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

May 22, 2023

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, and a total of 38 have been procured through FY2023. Since FY2011, Virginia-class boats have been procured at a rate of two per year. Virginia-class boats procured in FY2019-FY2023 were procured under a multiyear procurement (MYP) contract. The Navy wants the next Virginia-class MYP contract to begin not in FY2024, but in FY2025.

The Virginia-class design has been updated multiple times since FY1998. 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. When procured at a rate of two boats per year, VPM-equipped Virginia-class SSNs have an estimated procurement cost of about $4.3 billion per boat.

The Navy's proposed budget requests the procurement of the 39th and 40th Virginia-class boats. The Navy's FY2024 budget submission states that one of the two boats is to be built to a special configuration referred to as the "Modified VIRGINIA Class Subsea and Seabed Warfare (Mod VA SSW)" configuration, suggesting a configuration that includes a capability for conducting subsea and seabed warfare missions.

The two boats requested for procurement in FY2024 have an estimated combined procurement cost of $9,427.6 million (i.e., about $9.4 billion), including $5,356.9 million for the Mod VA SSW boat and $4,070.7 million for the other boat. The two boats have received a combined total of $2,297.7 million in prior-year advance procurement (AP) funding, and the Navy's proposed FY2024 budget requests the remaining $7,130.0 million needed to complete their estimated combined procurement cost. The Navy's proposed FY2024 budget also requests $1,855.5 million in AP funding for Virginia-class boats to be procured in future fiscal years, $1,360.0 million in Economic Order Quantity (EOQ) funding, which is an additional kind of AP funding that can occur under an MYP contract, and $168.2 million in cost-to-complete (CTC) funding to cover cost growth on Virginia-class boats procured in prior years, bringing the total amount of procurement, AP, EOQ, and CTC funding requested for FY2024 to $10,513.7 million (i.e., about $10.5 billion).

The Navy's current force-level goal, which was released in December 2016, calls for achieving and maintaining a fleet of 355 manned ships, including 66 SSNs. The Navy and the Office of the Secretary Defense have been working since 2019 to develop a successor Navy force-level goal to replace the 355-goal of 2016. Studies of this emerging force-level goal that have been released by the Navy in summary form suggest that the new force-level goal could call for achieving and maintaining a force of 66 to 72 SSNs.

The Navy's FY2024 five-year (FY2024-FY2028) shipbuilding plan includes a total of 10 Virginia-class boats, to be procured at a rate of two per year. The Navy's FY2024 30-year (FY2024-FY2053) shipbuilding plan includes three alternative 30-year shipbuilding profiles for the period FY2029-FY2053. Under these profiles, the SSN force would reach a minimum of 46 boats in FY2030, and grow to 60, 69, or 63 boats by FY2053. Under the alternative where the SSN force grows to 69 boats by FY2053, the force would reach 66 boats in FY2049.

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Introduction

This report provides background information and issues for Congress on the Virginia (SSN-774) class nuclear-powered attack submarine (SSN) program. The Navy has been procuring Virginia-class SSNs since FY1998, and a total of 38 have been procured through FY2023. Since FY2011, Virginia-class boats have been procured at a rate of two per year. The Navy's proposed FY2024 budget requests the procurement of the 39th and 40th Virginia-class boats.

The Virginia-class program poses multiple issues for Congress. Decisions that Congress makes on these issue could substantially affect U.S. Navy capabilities and funding requirements, and the U.S. shipbuilding industrial base.

The Navy's SSN(X) next-generation attack submarine program, which is to be the eventual successor to the Virginia-class SSN program, is discussed in another CRS product: CRS In Focus IF11826, *Navy Next-Generation Attack Submarine (SSN[X]) Program: Background and Issues for Congress*, by Ronald O'Rourke.

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.

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 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;

[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 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.

- 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 recent years from the post-Cold War era to a situation of 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

Force-Level Goal

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

The Navy's current force-level goal, released in December 2016, is to achieve and maintain a fleet of 355 manned ships, including 66 SSNs.[6]

Emerging Successor Force-Level Goal

The Navy and Department of Defense (DOD) since 2019 have been working to develop a new force-level goal to replace the 355-ship force-level goal. Studies of this emerging force-level goal that have been released by the Navy in summary form suggest that the new force-level goal could call for achieving and maintaining a force of 66 to 72 SSNs.[7]

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

Past and Current Force Levels

During most of the 1980s, when plans called for achieving a 600-ship Navy including 100 SSNs, the SSN force included more than 90 boats, peaking at 98 boats at the end of FY1987. The number of SSNs declined after that in a manner that roughly paralleled the decline in the total

[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, *Great Power Competition: Implications for Defense—Issues for Congress*, by Ronald O'Rourke.

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

[7] For the effort to develop a successor to the 355-ship goal of 2016, including the studies that the Navy has released in summary form, see CRS Report RL32665, *Navy Force Structure and Shipbuilding Plans: Background and Issues for Congress*, by Ronald O'Rourke.

size of the Navy over the same time period. The 50 SSNs in service at the end of FY2022 included the following:

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

The three classes of SSNs listed above are discussed further later in this report. In addition to the 50 SSNs shown above, the Navy operates four Ohio (SSBN-726) class SSGNs. Compared to the Navy's SSNs, the SSGNs have a much larger capacity for carrying cruise missiles and SOF, but they are nevertheless general-purpose submarines that can perform missions performed by SSNs.

Projected Procurement Rates and Force Levels

The Navy's FY2024 five-year (FY2024-FY2028) shipbuilding plan includes a total of 10 Virginia-class boats, to be procured at a rate of two per year. The Navy's FY2023 30-year (FY2023-FY2052) shipbuilding plan, released on April 20, 2022, includes three alternative 30-year shipbuilding profiles for the period FY2028-FY2052. Under these profiles, SSNs would be procured during FY2028-FY2052 at a rate of 1.76 to 2.24 boats per year. Based on the three alternative shipbuilding profiles, the FY2023 30-year shipbuilding plan projects that the SSN force will reach a minimum of 46 boats in FY2028, return to 50 boats in FY2032, and grow to 60 to 69 SSNs by FY2052.[8] (The alternative shipbuilding profiles also include the procurement of four to six new SSGNs, with the first to be procured as early as FY2037 or as late as FY2042.)

The number of boats in the SSN force is projected to experience a valley or trough from the mid-2020s through the early 2030s. This valley is a projected consequence of having procured a relatively small number of SSNs during the 1990s, in the early years of the post-Cold War era. The projected SSN valley was first identified by CRS in 1995 and has been discussed in CRS reports and testimony every year since then. As noted above, the FY2023 30-year shipbuilding plan projects that the SSN force will reach a minimum of 46 boats in FY2028, return to 50 boats in FY2032, and then grow to more than 50 boats in subsequent years.

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.[9] To help fill in part of the projected valley, the Navy plans to refuel and extend the service lives of up to seven Los Angeles-class SSNs, while also pursuing "updated service life estimates for the remaining 688s based on current hull by hull utilization."[10] A November 17, 2021, press report stated

[8] For projected force levels each year from FY2023 to FY2052, see CRS Report RL32665, *Navy Force Structure and Shipbuilding Plans: Background and Issues for Congress*, by Ronald O'Rourke.

[9] China took note of the projected valley. The November 2014 edition of a Chinese military journal, for example, included 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.)

[10] Source: Navy information paper on FY2022 Fiscal Planning Framework and SSN-688 class service live extension program questions, February 5, 2021, provided by Navy Office of Legislative Affairs to Congressional Budget Office (CBO) and CRS on February 5, 2021.

> The decline in the number of the Navy's attack submarines (SSNs) is leveling out sooner than was feared just a few years ago, made possible by the decision to extend the service lives of some older SSNs.
>
> Previously, the force level of SSNs was predicted to decline to a "trough" of 41 SSNs in the mid-2020s before the number would start to increase as the building of two Virginia-class SSNs per year hit its stride.
>
> With 50 submarines "we are at that inflection point right now," said Vice Adm. Bill Houston, commander, Naval Submarine Forces, speaking Nov. 17 at the Naval Submarine League's annual symposium in Arlington. "We are actually very stable right now [at 50] and we're starting to increase our numbers.
>
> "How are we doing that? Through an awful lot of hard work by those people who came before me and whose shoulders we're standing on right now; tremendous hard work from the shipbuilders and tremendous from the Navy, from the Department of Defense and from our overall government," Houston said.
>
> An important initiative is the service life extension of several Los Angeles-class SSNs.
>
> "There is additional margin in the Los Angeles class," he said. "We actually have reactor cores available which will refuel and extend a significant number of Los Angeles-class submarines."
>
> Houston was not specific in the number of Los Angles-class SSNs submarines that will go through life extensions. The Navy previously has mentioned consideration of extending the service lives of five to seven boats.
>
> "We found that on most of our Los Angeles [SSNs] had significant hull margins, so we were able to extend them, and they had the fuel to go longer," he said. "There are several Los Angeles's that we will physically refuel and add years on them. Just due to the absolutely incredible job we did when we built the Los Angeles and the Ohio [SSBN and SSGN] that we could extend those ships as long as we can."[11]

A November 18, 2021, press report stated

> The Navy is "systematically" assessing each one of its Los-Angeles class submarines to determine if their service lives can be extended for two to three years, a process a senior officer says will result in a 20% improvement in force projections compared to previous forecasts.
>
> Rear Adm. Doug Perry, director of undersea warfare requirements, told attendees at Naval Submarine League today that he most recently approved a three-year extension for the nuclear-powered attack submarine Alexandria (SSN 757) earlier this year.
>
> He added that each boat's extension is being assessed on a case-by-case basis.
>
> "We are currently forecast to sustain a force of 50 SSNs throughout this decade," Perry said. "And then as we build our Virginia-class submarines we will go above 50 and get up to the fiscal year 2016 force structure assessment requirement of 66 SSNs."
>
> At least one factor that has likely contributed to the Navy's ability to squeeze out two or three extra years of service life on some of its submarines is, ironically, its maintenance backlog.
>
> The service has taken harsh criticism from Capitol Hill for at times allowing some boats to sit in dock for several years at a time while awaiting servicing. That time in dock—and by

[11] Richard R. Burgess, "Vice Adm. Houston: Sub Force Approaching Inflection Point of 50 SSNs," *Seapower*, November 17, 2021.

> extension time when the sub's reactor was not being used—likely comes into play when assessing whether the boat can sail past its original service life.
>
> The Navy is also starting to work on refueling "five still very capable" Los-Angeles submarines with new reactor cores, Perry said, potentially extending their service lives for an additional 10 years or more.
>
> The service for several years now has been experimenting with whether it could effectively refuel the submarines and had previously stated additional refuelings would be contingent initial trials. Perry also said Portsmouth Naval Shipyard had been selected as the best yard to do that work.[12]

Submarine Construction Industrial Base

U.S. Navy submarines are built by General Dynamics' Electric Boat Division (GD/EB) of Groton, CT, and Quonset Point, RI, and Huntington Ingalls Industries' Newport News Shipbuilding (HII/NNS), of Newport News, VA. 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.[13] 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 capacity-related 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 C**.

U.S. SSN Classes[14]

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 360 feet long, have a

[12] Justin Katz, "Navy Assessing LA Sub Fleet for Possible Life Extensions," *Breaking Defense*, November 18, 2021. See also Rich Abott, "Navy Assessing Los Angeles Subs For Life Extension," *Defense Daily*, November 19, 2021; David Axe, "To Keep Up Its Undersea Strength, The U.S. Navy Aims To Keep Old Submarines Longer," *Forbes*, November 22, 2021; Megan Eckstein, "US Navy Avoided a 2022 'Trough' in Submarine Fleet Size, but Industry Challenges Threaten Future Growth," *Defense News*, January 3, 2022.

[13] 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. In terms of work provided to these firms, the Navy states that a carrier nuclear propulsion plant is roughly equivalent to five submarine propulsion plants.

[14] Source for submarine lengths, beams (i.e., hull diameters), and submerged displacements: U.S. Navy, "Attack Submarines – SSN," updated March 13, 2023.

beam (i.e., hull diameter) of 33 feet, and have a submerged displacement of about 6,900 tons. They are equipped with four 21-inch diameter torpedo tubes and can carry a total of about 26 torpedoes 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 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 FY2022, 36 of the 62 boats in the class had been retired.

Seawolf (SSN-21) Class

Seawolf (SSN-21) class submarines are larger and more heavily armed than Los Angeles-class submarines. They are equipped with eight 30-inch-diameter torpedo tubes and can carry a total of 50 torpedoes or cruise missiles. 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 *Seawolf* (SSN-21), *Connecticut* (SSN-22), and *Jimmy Carter* (SSN-23).

SSN-21 and SSN-22 were procured in FY1989 and FY1991 and entered service in 1997 and 1998, respectively. They are 353 feet long, have a beam of 40 feet, and have a submerged displacement of 9,138 tons. SSN-23 was originally procured in FY1992. Its procurement was suspended in 1992 and then reinstated in FY1996. It entered service in 2005. SSN-23 was built to a lengthened configuration compared to the other two ships in the class—it is 453 feet long (i.e., 100 feet longer than SSN-21 and SSN-22), has a beam of 40 feet, and has a submerged displacement of 12,158 tons. The Navy states that SSN-23 includes "a 100-foot-long, 2,500-ton hull extension, known as the multi-mission platform, to test new generations of weapons and support Navy SEAL (Sea, Air and Land forces) operations."[15]

Virginia (SSN-774) Class

The Navy has been procuring Virginia-class SSNs (**Figure 1** and **Figure 2**) 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 377 feet long, has a beam of 34 feet, and has a submerged displacement of about 7,800 tons. Virginia-class boats are equipped with four 21-inch diameter torpedo tubes and can carry a total of about 25 torpedoes in their torpedo tubes and internal magazines. Virginia-class boats are also equipped with vertical launch tubes in their bows for carrying and launching 12 Tomahawk cruise missiles.

Virginia-class boats equipped with the Virginia Payload Module (VPM—see discussion below) are 84 feet longer—they are 461 feet long, have a beam of 34 feet, and have a submerged displacement of about 10,200 tons. The VPM can be armed with 28 additional Tomahawk cruise missiles. In addition to the VPM, the Virginia-class design has been updated multiple times in other ways since FY1998.

[15] Andrea Perez, "USS Jimmy Carter Conducts Change of Command," Defense Visual Information Distribution Service (DVIDS), December 18, 2020. See also H. I. Sutton, "SSN-23," Covert Shores, August 27, 2017; John P. Davis, "USS Jimmy Carter (SSN-23), Expanding Future SSN Missions," GlobalSecurity.org, undated. For a press report on SSN-23, see, for example, Benjamin Brimelow, "The US Navy's Only Operational Sub Named After a President Has Been Doing Top-Secret Missions for 17 Years," *Business Insider*, March 10, 2022.

Figure 1. Virginia-Class Attack Submarine

Source: Cropped version of photograph accompanying Dan Ward, "Opinion: How Budget Pressure Prompted the Success of Virginia-Class Submarine Program," *USNI News*, November 3, 2014. The caption credits the photograph to the U.S. Navy and states that it shows USS *Minnesota* (SSN-783) under construction in 2012.

