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Navy Virginia-Class Submarine Program and AUKUS Submarine Proposal: Background and Issues for Congress

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Summary

Issues for Congress regarding the Navy's Virginia (SSN-774) class nuclear-powered attack submarine (SSN) program include the FY2024 procurement funding request for the program and the proposal for selling three to five Virginia-class boats to Australia and transferring U.S. submarine and naval nuclear propulsion technology to Australia under a U.S.-UK-Australia security agreement called AUKUS.

Virginia-class FY2024 procurement funding. 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. 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 current ship force-level goal, which was released in December 2016, calls for achieving and maintaining a fleet of 355 manned ships, including 66 SSNs. Under the Navy's FY2024 30-year (FY2024-FY2053) shipbuilding plan, which includes three alternatives, the SSN force would reach a minimum of 46 boats in FY2030 and grow to 60, 69, or 63 boats by FY2053.

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. 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).

In addition to the above requested funds, on October 20, 2023, the Administration submitted a request for FY2024 emergency supplemental funding for national security priorities that includes, among other things, a total of \$3,393.2 million in funding for the submarine industrial base to support construction of new submarines and maintenance of existing submarines.

AUKUS submarine proposal. In September 2021, the U.S., UK, and Australian governments announced a significant new security partnership, called AUKUS. The proposed first major initiative under AUKUS, referred to as Pillar 1, would be a project to rotationally deploy up to five U.S. and UK SSNs out of a port in Western Australia, and more significantly, for Australia, with U.S. and UK assistance, to acquire, operate, and maintain its own force of eight conventionally armed SSNs, including three to five Virginia-class SSNs that would be sold to Australia. Key questions for Congress regarding the proposed Pillar 1 pathway include the following: Should Congress approve, reject, or modify the proposed sale of three to five Virginia-class attack submarines to Australia? Should Congress approve, reject, or modify the proposed transfer of U.S. submarine and naval nuclear-propulsion technology to Australia?

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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) procurement program, and
- a proposal for selling three to five Virginia-class SSNs and transferring U.S. submarine and naval nuclear propulsion technology to Australia under a U.S.-UK-Australia security agreement called AUKUS.

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.

Issues for Congress include those relating to the proposed procurement of Virginia-class boats in FY2024 and subsequent years, and those relating to the proposal under the AUKUS agreement for selling three to five Virginia-class boats and transferring U.S. submarine and naval nuclear propulsion technology to Australia under AUKUS. Decisions that Congress makes on these issues could substantially affect U.S. Navy capabilities and funding requirements, Australian military capabilities, 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 Submarines¹

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

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

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

³ The Navy's four SSGNs are former Trident SSBNs that have been converted (i.e., modified) to carry Tomahawk cruise missiles and SOF rather than SLBMs. Although the SSGNs differ somewhat from SSNs in terms of mission (continued...)

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

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

The technical (including acoustic) superiority of U.S. Navy nuclear-powered submarines is generally considered a foundation of U.S. superiority in undersea warfare, which in turn underpins a U.S. ability to leverage the world's oceans as a medium of operations and maneuver, deny that to others, and thereby generate a huge asymmetric strategic advantage for the United States. 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 and ASuW against Russian and Chinese submarines and surface ships has become a more prominent mission. DOD officials and other observers view SSNs as particularly useful for implementing certain elements of the national defense strategy because of their ability to evade China's improving anti-access/area-denial (A2/AD) forces.⁶

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.⁷

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.

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

⁷ 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.

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.⁸ 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 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 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 force grows to 69 boats by FY2053, the force would reach 66 boats in FY2049.

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 FY2024 30-year shipbuilding plan projects that the SSN force would reach a minimum of 46 boats in FY2030, return to 50 boats in FY2032, and then grow to more than 50 boats starting in FY2036.

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

⁸ 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.

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 (continued...)

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

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.¹¹ 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 Maintenance Backlog

As shown in **Table 1**, the number of SSNs either in depot maintenance or idle (i.e., awaiting depot maintenance) has increased from 11 boats (about 21% of the SSN force) in FY2012 to 18 boats (about 37% of the SSN force) as of May 2023. In advance policy questions submitted for a September 14, 2023, hearing before the Senate Armed Services Committee to consider her nomination to be Chief of Naval Operations, Admiral Lisa Franchetti, the Vice Chief of Naval Operations, stated that the fraction of the SSN force either in depot maintenance or idle had been reduced since May 2023 to 33%.¹²

The Navy has stated that industry best practice would call for about 20% of the SSN force to be in depot maintenance (and for none to be idle) at any given moment,¹³ and Admiral Franchetti has

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. See also Richard R. Burgess, “Vice Adm. Houston: Sub Force Approaching Inflection Point of 50 SSNs,” *Seapower*, November 17, 2021; 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.

¹¹ 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.

¹² Senate Armed Services Committee, Advance Policy Questions for Admiral Lisa M. Franchetti, USN, Nominee for Appointment to be Chief of Naval Operations, pp. 31, 32.

¹³ Megan Eckstein, “US Navy Hopes New Funding Model Can Cut Sub Maintenance Delays by 2026,” *Defense News*, November 17, 2022; 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*, (continued...)

stated that the Navy has adopted the 20% figure as its goal.¹⁴ As also shown in **Table 1**, the increase since FY2012 in the number of SSNs in depot maintenance or idle has substantially reduced the number of SSNs operationally ready at any given moment, reducing the SSN force’s capacity for meeting day-to-day mission demands and potentially putting increased operational pressure on SSNs that are operationally ready.

Table 1. Numbers of SSNs in Maintenance or Awaiting Maintenance
Average number or percentage of SSNs for each fiscal year

Fiscal year	Number in force	Number in depot maintenance	Number awaiting depot maintenance (aka idle)	Combined number in depot maintenance or idle	% of force in depot maintenance or idle	Number operationally ready
FY08	51	11	0	11	22%	40
FY09	52	10	1	11	21%	41
FY10	52	10	0	10	19%	42
FY11	52	11	0	11	21%	41
FY12	53	10	1	11	21%	42
FY13	53	12	0	12	23%	41
FY14	53	13	2	15	28%	38
FY15	53	9	1	10	19%	43
FY16	52	12	1	13	25%	39
FY17	50	12	2	14	28%	36
FY18	50	14	2	16	32%	34
FY19	50	13	3	16	32%	34
FY20	50	10	5	15	30%	35
FY21	49	14	4	18	37%	31
FY22	49	11	5	16	33%	33
FY23*	49	14	4	18	37%	31

Source: U.S. Navy information paper dated June 13, 2023, and provided to CRS and Congressional Budget Office (CBO) by Navy Office of Legislative Affairs on June 15, 2023. *Data for FY2023 is as of May 2023. In advance policy questions submitted for a September 14, 2023, hearing before the Senate Armed Services Committee to consider her nomination to be Chief of Naval Operations, Admiral Lisa Franchetti, the Vice Chief of Naval Operations, stated that the fraction of the SSN force either in depot maintenance or idle had been reduced since May 2023 to 33%. (Senate Armed Services Committee, Advance Policy Questions for Admiral Lisa M. Franchetti, USN, Nominee for Appointment to be Chief of Naval Operations, pp. 31, 32.)

The increase in the number of SSNs in depot maintenance or idle is due primarily to insufficient numbers of workers and facility constraints at the four government-operated Naval Shipyards (NSYs), which are the primary facilities for performing depot-level overhaul and maintenance work on the Navy’s nuclear-powered ships, including the SSNs. Supply chain issues affecting the

January 12, 2023; Justin Katz, “As AUKUS Looms, US Navy Sub Leaders Sound Alarms at Home,” *Breaking Defense*, November 4, 2022.

¹⁴ Senate Armed Services Committee, Advance Policy Questions for Admiral Lisa M. Franchetti, USN, Nominee for Appointment to be Chief of Naval Operations, pp. 31, 32.

availability of repair parts for SSNs are an additional issue. To address capacity constraints at the NSYs, the Navy has increased staffing at the NSYs and in 2018 began a 20-year, multibillion-dollar investment plan, called the Shipyard Infrastructure Optimization Program (SIOP), to modernize the NSYs' facilities.¹⁵ The Navy has also shifted a small number of SSN overhauls to GD/EB and HII/NNS. For additional background information on the SSN maintenance backlog, which has been a matter of concern and oversight for the congressional defense committees, see **Appendix C**.

U.S. SSN Classes¹⁶

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 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

¹⁵ For an overview of the SIOP, see U.S. Navy, Naval Sea Systems Command, “Shipyard Infrastructure Optimization Program” accessed June 22, 2023, at <https://www.navsea.navy.mil/Home/Shipyards/SIOP/>. See also Government Accountability Office, *Navy Readiness[:] Actions Needed to Address Cost and Schedule Estimates for Shipyard Improvement*, GAO-23-106067, June 2023, 49 pp.; Government Accountability Office, *Naval Shipyards[:] Ongoing Challenges Could Jeopardize Navy’s Ability to Improve Shipyards*, Statement of Diana C. Maurer, Director, Defense Capabilities and Management, Testimony Before the Subcommittees on Readiness and Management Support and Seapower, Committee on Armed Services, U.S. Senate, GAO 22-105993, May 10, 2022, 18 pp.

¹⁶ Source for submarine lengths, beams (i.e., hull diameters), and submerged displacements: U.S. Navy, “Attack Submarines—SSN,” updated March 13, 2023.

hull extension, known as the multi-mission platform, to test new generations of weapons and support Navy SEAL (Sea, Air and Land forces) operations.”¹⁷

Virginia (SSN-774) Class

The Navy has been procuring Virginia-class SSNs (**Figure 1**, **Figure 2**, and **Figure 3**) 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.

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.

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.

¹⁷ 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 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.

Figure 3. Virginia-Class Attack Submarine



Source: Photograph accompanying Megan Eckstein, “The US Navy Is Spending Billions to Stabilize Vendors. Will It Work?” *USNI News*, September 8, 2023. The caption credits the photograph to Ashley Cowan/HII and states that it shows the USS *New Jersey* (SSN-796) being moved at HII/NNS in April 2022.

Virginia-Class Program

Program Elements

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 2 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 2. 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 were 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).¹⁸

¹⁸ 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.

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 contract that would begin in FY2025.¹⁹ 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 to be used as a contractual vehicle for procuring the two boats requested for procurement in FY2024, but those two boats would 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 would put 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 would maximize efficiency and supplier-firm stability in those years for both the Virginia- and Columbia-class programs.²⁰

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.²¹ 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.²²

¹⁹ 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.

²⁰ Source: Navy briefing on Virginia-class program for CRS and CBO, April 28, 2023.

²¹ See Section 121 of the FY1998 National Defense Authorization Act (H.R. 1119/P.L. 105-85 of November 18, 1997).

²² 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),²³ 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.²⁴

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.²⁵ The four additional launch tubes in the VPM could carry a total of 28 additional Tomahawk cruise missiles (seven per tube),²⁶

²³ The IEP was previously called the Submarine Unified Build Strategy, or SUBS.

²⁴ 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 Replacement 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.

²⁵ 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.

²⁶ 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%.²⁷

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.²⁸

Schedule and Cost Performance

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.²⁹ 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.³⁰ The Virginia (SSN-774) class program received a David Packard Excellence in Acquisition Award from DOD in 2008.

Beginning in 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. Delivery delays have continued since then, and cost growth has emerged

²⁷ 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 launch 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%.

²⁸ 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.

²⁹ 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.

³⁰ 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.

as an additional issue. This issue is discussed in more detail in the “Issues for Congress” section of this report.

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**.

FY2024 Funding Request

Virginia-Class Procurement Funding Requested in FY2024 Budget Submission

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,³¹ suggesting a configuration that includes a capability for conducting seabed warfare missions.³²

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).

