *Navy Shipyards[:] Actions Needed to Address the Main Factors Causing Maintenance Delays for Aircraft Carriers and Submarines*, GAO-20-588, August 2020, summary page.

> Though Boise has remained a "problem child" for longer than anticipated, Moore noted in the recent interview that SSN maintenance is wrapping up on time more and more as capacity at the public yards grows….
>
> Moore said he was confident NAVSEA was in a good position on SSN maintenance because a whole set of improvements had been made in tandem in recent years: not only was the [naval shipyard] workforce now up to its goal of 36,700 personnel, but an effort to create better business practices is underway and the first projects in a 20-year Shipyard Infrastructure Optimization Plan (SIOP) program are already hitting the waterfront.[68]

A March 2019 Navy report to Congress states that in response to the above committee report language

> The Navy submitted an initial [submarine maintenance] plan in December 2018, that reflected FY 2019 budget information. The Navy has [now] updated this plan to incorporate data from the President's FY 2020 budget submitted on March 11, 2019….
>
> … In the post-Cold War and post 9/11 era, there have been decades of decision making associated with the re-posturing of defense strategies, such as: the reduction in maintenance capacity and flexibility though Base Realignment and Closures (BRAC), increased Operational Tempo (OPTEMPO), evolution of submarine life cycle maintenance plans, budget reductions, and budget uncertainties that have contributed to the current challenges facing the submarine fleet.
>
> The root cause of submarine idle time and associated loss of operational availability, as discussed in the recent Government Accountability Office (GAO) report 19-229, "Actions Needed to Address Costly Maintenance Delays Facing the Attack Submarine Fleet" (issued November 2018), is largely due to public shipyard capacity not keeping pace with growing maintenance requirements that have been building for a number of years prior to the USS BOISE (SSN 764) FY 2016 Engineered Overhaul (EOH). The workload to capacity mismatch resulted in lower priority attack submarine (SSN) availabilities (as compared to ballistic missile submarines and nuclear-powered aircraft carriers) being delivered late and a bow-waving of workload from one fiscal year to the next that could not be executed. The workload backlog exacerbated the public shipyard workload-to-capacity mismatch and contributed to an increasing trend in late SSN [maintenance] deliveries.
>
> The Navy has taken several actions to improve the workload-to-capacity balance at the public shipyards. Notably, over 20,600 workers were hired from FY 2013 through FY 2018, which after accounting for attrition, increased total end strength from 29,400 to 36,700. However, the accelerated hiring resulted in 56 percent of the production workforce having less than five years of experience. The less experienced workforce requires a greater investment in training, as described in the Navy's Report to Congress on the Naval Shipyard Development Plan (issued March 2018), which offers some near term productivity gains. The Navy has also taken additional actions to balance workload at our public shipyards by outsourcing four submarine maintenance availabilities to the private sector and plans to outsource another two submarine availabilities to the private shipyards starting in FY 2020 and FY 2021. Additionally, to ensure on-time delivery from maintenance availabilities, availability inductions have been rescheduled to occur when the shipyards have the capacity to accomplish the availability(s) within programmed schedule durations. This necessary action to improve the on-time delivery of current maintenance availabilities has resulted in some additional submarine maintenance backlog and some accumulation of idle time. Based on actions and initiatives the Navy is currently pursuing to improve submarine operational availability and the outsourcing of two additional

[68] Megan Eckstein, "NAVSEA Says Attack Sub Repairs Much Improved as USS Boise Enters Yard Following 4-Year Wait," *USNI News*, May 26, 2020.