Figure 2. Virginia-Class Attack Submarine

Source: Cropped version of photograph accompanying Megan Eckstein, "Newport News Has Fully Staffed Attack Sub Line, After Years of Delays," *Defense News*, February 9, 2023. The caption credits the photograph to Matt Hildreth/HII and states that it shows USS *Montana* (SSN-794) under construction at HII/NNS.

Virginia-Class 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 (VPM—see discussion below). When procured at a rate of two boats per year, VPM-equipped Virginia-class SSNs have an estimated procurement cost in FY2025 of about $4.3 billion per boat.

Annual Procurement Quantities

Table 1 shows annual numbers of Virginia-class boats procured from FY1998 (the lead boat) through FY2023, and the numbers projected for procurement in FY2024-FY2028 under the Navy's FY2024 budget submission. A total of 38 Virginia-class boats have been procured through FY2023.

Table 1. Actual and Projected Virginia-Class Procurement Quantities

(Projected quantities for FY2024-FY2028 as shown in Navy's FY2024 budget submission)

FY98	1	**FY06**	1	**FY14**	2	**FY22**	2
FY99	1	**FY07**	1	**FY15**	2	**FY23**	2
FY00	0	**FY08**	1	**FY16**	2	***FY24***	2
FY01	1	**FY09**	1	**FY17**	2	***FY25***	2
FY02	1	**FY10**	1	**FY18**	2	***FY26***	2
FY03	1	**FY11**	2	**FY19**	2	***FY27***	2
FY04	1	**FY12**	2	**FY20**	2	***FY28***	2
FY05	1	**FY13**	2	**FY21**	2		

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

Multiyear Contracting

With the exception of the Virginia-class boat that was procured in FY2003, all Virginia-class boats procured from FY1998 through FY2023 have been procured under multiyear contracting, meaning either a block buy contract (for the boats procured in FY1998-FY2002) or multiyear procurement (MYP) contracts (for the boats procured from FY2004 through FY2003).[16]

The Navy wants the next Virginia-class MYP contract to begin not in FY2024, but in FY2025. As part of its FY2024 budget submission, the Navy has requested authority for a Virginia-class MYP

[16] The first four Virginia-class boats, known as the Block I boats, were procured under an FY1998-FY2002 block buy contract. 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 and the subsequent FY2004-FY2008 MYP contract, and was contracted for separately. The next five Virginia-class boats, known as the Block II boats, were procured under an FY2004-FY2008 MYP contract. The next eight Virginia-class boats, known as the Block III boats, were procured under an FY2009-FY2013 MYP contract. The next 10 Virginia-class boats, known as the Block IV boats, were procured under an FY2014-FY2018 MYP contract. The next 10 Virginia-class boats, known as the Block V boats, were procured under an FY2019-FY2023 MYP contract. For more on MYP and 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.

contract that would begin in FY2025.[17] The two boats requested for procurement for FY2024 are to be added as non-MYP options to the FY2019-FY2023 Virginia MYP contract. The FY2019-FY2023 MYP contract, in other words, is be used as a contractual vehicle for procuring the two boats requested for procurement in FY2024, but those two boats will be executed as non-MYP boats, without the special MYP procurement authorities (and resultant cost reductions) that were applied to the other boats procured under the FY2019-FY2023 MYP contract. The Navy states that treating the two boats requested for procurement in FY2024 in this manner will permit the next Virginia-class MYP contract—the one that is to cover boats procured in FY2025-FY2029—into better schedule alignment with contracts for procuring Columbia-class ballistic missile submarines, which will maximize efficiency and supplier-firm stability in those years for both the Virginia- and Columbia-class programs.[18]

Joint Production Arrangement

Virginia-class boats are built jointly by GD/EB—the program's prime contractor—and HII/NNS. 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.[19] 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.[20]

[17] The Navy typically requests authority for an MYP contract for the Virginia-class program one year in advance of the proposed start of the MYP contract. The Navy states that "if the MYP [proposed to begin in FY2025] is not approved in FY 2024, the Navy would lose EOQ savings across the procurement and the long-term shipbuilder and vendor base stability achieved with an MYP authority. If an MYP is not authorized for the next Block of VCS submarines, the Navy may have to enter a single ship procurement contract for FY 2025 ships forcing industry to assume greater risk and raise prices." (Source: "Twelfth Package of Legislative Proposals Sent to Congress for Inclusion in the National Defense Authorization Act for Fiscal Year 2024 – Individual Proposals (Sent to Congress on May 18, 2023)," posted at https://ogc.osd.mil/OGC-Offices/Office-of-Legislative-Counsel/DoD-Legislative-Proposals-2024/.) See also Nick Wilson, "Citing Essential Cost Savings, DOD Seeks Multiyear Authority for Block VI Virginia Submarines," *Inside Defense*, May 19, 2023.

[18] Source: Navy briefing on Virginia-class program for CRS and CBO, April 28, 2023.

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

[20] 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.

Integrated Enterprise Plan (IEP)

Under a plan it calls the Integrated Enterprise Plan (IEP),[21] 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. 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.[22]

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, including payloads with diameters larger than the 21-inch diameter of a torpedo or Tomahawk missile.[23] The four additional launch tubes in the VPM could carry a total of 28 additional Tomahawk cruise missiles (seven per tube),[24]

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[21] The IEP was previously called the Submarine Unified Build Strategy, or SUBS.

[22] 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 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.

[23] 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.

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

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%.[25]

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 SSGNs. Each SSGN is equipped with 24 large-diameter vertical launch tubes, of which 22 can be used to carry up to seven 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.

Acoustic and Other Improvements

The Virginia-class design has been updated multiple times since FY1998. 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.[26]

Schedule and Cost Performance

Earlier Record

The Virginia-class 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 HII/NNS.[27] The lead ship in the program, however, was delivered within four months of the target date that had been established about a decade earlier, and subsequent boats in the program were delivered largely on cost and ahead of schedule.[28] The Virginia (SSN-774) class program received a David Packard Excellence in Acquisition Award from DOD in 2008.

[25] 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%.

[26] 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 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.

[27] 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.

[28] 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.

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 was transitioning 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 experienced months-long delays in efforts to build boats relative to their targeted delivery dates.[29] A February 10, 2022, press report stated

> Huntington Ingalls Industries is planning an investment in its submarine-industrial base to help stabilize production as demand for sub components increases.
>
> This comes as the parent company reported optimism for getting back to on-time delivery, even as its Newport News Shipbuilding yard missed two submarine milestones at the end of 2021.
>
> Chris Kastner, HII's chief operating officer and soon-to-be CEO, said Feb. 10 during the company's quarterly earnings call that Block IV Virginia-class submarines Montana and New Jersey were nearing milestones that were expected to take place by the end of 2021.
>
> Montana launched [i.e., put into the water for the final stages of its construction] in March [2021], but it was meant to complete sea trials and be delivered to the U.S. Navy by the end of the year. Instead, the shipyard announced Feb. 7 [2022] that the submarine had completed its initial round of sea trials, which will be followed by further at-sea activity before the Navy takes ownership of the boat.
>
> New Jersey was christened and achieved pressure hull complete during 2021, meaning all hull sections were joined as a watertight unit. But it didn't achieve float-off as planned. Kastner said that would happen soon.
>
> "While we did not achieve our projected end-of-year milestones, the [Virginia-class submarine] program continues to improve its progress towards a consistent two-per-year cadence," he said in his opening remarks during the call.
>
> Later, in response to a question, he added that Virginia-class production "is pretty stable. Missed milestones at the end of the year related to Montana and New Jersey, but those will happen here momentarily. But they're pressing towards getting back to a two-a-year cadence; the team is very focused on that."...
>
> "It's pretty encouraging from a modules standpoint at Newport News last year. They met their commitment on modules, so they're getting some stability in the manufacturing organization at Newport News," he said.[30]

A January 24, 2022, press report stated

> General Dynamics Electric Boat is just weeks from delivering attack submarine Oregon to the Navy, about 16 months after Oregon was originally due and nearly two years after the Connecticut shipyard delivered its last submarine.
>
> This Block IV Virginia-class attack submarine has suffered from a complex web of factors, some related to the COVID-19 pandemic now entering its third year, but most related to

[29] 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.

[30] Megan Eckstein, "Huntington Ingalls Considers Industrial Base Investment, as Sub Construction Lags Behind," *Defense News*, February 10, 2022.

the prioritization of the Columbia-class ballistic missile submarine program, Electric Boat President Kevin Graney said in an update on the yard's performance.

On the workforce side, he said, the Columbia program—not just a top priority for the shipyard, but also for the Navy and the Pentagon—is "staffed up to where we need to be right now" to keep the first-in-class Columbia on track for a 2027 delivery and 2030 maiden deployment. But that's come at the expense of the Virginia program production line.

"To achieve Columbia, we did take some resources from Virginia to support that. And I think at this point right now, any new folks that we're adding to the business ... will be largely dedicated to Virginia. And that's because that Columbia manning right now is fairly stable and will be for the foreseeable future," Graney said in a Jan. 24 virtual event hosted by the shipyard.

As a result, that means the newest and least experienced workers are being assigned to the Virginia SSN production line, and any shortfalls in manning are expected to solely affect SSNs. Graney said the training pipeline was halted in early 2020 due to COVID but was restarted in late 2020 and continued to produce new shipbuilders throughout 2021.

Still, like the rest of the labor market, Graney said Electric Boat is seeing higher attrition and a tougher time hiring. While not unique to the shipyard, those conditions are disproportionately affecting Virginia SSN construction.

Submarine Oregon was originally meant to deliver in the fall of 2020, but the delivery date continued to slip. With people and materials prioritized to Columbia, Oregon had material challenges and a higher re-work rate, Graney said.

Oregon went out for sea trials in December, and Graney said the boat's propulsion system was "flawless." There are some "relatively small items" that remain to be addressed elsewhere on the boat, he added, but by the end of the week the submarine should be back out to sea for its final trials with the Navy's Board of Inspection and Survey.

"Once that completes, we are fast-tracked to get to delivery—I think the timeline generally from INSURV [the Navy Board of Inspection and Survey's inspection] to delivery is about a week, so we are poised to get that boat delivered, and I think USS Montana will be right on her heels," Graney said....

Graney said a second submarine, the Hyman G. Rickover, is also on track for delivery from Electric Boat this year. This would come after an extended pause in submarine deliveries: Vermont delivered in April 2020, with Oregon next in line and on track for a February 2022 delivery.

Though not a primary factor on Oregon, Graney noted COVID has caused some challenges for the yard and its workforce.

The workforce is now 86% vaccinated, a figure it reached through incentives rather than mandates, Graney said. Still, the omicron variant of the virus led to a surge in COVID case numbers that hit the New England area earliest in the U.S. In the eight weeks since Thanksgiving, Electric Boat has seen its highest case count of the whole pandemic, according to Graney. In fact, 42% of all reported cases among employees have happened just in these last eight weeks.

"How that hits us, especially coming off of the holiday shutdown that we do between Christmas and new year, we ended up with a lot of people unable to come in because of the protocols associated with COVID. And, unfortunately, it hit our senior ranks—that is, our leadership ranks, supervisors, first-line supervisors and above—disproportionately relative to the rank and file. So, hard to lead a crew of people when your leader's 'on the beach' suffering from COVID," Graney said.

> "I think we're getting better here with each passing week, each passing day … and I hope to be out of the woods here with regard to any additional impact from omicron in the coming week or two," he added.[31]

December 2021 Determinations Pursuant to Defense Production Act (DPA)

On December 21, 2021, President Biden signed three determinations permitting the use of the Defense Production Act (DPA) to strengthen the U.S. submarine industrial base for the purpose of increasing production of Virginia-class submarines. For more on these determinations, see **Appendix D**.

Proposed Sale of Three to Five Virginia-Class Boats to Australia under AUKUS Agreement

In September 2021, the U.S., UK, and Australian governments announced a significant new security partnership, called AUKUS (pronounced *AW-kus*, rhyming with *caucus*), with the acronym referring to Australia, the UK, and the United States.[32] The first major initiative under AUKUS is to be a project for Australia, with U.S. and UK assistance, to acquire and operate its own force of SSNs. The project, called SSN AUKUS, is to make Australia the world's seventh country (along with the United States, the UK, France, Russia, China, and India) to operate nuclear-powered submarines. The United States since 1958 has provided assistance to the UK's nuclear-powered submarine program;[33] under the AUKUS agreement, Australia would become the second country to receive U.S. assistance in this area.

On March 13, 2023, following an 18-month study period that followed the September 2021 announcement, the three governments issued a joint statement outlining the SSN AUKUS pathway. The trilateral statement states (emphasis added):

> In September 2021, Australia, the United Kingdom and the United States announced AUKUS—a new security partnership that will promote a free and open Indo-Pacific that is secure and stable.
>
> The first major initiative of AUKUS was our historic trilateral decision to support Australia acquiring conventionally-armed, nuclear-powered submarines (SSNs). Today, we announce our pathway to achieve this critical capability.
>
> Together we will deliver SSN-AUKUS—a trilaterally-developed submarine based on the United Kingdom's next-generation design that incorporates technology from all three nations, including cutting edge U.S. submarine technologies. Australia and the United Kingdom will operate SSN-AUKUS as their submarine of the future. Australia and the United Kingdom will begin work to build SSN-AUKUS in their domestic shipyards within this decade.

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[31] Megan Eckstein, "Electric Boat Readies to Deliver Attack Sub Oregon, Almost Two Years After Last Delivery," *Defense News*, January 24, 2022.

[32] For more on the AUKUS agreement, see CRS In Focus IF12113, *AUKUS and Indo-Pacific Security*, by Derek E. Mix and Bruce Vaughn, CRS In Focus IF11999, *AUKUS Nuclear Cooperation*, by Paul K. Kerr and Mary Beth D. Nikitin; CRS In Focus IF11678, *The "Quad": Cooperation Among the United States, Japan, India, and Australia*, coordinated by Emma Chanlett-Avery; and CRS Report R47378, *Australia: Background and U.S. Relations*, by Bruce Vaughn.

[33] For additional discussion of U.S. assistance to the UK's nuclear-powered submarine program, see CRS Report R41129, *Navy Columbia (SSBN-826) Class Ballistic Missile Submarine Program: Background and Issues for Congress*, by Ronald O'Rourke.

In order to deliver conventionally-armed, nuclear-powered submarines to Australia at the earliest possible date, we intend to pursue the following phased approach, moving through each phase based on mutual commitments from each nation:

—Beginning in 2023, Australian military and civilian personnel will embed with the U.S. Navy, the Royal Navy, and in the United States and United Kingdom submarine industrial bases to accelerate the training of Australian personnel. The United States plans to increase SSN port visits to Australia beginning in 2023, with Australian sailors joining U.S. crews for training and development; the United Kingdom will increase visits to Australia beginning in 2026.

— As early as 2027, the United States and United Kingdom plan to begin forward rotations of SSNs to Australia to accelerate the development of the Australian naval personnel, workforce, infrastructure and regulatory system necessary to establish a sovereign SSN capability.