Additional Funding for Submarine Industrial Base Requested on October 20, 2023

In addition to the above requested funds, on October 20, 2023, the Administration submitted a request for FY2024 emergency supplemental funding for national security priorities that includes, among other things, a total of \$3,393.2 million (i.e., about \$3.4 billion) in funding for the

³¹ *Department of Defense, Fiscal Year (FY) 2024 Budget Estimates, Navy Justification Book Volume 1 of 1, Shipbuilding and Conversion, Navy, March 2023, p. 113.*

³² 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.)

submarine industrial base to support construction of new submarines and maintenance of existing submarines, as follows:

- \$557.758 million in the Operation and Maintenance, Navy (OMN) appropriation account for improvements at the four government-operated naval shipyards (NSYs) that maintain the Navy’s nuclear-powered ships, including the Navy’s submarines;
- \$2,055.0 million in the Shipbuilding and Conversion, Navy (SCN) appropriation account (i.e., the Navy’s shipbuilding account) to increase production rates and submarine availability through initiatives in supplier development, shipbuilder and supplier infrastructure, workforce development, technology advancements, and strategic sourcing;
- \$393.57 million in the Other Procurement, Navy (OPN) appropriation account to increase production rates and submarine availability through initiatives in supplier development, shipbuilder and supplier infrastructure, workforce development, technology advancements, and strategic sourcing;
- \$7.0 million in the Research, Development, Test and Evaluation, Navy (RDTEEN) appropriation account to increase production rates and submarine availability through initiatives in supplier development, shipbuilder and supplier infrastructure, workforce development, technology advancements, and strategic sourcing;
- \$281.914 million in the Military Construction, Navy and Marine Corps appropriation account to support infrastructure work at the NSYs to improve the ability to maintain the readiness of the fleet; and
- \$98.0 million in the National Nuclear Security Administration (NNSA) of the Department of Energy (DOE) for Naval Reactors (i.e., the Naval Nuclear Propulsion Program) to support hiring and infrastructure expansion at the Government-Owned, Contractor-Operated Naval Nuclear Laboratory sites in order to meet growing mission demands to provide the trilateral security partnership between Australia, United Kingdom, and United States (i.e., AUKUS) with nuclear propulsion plants.³³

AUKUS Proposal for Selling Virginia-Class SSNs and Transferring U.S. Submarine and Propulsion Technology to Australia

Proposal Is Referred to as Pillar 1 of AUKUS

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.³⁴ The proposed first major

³³ Source: Attachment 4: Submarine Industrial Base (pages 58-63) to letter dated October 20, 2023, from Shalanda D. Young, Office of Management and Budget, to The Honorable Patrick McHenry, Speaker Pro Tempore of the House of Representatives, accessed October 23, 2023, at <https://www.whitehouse.gov/wp-content/uploads/2023/10/Letter-regarding-critical-national-security-funding-needs-for-FY-2024.pdf>.

³⁴ 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*, (continued...)

initiative under AUKUS, referred to as Pillar 1, would be a project to rotationally deploy up to five U.S. and UK SSNs out of a port in Western Australia, and more significantly, for Australia, with U.S. and UK assistance, to acquire, operate, and maintain its own force of eight conventionally armed SSNs, including three to five Virginia-class SSNs that would be sold to Australia. Today only six countries—the United States, the UK, France, Russia, China, and India—operate nuclear-powered submarines. The United States since 1958 has provided assistance to the UK’s nuclear-powered submarine program;³⁵ under the AUKUS Pillar 1 initiative, Australia would become the second country to receive U.S. assistance in this area.

Key Elements of Proposed Pillar 1 Pathway

Key elements of the proposed Pillar 1 pathway include the following:³⁶

- **Embedding of Australian personnel.** Beginning in 2023, Australian military and civilian personnel would embed with the U.S. and UK navies, and in the U.S. and UK submarine industrial bases, to accelerate the training of Australian personnel. The United States would increase SSN port visits to Australia beginning in 2023, with Australian sailors joining U.S. crews for training and development; the UK would increase visits to Australia beginning in 2026.
- **Rotational deployments of U.S. and UK SSNs from Australia.** As early as 2027, the United States and UK would begin forward rotations of SSNs out of HMAS Stirling, an Australian naval base near Perth, in Western Australia, to accelerate the development of Australian naval personnel, workforce, infrastructure and regulatory system. Eventually, one UK SSN and up to four Virginia-class SSNs would be rotationally deployed out of HMAS Stirling under the arrangement, which would be called Submarine Rotational Force-West (SRF-West).
- **Sale of three to five Virginia-class boats to Australia.** Starting in the early 2030s, the United States would sell Australia three Virginia-class submarines, with the potential to sell up to two more if needed. Australian officials have stated that the first two Virginia-class boats would be existing boats with more than 20 years each of remaining expected service life, and that the third boat would be sold to Australia directly from the U.S. production line, with a full 33-year expected service life. In combination, the sale of three such boats would transfer more than 73 boat-years of SSN capability from the U.S. Navy to Australia’s navy. The U.S. Navy anticipates building additional Virginia-class SSNs in the 2030s as replacements for submarines sold to Australia.
- **UK and Australia construction of AUKUS SSNs incorporating U.S. technology.** The UK and Australia would design and build a new class of

coordinated by Emma Chanlett-Avery; and CRS Report R47378, *Australia: Background and U.S. Relations*, by Bruce Vaughn.

³⁵ 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.

³⁶ Sources: White House, “Joint Leaders Statement on AUKUS,” March 13, 2023; Commonwealth of Australia, *The AUKUS Nuclear-Powered Submarine Pathway, A Partnership for the Future*, undated, released ca. March 13, 2023, 57 pp.; 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); John Hunter Farrell, “Australia To Get One New Build Virginia Class Submarine, Two From U.S. Navy,” *The Drive*, June 8, 2023, which reports remarks made by Australian government officials in testimony at a May 2023 Australian parliamentary hearing.

AUKUS SSNs for use in the UK and Australian navies that would incorporate U.S. submarine and naval nuclear propulsion technology. The boats would be built in the UK and Australia, with the first boat delivered to the UK navy in the late 2030s and the first boat built in Australia delivered to the Australian navy in the early 2040s. If the Australian construction effort encounters delays, a fourth and perhaps fifth Virginia-class boat would be sold to permit Australia to continue the buildup of its SSN force. Australia by the mid-2050s would operate a force of eight SSNs, including three to five Virginia-class boats and five to three AUKUS SSNs.

- **Australian investments in U.S. and UK submarine industrial bases.** Australia would invest at least \$3 billion in its industrial base to establish its own capacity for building and maintaining SSNs, and additionally would “make a proportionate financial investment in the UK and US industrial bases.” Although some press reports have stated that Australia’s investment in the U.S. (or U.S. and UK) submarine construction industrial base would total \$3 billion,³⁷ the Australian government as of August 2023 had not yet definitized the size or timing of its proposed investment in the U.S. industrial base.³⁸

Impact on Size of U.S. SSN Force

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 (i.e., by roughly 6% to 10%) 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
- replacement SSNs for the three to five Virginia-class boats sold to Australia are built and enter service with the U.S. Navy.

In advance policy questions submitted for a September 14, 2023, hearing before the Senate Armed Services Committee to consider her nomination to be Chief of Naval Operations, Admiral Lisa Franchetti, the Vice Chief of Naval Operations, stated

The sale of between three and five Virginia Class SSNs will reduce [the] U.S. [SSN] inventory in the short term, but investments in the Submarine Industrial Base (SIB) are expected to restore capacity [i.e., numbers of SSNs] by producing more new construction submarines per year and reducing maintenance delays of our in-service submarines. In addition, the establishment of a U.S./UK rotational presence in Western Australia and Australia operating its own sovereign SSN force increases Allied SSN presence in the Indo-Pacific.³⁹

The Navy states in its FY2024 30-year shipbuilding plan, “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

³⁷ See, for example, Farrah Tomazin, “AUKUS Faces First ‘Critical Hurdle’ in Election-Focused US Congress,” *Sydney Morning Herald*, June 9, 2023; David Crowe, “New Fleet of Eight Nuclear Submarines to be Built in Australia in \$368 Billion Deal,” *Sydney Morning Herald*, March 14, 2023; Daniel Hurst and Julian Borger, “Aukus: Nuclear Submarines Deal Will Cost Australia Up to \$368bn,” *Guardian*, March 13, 2023; Lewis Jackson, “Australia’s Nuclear Submarine Plan to Cost Up to \$245 Billion by 2055—Defence Official,” *Reuters*, March 14, 2023.

³⁸ Source: CRS meeting with Australian embassy officials, August 23, 2023.

³⁹ Senate Armed Services Committee, Advance Policy Questions for Admiral Lisa M. Franchetti, USN, Nominee for Appointment to be Chief of Naval Operations, pp. 48-49.

sold to Australia would involve building three to five SSNs that would be in addition to those that were already envisaged as being built 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 in March 2019. This 30-year plan includes the procurement of SSNs at a steady rate of two boats per year from FY2021 through FY2049.⁴⁰

On this basis, it might be argued that building replacement SSNs for three to five Virginia-class boats sold to Australia would involve building SSNs at a rate of something more than two boats per year. At the September 14, 2023, hearing, Admiral Franchetti stated “My understanding is we need to reach [a U.S. SSN construction rate of] 2.2 [SSNs per year] to be able to meet” the additional SSN construction requirements resulting from the AUKUS agreement.⁴¹

Compared to a previously planned procurement rate of 2.0 boats per year, a procurement rate of 2.2 boats per year would equate to one additional boat every five years. If the first replacement boat were procured in FY2030 and an additional replacement boat were procured every five years thereafter (i.e., in FY2035, FY2040, and so on if needed), and if each boat were to take six years to build (which is a typical construction time for U.S. SSNs), then the third replacement boat would enter service in 2046, and the fourth and fifth replacement boats, if needed, would enter service in 2051 and 2056, respectively.

Whether the U.S. submarine construction industrial base would be able to achieve an SSN construction rate of 2.2 boats per year, particularly as it also is building new Columbia-class ballistic missile submarines, is a question that may be considered. As discussed later in this report, although Virginia-class submarines are currently being procured at a rate of two boats per year, the submarine construction industrial base is currently able to build them at a rate of about 1.2 boats per year, resulting in a growing backlog of SSN construction work, and the Navy does not anticipate the Virginia-class construction rate reaching 2.0 boats per year until 2028.

Under the Navy’s FY2024 30-year (FY2024-FY2053) shipbuilding plan, the Navy’s SSN force—without the sale of any Virginia-class boats to Australia—is projected to include 50 SSNs in FY2035 and either 55, 57, or 60 SSNs in FY2045. The FY2035 figure of 50 SSNs represents a shortfall of about 24% relative to the Navy’s SSN force-level goal of 66 boats, while the FY2045 figures of 55, 57, and 60 boats represent shortfalls of about 17%, 14%, and 9%, respectively, relative to the Navy’s SSN force-level goal of 66 boats.

Selling three Virginia-class boats to Australia by FY2035, and not replacing them through the construction of additional Virginia-class boats by FY2035, would reduce the projected number of SSNs in FY2035 to 47 boats, which would increase the percentage shortfall in the number of Navy SSNs relative to the Navy’s SSN force-level goal in FY2035 from the above-mentioned figure of about 24% to about 29%.

Selling three Virginia-class boats to Australia by FY2045, and not replacing them through the construction of additional Virginia-class boats by FY2045, would reduce the projected number of SSNs in FY2045 to 52, 54, or 57 boats, which would increase the percentage shortfalls in the number of Navy SSNs relative to the Navy’s SSN force-level goal in FY2045 from the above-

⁴⁰ 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.

⁴¹ Source: *CQ* transcript of hearing. See also Bryant Harris, “AUKUS Agreement Requires Submarine Production Boost, Franchetti Says,” *Defense News*, September 14, 2023; Linda Hersey, “Franchetti Presses for Increase in Virginia-Class Submarine Production,” *Inside Defense*, September 15, 2023.

mentioned figures of about 17%, 14%, and 9%, respectively, to about 21%, 18%, and 14%, respectively.

Selling five Virginia-class boats to Australia by FY2045, and not replacing them through the construction of additional Virginia-class boats by FY2045, would reduce the projected number of SSNs in FY2045 to 50, 52, or 55 boats, which would increase the percentage shortfalls in the number of Navy SSNs relative to the Navy's SSN force-level goal in FY2045 from the above-mentioned figures of about 17%, 14%, and 9%, respectively, to about 24%, 21%, and 17%, respectively.

May 2023 DOD Legislative Package

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).

For the text of the legislative package, see the “Legislative Activity” section of this report.

Potential Alternative of a U.S.-Australia Division of Labor

A potential alternative to the proposed sale of Virginia-class SSNs to Australia would be a U.S.-Australia military division of labor under which U.S. SSNs would perform both U.S. and Australian SSN missions while Australia invested in military forces for performing other military missions for both Australia and the United States. Such a U.S.-Australia military division of labor might be broadly similar to military divisions of labor that exist between the United States and some or all of its NATO or other allies for naval capabilities such as aircraft carriers, SSNs, large surface combatants, and amphibious ships, and for non-naval capabilities such as nuclear weapons, space assets, and intelligence, surveillance, and reconnaissance (ISR) capabilities.