> submarine availabilities to the private sector, the Navy assesses that the submarine idle time will be eliminated by the end of FY 2023 and the submarine maintenance backlog will be worked off by the end of FY 2023.[69]

A November 2018 GAO report on the issue stated the following:

> The Navy has been unable to begin or complete the vast majority of its attack submarine maintenance periods on time resulting in significant maintenance delays and operating and support cost expenditures. GAO's analysis of Navy maintenance data shows that between fiscal year 2008 and 2018, attack submarines have incurred 10,363 days of idle time and maintenance delays as a result of delays in getting into and out of the shipyards. For example, the Navy originally scheduled the USS Boise to enter a shipyard for an extended maintenance period in 2013 but, due to heavy shipyard workload, the Navy delayed the start of the maintenance period. In June 2016, the USS Boise could no longer conduct normal operations and the boat has remained idle, pierside for over two years since then waiting to enter a shipyard…. GAO estimated that since fiscal year 2008 the Navy has spent more than $1.5 billion in fiscal year 2018 constant dollars to support attack submarines that provide no operational capability—those sitting idle while waiting to enter the shipyards, and those delayed in completing their maintenance at the shipyards.
>
> The Navy has started to address challenges related to workforce shortages and facilities needs at the public shipyards. However, it has not effectively allocated maintenance periods among public shipyards and private shipyards that may also be available to help minimize attack submarine idle time. GAO's analysis found that while the public shipyards have operated above capacity for the past several years, attack submarine maintenance delays are getting longer and idle time is increasing. The Navy may have options to mitigate this idle time and maintenance delays by leveraging private shipyard capacity for repair work. But the Navy has not completed a comprehensive business case analysis as recommended by Department of Defense guidelines to inform maintenance workload allocation across public and private shipyards. Navy leadership has acknowledged that they need to be more proactive in leveraging potential private shipyard repair capacity. Without addressing this challenge, the Navy risks continued expenditure of operating and support funding to crew, maintain, and support attack submarines that provide no operational capability because they are delayed in getting into and out of maintenance.[70]

The House Appropriations Committee, in its report (H.Rept. 115-769 of June 20, 2018) on the FY2019 DOD Appropriations Act (H.R. 6157) stated the following:

> SUBMARINE MAINTENANCE SHORTFALLS
>
> The Committee recognizes that the nuclear-capable public naval shipyards are backlogged with submarine maintenance work, while private nuclear-capable shipyards have underutilized capacity. The Los Angeles (SSN–688) class submarines are especially impacted by this backlog, which significantly reduces their operational availability for missions in support of combatant commanders. The Committee directs the Secretary of the Navy to submit a report to the congressional defense committees not later than 90 days after the enactment of this Act that outlines a comprehensive, five-year submarine maintenance plan that restores submarine operational availability and fully utilizes both public and private nuclear-capable shipyards in accordance with all applicable laws. The plan should strive to provide both private and public shipyards with predictable frequency

[69] U.S. Navy, *President's FY 2020 Budget Update to Report to Congress on Submarine Depot Maintenance Prepared by Secretary of the Navy*, generated March 12, 2019, with cover letters dated March 21, 2019, provided to CRS by Navy Office of Legislative Affairs on March 27, 2019, pp. 3-4.

[70] Government Accountability Office, *Navy Readiness[:] Actions Needed to Address Costly Maintenance Delays Facing the Attack Submarine Fleet*, GAO-19-229, November 2018, summary page.

of maintenance availabilities and estimate any potential cost savings that distributing the workload may deliver. (Page 71)

Author Information

Ronald O'Rourke
Specialist in Naval Affairs

Disclaimer

This document was prepared by the Congressional Research Service (CRS). CRS serves as nonpartisan shared staff to congressional committees and Members of Congress. It operates solely at the behest of and under the direction of Congress. Information in a CRS Report should not be relied upon for purposes other than public understanding of information that has been provided by CRS to Members of Congress in connection with CRS's institutional role. CRS Reports, as a work of the United States Government, are not subject to copyright protection in the United States. Any CRS Report may be reproduced and distributed in its entirety without permission from CRS. However, as a CRS Report may include copyrighted images or material from a third party, you may need to obtain the permission of the copyright holder if you wish to copy or otherwise use copyrighted material.