— **Starting in the early 2030s, pending Congressional approval, the United States intends to sell Australia three Virginia class submarines, with the potential to sell up to two more if needed. This step will systematically grow Australia's sovereign SSN capability and support capacity.**

— In the late 2030s, the United Kingdom will deliver its first SSN-AUKUS to the Royal Navy. Australia will deliver the first SSN-AUKUS built in Australia to the Royal Australian Navy in the early 2040s.

This plan is designed to support Australia's development of the infrastructure, technical capabilities, industry and human capital necessary to produce, maintain, operate, and steward a sovereign fleet of conventionally-armed, nuclear-powered submarines. Australia is fully committed to responsible stewardship of naval nuclear propulsion technology.

When we announced the AUKUS partnership in September 2021, we committed to set the highest nuclear non-proliferation standard. The plan we announce today delivers on this commitment and reflects our longstanding leadership in, and respect for, the global nuclear non-proliferation regime. We continue to consult with the International Atomic Energy Agency to develop a non-proliferation approach that sets the strongest precedent for the acquisition of a nuclear-powered submarine capability.

Our plan elevates all three nations' industrial capacity to produce and sustain interoperable nuclear-powered submarines for decades to come, expands our individual and collective undersea presence in the Indo-Pacific, and contributes to global security and stability. In these outcomes, AUKUS reflects the principle that shared action, taken in partnership, can benefit all.

Implementing AUKUS will also require robust, novel information sharing and technology cooperation. Our nations are committed to further trilateral collaboration that will strengthen our joint capabilities, enhance our information and technology sharing, and integrate our industrial bases and supply chains while strengthening the security regimes of each nation.

For more than a century, our three nations have stood shoulder to shoulder, along with other allies and partners, to help sustain peace, stability, and prosperity around the world, including in the Indo-Pacific. We believe in a world that protects freedom and respects human rights, the rule of law, the independence of sovereign states, and the rules-based international order. The steps we are announcing today will help us to advance these mutually beneficial objectives in the decades to come.[34]

[34] White House, "Joint Leaders Statement on AUKUS," March 13, 2023.

A longer Australian report on the SSN AUKUS pathway that was released at about the same time as the March 13, 2023, trilateral statement states (emphasis added):

> Australia will invest significantly to uplift its domestic industrial base, including expanding the Australian industrial workforce and vendor base and building state-of-the-art facilities and capability upgrades to ensure it is ready to successfully steward the technology upon the SSN's arrival on Australian shores. **To realise a nuclear-powered submarine capability in the 2030s, and the first Australian-built SSN-AUKUS in the early 2040s, Australia will also make a proportionate financial investment in the UK and US industrial bases. This targeted investment will directly support the additional capacity needed to enable delivery of Australia's nuclear-powered submarines at the earliest opportunity**, ensuring Australia avoids a capability gap as its existing submarines reach the end of their operational life.[35]

The Navy's FY2024 30-year (FY2024-FY2053) shipbuilding plan states that

> the department [i.e., the Department of the Navy] recognizes the significant strategic opportunity presented by the Australia, United Kingdom, and United States (AUKUS) trilateral security pact to make a positive contribution to peace and stability in the Indo-Pacific region by enhancing deterrence. Based on the Tri-Lateral Agreement announcement of March 2023, the Navy anticipates building additional Virginia class SSNs in the 2030s as replacements for submarines sold to Australia. The full impact of AUKUS upon the Navy's shipbuilding plan cannot be characterized in this year's report [on the FY2024 30-year shipbuilding plan] given [that] the conclusion of the March 2023 Tri-Lateral Agreement coincided with the finalization of this report [on the FY2024 30-year shipbuilding plan] coupled with additional studies that will continue this summer. The Navy is committed to AUKUS and will continue to engage with Congress and industry as analysis of the Optimal Pathway refines future SSN workload....
>
> The [30-year] profiles shown in Tables A1-2 through A1-5 [of this report on the FY2024 30-year shipbuilding plan] do not reflect future adjustments to support the AUKUS trilateral agreement. Future [ship] Procurement Profiles, Battle Force [ship] Delivery [profiles], [ship] Retirement [profiles] and [resulting ship] Inventory Plans will be updated in future reports [i.e., reports on the Navy's 30-year shipbuilding plans for FY2025 and subsequent years] after further analysis refines future SSN workload. Based on the March 2023 Tri-Lateral announcement, the Navy anticipates building additional Virginia class SSNs in the 2030s as replacements for submarines sold to Australia.[36]

Selling three to five Virginia-class boats to Australia would reduce the size of the U.S. Navy's SSN force by three to five boats from the time that the boats are removed from U.S. Navy service until the earlier of the following two events:

- the three to five Virginia-class boats sold to Australia reach the end of their service lives and are retired; or

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[35] Commonwealth of Australia, The AUKUS Nuclear-Powered Submarine Pathway, A Partnership for the Future, undated, released ca. March 13, 2023, p. 10. On page 49, the document similarly states (emphasis added):

> The growth of Australia's submarine delivery infrastructure will be supported and complemented by the existing infrastructure in the United Kingdom and United States, which will be vital to the delivery of this trilateral program. **Australia will make a proportionate financial investment in the UK and US industrial bases in order for them to meet AUKUS requirements.**

A similar report was released by the UK government on March 14, 2023; see https://www.gov.uk/government/publications/the-aukus-nuclear-powered-submarine-pathway-a-partnership-for-the-future.

[36] U.S. Navy, *Report to Congress on the Annual Long-Range Plan for Construction of Naval Vessels for Fiscal Year 2024*, March 2023, p. 4, 15 (table note 3).

- replacement SSNs for the three to five Virginia-class boats sold to Australia are built and enter service with the U.S. Navy.

As stated by the Navy in the above-quoted passage, "the Navy anticipates building additional Virginia class SSNs in the 2030s as replacements for submarines sold to Australia." Strictly construed, building additional SSNs as replacements for three to five Virginia-class boats sold to Australia would involve building three to five SSNs that would be in addition to those that were already envisaged as being built in the 2030s for U.S. Navy use under the Navy 30-year shipbuilding plan that preceded the announcement of the AUKUS agreement in September 2021. The Navy 30-year shipbuilding plan with 30-year ship procurement profiles that preceded the announcement of the AUKUS agreement in September 2021 is the Navy FY2020 30-year (FY2020-FY2049) shipbuilding plan, which was submitted on March 20, 2019. This 30-year plan includes the procurement of 20 SSNs during the 10-year period FY2030-FY2039, at a steady rate of two boats per year.[37] On this basis, it might be argued that building replacement SSNs in the 2030s for three to five Virginia-class boats sold to Australia would involve building a total of 23 to 25 SSNs during the 10-year period FY2030-FY2039.

Other possible baselines for calculating the total number of SSNs that would need to be built during the 2030s so as to include three to five not-previously-planned SSNs include the three alternative 30-year SSN procurement profiles in the Navy's FY2024 30-year (FY2024-FY2053) shipbuilding plan. These alternative profiles include baseline totals of 16, 21, and 20 SSNs, respectively, during the 10-year period FY2030-FY2039,[38] compared to the above-noted total baseline total of 20 SSNs during that period under the FY2020 30-year plan.

On May 2, 2023, DOD sent to Congress its eighth package of legislative proposals for inclusion in the FY2024 National Defense Authorization Act (NDAA). The package included proposed measures that would

- provide DOD with the authority to accept payments from the government of Australia for the purpose of improving the U.S. submarine industrial base;
- authorize the transfer of up to two Virginia-class SSNs to the government of Australia in the form of a sale, with the costs of the transfer covered by the government of Australia; and
- provide for the training of the Australian private-sector personnel to support the development of the Australian submarine industrial base under the foreign military sales program pursuant to the Arms Export Control Act (AECA).[39]

FY2024 Funding Request

The Navy's proposed budget requests the procurement of the 39th and 40th Virginia-class boats. The Navy's FY2024 budget submission states that one of the two boats is to be built to a special

[37] U.S. Navy, *Report to Congress on the Annual Long-Range Plan for Construction of Naval Vessels for Fiscal Year 2020*, March 2019, Table A2-1 on page 13.

[38] U.S. Navy, *Report to Congress on the Annual Long-Range Plan for Construction of Naval Vessels for Fiscal Year 2024*, March 2023, p. Table A1-2 on pages 15-16.

[39] The text of the legislative package is available at Department of Defense, Office of Legislative Counsel, "DoD Legislative Proposals, Fiscal Year 2024," under "Eighth Package of Legislative Proposals Sent to Congress for Inclusion in the National Defense Authorization Act for Fiscal Year 2024—Individual Proposals (Sent to Congress on May 2, 2023)," posted at https://ogc.osd.mil/OGC-Offices/Office-of-Legislative-Counsel/DoD-Legislative-Proposals-2024/. See also Bryant Harris and Megan Eckstein, "Pentagon Seeks Authority to Transfer Nuclear Submarines to Australia," *Defense News*, May 17, 2023; Nick Wilson, "DOD Asks Congress for AUKUS Provisions in FY-24 Defense Authorization Bill," *Inside Defense*, May 17, 2023.

configuration referred to as the "Modified VIRGINIA Class Subsea and Seabed Warfare (Mod VA SSW)" configuration,[40] suggesting a configuration that includes a capability for conducting seabed warfare missions.[41]

The two boats requested for procurement in FY2024 have an estimated combined procurement cost of $9,427.6 million (i.e., about $9.4 billion), including $5,356.9 million for the Mod VA SSW boat and $4,070.7 million for the other boat. The two boats have received a combined total of $2,297.7 million in prior-year advance procurement (AP) funding, and the Navy's proposed FY2024 budget requests the remaining $7,130.0 million needed to complete their estimated combined procurement cost. The Navy's proposed FY2024 budget also requests $1,855.5 million in AP funding for Virginia-class boats to be procured in future fiscal years, $1,360.0 million in Economic Order Quantity (EOQ) funding, which is an additional kind of AP funding that can occur under an MYP contract, and $168.2 million in cost-to-complete (CTC) funding to cover cost growth on Virginia-class boats procured in prior years, bringing the total amount of procurement, AP, EOQ, and CTC funding requested for FY2024 to $10,513.7 million (i.e., about $10.5 billion).

Issues for Congress

Authorization for Transfer of up to Two Virginia-class SSNs to Australia in the Form of a Sale

One issue for Congress is whether to approve, reject, or modify DOD's AUKUS-related legislative package for the FY2024 NDAA sent to Congress on May 2, 2023, including the requested authorization for the transfer of up to two Virginia-class SSNs to the government of Australia in the form of a sale, with the costs of the transfer to be covered by the government of Australia. In considering this issue, Congress may consider several factors, including but not limited to the following:

- whether a decision on providing authority for transferring Virginia-class boats to Australia needs to be made as part of the FY2024 NDAA or could be deferred until a future NDAA;
- whether such an authorization, if provided, should be provided for up to two Virginia-class SSNs, as requested, or for some other number, such as up to three, up to five, or three to five;
- when, exactly, the Virginia-class SSNs sold to Australia would be removed from U.S. Navy service and transferred to Australia;

[40] *Department of Defense, Fiscal Year (FY) 2024 Budget Estimates, Navy Justification Book Volume 1 of 1, Shipbuilding and Conversion, Navy*, March 2023, p. 113.

[41] In a transcript published on September 27, 2022, of a podcast on subsea and seabed warfare recorded September 26, 2022, a GD/EB official states: "Subsea and Seabed warfare (SSW) is a new capability targeted for a single, late-block-V Virginia-class submarine. While we can't get into the details, we can say it is a complex, fast-moving program with strong Navy and congressional support. We're now well into the arrangement phase of the design, which is a critical phase of the program when we lock down major decisions on systems and components and the configuration of spaces." Another EB official states that "prior Virginia insertions [i.e. insertions of new elements into the Virginia-class design], like the Virginia Payload Module (VPM) compared to SSW, had about half as many arrangements and more time to sell them all." (Sydney Davies, "K. Graney Team Spotlight Podcast: Subsea and Seabed Warfare," EB Landing, September 27, 2022.)

- whether the Virginia-class SSNs sold to Australia would be existing Virginia-class SSNs with less than 33 years of remaining expected service life, or newly built Virginia-class SSNs with full 33-year expected service lives, or some combination;
- the prices that Australia would pay for the Virginia-class boats, and the amount of additional funding that Australia would make as "a proportionate financial investment" in the U.S. submarine construction industrial base;
- the ability of the U.S. submarine construction base in the 2030s to build for the U.S. Navy, as replacements for the sold Virginia-class boats, SSNs that would be in addition to those already envisaged for procurement for U.S. Navy use prior to the announcement of the AUKUS agreement;
- the impact of a three- to five-boat reduction in the size of the U.S. SSN force on the ability of the U.S. SSN force to perform SSN missions of interest to the United States;
- the net impact on collective allied deterrence and warfighting capabilities of transferring three to five Virginia-class boats to Australia while pursuing the construction of three to five replacement SSNs for the U.S. Navy;
- the benefits and risks of transferring U.S. naval nuclear propulsion technology and U.S. submarine technology to Australia; and
- broader considerations relating to U.S. relations and nuclear cooperation with Australia and the UK, U.S. relations with countries in the Indo-Pacific region other than Australia, and the overall political and security situation in the Indo-Pacific region.[42]

Regarding the net impact on deterrence of transferring three to five Virginia-class SSNs to Australia rather than keeping them in U.S. Navy service, supporters of transferring them might argue that the deterrent value of introducing SSNs to Australia's navy would be greater than the deterrent value of keeping those SSNs in U.S. Navy service because a newly created force of Australian SSNs would present China with a second allied decisionmaking center (along with the United States) for SSN operations in the Indo-Pacific, which would enhance deterrence of potential Chinese aggression by complicating Chinese military planning. This effect, supporters might argue, could be viewed as broadly comparable to the effect of the help that the United States, secretly at the time, reportedly provided to France during the Cold War on the design of France's nuclear warheads, so as to speed up the development and fielding of France's strategic nuclear deterrent force and thereby confront the Soviet Union more quickly with three decisionmaking centers—the United States, the UK, and France—that were armed with effective strategic nuclear deterrent forces.[43]

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[42] For more on the these broader considerations, see CRS In Focus IF12113, *AUKUS and Indo-Pacific Security*, by Derek E. Mix and Bruce Vaughn, CRS In Focus IF11999, *AUKUS Nuclear Cooperation*, by Paul K. Kerr and Mary Beth D. Nikitin; CRS In Focus IF11678, *The "Quad": Cooperation Among the United States, Japan, India, and Australia*, coordinated by Emma Chanlett-Avery; and CRS Report R47378, *Australia: Background and U.S. Relations*, by Bruce Vaughn.