Under a U.S.-Australia military division of labor involving SSNs, the proposed forward rotations of U.S. and UK SSNs to Australia would still be implemented, the size of the U.S. SSN force would be expanded by at least three to five boats above previous plans so as to provide additional U.S. SSNs for performing Australian SSN missions, and Australia, instead of using funds to purchase, operate, and maintain three to five Virginia-class SSNs, would instead invest those funds in other military capabilities (such as, for example, the production of long-range anti-ship missiles), so as to create an Australian capacity for performing other military missions for both Australia and the United States.

Variations of this potential alternative include but are not necessarily limited to the following:

- Under one variation of this potential alternative, the proposed sharing of U.S. naval nuclear propulsion technology and U.S. submarine technology, the proposed Australian investments in Australian and U.S. submarine-construction capability, and the other proposed actions for supporting eventual Australian

construction of AUKUS SSNs would continue, and Australia would eventually build its own AUKUS SSNs, reducing at that point the need for U.S. SSNs to perform Australian SSN missions.

- Under another variation of this potential alternative, the performance of Australian SSN missions by U.S. SSNs would continue indefinitely, and instead of implementing the technology sharing, making Australian investments in submarine-construction capability, and taking the other actions that would be needed to eventually build AUKUS SSNs, Australia would continue investing in other military capabilities for supporting a continuing U.S.-Australia division of labor. Under this variation, the size of the U.S. SSN force would eventually be expanded above previously planned levels by about eight boats (i.e., the planned eventual number of SSNs that Australia had planned to acquire).

Table 3 summarizes certain features of the proposed AUKUS Pillar 1 pathway and the two above-described variations of the potential alternative of a U.S.-Australia division of labor.

Table 3. Proposed AUKUS SSN Pathway and Potential Alternative

	Proposed AUKUS pathway	Potential alternative of U.S.-Australia division of labor	
		One variation	Another variation
Australian SSN missions to be performed in 2030s and beyond by...	Australian Navy SSNs, consisting initially of Virginia-class boats sold to Australia, later augmented by Australian-made AUKUS SSNs	U.S. Navy SSNs, until replaced by Australian-made AUKUS SSNs	U.S. Navy SSNs
Forward rotations of U.S. and UK SSNs to Australia	Yes	Yes	Yes
3 to 5 Virginia-class SSNs sold to Australia	Yes	No	No
AUKUS SSNs built in Australia for Australian use	Yes	Yes	No

Source: Table prepared by CRS.

Issues for Congress

AUKUS Proposal for Selling Virginia-Class SSNs and Transferring U.S. Submarine and Propulsion Technology to Australia

Key Questions for Congress

Key questions for Congress regarding the proposed pathway for Pillar 1 of the AUKUS agreement include the following:

- Should Congress approve, reject, or modify the proposed sale of three to five Virginia-class attack submarines to Australia?
- Should Congress approve, reject, or modify the proposed transfer of U.S. submarine and naval nuclear-propulsion technology to Australia?

Each of these questions is discussed below.

Proposed Sale of Virginia-Class SSNs to Australia

Overview of Potential Questions to Consider

In considering whether to approve, reject, or modify, the proposed sale of three to five Virginia-class attack submarines to Australia, Congress may assess the relative merits of the proposed Pillar 1 pathway and the above-described potential alternative (with two variations) of a U.S.-Australia division of labor. As a part of that assessment, Congress may consider several questions, including but not limited to the following:

- **Timing of a decision on whether to provide authority.** To meet process-related required lead times for selling Virginia-class boats to Australia, does a decision on whether to provide authority for selling Virginia-class boats to Australia need to be made by Congress in 2023, or could it be deferred until 2024 or later? If process-related required lead times for selling Virginia-class boats to Australia do not require that Congress make a decision in 2023, what would be the tradeoff between making a decision in 2023 (and thus sending a signal of alliance solidarity and deterrence to China sooner rather than later) and making a decision in 2024 or later (when there might be more information available to Congress about the details on specific elements of the proposed Pillar 1 pathway, including elements addressed in some of the bullet points below)?
- **Number of boats to include in an authorization.** Should an authorization for transferring Virginia-class boats to Australia, if one were to be provided, be 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? (The proposal for authorizing the transfer of two appears to reflect the above-discussed plan for the first two Virginia-class boats to be in-service boats.)
- **Sufficiency of information available to Congress.** Does Congress have sufficient information on the specific elements of the proposed Pillar 1 pathway (including elements addressed in some of the bullet points below) to adequately assess the merits of selling Virginia-class boats to Australia? Is the executive branch being adequately forthcoming in providing Congress with such information? What might be the potential implications if Congress were to make a decision about selling Virginia-class boats to Australia without sufficient information on the specific elements of the proposed Pillar 1 pathway (including elements addressed in some of the bullet points below)?
- **Dates that sold boats would be removed from U.S. Navy service.** When, exactly, would Virginia-class SSNs sold to Australia be removed from U.S. Navy service (or delivered directly from the U.S. production line) and transferred to Australia?
- **Specific boats that would be sold.** Which Virginia-class boats, specifically, would be sold to Australia? How many of the three to five boats would be existing boats with less than 33 years of remaining expected service life, and how many would be newly built boats?
- **Prices of boats that would be sold.** How much would Australia pay for each boat that it would purchase? Adjusted for their remaining expected service lives,

how would those sale prices compare to the \$4.3-billion procurement cost of a new VPM-equipped Virginia-class boat?

- **Australia’s investment in U.S. submarine industrial base.** How much additional funding would Australia provide as “a proportionate financial investment” for the U.S. submarine construction industrial base? When would this funding be provided? Would it be provided in a single payment or a series of payments?
- **Dates for procuring replacement boats.** When would each of the three to five replacement boats for the U.S. Navy be procured, and when would they each enter service?
- **U.S. industrial base capability for building replacement boats.** How able would the U.S. submarine construction base be in the 2030s to build, as replacements for sold Virginia-class boats, three to five new SSNs for the U.S. Navy that would be in addition to the SSNs already envisaged for procurement for U.S. Navy use prior to the announcement of the AUKUS agreement? How much additional funding would need to be invested in the U.S. submarine construction industrial base to enable it to build, as replacements for sold Virginia-class boats, three to five new SSNs for the U.S. Navy that would be in addition to the SSNs already envisaged for procurement for U.S. Navy use prior to the announcement of the AUKUS agreement?
- **Operational impact of reduction in U.S. SSN force.** What would be 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 day-to-day and wartime SSN missions of interest to the United States? What is the U.S. Navy’s view on this issue?
- **Net impact on collective allied deterrence and warfighting capability.** What would be the net impact on collective allied deterrence and warfighting capabilities of selling three to five Virginia-class boats to Australia while pursuing the construction of three to five replacement SSNs for the U.S. Navy?
- **Broader considerations.** How do 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 affect the assessment of whether to authorize the sale of Virginia-class boats to Australia?⁴²

Regarding U.S. industrial base capability for building replacement boats, an October 12, 2023, letter to President Biden from Senators Roger F. Wicker, Jeanne Shaheen, Dan Sullivan, Richard Blumenthal, Kevin Cramer, and Tim Kaine states

We write to express our strong support for advancing the Australia-United Kingdom-United States (AUKUS) partnership. The collaboration across the U.S. government over the last several months has enabled significant progress in the development of the legal authorities necessary for AUKUS implementation, and we are eager to see those authorities be signed into law this year.

⁴² For more on 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.

To realize the full potential of AUKUS, the American defense industrial base will require significant resources to improve submarine construction and maintenance rates. The volume of submarine tonnage the industrial base must produce to meet the Navy's own requirements and fully implement the AUKUS agreement will require historic and sustained investments in the submarine workforce and supplier network. To achieve such capacity, Congress must have a comprehensive understanding of the current status of the submarine industrial base as well as the future resource investments necessary to meet our nation's requirements.

We understand that a Submarine Industrial Base 2025 (SIB-25) study from the U.S. Navy and the Director of Cost Assessment and Program Evaluation is complete, but that the administration does not plan to share its findings with Congress until the President's Budget Request for Fiscal Year 2025 is released, sometime early next year. However, understanding the scope of the generational investment required for the SIB's viability is critical for development of AUKUS-authorizing legislation this year and for robust Congressional oversight as the United States charts the future course of AUKUS. Therefore, we ask the administration to provide the cost estimates contained within the SIB-25 study to Congress no later than October 31, 2023, to inform Congressional consideration of any AUKUS-associated legislation.

It is critical that the administration articulate a detailed plan for instituting necessary enhancements to the submarine industrial base. This is a crucial first step in posturing the United States to effectively address existing security challenges in the Indo-Pacific, and essential for fully realizing the potential of the AUKUS agreement.⁴³

Potential Arguments from Supporters

Potential arguments that might be made by supporters of the proposed sale of Virginia-class boats to Australia include but are not necessarily limited to the following:

- Selling Virginia-class boats to Australia would substantially enhance deterrence of potential Chinese aggression by sending a strong signal to China of the collective determination of the United States and Australia, along with the UK, to counter China's military modernization effort. The fact that the United States has never before sold a complete SSN to another country—not even the UK—would underscore the depth of this determination, and thus the strength of the deterrent signal it would send.
- The deterrent value of selling Virginia-class boats to Australia would be greater than the deterrent value of keeping those SSNs in U.S. Navy service for two reasons:
 - Compared with the option of keeping the SSNs in U.S. Navy service and waiting for Australia to build its own AUKUS SSNs, selling Virginia-class boats to Australia would substantially accelerate the creation of an Australian force of SSNs, and thus present China much sooner 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. In this regard, the accelerated deterrent effect of selling the boats to Australia would be broadly comparable not only to the effect of the help that the United States provided

⁴³ Letter dated October 12, 2023, to President Joe Biden from Senators Roger F. Wicker, Jeanne Shaheen, Dan Sullivan, Richard Blumenthal, Kevin Cramer, and Tim Kaine, accessed October 23, 2023, at <https://www.wicker.senate.gov/services/files/17397F99-D39B-4D53-BF10-6A7A6BF6C074>. See also Bryant Harris, "Senators Push Biden to Release Submarine Costs for AUKUS," *Defense News*, October 17, 2023.

to the UK's nuclear-powered submarine program starting in 1958, but also to 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.⁴⁴ A division of labor arrangement in which U.S. SSNs perform SSN missions for Australia would not generate this multiple-decisionmaking-center form of deterrence.

- The U.S. Navy anticipates building additional Virginia-class SSNs in the 2030s as replacements for submarines sold to Australia. Australia's promised investment in the U.S. submarine industrial base would help accelerate the date by which replacement boats, strictly construed, could be built and thereby minimize the time during which the size of the U.S. SSN force is reduced due to the sale of boats to Australia. Investments that Australia would make in the U.S. and Australian submarine construction industrial bases would increase the capacity of the combined U.S.-Australia submarine construction industrial base at a time when limits on the capacity of the U.S. submarine construction industrial base have become a matter of concern for U.S. policymakers.
- Australia intends to increase its defense budget as needed to be able to finance the purchase, operation, and maintenance of its Virginia-class boats without having to reduce funding for other Australian military capabilities that are needed for deterring or countering potential Chinese aggression. Increases to Australia's military budget would be sufficient to ensure that selling Virginia-class boats to Australia would have a net positive impact on Australia's overall military capabilities for deterring potential Chinese aggression.
- The Australian Navy is a fully professional force that would operate and maintain its Virginia-class boats in a manner fully adhering to the U.S. Navy's strict and exacting safety, quality-control, and accountability standards for submarines and nuclear-powered ships⁴⁵ so as to minimize, to the same extent as in the U.S. Navy, the risk of an accident that might call into question for third-party observers the safety of all U.S. Navy nuclear-powered ships.

Potential Arguments from Skeptics

Potential arguments that might be made by skeptics of the proposed sale of Virginia-class boats to Australia include but are not necessarily limited to the following:

⁴⁴ 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-french-nuclear-program-1969-1975-fourth-country-to-strategic>.

⁴⁵ For further discussion on these standards, see, for example, John W. Crawford and Steven L. Krahn, "The Naval Nuclear Propulsion Program: A Brief Case Study in Institutional Constancy," *Public Administration Review*, vol. 58, no. 2, March/April 1998: 159-166.