[43] See Richard H. Ullman, "The Covert French Connection," *Foreign Policy*, Summer 1989 (No. 75): 3-33, accessed at https://www.jstor.org/stable/1148862; "The French Bomb, with Secret U.S. Help, Documents from Nixon and Ford Administrations Show U.S. Assistance for French Nuclear Forces Earlier Than Previously Reported," National Security Archive, George Washington University, May 26, 2011, accessed at https://nsarchive2.gwu.edu/nukevault/ebb346/; William Burr, "U.S. Secret Assistance to the French Nuclear Program, 1969-1975: From "Fourth Country" to Strategic Partner," Wilson Center, undated, accessed at https://www.wilsoncenter.org/publication/us-secret-assistance-to-the-

(continued...)

Skeptics of transferring Virginia-class SSNs from the United States to Australia might argue that it could weaken deterrence of potential Chinese aggression if China were to find reason to believe, correctly or not, that Australia might use the transferred Virginia-class boats less effectively than the U.S. Navy would use them if the boats were retained in U.S. Navy service, or that Australia might not involve its military, including its Virginia-class boats, in U.S.-China crises or conflicts that Australia viewed as not engaging important Australian interests. In connection with the latter scenario, Australian Defence Minister Richard Marles in March 2023 reportedly confirmed that in exchange for the Virginia-class boats, Australia's government made no promises to the United States that Australia would support the United States in a future conflict over Taiwan.[44]

Supporters of the SSN AUKUS pathway could argue that the investments that Australia would make in its own submarine construction industrial base and the U.S. submarine industrial base would increase the capacity of the combined U.S.-Australian submarine construction industrial base at a time when (as discussed later in this report) limits on the capacity of the U.S. submarine construction industrial base have become a matter of concern for policymakers. Supporters might argue, in response to the alternative of a U.S.-Australian military division of labor (see next paragraph), that having Australia (with U.S. technical assistance) establish its own submarine construction industrial base and support its own force of SSNs would follow the model that was implemented between the United States and the UK in connection with the creation of the UK's SSN force.

Skeptics of the SSN AUKUS pathway might argue that it would be more cost effective for U.S. SSNs to perform both U.S. and Australian SSN missions while Australia invests in other types of military forces, so as to create a capacity for performing other military missions for both Australia and the United States. Such a U.S.-Australian military division of labor, they might argue, would be similar to military divisions of labor that exist between the United States and its NATO allies. Skeptics might argue that it would be inconsistent to argue that the U.S.-Australian relationship is close enough to contemplate the transfer of U.S. naval nuclear propulsion technology but not close enough to permit such division of labor, and that the SSN AUKUS pathway would result in parallel SSN-related investments in the United States and Australia comparable to parallel investments in certain military capabilities among NATO countries that have been criticized for their collective inefficiencies.[45]

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french-nuclear-program-1969-1975-fourth-country-to-strategic. The 1989 *Foreign Policy* article also includes this statement:

> One area in which the French requested but did not receive help was in antisubmarine-warfare (ASW) technology and, in particular, in silencing their own ballistic missile submarines to make them less easily tracked by Soviet hunter-killers. The U.S. Navy adamantly opposed any such assistance. Behind the navy's position was the extreme sensitivity of its own counter-ASW regime. "The security of our Poseidon-Trident force was so important that we were not going to share with anybody else the methods we used to preserve it," a senior civilian told me. Another said, "This is a jewel the navy will give to no one." (Pages 16-17)

[44] Rod McGuirk, "Australia Won't Promise to Side with US in Taiwan Conflict," *Associated Press*, March 20, 2023; Daniel Hurst, "Australia Has 'Absolutely Not' Committed to Join US in Event of War over Taiwan, Marles Says," *Guardian*, March 18, 2023; Georgia Hitch, "No Promise Given to US to Assist in Potential Taiwan Conflict in Exchange for Submarines, Says Defence Minister Richard Marles," *abc.net.au*, March 18, 2023.

[45] For examples of articles discussing such inefficiencies among NATO countries, see Sean Monaghan, "Solving Europe's Defense Dilemma: Overcoming the Challenges to European Defense Cooperation," Center for Strategic and International Studies (CSIS), March 1, 2023; Luigi Scazzieri, "Is European Defence Missing Its Moment?" Centre for European Reform, January 16, 2023; "EU Defence Review Calls for Greater European Cooperation to Match Defence Spending Increases," European Defence Agency, November 15, 2022; Bastian Giegerich and Ester Sabatino, "The (Sorry) State of EU Defense Cooperation," Carnegie Europe, October 6, 2022; Paul Taylor, "How to Spend Europe's (continued...)

Projected SSN Force Levels vs. SSN Force-Level Goal

Another issue for Congress concerns projected SSN force-levels compared to the SSN force-level goal. As mentioned earlier, the Navy's current force-level goal, which was released in December 2016, calls for achieving and maintaining a fleet of 355 manned ships, including 66 SSNs. The Navy and the Office of the Secretary Defense have been working since 2019 to develop a successor Navy force-level goal to replace the 355-goal of 2016. Studies of this emerging force-level goal that have been released by the Navy in summary form suggest that the new force-level goal could call for achieving and maintaining a force of 66 to 72 SSNs.

The Navy's FY2024 30-year (FY2024-FY2053) shipbuilding plan includes three alternative 30-year shipbuilding profiles for the period FY2029-FY2053. Under these profiles, the SSN force would reach a minimum of 46 boats in FY2030, and grow to 60, 69, or 63 boats by FY2053. Under the alternative where the SSN force grows to 69 boats by FY2053, the force would reach 66 boats in FY2049. Potential questions for Congress include the following:

- Should the Navy's next force-level goal—the successor to the 355-ship goal of 2016—include an SSN force-level goal of 66 boats, 72 boats, or some other number of boats?
- What are the potential operational implications of the SSN force declining to a minimum of 46 boats in FY2030, and of remaining below the 66-boat force-level goal until at least FY2049?

In assessing these questions, Congress may consider several factors, including but not necessarily limited to the following:

- U.S. national security strategy and national defense strategy, and the contributions that SSNs make to fulfilling those strategies;
- the funding that would be needed each year to procure SSNs and operate and support the SSN force, and the potential impact of SSN-related funding requirements on funding available for other Navy or DOD programs; and
- the capacity of the submarine construction industrial base.

Regarding the first factor above, DOD officials and other observers view SSNs as useful for implementing certain elements of the national defense strategy, particularly because of their ability to evade China's improving anti-access/area-denial (A2/AD) forces.[46]

Regarding the second factor above, as noted earlier, when procured at a rate of two boats per year, VPM-equipped Virginia-class SSNs have an estimated procurement cost of about $4.3 billion per boat. Increasing the size of the SSN force would increase the SSN force's annual operation and support costs.

The third factor above—the capacity of the submarine construction industrial base—is discussed further in the next section.

Defense Bonanza Intelligently, EU Countries Must Coordinate Procurement and Pool Resources to Avoid Wasting Money," *Politico*, September 2, 2022; Max Bergmann, Colin Wall, Sean Monaghan, and Pierre Morcos, "Transforming European Defense," Center for Strategic and International Studies (CSIS), August 18, 2022.

[46] For additional discussion, see CRS Report RL33153, *China Naval Modernization: Implications for U.S. Navy Capabilities—Background and Issues for Congress*, by Ronald O'Rourke.

Industrial-Base Capacity for Building Both Virginia- and Columbia-Class Boats

Overview

Another issue for Congress concerns the ability of the submarine construction industrial base to execute the work associated with procuring two VPM-equipped Virginia-class SSNs plus one Columbia-class SSBN per year (a procurement rate referred to in short as 2+1) from the mid-2020s to the mid-2030s. Policymakers and other observers have expressed concern about the industrial base's capacity for executing such a workload without encountering bottlenecks or other production problems in one or both of these programs. In a nutshell, the challenge for the industrial base—both shipyards and supplier firms—is to ramp up production from one "regular" Virginia-class boat's work per year (the volume of work prior to FY2011) to the equivalent of about five "regular" Virginia-class boats' work per year (the approximate volume of work represented by two VPM-equipped Virginia-class boats and one Columbia-class boat).[47]

Concerns about the ability of the submarine construction industrial base to execute the workload resulting from a sustained 2+1 procurement rate were heightened starting in 2019 by the earlier-noted reports about challenges faced by the two submarine-construction shipyards and associated supplier firms in meeting scheduled delivery times for Virginia-class boats as the Virginia-class program transitions from production of two "regular" Virginia-class boats per year to two VPM-equipped boats per year.[48]

Although Virginia-class submarines are being procured at a rate of two boats per year, Navy officials have noted that deliveries of Virginia-class submarines from GD/EB and HII/NNS have averaged 1.2 boats per year for the past five years.[49] On March 29, 2023, Secretary of the Navy Carlos Del Toro testified that the Virginia-class production rate was currently about 1.4 boats per year.[50] At an April 28, 2023, briefing on the Virginia-class program for CRS and the Congressional Budget Office (CBO), Navy officials stated that the rate as of that date was about

[47] If building a Virginia-class boat is viewed as requiring one unit of work, then building a VPM-equipped Virginia-class boat can be viewed as requiring about 1.25 units of work, and building a Columbia-class boat can be viewed as requiring about 2.5 units of work. On this basis, building two VPM-equipped Virginia-class boats and one Columbia-class boat would require about five units of work (1.25 + 1.25 + 2.5 = 5.0).

[48] 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.

[49] See, for example, Megan Eckstein, "Navy Frustration Building over Late Weapons, Ship Deliveries," *Defense News*, January 11, 2023; Rich Abott, "Fleet Forces And SecNav Argue For More Maintenance Yards," *Defense Daily*, January 12, 2023.

[50] Sam LaGrone, "SECNAV Del Toro: Virginia Attack Sub Construction 'Significantly Behind,' District of Columbia Submarine 10% Behind Schedule," *USNI News*, March 29 (updated March 30), 2023. See also Rich Abott, "SECNAV: Columbia Sub 10 Percent Behind, Virginia Subs Improving But Still Behind," *Defense Daily*, March 30, 2023.

1.3 boats per year.[51] A March 31, 2023 press report stated that Navy officials estimate that it will take another five years—until 2028—before the delivery rate will increase to 2.0 boats per year.[52]

The Navy's report on its FY2024 30-year (FY2024-FY2053) shipbuilding plan states

> Within the overall industrial base, including both shipyards and suppliers, varying levels of capacity and risk exist. Nuclear powered ship production, a unique capability with little to no opportunity for commercial or dual use production, is provided by two private shipyards that are currently facilitized and certified to construct nuclear powered ships and will be at capacity for the next 15-plus years building Columbia class SSBNs, Virginia class SSNs, next generation SSNs, and Ford class CVNs. Industrial base funding was provided in FY2023 to increase infrastructure, reduce production risk, help stabilize the more than 350 critical suppliers, and help enable recruitment, training and retention of the skilled production workforce. The PB2024 request includes funding to continue these efforts.[53]

Some observers have expressed interest in expanding the capacity of the submarine construction industrial base to support a procurement rate of three Virginia-class boats plus one Columbia-class boat per year (referred to in short as 3+1). Building three VPM-equipped Virginia-class boats and one Columbia-class boat per year would require the equivalent of about 6.25 "regular" Virginia-class boats' work per year.[54] The Navy testified in June 2021 that increasing the capacity of the submarine construction industrial base to support a 3+1 rate would require "$1.5 [billion] to $2 billion of further investment by ourselves plus industry, and an increase in the workforce."[55]

As noted earlier, on December 21, 2021, President Biden signed three determinations permitting the use of the Defense Production Act (DPA) to strengthen the U.S. submarine industrial base for the purpose of increasing production of Virginia-class submarines.

Press Reports

A May 8, 2023, press report stated

> Availability of parts, not people, is the largest barrier right now to catch up with the delays in constructing Virginia-class nuclear attack boats, company officials at submarine builder Newport News Shipbuilding told USNI News....
>
> While work stoppages and worker attrition due to the COVID-19 pandemic have been cited as reasons for the delay in submarine production, availability of parts and materials has become the primary reason for delays, Newport News president Jennifer Boykin told USNI News on Friday [May 5].
>
> "COVID had an impact because we had such a large percent of the workforce that wasn't here during the six months in 2020. Many of our suppliers, if not most, were struggling with some of the same issues. Many of our suppliers got off track because they didn't have

[51] Navy briefing on Virginia-class program for CRS and CBO, April 28, 2023.

[52] Sam LaGrone, "Navy Estimates 5 More Years for Virginia Attack Sub Production to Hit 2 Boats a Year," *USNI News*, March 31, 2023.

[53] See U.S. Navy, *Report to Congress on the Annual Long-Range Plan for Construction of Naval Vessels for Fiscal Year 2024* March 2023, p. 9.

[54] If building a Virginia-class boat is viewed as requiring one unit of work, then building a VPM-equipped Virginia-class boat can be viewed as requiring about 1.25 units of work, and building a Columbia-class boat can be viewed as requiring about 2.5 units of work. On this basis, building three VPM-equipped Virginia-class boats and one Columbia-class boat would require about 6.25 units of work (1.25 + 1.25 + 1.25 + 2.5 = 6.25).

[55] Spoken testimony by Jay Stefany, Acting Assistant Secretary of the Navy for Research, Development and Acquisition (i.e., the Navy's acting acquisition executive), as quoted in Megan Eckstein, "US Navy Needs $50M to Get Submarine Construction Back on Track after COVID-19," *Defense News*, June 9, 2021.

> [the] workforce," she said on Friday, a day ahead of the christening of Massachusetts (SSN-798).
>
> "Post COVID, not as many people came back … Most of our suppliers are really working, doing what they can to increase their workforce pipeline."
>
> While Newport News is doing well with the workforce for the moment, its suppliers are dealing with their own workforce issues that have increased the time it takes for parts to get to the yard.
>
> Workforce and supply chain concerns have prompted the Navy, HII and General Dynamics Electric Boat to retool the schedule for the Block V Virginia-class.
>
> "The intent was to incorporate some of these challenges," Boykin said.[56]

A March 29, 2023, press report stated

> Production of the Navy's first-in-class Columbia-class ballistic missile submarine—District of Columbia (SSBN-826)—is 10 percent behind schedule, Secretary of the Navy Carlos Del Toro told a House panel on Wednesday [March 29].
>
> Likewise, the production of Virginia-class attack boats is slowly improving but is "significantly behind" the target of two submarines per year, Del Toro told the House Appropriations defense subcommittee during a hearing.
>
> Del Toro's assessment was in response to questions from subcommittee chair Rep. Ken Calvert (R-Calif.), who cited a January Government Accountability Office study that warned the Navy did not have a clear understanding of the program's schedule risks. Del Toro contested the finding from GAO.
>
> "We do have clear visibility into the schedule challenges that Columbia faces. She's currently about 10 percent behind schedule is what she is given the challenges that we've faced with COVID and supply chain, not being able to get the advanced procurements that are necessary to be able to fulfill those requirements leads to her being 10 percent behind," Del Toro told Calvert.
>
> "The shortage of workers in the submarine community and across the nation is obviously a national challenge that we all have to address collectively. I do believe that increasing legal immigration in this country will help the blue-collar workforce, including those top workers that we need actually in the submarine force as well. … We are working very closely with industry to try to close these gaps."
>
> Following an earlier version of this post, a Navy official clarified to USNI News the estimate to which Del Toro was referring was an internal General Dynamics Electric Boat schedule 74-month schedule that was shorter than the Navy's contract schedule....
>
> "On the Virginia side of the house … they are significantly behind. They should be at two boats per year. They're currently [at] around 1.4. They have made some progress in moving in [the right] direction. I'm concerned particularly about the construction of the sterns and bows in Virginia and getting those up to Electric Boat up in Connecticut and integrating them all," Del Toro said.
>
> "We are holding industry accountable in every which way that we possibly can and working with them at the same time to try to close these gaps."[57]

[56] Sam LaGrone, "Submarine Supply Chain Largest Barrier to Improving Virginia Attack Sub Schedule, Says Boykin," *USNI News*, May 8, 2023.

[57] Sam LaGrone, "SECNAV Del Toro: Virginia Attack Sub Construction 'Significantly Behind,' District of Columbia Submarine 10% Behind Schedule," *USNI News*, March 29 (updated March 30), 2023. See also Rich Abott, "SECNAV: Columbia Sub 10 Percent Behind, Virginia Subs Improving But Still Behind," *Defense Daily*, March 30, 2023.

A March 15, 2023, press report stated

> The sea service [i.e., the Navy] spent more than $1 billion between fiscal 2018 and 2022 on bolstering the two nuclear shipbuilding yards and their thousands of suppliers, and kicked off another five-year, $2.4 billion investment in FY23—on top of the annual cost of procuring submarines.
>
> The Navy this year is also launching a separate $2.2 billion investment in Virginia-class maintenance and readiness, which will also benefit many of the same parts suppliers....
>
> There was a time when Navy officials thought a couple-billion-dollar infusion into the submarine industrial base could help expand production from two Virginias a year to three. In June 2021, then-acting Assistant Secretary of the Navy for Research, Development and Acquisition Jay Stefany told senators it would take "a major investment of effort, capital and workforce" and cited an internal study that called for $1.5 billion to $2 billion—plus industry's own investments—to get to that higher rate.
>
> The Navy will ultimately spend more than that just to secure on-time production of two Virginias a year....
>
> A senior administration official told Defense News last week the Navy investments so far "are down payments on what needs to be done for the U.S. submarine industrial base," adding the administration would "work with Congress to get very substantial lifts in the U.S. submarine industrial base, lifts that go significantly beyond the $4.6 billion we will have submitted with the president's budget submission," referring to the $2.4 billion effort that began last year and the $2.2 billion effort kicked off with this week's FY24 request....
>
> Here's a closer look at what's been invested so far: ...
>
> The Navy last year made the first payments of a five-year, $2.4 billion investment in industrial base and workforce development support, including nearly $750 million in FY23 for the submarine industrial base.
>
> Rep. Joe Courtney, the top Democrat on the House Armed Services Committee's seapower panel, noted the newly released FY24 budget proposal seeks $647 million more to expand the submarine industrial base....
>
> The FY23 funding included $541 million for supplier development, workforce development, shipyard infrastructure and strategic outsourcing to other shipyard....
>
> Congress designated the remaining $207 million in FY23 submarine industrial base funding for workforce development initiatives to help the shipyards cope with labor shortages that have hindered production....
>
> ... a 2021 Congressional Budget Office report showed the number of parts taken from one Virginia submarine to complete maintenance on another skyrocketed in 2019 and remained high since.
>
> That's where the new $2.2 billion investment in Virginia-class spares and maintenance will come into play.
>
> The Navy is asking for $541 million in FY24 for spare parts, according to Rear Adm. John Gumbleton, the deputy assistant secretary of the Navy for budget and director of fiscal management....
>
> Even as Congress works through the FY24 budget process, the service will use its Navy Working Capital Fund to purchase $200 million to $350 million in spare parts so that they're waiting on the shelves in FY24 and the Navy can use its appropriated funds to buy those parts for immediate use.

> This funding is meant to give parts suppliers an increased but stable demand while also helping address widespread maintenance delays.[58]

A March 6, 2023, press report stated

> Electric Boat hired 3,700 shipbuilders last year. It wants to hire more than 5,000 this year and just as many every year for decades into the future.
>
> Last spring, it hired a fifth of UConn's engineering grads. At the other end of the education pipeline, it is promoting shipbuilding careers in elementary schools, setting its sights on second graders who will join the workforce when EB hopes to hit its peak employment target in 10 years.
>
> "My first words to you this morning," President Kevin Graney deadpanned last week to a roomful of political, government and military officials at a breakfast meeting at the Mystic Marriott. "EB is hiring."
>
> The nation's foremost builder of submarines is, Graney said, in the midst of a "once in generation expansion," producing for its principal customer, the U.S. Navy, the ships that will form the front line in a scramble by the U.S. and its allies to catch up with and contain Chinese expansionism.
>
> But one of the challenges emerging from a new shipbuilding boom is a shortage of shipbuilders....
>
> As [submarine] construction gears up, there is concern over whether Electric Boat—and the thousands of other manufacturers in the supply chain known as the submarine industrial base—can hire and begin production quickly enough to meet the aggressive construction and delivery schedule on which the Navy says U.S. security depends....
>
> By scouring the northeast for tradesmen and engineers, Electric Boat says it is meeting and will continue to meet the Navy's ambitious delivery schedule of two Virginia and one Columbia class submarines a year....
>
> Electric Boat said it is meeting the delivery schedule and will continue to do so, although there was a slippage in the Virginia work after a portion of its tight workforce was shifted to the Columbia program when the Navy designated that as the nation's top defense priority.[59]

A February 9, 2023, press report stated

> The Virginia-class submarine production line at Newport News Shipbuilding is now fully staffed, after taking a back seat to the preeminent Columbia-class submarine program for years.
>
> A larger workforce is one of several factors that give the company confidence the remaining Block IV Virginia boats will be delivered on their new schedule. The vessels were bought at a pace of two a year and were meant to deliver at the same rate. However, they are only arriving at a rate of about 1.2 boats annually, several U.S. Navy officials recently said.
>
> In fact, Newport News Shipbuilding and General Dynamics Electric Boat, which co-build all the submarines, did not deliver a single sub to the Navy from April 2020 to February 2022.

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[58] Megan Eckstein, Joe Gould, and Bryant Harris, "How the US Plans to Expand Its Submarine Industrial Base for AUKUS," *Defense News*, March 15, 2023.

[59] Edmund H. Mahony, "CT's Electric Boat Looking to Hire 5,000 More Employees Amidst 'Once in Generation Expansion,'" *Hartford Courant*, March 6, 2023.

> The boats were already behind schedule when the COVID-19 pandemic exacerbated the issue. As the two submarine construction yards—Newport News Shipbuilding in Virginia and Electric Boat in Connecticut—ramped up the size of their workforce in anticipation of a greater workload, they had to ensure the Columbia production line was fully staffed and remained on schedule.
>
> Any shortfalls, then, fell on the Virginia program.
>
> "We're fully staffed on Block IV and Columbia, and we're working very hard on execution there," the CEO of HII, Chris Kastner, said Feb. 9 on an earnings call.[60]

A January 31, 2023, press report stated

> The U.S. Navy and its suppliers have thousands of open jobs at government repair yards and in the private shipbuilding and ship repair industrial base, as hiring and retaining skilled workers has become "our No. 1 strategic challenge across the enterprise," according to the head of Naval Sea Systems Command.
>
> Vice Adm. Bill Galinis said Monday government and industry are competing against each other for a undersized pool of talent in both trades and white-collar specialties....
>
> Matt Sermon, the executive director for the Program Executive Office for Strategic Submarines, noted at the same conference a recent analysis showed the submarine industrial base will need to hire 100,000 people over the next 10 years for submarine construction alone, at the two main shipyards as well as their 17,000 vendors. This would cover the workforce needed to build one Columbia-class ballistic missile submarine and two Virginia-class attack submarines each year.[61]

Strategic Outsourcing

One option for addressing industrial-base challenges of building both Columbia-class boats and Virginia-class SSNs at the same time is to increase the use of shipyards other than GD/EB and HII/NNS, as well as other manufacturing facilities, in building components of Columbia- and/or Virginia-class boats—a practice sometimes referred to as strategic outsourcing. An October 21, 2022, press report states:

> The U.S. Navy is pouring billions of dollars into shoring up the companies that help build nuclear-powered submarines and aircraft carriers.
>
> But these companies, and especially prime contractors General Dynamics Electric Boat and HII's Newport News Shipbuilding, cannot hire enough people to keep up with demand.
>
> So they're outsourcing work that was previously done in-house, two admirals said.
>
> Rear Adm. Jon Rucker, the program executive officer for attack submarines, said the Navy spent more than $1 billion between fiscal 2018 and fiscal 2022, and that the service is committed to $2.4 billion from fiscal 2023 to fiscal 2027.
>
> These funds cover supplier development, workforce development, shipbuilder infrastructure, the development of technologies such as additive manufacturing and nondestructive testing, government oversight, and strategic outsourcing.

[60] Megan Eckstein, "Newport News Has Fully Staffed Attack Sub Line, After Years Of Delays," *Defense News*, February 9, 2023.

[61] Megan Eckstein, "Workforce Woes Are Top 'Strategic Challenge' for Navy, Admiral Says," *Defense News*, January 31, 2023. See also Rich Abott, "Navy Official Describes 100,000-Person Submarine Workforce Challenges," *Defense Daily*, January 31, 2023; Nick Wilson, "Navy Officials Highlight Labor Shortages, Other Key Challenges for Submarine Production And Maintenance," *Inside Defense*, January 31, 2023.

> In terms of tonnage of submarine construction, the Navy will see a 5.5 times increase from FY11 to FY25. But the number of suppliers has dropped to about 5,000, compared to 17,000 companies during the last submarine construction surge in the 1980s, Rucker said last month at an American Society of Naval Engineers conference.
>
> Rucker said the Navy is trying to target its investments where it can make the most impact: 350 companies are considered "critical suppliers" in the submarine-industrial base, and 55% of those are located in six states. So workforce development dollars are focused on those states to do the most good for critical suppliers in need of more workers. This effort could see the establishment of new training sites in Virginia and Pennsylvania.
>
> Outsourcing is becoming more important as some regions realize they aren't receiving enough interest for people to join the manufacturing industry, despite federal and state government efforts to create manufacturing training opportunities.
>
> "We are saturated in certain areas of the country. The Northeast is one of those. If we cannot bring the people to the work, we're going to take the work to the people," Rucker said.
>
> Today, he explained, Electric Boat outsources 1.1 million hours' worth of work a year and Newport News Shipbuilding outsources 900,000 hours as they build new Virginia- and Columbia-class submarines.
>
> By 2025, that combined 2 million hours will grow to 5 million, he said—which equates to half the work to build a Virginia submarine.
>
> Rucker said companies across the U.S. are building structural pieces of submarines, including some large modules, that were previously built at Electric Boat and Newport News facilities. Now they're constructed by companies with available workers and space, and then shipped to the shipyard for assembly.[62]

A December 6, 2022, news release from Austal USA of Mobile, AL—a shipyard that builds conventionally powered surface ships for the Navy—states:

> Production has commenced at Austal USA's shipyard in Mobile, Ala., in support of their strategic partnership with General Dynamics Electric Boat (GDEB) to support the U.S. Navy's recapitalization of the nation's nuclear submarine fleet. Leveraging Austal USA's lean manufacturing techniques and modern steel production line facilities, a focus factory approach is being used to expand production capacity of the submarine industrial base.
>
> As part of the partnership, Austal USA is constructing and outfitting Command and Control Systems Modules (CCSM) and Electronic Deck Modules (EDM) for the Virginia- and Columbia-class programs. GDEB commenced on-the-job training efforts in April 2022 to provide certification for skilled trades and supervisory positions to ensure consistent work practices and adherence to quality assurance standards....
>
> Work commenced in late November on two tanks for a Virginia class submarine. The first CCSM is scheduled to arrive at Austal USA's Mobile shipyard in late January 2023 for initial outfitting efforts. The work will support a gradual ramp up to full fabrication and outfitting of CCSMs and EDMs across both submarine classes beginning in 2026.[63]

[62] Megan Eckstein, "Defense Firms Outsource Sub, Carrier Construction amid Labor Woes," *Defense News*, October 21, 2022.

[63] Austal USA, "Austal USA Commences Submarine Work," December 6, 2022. See also Justin Katz, "Known for LCS, Alabama-Based Austal USA Starts Submarine Work," *Breaking Defense*, January 19, 2023; Rojoef Manuel, "Austal, General Dynamics Team Up for US Navy Nuclear Submarine Production," *Defense Post*, December 8, 2022; Rich Abott, "Austal Starts Submarine Construction Support Work," *Defense Daily*, December 12, 2022.

Potential Oversight Questions for Congress

Potential oversight questions for Congress include the following:

- What is the total estimated cost of actions needed to increase the capacity of the submarine-construction industrial base to a 2+1 annual production rate? What portion of this cost has been funded through FY2023, and what portion remains to be funded in FY2024 and subsequent years? How much of that remaining cost has been requested for FY2024 itself? What portions of all these costs are to be funded by government, and what portions are to be funded by industry?
- Can the estimated date for achieving a construction rate of 2.0 Virginia-class boats per year be accelerated from 2028 to an earlier year? If so, what additional actions would be necessary, and what is their estimated cost?
- What additional actions would be needed to increase the capacity of the submarine-construction industrial base to a 3+1 annual production rate? What would these actions cost, and when would the 3+1 capacity be attained?
- What impact is the December 21, 2021, presidential determinations relating to the DPA having on the capacity of the submarine construction industrial base to build both Virginia- and Columbia-class submarines? What actions has the determinations made possible that were not previously permitted? What actions are included in the proposed FY2024 budget, and at what cost? What would be the specific effect of these actions, and how long would they take to implement?

Reported Industry-Navy Dispute over Liability Insurance

Another oversight issue for Congress concerned a reported dispute between GD/EB and the Navy over liability insurance that has delayed the signing of a contract for building Virginia-class boats. In May 2023, it was reported that this dispute had been settled—a May 11, 2023, press report stated

> The U.S. Navy has settled an insurance dispute with two key shipbuilding companies that has delayed the ordering of two Virginia-class submarines, according to people familiar with the matter.
>
> The dispute centered on who should pay if a Tomahawk cruise missile were to accidentally explode during construction, damaging or destroying a nuclear-powered submarine worth more than $3 billion. For years, the Navy had indemnified the yards—Electric Boat, which is owned by General Dynamics, and Newport News Shipbuilding, a division of HII—essentially providing the insurance that the yards found difficult to obtain from a private insurer.
>
> But in 2018, the Navy decided the arrangement heaped too much risk on the service, and ceased to offer indemnification. The service asked the shipyards to find private insurance, but they declined. In February 2022, the Navy suspended plans to order long-lead parts for two Virginia-class attack submarines. "Under the current law, Secretary of the Navy Carlos Del Toro makes the final decision on indemnification for Navy and Marine Corps contracts," USNI News wrote in December.
>
> In January, Del Toro urged the companies to come to the table and negotiate.
>
> "I'm going to hold the ground and I'm willing to compromise on some things," Del Toro said. "I'm not willing to compromise on everything. They're going to have to come to the table with reasonable language that the American taxpayer can accommodate on that ground."