- The potential benefits, costs, and risks of selling three to five Virginia-class boats to Australia are uncertain in the absence of specific information on items such as the dates that the sold boats would be removed from U.S. Navy service, the remaining service lives of the boats that would be sold, the prices of the boats that would be sold, the amount and timing of Australia's investment in the U.S. submarine industrial base,⁴⁶ the dates when each of the three to five replacement boats would be procured, and the dates when they would each enter service, the details of the Navy's plan for increasing the SSN production rate to at least 2.2 SSNs per year while also building Columbia-class ballistic missile submarines, and 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 day-to-day and wartime SSN missions of interest to the United States.
- Selling Virginia-class boats to Australia could weaken deterrence of potential Chinese aggression if China were to find reason to believe, correctly or not, that Australia might use its 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. 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.⁴⁷ Virginia-class boats are less certain to be used in a U.S.-China conflict over Taiwan, or less certain to be used in such a conflict in the way that the United States might prefer, if they are sold to Australia rather than retained in U.S. Navy service.
- Given the challenges that the U.S. submarine industrial base is experiencing in achieving a desired construction rate of two Virginia-class boats per year, the ability to build replacement SSNs, strictly construed, for Virginia-class boats sold to Australia is uncertain. The duration of the impact of selling Virginia-class boats to Australia on the size of the U.S. SSN force is thus uncertain and could be longer than anticipated.
- The costs for Australia of acquiring, operating, and maintaining Virginia-class boats could reduce, perhaps significantly, funding within Australia's military budget for other Australian military capabilities, particularly if Virginia SSN-related costs turn out to be higher than expected. If this were to occur, there could be a net negative impact on Australia's overall military capabilities for deterring potential Chinese aggression.
- It would be more cost-effective to pursue a U.S.-Australia division of labor under which U.S. SSNs would perform both U.S. and Australian SSN missions while Australia invests in other types of military forces.⁴⁸ Such a division of labor

⁴⁶ As noted earlier, although some press reports have stated that Australia's investment in the U.S. (or U.S. and UK) submarine construction industrial base would total \$3 billion, the Australian government as of August 2023 had not yet definitized the size or timing of its proposed investment in the U.S. industrial base.

⁴⁷ 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.

⁴⁸ In connection with a project that Canada initiated in 1987 (and later canceled) to acquire a force of 10 to 12 UK- or (continued...)

would follow the general model of military divisions of labor that exist between the United States and some or all its NATO and other allies for naval capabilities such as aircraft carriers, SSNs, large surface combatants, and amphibious ships, and for non-naval capabilities such as nuclear weapons, space assets, and intelligence, surveillance, and reconnaissance (ISR) capabilities. It would be inconsistent to argue that the U.S.-Australia relationship is close enough to contemplate the transfer of U.S. naval nuclear propulsion technology but not close enough to permit a division of labor on SSNs. The proposed 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 by some observers for their collective inefficiencies.⁴⁹

- While the Australian Navy is a fully professional force that would operate and maintain its Virginia-class boats in a manner fully adhering to the U.S. Navy's strict and exacting safety, quality-control, and accountability standards for submarines and nuclear-powered ships, selling Virginia-class boats to Australia would unavoidably make another country responsible for preventing an accident with a U.S.-made SSN that that might call into question for third-party observers the safety of all U.S. Navy nuclear-powered ships. Such an accident might affect U.S. public support for operating U.S. Navy nuclear-powered ships and/or the ability of U.S. Navy nuclear-powered ships to make port calls around the world for purposes of sending deterrent signals of alliance resolve and solidarity to China, Russia, or other potential adversaries; conducting diplomacy and engagement activities with the countries being visited; resupplying U.S. Navy nuclear-powered ships with food and other provisions; and providing rest and

French-made SSNs, Admiral Kinnaird R. McKee, then-Director of the U.S. Naval Nuclear Propulsion Program (aka Naval Reactors), testified in March 1988 that the project “puts at risk resources that ought to be used for other purposes” and that Canada “could make a better contribution to NATO in other areas with the same amount of money.” (U.S. Congress. House. *Hearings on National Defense Authorization Act for Fiscal Year 1989—H.R. 4264, and Oversight of Previously Authorized Programs, before the Committee on Armed Services, House of Representatives, Seapower and Strategic and Critical Materials Subcommittee, Title 1, 100th Cong., 2nd Sess., Hearings held March 1, 3, 8, 9, 10, and 17, 1988, H.A.S.C. No. 100-70, p. 345. The hearing in question, on submarine programs, was held on March 9, 1988. [Included in CRS/FDT bound volume collection as *House Armed Services Committee, Hearings. (Vol.) 5, 100th Congress, 2d Sess., 1988, CRS-F.*])*

⁴⁹ For examples of reports and articles discussing such inefficiencies among NATO countries and potential steps to mitigate these inefficiencies, see “EU Incentivizing Common Procurement Between Members,” *Aviation Week*, October 10, 2023; Stephen Flanagan and Anna M. Dowd, “Alliance Assignments: Defense Priorities for Key NATO States,” *War on the Rocks*, October 4, 2023; David A. Ochmanek, et al., *Inflection Point, How to Reverse the Erosion of U.S. and Allied Military Power and Influence*, RAND, 2023, 217 pp.; Nicole Koenig et al., *Defense Sitters, Transforming European Militaries in Times of War*, Special Edition of the Munich Security Report on European Defense, Munich Security Conference (MSC), June 2023, 95 pp.; Max Bergmann and Otto Svendsen, *Transforming European Defense, A New Focus on Integration*, Center for Strategic and International Studies (CSIS), June 2023, 64 pp.; 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 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.

recreation for the crews of those ships.⁵⁰ In 1971, Australia suspended visits by U.S. Navy and other nuclear-powered ships to Australian ports pending a review of the safety implications of such visits.⁵¹

Proposed Transfer of Submarine and Naval Nuclear Propulsion Technology

Overview

U.S. submarine and naval nuclear propulsion technology, reflecting decades of cumulative U.S. Navy research, development, design, construction, and operational experience, are generally considered crown jewels of U.S. military technology and consequently are highly protected. As noted earlier, the technical (including acoustic) superiority of U.S. Navy nuclear-powered submarines is generally considered a foundation of U.S. superiority in undersea warfare, which in turn underpins a U.S. ability to leverage the world's oceans as a medium of operations and maneuver, deny that to others, and thereby generate a huge asymmetric strategic advantage for the United States.

⁵⁰ A 2020 publication from the U.S. Naval Nuclear Propulsion Program (aka Naval Reactors) states

From the beginning, the [U.S. Naval Nuclear Propulsion] Program recognized that the environmental safety of operating U.S. nuclear-powered ships would be key to their acceptance at home and abroad. The Program maintains the same rigorous attitude toward the control of radioactivity and protection of the environment as it does toward reactor design, testing, operation, and servicing. As a result, the Program has a well-documented record showing the absence of any adverse environmental effect from the operation of U.S. nuclear-powered warships. Because of this record, these ships are welcome in over 150 ports in over 50 countries and dependencies.

(Department of Energy and Department of the Navy, *The United States Naval Nuclear Propulsion Program 2020, Over 166 Million Miles Safely Steamed on Nuclear Power*, p. 31.)

The document similarly states on page 1

Naval Reactors maintains an outstanding record of over 166 million miles safely steamed on nuclear power. The Program currently operates 98 reactors and has accumulated over 7,100 reactor-years of operation.... Because of the Program's demonstrated reliability, U.S. nuclear-powered warships are welcomed in more than 150 ports of call in over 50 foreign countries and dependencies.

Regarding the program's safety record, the document states on page 32

Throughout the Program's entire history—over 7,100 reactor years of operation and more than 166 million miles steamed on nuclear power—there has never been a reactor accident, nor any release of radioactivity that has had an adverse effect on human health or the quality of the environment.

The Department of Energy similarly states

The [U.S. Naval Nuclear Propulsion] Program maintains the same rigorous attitude toward the control of radioactivity and protection of the environment as it does toward reactor design, testing, operation, and servicing. As a result, the Program has a well-documented record showing the absence of any adverse environmental effect from the operation of U.S. nuclear-powered warships. Because of this record, these ships are welcome in over 150 ports in more than 50 countries and dependencies, as well as in U.S. ports.

(Department of Energy, National Nuclear Security Administration, "Powering the Navy" expandable section entitled "Concern for the Environment," accessed October 11, 2023 at <https://www.energy.gov/nnsa/powering-navy>.)

⁵¹ See Commonwealth of Australia, Royal Australian Navy, *Port Visits to Australia by Nuclear-Powered Vessels: A Historical Context*, 2023, PDF pages 7 to 10 of 26, accessed October 11, 2023, at <https://www.navy.gov.au/sites/default/files/documents/Port%20Visits%20to%20Australia%20by%20Nuclear-Powered%20Vessels%20-%20A%20Historical%20Context.pdf>. See also Australian Government, Australian Radiation Protection and Nuclear Safety Agency, "Nuclear-Powered Vessel Visit Planning," accessed October 11, 2023, at <https://www.arpsa.gov.au/research/radiation-emergency-preparedness-and-response/visits-by-nuclear-powered-warships>.

Given its high degree of importance to overall U.S. strategy, U.S. naval nuclear propulsion technology to date has been shared with only one other country—the UK, through an arrangement begun in 1958 reflecting the U.S.-UK special relationship and U.S.-UK cooperation on nuclear-related matters dating back to the Manhattan project during World War II. During the Cold War, when the United States and its allies were engaged in an extended, high-stakes strategic competition against the Soviet Union and Warsaw Pact allies, the United States reportedly turned down requests from U.S. allies other than the UK—including France, Italy, the Netherlands, and Japan—to share U.S. naval nuclear propulsion technology.⁵²

Regarding France, a 1989 journal article on assistance that the United States provided to France on the design of French nuclear warheads stated

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.”⁵³

Regarding Japan, Admiral Kinnaird R. McKee, then-Director of the U.S. Naval Nuclear Propulsion Program (aka Naval Reactors), testified in March 1988:

Frankly, I think Japan is smart enough, if they really want to, to develop a phase-to-phase [sic: phased-array] radar.⁵⁴ They have also asked us for help in nuclear submarines. We say[,] “If you want to get into the nuclear submarine business, go ahead and do it. You don’t need our help.”

Just as a matter of principle, I really have trouble with transferring that level of technology to anybody. The second and third order effect of doing these things are the ones that kill us. When you get right down to the key issue, “Why don’t we do it and make a little money,” people tend to not want to be bothered with the side effects.⁵⁵

⁵² Regarding France, Italy, and the Netherlands, see the letter from Representative Melvin Price that is reprinted in **Appendix E**, which states in part

It is important to appreciate that there is nothing new about an ally wanting our naval nuclear propulsion technology—or about the consistently strong U.S. policy against its releases. Over the years, we have turned down requests from a number of countries, including France, Italy, and the Netherlands.

⁵³ Richard H. Ullman, “The Covert French Connection,” *Foreign Policy*, Summer 1989 (No. 75): 16-17, accessed at <https://www.jstor.org/stable/1148862>.

⁵⁴ Admiral McKee’s testimony at this point is referring to a proposal at the time, which he was asked to comment on, to sell to Japan the U.S. Navy’s surface ship Aegis weapon system, which included the SPY-1 phased-array radar. The system was eventually sold to Japan and is now used on eight Japanese destroyers. The system was also sold to South Korea, Australia, Spain, and Norway for use on ships in the navies of those countries. For more on the Aegis system, see CRS Report RL32109, *Navy DDG-51 and DDG-1000 Destroyer Programs: Background and Issues for Congress*, by Ronald O’Rourke, and CRS Report RL33745, *Navy Aegis Ballistic Missile Defense (BMD) Program: Background and Issues for Congress*, by Ronald O’Rourke.

⁵⁵ U.S. Congress. House. *Naval Nuclear Propulsion Program—1989, Hearing on National Defense Authorization Act for Fiscal Year 1989—H.R. 4264, and Oversight of Previously Authorized Programs, Department of Energy National Security Programs, before the Procurement and Military Nuclear Systems Subcommittee of the Committee on Armed Services, House of Representatives, 100th Cong., 2nd Sess., March 3, 1988, U.S. Govt. Print. Off., 1988, H.A.S.C. No. 100-75, p. 3. (Included in CRS/FDT bound volume collection as *House Armed Services Committee, Hearings. [Vol.] 9, 100th Congress, 2d Sess., 1988, CRS-F.*)*

Admiral McKee's testimony above was given in connection with a project that Canada initiated in 1987 to acquire a force of 10 to 12 UK- or French-made SSNs. A choice by Canada to select the UK SSN design (the Trafalgar-class design) would have involved the transfer to Canada of naval nuclear propulsion technology in the Trafalgar-class design that was derived from the naval nuclear propulsion technology that the United States provided to the UK beginning in 1958, which would raise a question of U.S. approval for a potential sale of UK-made SSNs to Canada. The issue was discussed in a 1988 CRS report.⁵⁶

In a November 18, 1987, presentation at a conference in Ottawa, Canada, U.S. Navy Captain Robert F. Hofford, the U.S. naval attaché in Ottawa—who stated that he was expressing his own views, which did not necessarily reflect those of the U.S. government—stated

As a matter of fact, Canada stands at the end of a line of about six different nations [other than the UK] that have requested exactly the same support from the U.S. for [a] nuclear submarine program. In fact we have turned them all down up to this point, so Canada is in a unique position of being the first country other than the British to be allowed or to even start a technology information flow that will allow the country to pursue its lines toward a nuclear program.⁵⁷

Canada canceled its SSN project in 1989, mooting the potential question of whether to share with Canada naval nuclear propulsion technology in the Trafalgar-class design that was derived from the naval nuclear propulsion technology that the United States provided to the UK beginning in 1958.