> Congress as well expressed worry about the impending delays to the delivery of the planned submarines, and alluded to the dispute in the 2023 defense policy bill. This all comes as companies are trying to quell supply issues caused by the pandemic and hire workers....
>
> On Thursday [May 11], a Navy official said a deal had been agreed upon by the Navy and the shipyards.
>
> "We have reached agreements with the companies that are involved here," said the Navy official, speaking anonymously because the contracts for the sub parts had not yet been awarded.
>
> The official declined to say what the deal entailed or whether the subs' delivery would be delayed.[64]

Prior to the above-reported settlement of the dispute, a January 11, 2023, press report stated

> The Navy and General Dynamics are still at an impasse over an insurance spat that has resulted in the 11-month delay to contracts for two Virginia-class attack submarines, Secretary of the Navy Carlos Del Toro told USNI News on Wednesday.
>
> The service and the submarine builder disagree on the share of responsibility in the event of an accident occurring either during construction or operations aboard attack boats that field Tomahawk Land Attack Missiles. Until 2018, the Navy had financially protected General Dynamics Electric Boat from liability in the event of a Tomahawk accident in new submarine construction under an unusually high-risk provision due to its higher energy propellant.
>
> The Navy says that EB should cover the risk, while General Dynamics has said they are unable to secure an insurance policy that would cover any accidents with high-energy propellant in the missiles that could cost billions in damages and be an existential risk for the company, several sources familiar with the negotiations have told USNI News.
>
> "The American taxpayers have the right that when a company does something that is willful and wrong … and it results in a catastrophic event, that they not be the ones to be held accountable, that industry be held accountable for that. That's my responsibility to the American taxpayer, as a U.S. government official," Del Toro told reporters during a press roundtable at the Surface Navy Association symposium.
>
> "I'm going to hold the ground and I'm willing to compromise on some things. I'm not willing to compromise on everything. They're going to have to come to the table with reasonable language that the American taxpayer can accommodate on that ground."
>
> A spokesman for General Dynamics declined to comment on the contract dispute when contacted by USNI News....
>
> The split between the service and the shipbuilder has stalled the advance procurement contracts for two Block V Virginia-attack boat that were set to start in Fiscal Year 2024 and are now almost a year late, several sources confirmed to USNI News over the last month.[65]

Cost and Schedule Risk in Virginia-Class Block V Design

Another potential issue for Congress concerns cost and schedule risk in building the Block V version of the Virginia-class submarine—the version procured during the FY2019-FY2023

[64] Marcus Weisgerber, "Navy, Shipyards Settle Dispute that Delayed Submarine Orders," *Defense One*, May 11, 2023.

[65] Sam LaGrone, "SECNAV: New Virginia Attack Boat Contracts Still Stalled Over Missile Insurance Issue; Lockheed, Northrop Clear Hypersonic Deal with Navy," *USNI News*, January 11, 2023.

Virginia-class MYP contract. A June 2022 Government Accountability Office (GAO) report—the 2022 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**
>
> Over the past year, work on Block V submarines fell further behind schedule and construction costs continued to grow above original targets due to overall higher workforce demand and additional factors such as correspondingly less experienced workers.
>
> The Navy's prioritization of the Columbia class submarine relative to the Virginia class submarine exacerbated the effect of these workforce trends for Virginia class construction. The same companies build both submarine classes and have been challenged to meet both programs' increasing workforce needs. Program officials reported that the shipbuilders added more workers to the Columbia class construction efforts than the Virginia class, contributing to delays on the Virginia class submarines.
>
> Consequently, program officials expect that the first three Block V submarines will be delivered late. Additional cost increases and schedule delays are likely. The Navy's current cost and schedule projections may be optimistic because they assume a significant amount of improvement in construction efficiency that has yet to be achieved, and the Columbia class's growing staffing needs continue to add risk for the Virginia class.
>
> Program officials reported that acoustic superiority improvements were installed on a Block III submarine delivered in September 2018 in an effort to reduce risk to Block V. Program officials reported that no issues were found with integrating acoustic superiority during that submarine's construction and it successfully completed initial at-sea testing in October 2021.
>
> **Program Office Comments**
>
> We provided a draft assessment to the program office for review and comment. The program office provided technical comments, which we incorporated where appropriate. The program office reported that it began full-rate production of two submarines per year in 2011, but it also stated that the shipbuilders are not currently meeting that delivery pace. It also stated that two Block IV Virginia class submarines—SSN 793 and SSN 794—are scheduled to be delivered in early 2022.[66]

Additional Issues

Virginia-Class Maintenance Requirements and Operational Availability

Another issue for Congress concerns the maintenance requirements and operational availability of Virginia-class boats. A September 22, 2022, press report states:

> With its Virginia class of attack submarines suffering from maintenance woes and low operational availability, the U.S. Navy is working to ensure its next attack submarine is easier to sustain, according to the program executive officer [PEO] for attack submarines....
>
> [On September 21, at the American Society of Naval Engineers' annual Fleet Maintenance and Modernization Symposium, Rear Admiral Jonathan] Rucker said PEO Attack Submarines is revisiting the maintenance plan for these Virginia SSNs in the hopes of improving sustainment and that the Navy must take a better approach while designing the

[66] Government Accountability Office, *Weapon Systems Annual Assessment[:] Challenges to Fielding Capabilities Faster Persist*, GAO-22-105230, June 2022, p. 190.

SSN(X) next-generation attack submarine to ensure high operational availability and easier sustainment throughout the lifecycle.

Coming off of the Cold War-era Seawolf-class submarine, designed to be fast, lethal and stealthy, the Navy took a different approach with the Virginia class, Rucker said, and opted to "build a submarine for an affordable cost to ensure we could get the numbers we needed."

"I'm not going to say that sustainment came as an afterthought but, to be honest, it was … a challenge we'll deal with later," he added. "Unfortunately, some of that challenge is here today."

At the same conference, Rear Adm. Scott Brown, who oversees maintenance at the Navy's four public shipyards, said the service didn't make the required upfront investments when designing and acquiring the Virginia class, meaning shipyard workers today reach for parts and components and find they're not there.

"It's resulting in a lot of churn, a lot of cannibalization—so we have to take things off other boats to stick them on the boat we're trying to get out—and a lot of, frankly, frustration with the workforce on waiting for stuff that doesn't exist," Brown said. "Of course, that leads to delays."

Rucker said the Navy must ensure that doesn't happen with future [submarine] classes.

... Rucker, who previously served as program manager for the Columbia class, said the Navy designed the ship [i.e., the Columbia class submarine] with maintenance in mind, even bringing in ship maintainers for their input on potential issues such as access and rigging points.

Maintenance is also a focus for the SSN(X) [next-generation attack submarine] program,[67] he said.

"There are things we've already learned on Virginia: of the over a million parts, less than 0.1% of the design is not doing what we thought it would from [a life expectancy perspective]. It's 32 items, to be exact," Rucker said. "We've already figured out what those were, we redesigned them or changed the maintenance cycle."

Those improved parts could be used on SSN(X).

Rucker said the SSN(X) design phase prioritizes this focus on maintenance. The program's initial capabilities document lays out four top-level requirements: speed, stealth, payloads, and operational availability.[68]

A September 21, 2022, press report stated

The earliest Virginia-class boats are among the hardest submarines to repair on time.

"We've seen a significant growth in the amount of man days required in submarine availabilities, particularly in the Virginia class," [Vice Admiral William] Galinis [the commander of the Naval Sea Systems Command] said.

"We're doing a deep dive to figure out why that is. It's really a continuous process."...

The Virginias were designed to operate closer to shore and with components that met rigorous NAVSEA standards for submarine safety, but were not as durable as some of the older components on the Los Angeles-class boats.

[67] For more on the SSN(X) program, see CRS In Focus IF11826, *Navy Next-Generation Attack Submarine (SSN[X]) Program: Background and Issues for Congress*, by Ronald O'Rourke.

[68] Megan Eckstein, "Next-Generation Attack Subs Will Be Designed with Maintenance in Mind," *Defense News*, September 22, 2022.

> "When we came off the Sea Wolf-class we had an extremely capable but relevantly more expensive submarine," [Rear Admiral Jonathan] Rucker said.
>
> "Where we were in the beginning of the Virginia class, we had a charge early on to build a design and build a submarine for an affordable cost to make sure we got the numbers we needed."
>
> Sustainment of the submarine class wasn't a major requirement for the program and the Navy pushed maintenance aside for other cost saving considerations.
>
> "Unfortunately, some of those challenges are here today," Rucker said.
>
> USS Virginia (SSN-774), commissioned in 2004, is wrapping up a mid-life availability and lessons from that repair and other early boats in the class are informing a class-wide maintenance plan to assist with scheduling and securing materials.
>
> That Navy will implement that plan starting in Fiscal Year 2023 and may not see improvements until FY 2024.
>
> "If you throw a rudder over on the Titanic, it takes a while for the ship to turn," Rucker told USNI News.
>
> "It's going to take a little bit of time, just because there's a lag and getting the resources or changing behavior or ensuring that we plan better for what we're going to do."
>
> In the long term, the lessons from the Virginia-class sustainment issue have informed how the Navy planned for repairing and maintaining the Columbia-class ballistic missile submarines and the next-generation attack submarine SSN(X), Rucker said.[69]

Shortage of Spare Parts for Virginia-Class Boats Undergoing Maintenance

A related issue for Congress concerns a shortage of spare parts for existing Virginia-class boats undergoing maintenance. A June 21, 2021, press report states

> The U.S. Navy has swapped more than 1,600 parts among its new Virginia-class submarines since 2013 to ease maintenance bottlenecks as components that are supposed to last 33 years wear out decades sooner.
>
> Parts are being shuttled regularly among the nuclear-powered fast-attack submarines so that vessels in the $166 billion class built by General Dynamics Corp. and Huntington Ingalls Industries Inc. can return to operations, according to data from the Naval Sea Systems Command and the Congressional Budget Office[70]….
>
> If a part isn't available for a sub that's finishing refurbishment, shipyard maintenance workers may be forced to borrow, or "cannibalize," one from a submarine entering maintenance in order to reduce delays. Most cannibalized parts are for non-propulsion electronic systems, but the Navy declined to specify which ones are affected, citing operational security.
>
> The number of swapped parts for the submarines, which began entering service in 2004, increased from 100 in 2013 to 171 in 2016, 201 in 2018 and 452 in 2019 before declining to 318 last year. The Navy projects the number will drop to 82 between this year and next….

[69] Sam LaGrone, "NAVSEA: Navy 'Struggling' to Get Attack Subs Out of Repairs on Time as Demand Increases," *USNI News*, September 21, 2022. See also Audrey Decker, "Navy Still 'Really Struggling' with On-Time Maintenance for Virginia," *Inside Defense*, September 21, 2022.

[70] This is a reference to a recent CBO report: Congressional Budget Office, *The Capacity of the Navy's Shipyards to Maintain Its Submarine*s, March 2021, 21 pp.

> The big disadvantage of cannibalizing parts from one submarine to another is the extra workload involved, according to the Congressional Budget Office, as well as the risk that a part might be damaged during the extra steps. The Navy doesn't know how much the swaps add to workload, saying that at this point "there is limited range and depth of data."…
>
> Some parts identified to last 33 years based on engineering analysis and testing,"were subject to degradation" such as "corrosion caused by complex galvanic interactions," or when two dissimilar metals or electrical parts come in contact for an extended period of time, "that had not been predicted in some operating environments," the Navy said….
>
> The Navy's submarine leaders are "not satisfied with any material cannibalization that limits our submarine fleet's ability to respond to national tasking and is taking all steps necessary to avoid these scenarios," the command said. It said it is ordering parts earlier to "reduce material work stoppages and maintenance delays awaiting components."
>
> According to the Navy, 70% of the part swaps were between Block I subs that first entered service in 2004 and Block II vessels initially delivered in 2008.
>
> Flaws in contractor quality and parts that were out of specification "contribute to a small percentage" of premature parts wear, the Navy said.[71]

Substandard Steel

Another issue for Congress concerns substandard steel used for building Navy submarines between 1985 and 2017, a problem that investigators discovered in 2017 and that was first reported in 2020.[72]

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[73] and 2019.[74]

Defective Parts

Another issue for Congress concerns three Virginia-class boats that were reported in 2016 to have been built with defective parts.[75]

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[71] Anthony Capaccio, "U.S. Navy's Deadliest New Sub Is Hobbled over Spare Parts," *Bloomberg*, June 21, 2021.

[72] For press reports on this issue, see, for example, Gene Johnson, "Metallurgist Gets 2.5 Years for Faking Tests on Sub Parts," *Associated Press*, February 14, 2022; Gene Johnson (Associated Press), "Feds Say Company Provided Subpar Steel for US Navy Subs," *Defense News*, June 15, 2020; Sam LaGrone, "Navy Has 'Mitigated' Risk of Suspect Steel From Company in Federal Fraud Case," *USNI News*, June 19, 2020; Julia Bergman, "Submarine Supplier Mishaps Lead to Call for Hearing," *New London Day*, June 16 (updated June 17), 2020; Gene Johnson, "Metallurgist Admits Faking Steel-Test Results for Navy Subs," *Associated Press*, November 8, 2021; Agence France-Presse, "US Navy Boosts Monitoring of Subs After Falsified Steel Tests," *France 24*, November 10, 2021; Geoff Ziezulewicz, "Navy Says It Ensured Sub Safety After Fake Strength Tests Surfaced, But Won't Detail How," *Defense News*, *Navy Times*, January 6, 2022.

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

[74] 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.

[75] For press reports on this issue, see, for example, 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.

Legislative Activity for FY2024

Congressional Action on FY2024 Funding Request

The Navy's proposed budget requests the procurement of the 39th and 40th Virginia-class boats. The two boats have an estimated combined procurement cost of $9,427.6 million (i.e., about $9.4 billion). The two boats have received a combined total of $2,297.7 million in prior-year advance procurement (AP) funding, and the Navy's proposed FY2024 budget requests the remaining $7,130.0 million needed to complete their estimated combined procurement cost. The Navy's proposed FY2024 budget also requests $1,855.5 million in AP funding for Virginia-class boats to be procured in future fiscal years, $1,360.0 million in Economic Order Quantity (EOQ) funding, which is an additional kind of AP funding that can occur under an MYP contract, and $168.2 million in cost-to-complete (CTC) funding to cover cost growth on Virginia-class boats procured in prior years, bringing the total amount of procurement, AP, EOQ, and CTC funding requested for FY2024 to $10,513.7 million (i.e., about $10.5 billion).

As noted earlier, as part of its FY2024 budget submission, the Navy has requested authority for a Virginia-class MYP contract that would begin in FY2025.[76]

Table 2 summarizes congressional action on the Navy's FY2024 budget funding request for the procurement of Virginia-class boats in FY2024 and subsequent years.

Table 2. Congressional Action on FY2024 Funding Request

Millions of dollars, rounded to nearest tenth, under Navy's original FY2024 budget submission

		Authorization			Appropriation		
	Request	**HASC**	**SASC**	**Final**	**HAC**	**SAC**	**Final**
Procurement	7,130.0						
Advance procurement (AP)	1,855.5						
Economic Order Quantity (EOQ)	1,360.0						
(Quantity)	*(2)*						
Cost-to-complete	168.2						
TOTAL	**10,513.7**						

Sources: Table prepared by CRS based on Navy's original FY2024 budget submission, committee and conference reports, and explanatory statements on FY2024 National Defense Authorization Act and FY2024 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.

[76] As noted earlier, the Navy typically requests authority for an MYP contract for the Virginia-class program one year in advance of the proposed start of the MYP contract. The Navy states that "if the MYP [proposed to begin in FY2025] is not approved in FY 2024, the Navy would lose EOQ savings across the procurement and the long-term shipbuilder and vendor base stability achieved with an MYP authority. If an MYP is not authorized for the next Block of VCS submarines, the Navy may have to enter a single ship procurement contract for FY 2025 ships forcing industry to assume greater risk and raise prices." (Source: "Twelfth Package of Legislative Proposals Sent to Congress for Inclusion in the National Defense Authorization Act for Fiscal Year 2024 – Individual Proposals (Sent to Congress on May 18, 2023)," posted at https://ogc.osd.mil/OGC-Offices/Office-of-Legislative-Counsel/DoD-Legislative-Proposals-2024/.) See also Nick Wilson, "Citing Essential Cost Savings, DOD Seeks Multiyear Authority for Block VI Virginia Submarines," *Inside Defense*, May 19, 2023.

Appendix A. Past SSN Force-Level Goals

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

The Reagan-era (i.e., 1980s-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.[77] 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.[78]

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.[79] 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."[80] 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
- "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."[81]

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[77] 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.

[78] 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.

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

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

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

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."[82]

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.[83]

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.[84]

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.[85]

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.

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

[83] 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.

[84] 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.

[85] 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.[86]

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.[87] 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

[86] 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.

[87] 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.[88]

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.

[88] 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. SSN Maintenance Delays

This appendix presents additional background information on delays 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 resulting from delays in maintenance can put added operational pressure on other SSNs that are available for deployment.

A January 12, 2023, press report stated

> Top Navy officials this week promoted the idea of adding more public shipyards [i.e., government-operated naval shipyards, or NSYs] to improve ship maintenance.
>
> Speaking during the annual Surface Navy Association symposium on Wednesday [January 11], Adm. Daryl Caudle, Commander of U.S. Fleet Forces Command, emphatically said there is a good argument for the need to add at least a fifth public shipyard.
>
> "Of course. I need six! I need enough capacity in our shipyards to drive the backlog down to zero…I can today, if I had the backlog chipped down, have a more effective, larger fleet today." Caudle said on Wednesday during the Surface Navy Association symposium.[89]

A November 17, 2022, press report stated (emphasis added):

> **The U.S. Navy has nearly twice as many submarines sidelined for maintenance than it should**, and those boats in maintenance ultimately require three times more unplanned work than they should, the program executive officer for attacks subs has said.
>
> But the service thinks it can turn these and other problematic statistics around by changing when and how it funds submarine maintenance. In fact, Rear Adm. Jon Rucker said he thinks the Navy can implement industry best practices starting in fiscal 2026 and, by the end of that fiscal year, get to almost zero delay days.
>
> Several aspects of submarine maintenance preparation are awry, setting up the boats for poor outcomes, Rucker said this month at the Naval Submarine League's annual conference.
>
> On the planning side, engineers aren't sticking to milestones that lock the work package at a certain point; instead, they continue to jam in more work, which throws off assumptions about the materials to order and the availability of skilled labor.
>
> Because of the addition of extra work once the maintenance availability starts, coupled with unexpected problems that arise, Rucker said 30% of the total work on submarines is unplanned, compared to an industry best practice of 10%.
>
> The Navy has set a goal to get to 10% unplanned work by FY26, and much of that improvement will come from discipline in the planning process.
>
> When it comes to ordering materials, Rucker said, the Navy isn't funding these at the right amount or at the right time.
>
> For starters, he explained, the Navy only funds 40% to 50% of materials ahead of the start of a maintenance availability; the remaining amount is ordered after the availability starts and workers can get a closer look at the insides of the boat. Much of this material is considered "contingent"—the Navy will not order it until workers see that the condition of the submarine requires certain work be done and therefore materials to be ordered.
>
> The problem is that almost every single boat requires all the same contingent work, Rucker said, meaning it would be better to assume up front the work will be done and the parts are

[89] Rich Abott, "Fleet Forces And SecNav Argue For More Maintenance Yards," *Defense Daily*, January 12, 2023.

required. “We’re going to buy the material anyway; we just buy it late” under the current system, he explained.

By fiscal 2026, he said, the Navy will aim to have 90% to 95% of total material on hand when an availability starts, rather than today’s 40% to 50% figure. This issue of buying materials earlier is made all the more dire by the increasing delivery times of many materials.

Rucker told reporters after his speech at the conference that the Navy used to get away with later material orders for two reasons: The older Los Angeles-class attack boats had a more plentiful inventory of spare parts on hand due to investments when that submarine class was in construction, and because parts not already on hand could typically be delivered within two to 12 months.

Today, the Navy has few spares on hand for the newer Virginia-class boats. And when items like large pumps and valves are unexpectedly needed, it can take as long as three years to get them made and delivered.

“We have to phase the money differently. Our model’s broken because it was built on an assumption of the way things were 20 or 30 years ago, when we had three times the suppliers [in the industrial base], a very mature class” with plenty of spares on hand, he said.

“But the model doesn’t support the fact that we have longer leads, fewer suppliers; it takes more time, and we didn’t buy all the stuff we needed to. We’re going to adjust the way we buy things,” he added.

He made clear the Navy isn’t asking to buy materials “early,” but rather on a new timeline that better reflects long delivery times and the imperative to have 90% to 95% of the material on hand at the start of work.

Rucker said the submarine community decided on these changes too late to modify the FY23 funding request. He’s working to get them implemented in the FY24 budget request, which is to be released in the spring. If the Navy can properly phase its spending on materials for submarine repair work, it will give industry a more predictable workload, ensure more materials are on hand at the start of a repair project and reduce a major barrier to submarines coming out of maintenance on schedule.

Overall, Rucker explained in his speech, the Navy has gone from nearly 1,600 delay days of maintenance for attack submarines in FY19 to 1,100 delay days in FY22, which ended Sept. 30.

Late materials alone account for more than 100 of those days, Rucker said.

His office projects that figure will come down to about 700 delay days by FY26 based on changes already implemented—and Rucker said that better planning and earlier materials purchased will get the community to as close to zero as possible by the end of FY26, assuming the changes are implemented this next budget cycle.

This drive to zero delay days comes in the context of an undersized attack submarine force that’s kept busy. Navy and Pentagon leadership repeatedly call the submarine force among America’s top advantages over adversaries like China and Russia; yet the U.S. has 50 attack submarines and four related “large payload submarines,” compared to a requirement for a combined 66 to 72 attack and large payload subs.

> **Of the 50 attack subs, Rucker said 18 are in maintenance or waiting for their turn. Industry best practice would call for just 20% to be tied up in repairs, or 10 boats instead of 18.**[90]
>
> The Navy in 2010 decided to put the submarines through fewer but longer maintenance availabilities, allowing the boats to have longer operational cycles. But Rucker said this new model—when all the delays are taken into account—means a sub going into maintenance is out of the fleet for an average of 450 to 700 days, depending on the class, at a time when operational commanders are itching for all the submarine presence they can get.
>
> To help overcome the backlog of maintenance work faster, construction yards Newport News Shipbuilding and General Dynamics Electric Boat are helping with some repairs of Los Angeles-class subs. The former has Columbus, and the latter was awarded a contract over the summer for repairs on Hartford.
>
> Boise, the poster child for submarine maintenance woes—it returned from its last deployment in January 2015 and has been waiting to get into maintenance since fiscal 2016, losing its certification to dive amid the delays—is expected to go into maintenance at Newport News. But Rucker said a final decision on its funding would be revealed in the FY24 budget request, and he would not comment further on plans for that boat.[91]

A November 14, 2022, press report stated

> When a U.S. attack submarine arrives for shipyard maintenance, Navy rules say the vast majority of the necessary parts and materiel must be there waiting. But most jobs actually begin with half or even fewer of the needed items on hand. That means delays, extra cost, and usually, stealing items from other projects, which compounds the problems across the sub force.
>
> That's a planning and funding problem, according to the program executive officer for attack submarines, who says he's working to fix it by 2026.
>
> "On the material side, we are not funding them properly…We do not fund the right amount and we do not phase it properly," Rear Adm. Jonathan Rucker said Nov. 2 at the annual Naval Submarine League symposium in Arlington, Virginia....
>
> Currently, just 40 to 50 percent of the required parts and material are on hand when a sub arrives in the yard, Rucker said.
>
> Part of the problem is that the Navy lacks funds for "contingent material": parts to fix problems that are discovered during the work, like valves that are found to need replacement. But, Rucker said, these kinds of things are actually predictable.
>
> "Every availability—about 90 percent—we use the same stuff. We know that, but we don't order it until then," he said.
>
> Because submarine parts are so specialized and the supply chain so constrained, this generally means the yard has to take the items from some other planned submarine-maintenance project, Rucker said.

[90] Regarding this point, see also Megan Eckstein, "Navy Frustration Building over Late Weapons, Ship Deliveries," *Defense News*, January 11, 2023; Rich Abott, "Fleet Forces And SecNav Argue For More Maintenance Yards," *Defense Daily*, January 12, 2023; Justin Katz, "As AUKUS Looms, US Navy Sub Leaders Sound Alarms at Home," *Breaking Defense*, November 4, 2022.

[91] Megan Eckstein, "US Navy Hopes New Funding Model Can Cut Sub Maintenance Delays by 2026," *Defense News*, November 17, 2022.

> "And with lead times of material on the order of up to two years and some more, no wonder we don't have the material we have to count on," he said. "Because we order it after the avail starts, and we don't get it in time to do it, so we got to take it from somewhere else."
>
> Rucker said for new construction, the material is bought upfront. He wants to do the same for sustainment.
>
> "So, we're changing that model so where we're going to phase the funding differently and order the contingent material in advance and so it's ready," he said. "So when we get to that point, the stuff's on the shelf. That's part of the problem of not buying all that stuff early on. Decisions were made early; we got to get after it."
>
> By 2026, each availability will start with the required 90 to 95 percent of the material on hand, he said.
>
> But missing material is only part of what causes submarine-maintenance delays. Rucker said that planning and shipyard throughput are also causes for not "executing."
>
> Currently, the attack submarine force has about 1,100 days of maintenance delay, down from about 1,500 to 1,600 days in 2019, Rucker said, adding that improvements already in the works will reduce total annual delay days to 700 by 2026.
>
> Late material adds 100 to 111 days of delay to each availability. These are the delays that better planning and funding is intended to reduce.
>
> How the Navy could do this phased-funding approach is unclear. Rucker told reporters he is working to see which budget year to introduce it. When asked about the budgeting process for implementing something like this, officials with U.S. Naval Sea Systems Command and the Navy said they could not comment on internal budget deliberations or future budgets.[92]

A November 2, 2022, press report stated

> Within the next year the US Navy wants to initiate a "scoping study" aimed at determining if the service needs to establish a fifth public shipyard to support future submarine maintenance, according to a senior officer involved in the task, a notion that previously met with some resistance from lawmakers.
>
> Rear Adm. Jonathan Rucker, program executive officer for attack submarines, told reporters here at the Naval Submarine League symposium that industry frequently asks the Navy about considerations for a new public shipyard. He also stressed that the scoping study was preliminary and there is no clear consensus in the service yet about whether another shipyard is even necessary, let alone whether it will be built.
>
> "Right now, we're in a stage to say: 'Let's go scope how capable our shipyards could be?'" he said. Once the service completes its Shipyard Infrastructure Optimization Program, "how efficient will we be?" he continued, referring to the Navy's 20-year plan to overhaul the four existing public shipyards....
>
> Breaking Defense in May published an extensive report about one Ohio businessman's proposal to the Navy to do just that [see the May 9, 2022, press report excerpted below]. Ed Bartlett, an engineer and former enlisted sailor, called his proposal "the only actionable plan" to relieve the Navy's submarine maintenance backlog, and he has numerous former admirals, shipbuilding industry giants and local politicians backing his ideas. But at the time, lawmakers on Capitol Hill seemed unconvinced that now's the time for such a major

[92] Caitlin M. Kenney, "Only Half the Parts Are Waiting When US Attack Submarines Come in For Repairs," *Defense One*, November 14, 2022. See also Justin Katz, "As AUKUS looms, US Navy Sub Leaders Sound Alarms at Home," *Breaking Defense*, November 4, 2022.

> investment. [Rep.] Joe Courtney, Conn., a House Democrat known for being hawkish on Navy spending, called it a "tall order."
>
> Rucker today said the service had underestimated several issues that are now causing problems, such as the second- and third-tier ramifications of the coronavirus pandemic. But he added that another shipyard is a "big path to go down," if that decision is ever made. Right now, the Navy's urgent focus is on improving the capabilities and efficacy of the current shipyards, he added.[93]

A September 21, 2022, press report stated

> The submarine industrial base, already strained by demand for new construction, may need to accelerate its production of spare parts to alleviate submarine maintenance woes.
>
> The vast majority of submarine maintenance availabilities run late, in part due to poor planning practices and in part because repair yards rely on a pool of replacement parts "that just doesn't exist" after the Navy failed to sufficiently prepare for Virginia-class submarine sustainment, according to two admirals.
>
> "That upfront investment didn't happen for Virginia-class, so we're missing that whole sustainment tail, or a big portion of that," Rear Adm. Scott Brown, the deputy commander of Naval Sea Systems Command for industrial operations (NAVSEA 04), said Sept. 20 at the American Society of Naval Engineers' annual Fleet Maintenance and Modernization Symposium here.
>
> "It's resulting in a lot of churn, a lot of cannibalization—so we have to take things off other boats to stick them on the boat we're trying to get out—and a lot of, frankly, frustration with the workforce on waiting for stuff that doesn't exist," he added. "Of course, that leads to delays."
>
> He said the Navy asked the Center for Naval Analyses to study the connection between material delays and extended maintenance availabilities; the research organization found the lack of material on hand "is a fairly large contribution to our delays," according to Brown.
>
> Vice Adm. Bill Galinis, the commander of NAVSEA, said Sept. 21 at the same conference that only 20% to 30% of submarine maintenance availabilities over the last decade have finished on time. The problem is worsening as the Virginia-class submarines account for a greater percentage of the undersea fleet, he said.
>
> "We've seen a significant growth in the amount of man days required to complete a submarine [maintenance] availability, particularly a Virginia-class one, and [we're] really trying to deep-dive and understand why that really is," Galinis added.
>
> He pointed to a couple potential factors. For parts purchased with annual operations and maintenance funding, global supply chain issues mean it takes longer for parts to be delivered. In some cases, it's taking up to two years, putting current and upcoming availabilities at risk.
>
> For spare parts managed through the Defense Logistics Agency or the Naval Supply Systems Command, the Navy has only funded some of these at about 40% or 50% in recent years. As a result, parts simply aren't in the inventory when needed by the Navy's four public shipyards.
>
> And, Galinis added, the rotable pool of spares is too small due to a lack of investment in the early years of the Virginia-class acquisition. The rotable pool is made up of parts taken off a submarine by shipyard workers and later refurbished for use in the future.