Potential Arguments from Supporters

Potential arguments that might be made by supporters of a transfer of U.S. submarine and naval nuclear propulsion technology under Pillar 1 include but are not necessarily limited to the following:

- Transferring this technology would permit it to be leveraged not only by the United States and the UK, but by Australia as well. This would enable the technology to be leveraged by the United States and its allies at a larger scale—through the addition of Australian funding, industrial base capacity, and personnel—and thereby achieve greater collective allied deterrent and warfighting capability.
- Not sharing this technology would mean that any Australian effort to design and build its own SSNs, if attempted, would take many more years, cost much more (potentially reducing funding for other Australian military capabilities), and likely result in Australian SSNs with less capability. Such an effort would be much less cost-effective and have a much-delayed and reduced impact in terms of countering China.
- Australia is fully capable of, and fully committed to, protecting U.S. submarine and naval nuclear propulsion technology. The Australian government has stated “Building on the decades of experience that the UK and the US have in protecting sensitive and classified nuclear material, naval nuclear propulsion technology and SSN capabilities, Australia has committed to a strong security

⁵⁶ For a discussion of this issue, see CRS Issue Brief IB88083, *Canadian Nuclear-Powered Attack Submarine Program: Issues for Congress*, updated April 24, 1989 (archived), by Ronald O'Rourke. This report is available to congressional clients directly from the author.

⁵⁷ Transcript of presentation.

posture to deliver an uncompromised SSN program, as a responsible steward of nuclear technology.”⁵⁸ A May 23, 2023, press report stated: “ASIO [Australian Security Intelligence Organisation] officers are being embedded within the Defence Department to help prevent foreign spies from stealing the highly prized nuclear-powered submarine secrets Australia plans to acquire under the AUKUS pact with the United States and United Kingdom.... [ASIO Director-General Mike Burgess] described AUKUS as a ‘great shiny example of something that foreign intelligence services would like to get insights on’, raising the importance of ensuring the Australian Defence Force has the best possible security protections as the nuclear-powered submarine plan advances. ‘It’s a new target that has received new attention from foreign intelligence services,’ Burgess said. ‘I have people embedded in the AUKUS team in Defence that actually help Defence with their security posture ... I’m confident Defence understand the threats to security and the job they have to do to manage that risk effectively.’ Attempts to access sensitive Defence information is a ‘constant’ and ‘very persistent’ threat, he added.” An October 23, 2023, press report stated: “Mr. Burgess, who spoke on the sidelines of the Five Eyes intelligence summit in Palo Alto, [CA,] said he also had separate concerns about adversaries trying to infiltrate Australia’s sensitive AUKUS pact information, but that ASIO was capable of handling that. ‘Some nations have said AUKUS is interesting. They’ll already be trying to tap into that through the UK and the US. Australia is now part of that,’ he said. ‘They’re probably looking for how can they get inside [AUKUS] once it is set up. That’s traditional espionage. We’re capable of handling that with our defence and defence industry partners.’ ‘Of course, given the significance of AUKUS, we’re in conversations with what security or additional security capabilities is needed by defence, [and by the] defence industry.’”

Potential Arguments from Skeptics

Potential arguments that might be made by skeptics of a transfer of U.S. submarine and naval nuclear propulsion technology under Pillar 1 include but are not necessarily limited to the following:

- The Soviet Union and its allies during the Cold War posed a formidable military challenge to the United States and its NATO allies that included a Soviet navy with as many as 300 nuclear- and conventionally powered submarines armed with a variety of nuclear and conventional weapons. Notwithstanding this challenge, the U.S. government, taking into account the crown-jewel status of U.S. submarine and naval nuclear propulsion technology, reportedly turned down requests from U.S. NATO allies such as France, Italy, the Netherlands, and Japan to share U.S. naval nuclear propulsion technology, and reportedly turned down a request from France—to which the United States reportedly had provided assistance regarding the design of France’s nuclear warheads—to share U.S. ASW technology, including technology for silencing submarines.

⁵⁸ The Australian government states “Building on the decades of experience that the UK and the US have in protecting sensitive and classified nuclear material, naval nuclear propulsion technology and SSN capabilities, Australia has committed to a strong security posture to deliver an uncompromised SSN program, as a responsible steward of nuclear technology.” (Commonwealth of Australia, *The AUKUS Nuclear-Powered Submarine Pathway, A Partnership for the Future*, undated, released ca. March 13, 2023, p. 38.)

- Notwithstanding Australia’s capability for, and commitment to, protecting U.S. submarine and naval nuclear propulsion technology, sharing this technology with another country, particularly in an era of advanced and persistent computer hacking threats, would increase the attack surface,⁵⁹ meaning the number of potential digital and physical entry points that China, Russia, or some other country could attempt to penetrate to gain access to that technology. In this instance, the addition to the attack surface could include not only Australian government organizations, but Australian contractors and subcontractors involved in Pillar 1 efforts.⁶⁰ Chinese hackers in 2018 successfully stole a large amount of unclassified but sensitive information relating to undersea warfare from a U.S. contractor working for the Naval Undersea Warfare Center in Newport, RI.⁶¹ Hackers linked to China reportedly are highly active in attempting to penetrate Australian government and contractor computers.⁶² A March 1, 2023,

⁵⁹ The National Institute of Standards and Technology (NIST) defines attack surface as “the set of points on the boundary of a system, a system element, or an environment where an attacker can try to enter, cause an effect on, or extract data from, that system, system element, or environment.” (National Institute of Standards and Technology, Computer Security Resource Center, “Attack Surface,” accessed October 23, 2023, at https://csrc.nist.gov/glossary/term/attack_surface.) IBM similarly defines it as “the sum of vulnerabilities, pathways or methods—sometimes called attack vectors—that hackers can use to gain unauthorized access to the network or sensitive data, or to carry out a cyberattack.” (IBM, “What Is an Attack Surface?” accessed October 23, 2023, at <https://www.ibm.com/topics/attack-surface>.) The cybersecurity firm CrowdStrike similarly defines it as “the total number of all possible entry points for unauthorized access into any system. It includes all vulnerabilities and endpoints that can be exploited to carry out a security attack. The attack surface is also the entire area of an organization or system that is susceptible to hacking.” (CrowdStrike, “What Is an Attack Surface?” accessed October 23, 2023, at <https://www.crowdstrike.com/cybersecurity-101/attack-surface/>.)

⁶⁰ Regarding Canada’s project to acquire a force of 10 to 12 UK- or French-made SSNs, Admiral Kinnaird R. McKee, then-Director of the U.S. Naval Nuclear Propulsion Program (aka Naval Reactors), testified in March 1988 (i.e., years before the rise of the internet and internet-based cyber espionage):

We have a number of very sensitive arrangements with a lot of our allies on a government-to-government, navy-to-navy, military-to-military basis that deal with certain things we do. But once the Canadians talk about launching into a 12 nuclear submarine building program, we are talking about a proliferation of technology across a very broad industrial base. The Canadians intend to do 65 percent of the work [for building those submarines] in Canada. That is proliferating the technology over a wide range of industrial activities that have never had any involvement in this kind of business.

So there is, I think, a clear and present concern that dissemination would not be in our national interests. That is how we get into it.

(U.S. Congress. House. *Hearings on National Defense Authorization Act for Fiscal Year 1989—H.R. 4264, and Oversight of Previously Authorized Programs, before the Committee on Armed Services, House of Representatives, Seapower and Strategic and Critical Materials Subcommittee, Title I, 100th Cong., 2nd Sess., Hearings Held March 1, 3, 8, 9, 10, and 17, 1988, H.A.S.C. No. 100-70, p. 351. The hearing in question, on submarine programs, was held on March 9, 1988. [Included in CRS/FDT bound volume collection as, *House Armed Services Committee, Hearings. (Vol.) 5, 100th Congress, 2d Sess., 1988, CRS-F.*])*

⁶¹ Ellen Nakashima and Paul Sonne, “China Hacked a Navy Contractor and Secured a Trove of Highly Sensitive Data on Submarine Warfare,” *Washington Post*, June 8, 2018; Helene Cooper, “Chinese Hackers Steal Unclassified Data From Navy Contractor,” *New York Times*, June 8, 2023.

⁶² See, for example, Max Mason, “Chinese Hackers Use G7 Ruse to Target Australian Government Officials,” *Australian Financial Review*, June 19, 2023; News.com.au, “Chinese Cyber Attack on Australia Exposed,” *News.com.au*, August 30, 2022; Bill Toulas, “Chinese Hackers Target Australian Govt with ScanBox Malware,” *Bleeping Computer*, August 30, 2022; Jamie Tarabay, “How Hackers Hammered Australia After China Ties Turned Sour,” *Bloomberg*, August 30, 2021; Jacob Greber, “US accuses Chinese nationals of hacking Australian defence contractor,” *Australian Financial Review*, July 22, 2020; Daniel Hurst, “Hackers Linked to China Allegedly Stole Data from Australian Defence Contractor,” *Guardian*, July 22, 2020; Lauren Ferri and Charlie Coë, “Top Chinese Hackers (continued...)”

press report stated that “Chinese hackers ‘significantly increased’ attacks on Australian government, industry and education after the AUKUS nuclear submarine pact came under the crosshairs of the world’s most prolific espionage operation, according to cyber security experts.” The article quoted a senior employee of the cyber security company CrowdStrike as stating that the AUKUS agreement “has been in the crosshairs of Australia’s cybersecurity adversaries since it was announced.”⁶³ Sharing this technology might ultimately enable the construction of three to five AUKUS SSNs for Australia’s navy. It is not clear that the risks of sharing this technology would be worth this benefit.

Summary of Some Key Factors

Drawing from the above discussion, some key factors that Congress may consider in deciding whether to approve, reject, or modify the proposed sale of three to five Virginia-class attack submarines to Australia, and whether to approve, reject, or modify the proposed transfer of U.S. submarine and naval nuclear-propulsion technology to Australia, include but are not necessarily limited to the following:

- The sufficiency of information available to Congress for adequately assessing the merits of, and acting on, the proposed sale of the Virginia-class boats and the proposed technology transfer.
- The potential net impact on deterrence on warfighting capability of the proposed sale of the Virginia-class boats, including
 - the deterrent value of Australia being a second allied decisionmaking center (along with the United States) for SSN operations in the Indo-Pacific;
 - how Virginia-class boats sold to Australia would be used for deterrence and in potential conflict scenarios, compared with how they would be used for those purposes if they remained in U.S. Navy service, and how China might (correctly or not) assess this question;
 - the impact on the size of the U.S. SSN force, and how that would be affected by the ability of the U.S. submarine construction industrial base to build, as replacements for sold Virginia-class boats, three to five new SSNs for the U.S. Navy that would be in addition to the SSNs already envisaged for procurement for U.S. Navy use prior to the announcement of the AUKUS agreement, and the dates when such boats would be built; and
 - the net impact on funding that would be available within Australia’s military budget for other Australian military capabilities that could contribute to combined U.S.-UK-Australian deterrence and warfighting capability, and the cost-effectiveness of using Australian funding for acquiring and sustaining an Australian SSN force compared with using Australian funding for other military capabilities that are needed for deterring or countering potential Chinese aggression.
- The impact, if any, of selling Virginia-class boats to Australia on the risk of an accident that might call into question for third-party observers the safety of all U.S. Navy nuclear-powered ships and thereby affect U.S. public support for

Stole a Treasure Trove of Information from an Australian Defence Contractor Including Top-Secret Weapon and Military Data,” *Daily Mail*, July 21, 2020.

⁶³ Justin Vallejo, “Extent of Hacks against Australia after AUKUS Deal Revealed,” *Herald Sun*, March 1, 2023.

operating U.S. Navy nuclear-powered ships and/or the ability of U.S. Navy nuclear-powered ships to make port calls around the world.