[93] Justin Katz, "Navy 'Scoping Study' to Examine Shipyard Capacity, Potential for a New Yard," *Breaking Defense*, November 2, 2022.

> He added that the refurbishment process is moving too slowly, meaning parts aren't available when needed. Galinis said the Navy may have to contract out some of that refurbishment work.
>
> Brown told Defense News his office, which oversees the work of all four public shipyards, wants to increase the inventory of each component in the rotable pool and also add new types of components that have particularly blocked the service from completing maintenance availabilities on time.
>
> Brown said he doesn't expect the problem to cost the Navy more, but the service may need to spend more quickly on spares and sustainment.
>
> "That's going to cause a push of material dollars to the left in the [five-year Future Years Defense Program] to buy early to make sure we have that stuff. But it's eventually going to equalize out, because we're going to end up buying it anyway," he said.
>
> Galinis also pointed to a lack of rigor in submarine planning and project management, which he said is exacerbating the maintenance delays.
>
> A number of pre-availability assessments and tests must take place on all submarines, aircraft carriers and surface ships to help identify the exact condition of the ship and what work is needed.
>
> "The submarine force is probably the hardest one for us to get that done, principally because of their operational schedule and just in some cases the difficulty getting teams out to a submarine," Galinis said. But it means some planning documents aren't completed until the submarine is back in port, generating additional delays.
>
> Indeed, whereas surface ships only see about 10% so-called unplanned work, aircraft carriers have been seeing a 22% unplanned work rate and submarines are nearing 30%, the NAVSEA commander said.[94]

A July 11, 2022, press report stated that

> maintenance issues are hindering the East Coast fleet's readiness, according to Adm. Daryl Caudle, who leads U.S. Fleet Forces Command....
>
> [Caudle stated:] "As far as some things I'm seeing where we're not performing: Let's go to the submarine force first. The lack of capacity and the lack of performance at our public and private yards are driving availabilities—these are depot availabilities now—past our class maintenance time frames to such an extent that they have consumed all the dry docks. So if I have an emergent issue, I don't really have good options to bring in units for those things that may be emergent dry-docking repairs. They have also forced ships—because submarines expire, their hulls expire—for them to be tied up alongside waiting on their availability to start because there's no place to put them. We call those idle submarines.
>
> "The number of idle submarines has crept up over time. They fluctuate now between five to, worst case, it got to a point we were at about nine out. So these are submarines just sitting pierside because the hulls expired, they can't submerge and they're not ready to go into their depot availability. This backlog is causing me to lose fleet size due to this problem."[95]

A May 12, 2022, press report states

[94] Megan Eckstein, "Submarine Fleet Needs More Spare Parts to Stem Maintenance Delays," *Defense News*, September 21, 2022. See also Sam LaGrone, "NAVSEA: Navy 'Struggling' to Get Attack Subs Out of Repairs on Time as Demand Increases," *USNI News*, September 21, 2022.

[95] Megan Eckstein, "Six Questions with the Head of US Fleet Forces Command," *Defense News*, July 11, 2022.

> Chief of Naval Operations Adm. Michael Gilday had blunt words today for two powerhouse companies that build submarines for the Navy: We need your shipyards, but not the problems that come with them.
>
> "We know that we don't have the capacity in our public shipyards to handle all of that [submarine] maintenance. We need Electric Boat and we need Huntington Ingalls to be able to do that work," said Gilday. "They are under performing. They are over cost and way over schedule."
>
> Gilday was testifying before the Senate Armed Services Committee about the Navy's fiscal 2023 budget request alongside Navy Secretary Carlos Del Toro and Marine Corps Commandant Gen. David Berger....
>
> Todd Corillo, a Newport News Shipbuilding spokesman, in a statement to Breaking Defense, acknowledged the shipbuilder has "experienced challenges" since reconstituting its submarine repair business "following a 10-year hiatus."
>
> "In this time, we have built a proficient workforce, matured the supply chain, developed process improvements and made smart investments in required facilities," he said. "Although we experienced challenges with our transition back into this complex business, we are now keeping pace with current submarine repair needs and also forecasting future workflow to drive predictable capacity and performance."[96]

A May 9, 2022, press report stated

> With the Navy working through its long-term plan to relieve the notorious submarine maintenance backlog and other well-known issues piling up at the service's four public shipyards, into the space has stepped Ed Bartlett, an engineer and former enlisted sailor who has spent the last several years arguing that the solution is obvious: It's time to build a fifth shipyard.
>
> Bartlett has now twice pitched the Navy on a proposal to buy and build a fifth public shipyard and depot facility in Ohio. His company calls the proposal "the only actionable plan" to relieve the Navy's submarine maintenance backlog, and his offer has the backing of former admirals, a shipbuilding industry giant and local politicians.
>
> But what may seem an easy solution on paper has, so far, been met with cold reality. The Navy rejected Bartlett's proposal the first time due to cost and policy concerns, and still sees issues with a revised proposal submitted earlier this year. There's also a host of technical and legal hurdles any plan for a new shipyard in the Great Lakes would have to overcome.
>
> And while lawmakers have been less than impressed with the Navy's long-term, $21 billion Shipyard Infrastructure Optimization Plan (SIOP), there doesn't seem to be much energy around the idea of a new shipyard—at least outside of the Ohio delegation, who would benefit from Bartlett's pitch.
>
> With the Navy's first admiral directly charged with overseeing SIOP set to testify in front of Congress this week for the first time, the one thing that all sides seem to agree on is this: The Navy must move faster to get its ships out of port and underway, and business as usual will only leave the US critically vulnerable in a future conflict.[97]

A February 16, 2022, press report stated

[96] Justin Katz, "Navy's Submarine Builders 'Over Cost', 'Under Performing': Top Admiral," *Breaking Defense*, May 12, 2022.

[97] Justin Katz, "Is a New Navy Shipyard Realistic, or Just a 'Tall Order?'" *Breaking Defense*, May 9, 2022.

> The U.S. Navy attack submarine force inventory is at a low, and maintenance backlogs are making it harder to conduct important development work, the commander of the submarine force in U.S. Pacific Fleet said this week.
>
> Rear Adm. Jeffrey Jablon said the SSN fleet sits at just 47 today—down from 50 attack subs in the fall, due in part to submarine decommissionings happening as planned while new deliveries from industry run behind schedule.
>
> That 47 is further diminished by maintenance challenges, he said while speaking at a Feb. 16 panel at the WEST 2022 conference, cohosted by the U.S. Naval Institute and AFCEA International.
>
> In fiscal 2016, because of idle time for subs awaiting maintenance—on boats which have exceeded their operational limits and were no longer allowed to submerge under the water until they underwent maintenance—the Navy lost about 360 days of operations.
>
> In FY21, the fleet lost nearly 1,500 days to idle time—the equivalent of taking four submarines out of the fleet.
>
> Additionally, Jablon said in FY21 the fleet lost the equivalent of 3.5 submarines to repair periods that ran longer than planned.
>
> "That's about seven and a half SSNs that I cannot use last year because of awaiting maintenance or maintenance delay," he said.
>
> Even with that smaller fleet, he told Defense News, "we meet all our operational commitments. We're able to ensure that our ships are combat ready when they deploy. We meet the requirements of our combatant commanders that are placed upon us."
>
> But "it results in less ability to do tactical development at sea," Jablon added, noting it also cuts into commanding officers' discretionary time at sea to bolster training in particular areas.
>
> "We're still able to prepare the ship to be combat ready when they deploy," he said, but "it's more difficult, it's more deliberate, it takes more input from the [type commander] staff to do that."[98]

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,[99] 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.

[98] Megan Eckstein, "Submarine Maintenance Backlogs and Delays Take Toll on Fleet's Development Work at Sea," *Defense News*, February 16, 2022.

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

> 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 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."[100]

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.

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

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 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.[101]

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

[101] 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.

> 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….
>
> 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.[102]

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 decisionmaking 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

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

> 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 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.[103]

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

[103] 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.

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.[104]

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

Appendix D. December 2021 Determinations Pursuant to Defense Production Act (DPA)

This appendix presents background information on three determinations signed by President Biden on December 21, 2021, permitting the use of the Defense Production Act (DPA) [105] to strengthen the U.S. submarine industrial base for the purpose of increasing production of Virginia-class submarines.

A December 21, 2021, memorandum from President Biden to Secretary of Defense Lloyd Austin stated

> By the authority vested in me as President by the Constitution and the laws of the United States of America, including section 303 of the Defense Production Act of 1950, as amended (the "Act") (50 U.S.C. 4533), I hereby determine, pursuant to section 303(a)(5) of the Act, that:
>
> (1) Large Scale Fabrication, Shipbuilding Industrial Base Expansion for Resilience and Robustness, and Maritime Workforce Training Pipelines in support of Virginia Class attack submarine production are industrial resources, materials, or critical technology items essential to the national defense;
>
> (2) without Presidential action under section 303 of the Act, United States industry cannot reasonably be expected to provide the capability for the needed industrial resource, material, or critical technology item in a timely manner; and
>
> (3) purchases, purchase commitments, or other action pursuant to section 303 of the Act are the most cost-effective, expedient, and practical alternative method for meeting the need.
>
> Pursuant to section 303(a)(7)(B) of the Act, I find that action to expand the domestic production capability for these supply chains is necessary to avert an industrial resource or critical technology item shortfall that would severely impair national defense capability. Therefore, I waive the requirements of section 303(a)(l)-(a)(6) of the Act for the purpose of expanding the domestic production capability for these supply chains.
>
> Ensuring a robust, resilient, and competitive domestic defense industrial base that has the capability, capacity, and workforce to meet the Virginia Class submarine undersea warfighting mission is essential to our national security.
>
> You are authorized and directed to publish this determination in the Federal Register.[106]

A December 22, 2021, DOD statement about the presidential determinations stated

> The president signed on Dec. 21, 2021 three determinations permitting the use of the Defense Production Act (DPA) to strengthen the U.S. submarine industrial base. The expansion of the authority will allow the U.S. Navy to maintain its maritime superiority.
>
> Scaling the production of Virginia Class Attack Submarines will ensure the U.S. Navy can meet its missions to maintain open sea lanes for global communication and commerce, enhance diplomatic partnerships, and grow a robust underwater warfare capability.

[105] For more on the DPA, see CRS Report R43767, *The Defense Production Act of 1950: History, Authorities, and Considerations for Congress*, by Heidi M. Peters, and CRS In Focus IF11767, *The Defense Production Act Committee (DPAC): A Primer*, by Michael H. Cecire.

[106] White House, "Memorandum on the Presidential Determination Pursuant to Section 303 of the Defense Production Act of 1950, as amended," December 21, 2021.

> Through the DPA, the U.S. Navy can make key investments with the manufacturers and suppliers executing the submarine shipbuilding plan.
>
> These activities will strengthen the shipbuilding industrial base and allow its heavy manufacturing and large scale fabrication suppliers to meet growing demand and expand the maritime workforce training pipeline.
>
> The department continues to work with key stakeholders to use the DPA authorities to address risks and challenges across the Submarine Enterprise supply chain. These authorities expand options and opportunities to accelerate and scale critical investments across key markets.[107]

Regarding Title III of the DPA, DOD states

> The Defense Production Act (DPA) Title III program is dedicated to ensuring the timely availability of essential domestic industrial resources to support national defense and homeland security requirements. The program works in partnership with the Uniformed services, other government agencies, and industry to identify areas where critical industrial capacity is lagging or non-existent. Once an area is identified, the program engages with domestic companies to mitigate these risks using grants, purchase commitments, loans, or loan guarantees. By executing its mission, the DPA Title III program reduces the nation's reliance on foreign supply chains and ensures the integrity of materials supplied to the American Warfighter.
>
> The DPA Title III program, governed by 50 USC 4531-4534, is one of the key investment tools of the [DOD] Industrial Policy office.[108]

A December 22, 2021, Navy information paper states

> The Defense Production Act (DPA) Title III program is dedicated to ensuring the timely availability of essential domestic industrial resources to support national defense and homeland security requirements. The program works in partnership with the Uniformed services, other government agencies, and industry to identify areas where critical industrial capacity is lagging or non-existent. Once these fragilities, vulnerabilities, or opportunities are identified, DPA authorities are uniquely positioned to allow engagement with domestic suppliers that mitigate capacity and capability risks using grants, purchase commitments, loans, or loan guarantees
>
> As the U.S. Navy continues to build a more lethal force that maintains maritime superiority, enables sea lanes of global communication and commerce, and ensures diplomatic partnerships, strategic undersea warfare remains the foundation. With VIRGINIA Class (VCS) currently challenged to meet a two per year production cadence, increasing the capacity and capabilities of the submarine industrial base is necessary to achieve the generational increase in demand. This demand will continue to grow with serial production of one (1) COLUMBIA Class (CLB) submarine plus two VIRGINIA Class (VCS) submarines per year expected to start in Fiscal Year 2026.
>
> DPA Title III authorities granted in these PDs support Navy efforts to achieve and sustain consistent production of the VCS Program, meeting schedule and a cadence of two VCS per year in accordance with authorizations and appropriations, concurrent with the national priority CLB Class Ballistic Missile Submarine Program. Specific areas of focus for leveraging these authorities are: strategic sourcing expansion, shipbuilding industrial base expansion for resilience and robustness, and growing the maritime workforce training pipeline.

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[107] Department of Defense, "Defense Production Act Title III Presidential Determinations for Submarine Industrial Base Production Capacity Essential to the Virginia Class Attack Submarine Program," December 22, 2021.

[108] Department of Defense, "Defense Production Act (DPA) Title III," undated, accessed January 3, 2022.

> Specific projects with associated costs and timelines to support sustained 1 CLB + 2 VCS per year are being refined, and the Navy will consider where this DPA Title III authority will best mitigate capacity and capability risks.[109]

An April 14, 2023, press report states that Austal USA of Mobile, AL, "received a $50 million Defense Production Act grant to construct the new submarine module facility, which Austal matched with another $50 million from its own coffers. The facility will take about a year to construct."[110]

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[109] Navy information paper entitled "Defense Production Act Title III—Presidential Determination for Virginia Class Production," December 22, 2021, provided to CRS and CBO by Navy Office of Legislative Affairs on January 7, 2022. See also Sten Spinella, "Defense Production Expansion Could Bring Help to Region's Submarine Industry," *New London Day*, January 3, 2022.

[110] Bryant Harris, "Austal Eyes 1,000 New Hires for Nuclear Submarine Work," *Defense News*, April 14, 2023.