- The impact, if any, of transferring U.S. submarine and naval nuclear propulsion technology to Australia on the risk of China, Russia, or some other country gaining access to that technology.
- How the proposed Pillar 1 pathway compares on the above factors to the alternative described earlier of a U.S.-Australia division of labor on SSNs and other military capabilities.

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 particularly useful for implementing certain elements of the national defense strategy because of their ability to evade China's improving anti-access/area-denial (A2/AD) forces.⁶⁴

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

⁶⁴ 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.

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.

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).⁶⁵

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.⁶⁶

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.⁶⁷ On March 29, 2023, Secretary of the Navy Carlos Del Toro testified that the Virginia-class production rate was at that point about 1.4 boats

⁶⁵ 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 ($1.25 + 1.25 + 2.5 = 5.0$).

⁶⁶ 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.

⁶⁷ 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.

per year.⁶⁸ 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 1.3 boats per year.⁶⁹ 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.⁷⁰ In advance policy questions submitted for a September 14, 2023, hearing before the Senate Armed Services Committee to consider her nomination to be Chief of Naval Operations, Admiral Lisa Franchetti, the Vice Chief of Naval Operations, stated that the Navy’s goal is to stabilize the Virginia-class construction rate at 1.4 boats per year by the end of 2023, increase it to at least 1.5 boats per year by the end of 2024, and increase it to 2.0 boats per year by 2028.⁷¹

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.⁷²

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.⁷³ 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.”⁷⁴

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.

⁶⁸ 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.

⁶⁹ Navy briefing on Virginia-class program for CRS and CBO, April 28, 2023.

⁷⁰ Sam LaGrone, “Navy Estimates 5 More Years for Virginia Attack Sub Production to Hit 2 Boats a Year,” *USNI News*, March 31, 2023.

⁷¹ Senate Armed Services Committee, Advance Policy Questions for Admiral Lisa M. Franchetti, USN, Nominee for Appointment to be Chief of Naval Operations, p. 31.

⁷² 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.

⁷³ 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 ($1.25 + 1.25 + 1.25 + 2.5 = 6.25$).

⁷⁴ 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.

Press Report

A September 8, 2023, press report stated

The U.S. Navy expects the submarine-industrial base to start delivering attack submarines on time by 2028—more than a decade after vendors and shipbuilders began struggling to keep up with growing demand, made worse by the pandemic and the seismic disruption it brought to the labor market.

In fact, the Navy says, industry will have additional capacity by the early 2030s to start increasing the size of the attack sub fleet, which is currently smaller than its required size and would be more so following the sale of a couple boats to Australia as part of the AUKUS trilateral pact.

To get there, the sea service anticipates spending \$6.3 billion to bolster the submarine-industrial base—on top of the annual cost of buying and repairing submarines....

The Navy spent \$2.3 billion from fiscal 2018 to fiscal 2023 “to build and strengthen the Submarine Industrial Base’s capacity, capability and resiliency,” Whitney Jones, director of the Navy’s Submarine Industrial Base initiative, told Defense News in a written statement.

This money was spent across five main lines of effort.

First is supplier development, after what Jones called the “slow but sustained degradation of domestic manufacturing over the past 40 years.”

This money would boost the production capacity of existing suppliers, develop new suppliers in areas where there may be a single vendor building a critical part, and addressing market sectors where there has been a significant demand increase, such as electrical and electronics subcomponents....

The second area is shipyard infrastructure, to ensure General Dynamics Electric Boat and HII’s Newport News Shipbuilding can ramp up their production to a rate that will, in FY26, hit its highest rate by tonnage since World War II: one Columbia-class ballistic missile submarine and two Virginia-class attack submarines with the Virginia Payload Module insert each year, dubbed a 1+2 production rate....

The shipyards are making their own investments. For example, Newport News Shipbuilding spokesman Todd Corillo told Defense News the yard is in the midst of making \$1.9 billion in capital investments that started in 2016 and will run through 2025, which include facilities to accelerate submarine production.

The Navy is also pitching in with support for the facilities and equipment needed to keep up with growing demand.

The third effort, strategic outsourcing, appears to be taking some of this growing work away from the two shipyards. Jones said the Navy is looking to move at least 5 million production hours a year in large-scale steel fabrication, outfitting and other heavy manufacturing work to other locations, allowing the shipyards to focus on outfitting, final assembly and testing....

The fourth effort is workforce development, as companies in the submarine-industrial base of all sizes and in all locations struggle to recruit and retain the workers they need.

And the fifth is investing in new manufacturing technologies that can make work processes more efficient, such as automated welding, robotics and additive manufacturing.

In total, Jones said, the Navy and the submarine-industrial base are executing 79 projects in the current fiscal year aimed at boosting the capability, capacity and quality of work in the sub-tier supply chain, in support of the so-called 1+2 production rate of Columbia and Virginia submarines....

The Navy proposed spending \$2.4 billion from FY24 to FY28 to further infuse cash into the supply chain and churn out parts to support submarine maintenance....

During an Aug. 3 earnings call, HII President Chris Kastner said the company, through the second quarter of this year, “hired over 3,200 craftsmen and women on a solid pace to meet our full year plan of approximately 5,000. Although we’re meeting our hiring targets, attrition remains high and labor is still the greatest risk to meeting our plan.”

He called labor “the largest obstacle, the largest risk” on the Virginia-class program, and said the company would have to focus on recruiting, training and retaining skilled workers for years to come....

Jones, the Navy official, said FY24 money would address those issues. Beyond outlining previous and upcoming initiatives, she highlighted an effort to use data analytics to identify the best uses for this submarine-industrial base money.

The Navy team “must quantitatively and qualitatively describe challenges, gaps, and the impact of efforts/investments,” she said.

As part of that effort, her office has mapped out and performed a risk assessment of the 16,000 suppliers in the submarine-industrial base. It identified the more than 200 million parts the two shipbuilders will need to buy in the next 10 years, and found 15 critical chokepoints that could threaten these future purchasing plans.⁷⁵

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.

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

⁷⁵ Megan Eckstein, “The US Navy Is Spending Billions to Stabilize Vendors. Will It Work?” *USNI News*, September 8, 2023.

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.⁷⁶

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 2026.⁷⁷

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

⁷⁶ Megan Eckstein, "Defense Firms Outsource Sub, Carrier Construction amid Labor Woes," *Defense News*, October 21, 2022.

⁷⁷ 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 Abbott, "Austal Starts Submarine Construction Support Work," *Defense Daily*, December 12, 2022.

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 achieved by 2028? Can it 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?

Virginia-Class Delivery Delays and Cost Growth

Another potential issue for Congress concerns the delivery delays and cost growth in the Virginia-class program.

June 2023 GAO Report

A June 2023 Government Accountability Office (GAO) report—the 2023 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

Performance on VCS construction continues to degrade. The program now estimates construction of each Block V submarine will take an average of over 2 years longer than reported last year. The delays are due to problems meeting original staffing and work efficiency estimates.

Due to delays, program officials are developing a new, more realistic schedule for Block V. They said that they expect to complete this process in early 2023. Program officials stated that the shipbuilders do not have sufficient workforce to complete VCS while also constructing the Columbia class submarines and overhauling several Los Angeles class submarines. They noted VCS construction is about 25 percent below staffing needs as of September 2022.

In an effort to improve VCS construction, shipbuilders are outsourcing certain work that they would have otherwise completed in their shipyards, noted program officials. The officials told us that the shipbuilders implemented these changes due to shipbuilders’ workforce constraints and the limited physical capacity of some facilities.

The same factors that delayed the schedule also contributed to cost increases. While the fixed price incentive contract set target and ceiling prices for each submarine, program officials reported that the VCS shipbuilders have not met the work efficiency and material cost estimates that informed the target pricing. Consequently, the Navy plans to request more funds to complete Block V, as its prior budget requests covered the target prices, but not up to the ceiling prices.

Program Office Comments

We provided a draft of this assessment to the program office for review and comment. The program office provided technical comments, which we incorporated where appropriate. According to the program office, it remains challenged to meet a two ship per year construction rate. It also stated that the Navy is working with shipbuilders and investing in the submarine industrial base to address challenges, such as supply chain issues and workforce skills gaps, and to improve production capacity through strategic outsourcing.⁷⁸

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 [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.⁷⁹

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

⁷⁸ Government Accountability Office, *Weapon Systems Annual Assessment[:] Programs Are Not Consistently Implementing Practices That Can Help Accelerate Acquisitions*, GAO-23-106059, June 2023, p. 165.

⁷⁹ Sam LaGrone, “Submarine Supply Chain Largest Barrier to Improving Virginia Attack Sub Schedule, Says Boykin,” *USNI News*, May 8, 2023.

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.”⁸⁰

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

⁸⁰ 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.

to the Columbia program when the Navy designated that as the nation's top defense priority.⁸¹

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.

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.⁸²

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.⁸³

⁸¹ Edmund H. Mahony, “CT’s Electric Boat Looking to Hire 5,000 More Employees Amidst ‘Once in Generation Expansion,’” *Hartford Courant*, March 6, 2023.

⁸² Megan Eckstein, “Newport News Has Fully Staffed Attack Sub Line, After Years Of Delays,” *Defense News*, February 9, 2023.

⁸³ 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.

Additional Virginia-Class Issues

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 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,⁸⁴ 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).

⁸⁴ 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.

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.⁸⁵

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.

"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.⁸⁶

Shortage of Spare Parts for 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.

⁸⁵ Megan Eckstein, "Next-Generation Attack Subs Will Be Designed with Maintenance in Mind," *Defense News*, September 22, 2022.

⁸⁶ 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.

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 Office⁸⁷....

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....

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.⁸⁸

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 2020.⁸⁹

⁸⁷ This is a reference to a recent CBO report: Congressional Budget Office, *The Capacity of the Navy's Shipyards to Maintain Its Submarines*, March 2021, 21 pp.

⁸⁸ Anthony Capaccio, "U.S. Navy's Deadliest New Sub Is Hobbled over Spare Parts," *Bloomberg*, June 21, 2021.

⁸⁹ 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.

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 2017⁹⁰ and 2019.⁹¹

Defective Parts

Another issue for Congress concerns three Virginia-class boats that were reported in 2016 to have been built with defective parts.⁹²

Legislative Activity Regarding FY2024 Funding Request

Congressional Action on FY2024 Funding Request

Virginia-Class Procurement Funding Requested in FY2024 Budget Submission

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 FY2025.⁹³

⁹⁰ See William Cole, "Navy Subs Still Show Issue with Stealth Coating," *Military.com*, March 6, 2017.

⁹¹ 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.

⁹² 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.

⁹³ 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.

Additional Funding for Submarine Industrial Base Requested on October 20, 2023

In addition to the above requested funds, on October 20, 2023, the Administration submitted a request for FY2024 emergency supplemental funding for national security priorities that includes, among other things, a total of \$3,393.2 million (i.e., about \$3.4 billion) in funding for the submarine industrial base to support construction of new submarines and maintenance of existing submarines, as follows:

- \$557.758 million in the Operation and Maintenance, Navy (OMN) appropriation account for improvements at the four government-operated naval shipyards (NSYs) that maintain the Navy’s nuclear-powered ships, including the Navy’s submarines;
- \$2,055.0 million in the Shipbuilding and Conversion, Navy (SCN) appropriation account (i.e., the Navy’s shipbuilding account) to increase production rates and submarine availability through initiatives in supplier development, shipbuilder and supplier infrastructure, workforce development, technology advancements, and strategic sourcing;
- \$393.57 million in the Other Procurement, Navy (OPN) appropriation account to increase production rates and submarine availability through initiatives in supplier development, shipbuilder and supplier infrastructure, workforce development, technology advancements, and strategic sourcing;
- \$7.0 million in the Research, Development, Test and Evaluation, Navy (RDTEEN) appropriation account to increase production rates and submarine availability through initiatives in supplier development, shipbuilder and supplier infrastructure, workforce development, technology advancements, and strategic sourcing;
- \$281.914 million in the Military Construction (MilCon), Navy and Marine Corps appropriation account to support infrastructure work at the NSYs to improve the ability to maintain the readiness of the fleet; and
- \$98.0 million in the National Nuclear Security Administration (NNSA) of the Department of Energy (DOE) for Naval Reactors (i.e., the Naval Nuclear Propulsion Program) to support hiring and infrastructure expansion at the Government-Owned, Contractor-Operated Naval Nuclear Laboratory sites in order to meet growing mission demands to provide the trilateral security partnership between Australia, United Kingdom, and United States (i.e., AUKUS) with nuclear propulsion plants.⁹⁴

Table 4 summarizes congressional action on the Navy’s FY2024 budget funding request for the procurement of Virginia-class boats in FY2024 and subsequent years.

⁹⁴ Source: Attachment 4: Submarine Industrial Base (pages 58-63) to letter dated October 20, 2023, from Shalanda D. Young, Office of Management and Budget, to The Honorable Patrick McHenry, Speaker Pro Tempore of the House of Representatives, accessed October 23, 2023, at <https://www.whitehouse.gov/wp-content/uploads/2023/10/Letter-regarding-critical-national-security-funding-needs-for-FY-2024.pdf>.

Table 4. Congressional Action on FY2024 Funding Request

Millions of dollars, rounded to nearest tenth

	Request	Authorization			Appropriation		
		HASC	SASC	Final	HAC	SAC	Final
FY2024 Procurement Funding Request for Virginia-Class Program (all in SCN account)							
Procurement	7,130.0	7,130.0	7,130.0		7,130.0	7,130.0	
Advance procurement (AP)	3,215.5	2,890.4	3,215.5		3,215.5	3,158.8	
(Quantity)	(2)	(2)	(2)		(2)	(2)	
Cost-to-complete	168.2	168.2	168.0		168.2	168.2	
Total Virginia-class	10,513.7	10,188.6	10,513.7		10,513.7	10,457.0	
Emergency Supplemental Funding for Submarine Industrial Base (SIB) Requested on October 23, 2023							
OMN account	557.8	n/a	n/a				
SCN account	2,055.0	n/a	n/a				
OPN account	393.6	n/a	n/a				
RDTEN account	7.0	n/a	n/a				
MilCon account	281.9	n/a	n/a				
DOE NNSA for NR	98.0	n/a	n/a				
Total SIB	3,393.2	n/a	n/a				

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. Advance procurement funding includes both “regular” AP funding and Economic Order Quantity (EOQ) funding for multiyear procurement (MYP). **SCN** is Shipbuilding and Conversion, Navy; **OMN** is Operation and Maintenance; **OPN** is Other Procurement, Navy; **RDTEN** is Research, Development, Test and Evaluation, Navy; **MilCon** is Military Construction, Navy and Marine Corps; **DOE NNSA for NR** is Department of Energy National Nuclear Security Administration for Naval Reactors (i.e., the Naval Nuclear Propulsion Program). n/a is not applicable—the House and Senate versions of the FY2024 National Defense Authorization Act (NDAA) were reported prior to the submission of the emergency supplemental funding request on October 20, 2023.

FY2024 National Defense Authorization Act (H.R. 2670/S. 2226)

House

The House Armed Services Committee, in its report (H.Rept. 118-125 of June 30, 2023) on H.R. 2670, recommends the funding levels shown in the HASC column of **Table 4**. The recommended reduction of \$325.1 million in advance procurement (AP) funding is for “early to need.” (Page 445)

Section 131 of the bill would provide authority for a multiyear procurement (MYP) contract for not more than 13 Virginia-class submarines.

Section 344 would modify a requirement for a briefing on the Shipyard Infrastructure Optimization Plan (SIOP) and require a briefing on the implementation status of the SIOP.

Section 1024 would require quarterly briefings on SSN maintenance.

H.Rept. 118-125 states

Public Naval Shipyards

The committee recognizes the importance of the four naval public shipyards and is encouraged by the ongoing work as part of the Shipyard Infrastructure Optimization Program (SIOP). The committee encourages the Secretary of the Navy to ensure SIOP projects remain on schedule and to identify additional opportunities for enhanced capabilities for increased throughput at the public shipyards. (Page 124)

Senate

The Senate Armed Services Committee, in its report (S.Rept. 118-58 of July 12, 2023) on S. 2226, recommended the funding levels shown in the SASC column of **Table 4**. S.Rept. 118-58 states

Virginia Class Material Strategy.—The Committee remains concerned with persistent delays in submarine repair maintenance activities that reduce operational availabilities of submarines. The Committee notes that the availability of VIRGINIA Class submarine [VCS] materials have been a significant driver of maintenance delays. Therefore, the Committee supports the fiscal year 2024 President’s budget request of \$470,000,000 for the procurement of VCS spares and repair parts in support of the Navy’s revised VCS material strategy. In order to facilitate appropriate congressional oversight of this novel approach, the Committee directs the Secretary of the Navy not later than 90 days after the enactment of this act, and quarterly thereafter, to brief the congressional defense committees on the Navy’s VCS materials strategy. The briefing shall include (1) updates on the implementation of the strategy; (2) plans for the obligation of funding appropriated for VCS spares and repair parts; (3) an assessment of the health of the defense industrial base for VCS materials; and (4) an updated analysis of estimated cost savings and reductions in availability delays resulting from the Navy’s strategy. The Committee encourages the Secretary of the Navy to use predictive modeling and make adjustments to the budget development process and procurement lead times of VCS materials to improve material readiness. (Pages 146-147)

Section 123 of the bill would provide authority for a multiyear procurement (MYP) contract for 10 Virginia-class submarines.

FY2024 DOD Appropriations Act (H.R. 4365/S. 2587)

House

The House Appropriations Committee, in its report (H.Rept. 118-121 of June 27, 2023) on H.R. 4365, recommends the funding levels shown in the HAC column of **Table 4**.

Section 8010 of the bill would provide authority for a multiyear procurement (MYP) contract for Virginia-class submarines.

Senate

The Senate Appropriations Committee, in its report (S.Rept. 118-81 of July 27, 2023) on S. 2587, recommended the funding levels shown in the SAC column of **Table 4**. The recommended reduction of \$56.757 million in advance procurement (AP) funding is for “Long Lead Time CFE [contractor-furnished equipment] Two Year AP prior year execution delays.” (Page 135)

Section 8010 of the bill would provide authority for a multiyear procurement (MYP) contract for 10 Virginia-class submarines and government-furnished equipment (GFE).

S.Rept. 118-81 states

Submarine Construction Performance.—The Committee continues to be concerned by VIRGINIA Class Submarine [VCS] construction cost and schedule performance which impact not only the construction and delivery to the fleet of VCS, but also affect the COLUMBIA Class Submarine [COL] construction schedule. The Committee notes that the fiscal year 2024 President’s budget request includes funds for cost overruns of VCSs procured in fiscal years 2015, 2016, and 2017, and that cost overruns on additional ongoing new VCS construction programs are expected to exceed \$3,000,000,000 in future years. The Secretary of the Navy is directed to submit to the congressional defense committees the most current cost and schedule estimates, by VCS and COL, with the submission of each annual President’s budget request until delivery of the twelfth and final COLUMBIA hull. The report shall identify changes from the previous year, and include detailed explanations for all submarines not fully resourced to the Navy’s cost estimate, as well as all projected cost-to-complete requirements for previously appropriated submarines. (Page 137)

Legislative Activity Regarding Proposed Sale of Virginia-Class Boats Under AUKUS Agreement⁹⁵

May 2023 DOD Legislative Package Relating to AUKUS Agreement

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 the following proposed measures relating to the SSN part of the AUKUS agreement:

SEC. ____ ACCEPTANCE OF CONTRIBUTIONS IN SUPPORT OF AUSTRALIA, UNITED KINGDOM, AND UNITED STATES SUBMARINE SECURITY ACTIVITIES.

Chapter 155 of title 10, United States Code, is amended by inserting after section 2608 the following new section:

“§ 2609. Acceptance of contributions for Australia, United Kingdom, and United States submarine security activities; Submarine Security Activities Account

“(a) ACCEPTANCE AUTHORITY.—The Secretary of Defense may accept from the Government of Australia contributions of money made by the Government of Australia for use by the Department of Defense in support of non-nuclear related aspects of submarine security activities between Australia, the United Kingdom, and the United States (in this section referred to as ‘AUKUS’).

“(b) ESTABLISHMENT OF SUBMARINE SECURITY ACTIVITIES ACCOUNT.—(1) There is established in the Treasury of the United States a special account to be known as the ‘Submarine Security Activities Account’.

“(2) Contributions of money accepted by the Secretary of Defense under subsection (a) shall be credited to the Submarine Security Activities Account.

“(c) USE OF THE SUBMARINE SECURITY ACTIVITIES ACCOUNT.—(1) The Secretary of Defense may use funds in the Submarine Security Activities Account—

⁹⁵ Legislation shown in this section includes bills listed in Congress.gov as of August 15, 2023, that contain the term *AUKUS* and relate at least in part to Pillar 1 of AUKUS.

“(A) for any purpose authorized by law that the Secretary determines would support AUKUS submarine security activities; or

“(B) to carry out a military construction project that is consistent with the purposes for which the contributions were made and is not otherwise authorized by law.

“(2) Funds in the Submarine Security Activities Account may be used as described in this subsection without further specific authorization in law.

“(d) TRANSFERS OF FUNDS.—(1) In carrying out subsection (c), the Secretary of Defense may transfer funds available in the Submarine Security Activities Account to appropriations available to the Department of Defense.

“(2) In carrying out subsection (c), and in accordance with the Atomic Energy Act of 1954 (42 U.S.C. 2011 et seq.), the Secretary of Defense may transfer funds available in the Submarine Security Activities Account to appropriations or funds of the Department of Energy available to carry out activities related to AUKUS submarine security activities.

“(3) Funds transferred under this subsection shall be available for obligation for the same time period and for the same purpose as the appropriation to which transferred.

“(4) Upon a determination by the Secretary that all or part of the funds transferred from the Submarine Security Activities Account are not necessary for the purposes for which such funds were transferred, all or such part of such funds shall be transferred back to the Submarine Security Activities Account.

“(e) INVESTMENT OF MONEY.—(1) Upon request by the Secretary of Defense, the Secretary of the Treasury may invest money in the Submarine Security Activities Account in securities of the United States or in securities guaranteed as to principal and interest by the United States.

“(2) Any interest or other income that accrues from investment in securities referred to in paragraph (1) shall be deposited to the credit of the Submarine Security Activities Account.

“(f) RELATIONSHIP TO OTHER LAWS.—The authority to accept or transfer funds under this section is in addition to any other authority to accept or transfer funds.”.

—

SEC. ____ . AUSTRALIA, UNITED KINGDOM, AND UNITED STATES SUBMARINE SECURITY ACTIVITIES.

(a) AUTHORIZATION TO TRANSFER SUBMARINES.—

(1) **IN GENERAL.**—Subject to paragraph (6), the President may transfer not more than two Virginia class submarines from the inventory of the Navy to the Government of Australia on a sale basis under section 21 of the Arms Export Control Act (22 U.S.C. 2761).

(2) **COSTS OF TRANSFER.**—Any expense incurred by the United States in connection with the transfer authorized by this subsection shall be charged to the Government of Australia.

(3) **WAIVER OF CERTIFICATION REQUIREMENT.**—The requirement for the Chief of Naval Operations to make a certification under section 8678 of title 10, United States Code, shall not apply to a transfer under this subsection.

(4) **USE OF FUNDS.**—The Secretary of the Navy may use the proceeds of a transfer under this subsection—

(A) for the acquisition of vessels to replace the vessels transferred to the Government of Australia; or

(B) to carry out any other authority the use of which the Secretary of the Navy determines would improve the submarine industrial base.

(5) CREDITING OF RECEIPTS.—Notwithstanding any provision of law pertaining to the crediting of amounts received from a sale under the terms of the Arms Export Control Act (22 U.S.C. 2761), any receipt of the United States as a result of a transfer under this section shall—

(A) be credited, at the discretion of the Secretary of the Navy to—

(i) the appropriation, fund, or account used in incurring the original obligation;

(ii) an appropriate appropriation, fund, or account currently available for the purposes for which the expenditures were made; or

(iii) any other appropriation, fund, or account available for the purpose specified in paragraph (4)(B); and

(B) remain available for obligation until expended for the same purpose as the appropriation to which the receipt is credited.

(6) APPLICABILITY OF EXISTING LAW TO TRANSFER OF SPECIAL NUCLEAR MATERIAL AND UTILIZATION FACILITIES FOR MILITARY APPLICATIONS.—

(A) IN GENERAL.—With respect to any special nuclear material for use in utilization facilities or any portion of a vessel transferred under this subsection constituting utilization facilities for military applications under section 91 of the Atomic Energy Act (42 U.S.C. 2121), transfer of such material or such facilities shall only occur in accordance with such section 91.

(B) USE OF FUNDS.—The Secretary of Energy may use proceeds from a transfer described in subparagraph (A) for the acquisition of submarine naval nuclear propulsion plants and the nuclear fuel to replace the propulsion plants and fuel transferred to the Government of Australia.

(b) REPAIR AND REFURBISHMENT OF AUKUS SUBMARINES.—Section 8680 of title 10, United States Code, is amended—

(1) by redesignating subsection (c) as subsection (d); and

(2) by inserting after subsection (b) the following new subsection:

“(c) REPAIR AND REFURBISHMENT OF CERTAIN SUBMARINES.—

“(1) SHIPYARD.—Notwithstanding any other provision of this section, the Secretary of the Navy shall determine the appropriate shipyard in the United States, Australia, or the United Kingdom to perform any repair or refurbishment of a United States submarine involved in submarine security activities between Australia, the United Kingdom, and the United States (in this section referred to as “AUKUS”).

“(2) PERSONNEL.—Repair or refurbishment described in paragraph (1) may be carried out by personnel of the United States, United Kingdom, or Australia in accordance with the international arrangements governing AUKUS submarine security activities.”.

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SEC. ____. AUSTRALIA, UNITED KINGDOM, AND UNITED STATES SUBMARINE SECURITY TRAINING.

(a) IN GENERAL.—The President may transfer or authorize export of defense services to the Government of Australia under the Arms Export Control Act (22 U.S.C. 2751 et seq.) that may also be directly exported to Australian private-sector personnel to support the development of the Australian submarine industrial base necessary for submarine security activities between Australia, the United Kingdom, and the United States (in this section referred to as “AUKUS”), including where such private-sector personnel are not officers, employees, or agents of the Government of Australia.

(b) APPLICATION OF REQUIREMENTS FOR FURTHER TRANSFER.—Any transfer of defense services to the Government of Australia pursuant to subsection (a) to persons other than those directly provided such defense services pursuant to such subsection shall only be made in accordance with the requirements of the Arms Export Control Act (22 U.S.C. 2751 et seq.).⁹⁶

FY2024 National Defense Authorization Act (H.R. 2670/S. 2226)

House

In H.R. 2670 as passed by the House, Section 518 would require a report identifying gaps in the level of staffing necessary to accomplish AUKUS-related efforts in DOD. Section 3132 would require a report that contains a plan to establish a domestic enrichment capability dedicated to solely satisfying DOD requirements for highly enriched uranium (HEU), high-assay low enriched uranium, low enriched uranium, and depleted uranium, with such a report to include, among other things, a description of any changes in the DOD requirement for HEU due to AUKUS. (U.S. and British nuclear-powered warships use HEU in their reactors.)

Senate

Section 1353 of S. 2226 would require DOD to designate a senior DOD civilian official to be responsible for overseeing DOD activities relating to the AUKUS partnership.

The Senate Armed Services committee’s report (S.Rept. 118-58 of July 12, 2023) on S. 2226 states

Public shipyard support for AUKUS

The committee strongly supports the trilateral security agreement between the United States, Australia, and the United Kingdom, known as AUKUS, which presents a unique opportunity to significantly increase security cooperation and enhance collective security with two of our closest allies. Central to the agreement is the initiative to enable Australia to acquire nuclear-powered submarines. The committee notes the importance of ensuring appropriate attention is given to the Australian submarine industrial base, particularly Australian shipyards, to ensure that it is prepared to meet the demands of maintaining these advanced systems. As such, the committee directs the Secretary of Defense and the Secretary of the Navy to provide a report, no later than January 30, 2024, on the Department’s efforts and plans to leverage the expertise of the United States public shipyards, including lessons learned as part of the ongoing Shipyard Infrastructure Optimization Plan [SIOP], to support Australian shipyard improvements and worker training. (Page 268)

⁹⁶ Source: 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.

FY2024 DOD Appropriations Act (H.R. 4365/S. 2587)

Senate

The Senate Appropriations Committee's report (S.Rept. 118-81 of July 27, 2023) on S. 2587 states

Australia-United Kingdom-United States Trilateral Partnership Agreement.—The Committee supports the Australia-United Kingdom-United States Trilateral Partnership Agreement, which will strengthen allied presence and deterrence in the Indo-Pacific. Not later than 90 days after the enactment of this act, the Secretary of Defense shall submit a long-term plan to the congressional defense committees on the planned schedule, milestones, costs, and funding requirements for the transfer of Virginia Class submarines from the United States and to meet the U.S. Navy's requirement for attack submarines. This plan shall include funding requirements and plans for U.S. and partner investments in the U.S. submarine industrial base. (Page 138)

AUKUS Undersea Defense Act (H.R. 3939)

Section 3 of H.R. 3939 would authorize the transfer not more than two Virginia class submarines from the Navy to Australia on a sale basis under section 21 of the Arms Export Control Act, with the cost of the transfer to be borne by Australia. Section 4 would permit DOD to accept from Australia contributions of money made by Australia for use by DOD in support of non-nuclear related aspects of submarine security activities between Australia, the United Kingdom, and the United States. Section 5 would permit the President to transfer or authorize the export of defense services to Australia under the Arms Export Control Act that may also be directly exported to Australian private-sector personnel to support the development of the Australian submarine industrial base necessary for submarine security activities between Australia, the United Kingdom, and the United States.

AUKUS Submarine Transfer Authorization Act (H.R. 4619)

Section 3 of H.R. 4619 would, among other things, authorize the transfer up to two Virginia-class submarines from the Navy to Australia on a sale basis over a period of 15 years, with the cost of the transfer to be borne by Australia, subject to the President making certain certifications not less than 270 days prior to a transfer of a vessel, and providing for a joint resolution of disapproval by Congress within the 270-day period.

Bilateral Resilience in Industry Trade Security Act (BRITS Act) (H.R. 4715)

H.R. 4715 would amend the Arms Export Control Act to establish exceptions for the United Kingdom relating to licensing of defense articles and defense services for export under the act.

Keeping our Allies Leading in Advancement Act (KOALA Act) (H.R. 4716)

H.R. 4716 would amend the Arms Export Control Act to establish exceptions for Australia relating to licensing of defense articles and defense services for export under the act.

AUKUS Oversight and Accountability Act (H.R. 4725)

Section 2 of H.R. 4725 would require the Department of State to appoint a senior advisor in the Department of State to oversee and coordinate the implementation of the AUKUS partnership, establish a task force on AUKUS governance to be led by the senior advisor, and require the senior advisor to submit reports to Congress on a quarterly and annual basis. Section 3 would make modifications to the Arms Export Control Act and other authorities.

Truncating Onerous Regulations for Partners and Enhancing Deterrence Operations (TORPEDO) Act of 2023 (S. 1471)

S. 1471 contains provisions that would address various proposed activities to be carried out under the AUKUS agreement. Sections relating to the SSN AUKUS project (i.e., Pillar 1) include but are not necessarily limited to Sections 3, 4, 6, and 12-15.

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.⁹⁷ 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 2012.⁹⁸

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.⁹⁹ 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."¹⁰⁰ 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 CINC's' and national intelligence community's highest operational and collection requirements."¹⁰¹

⁹⁷ 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.

⁹⁸ 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.

⁹⁹ Secretary of Defense Les Aspin, U.S. Department of Defense, *Report on the Bottom-Up Review*, October 1993, pp. 55-57.

¹⁰⁰ Secretary of Defense William S. Cohen, U.S. Department of Defense, *Report of the Quadrennial Defense Review*, May 1997, pp. 29, 30, 47.

¹⁰¹ 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."¹⁰²

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.¹⁰³

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.¹⁰⁴

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.¹⁰⁵

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.

¹⁰² U.S. Department of Defense, *Quadrennial Defense Review*, September 2001, p. 23.

¹⁰³ 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.

¹⁰⁴ 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.

¹⁰⁵ 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.¹⁰⁶

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.¹⁰⁷ 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

¹⁰⁶ 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.

¹⁰⁷ 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.¹⁰⁸

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.

¹⁰⁸ 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 Backlog

This appendix presents additional background information on the SSN maintenance backlog.

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.¹⁰⁹

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 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

¹⁰⁹ Rich Abott, “Fleet Forces And SecNav Argue For More Maintenance Yards,” *Defense Daily*, January 12, 2023.

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 18.¹¹⁰

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

¹¹⁰ 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.

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.¹¹¹

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.

“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.”

¹¹¹ Megan Eckstein, “US Navy Hopes New Funding Model Can Cut Sub Maintenance Delays by 2026,” *Defense News*, November 17, 2022.

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.¹¹²

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 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.¹¹³

¹¹² 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.

¹¹³ Justin Katz, “Navy ‘Scoping Study’ to Examine Shipyard Capacity, Potential for a New Yard,” *Breaking Defense*, November 2, 2022.

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 rotatable pool of spares is too small due to a lack of investment in the early years of the Virginia-class acquisition. The rotatable pool is made up of parts taken off a submarine by shipyard workers and later refurbished for use in the future.

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 rotatable 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.¹¹⁴

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.”¹¹⁵

A May 12, 2022, press report states

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....

¹¹⁴ 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.

¹¹⁵ Megan Eckstein, “Six Questions with the Head of US Fleet Forces Command,” *Defense News*, July 11, 2022.

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.”¹¹⁶

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.¹¹⁷

A February 16, 2022, press report stated

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.

¹¹⁶ Justin Katz, “Navy’s Submarine Builders ‘Over Cost’, ‘Under Performing’: Top Admiral,” *Breaking Defense*, May 12, 2022.

¹¹⁷ Justin Katz, “Is a New Navy Shipyard Realistic, or Just a ‘Tall Order?’” *Breaking Defense*, May 9, 2022.

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.”¹¹⁸

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,¹¹⁹ work that will include significant maintenance on the nuclear propulsion system and modernization upgrades.

The running tab on Boise so far is \$355 million, with advanced planning money already awarded, according to the Defense Department contract announcement. The work under this contract is scheduled to wrap up in May 2023, eight years after the sub left the operational fleet.

While Boise could be wrapped up by 2023—the overhaul was initially scheduled for 25 months—it’s possible the repairs could take longer, O’Rourke said.

The bill will be paid out of 2020 Operations & Maintenance funding, according to the contract announcement.

Boise has been something of a cause célèbre among congressional leaders, who have pointed to the ship’s long wait to enter the shipyard as emblematic of the Navy’s struggle with maintenance delays. The issue with attack submarines has been complicated, because while that work would typically be done in the public shipyards, those have been backed up with aircraft carriers and the Ohio-class ballistic missile subs.

Some of the Navy’s problems will resolve themselves after ballistic missile subs are refueled, said Bryan Clark, a retired submarine officer and analyst with the Center for Strategic and Budgetary Assessments, in a 2019 interview.

“The big factor here is that attack submarines are last in line when it comes to maintenance,” Clark explained then. “And that maintenance is done in the public yards, both the refueling and non-refueling overhauls. So that’s why you see submarines like

¹¹⁸ Megan Eckstein, “Submarine Maintenance Backlogs and Delays Take Toll on Fleet’s Development Work at Sea,” *Defense News*, February 16, 2022.

¹¹⁹ Colleen O’Rourke is no relation to Ronald O’Rourke.

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.”¹²⁰

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.



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

¹²⁰ David B. Larter, “The Hapless Attack Sub Boise Could Return to the Fleet in 2023 After 8 Years Sidelined,” *Defense News*, September 22, 2020.

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.¹²¹

A May 26, 2020, press report stated

After years of struggling to conduct attack submarine maintenance—with the four public naval shipyards prioritizing SSN work last, behind a backlog of ballistic-missile sub and aircraft carrier work, and private shipyards finding it tough to resume submarine repair work after years of only doing new construction—the Navy appears back on track for its SSN maintenance, the head of Naval Sea Systems Command told USNI News.

The move of attack submarine USS Boise (SSN-764) to the dry dock at Newport News Shipbuilding in Virginia is the most visible sign of things moving in the right direction, after the sub has been sitting pier side at nearby Norfolk Naval Shipyard for more than four years waiting for maintenance to begin.

The Navy had previously hoped to get Boise into Newport News as early as 2018, but the private yard struggled with its first two Los Angeles-class SSN maintenance periods—for USS Helena (SSN-725) and USS Columbus (SSN-762)—and didn't have the room for the sub or the workforce to start working on it. As Boise lingered, it became a focal point in the discussion about a lack of repair capacity and a backup of work at the four public naval shipyards.

But, NAVSEA Commander Vice Adm. Tom Moore told USNI News, the Navy is moving into a new era of on-time submarine maintenance....

Moore told USNI News in an interview last week that "I think we are well-positioned on Boise, certainly way better than we were on Helena and Columbus, when we learned so many lessons the hard way: that, one, they hadn't done submarine work in 10 years, and I think we underestimated how they had atrophied in that skill set, and I think they did as well; and the other thing is, I think we recognized that we probably put too much on their plate, with multiple availabilities on their plate at one time." ...

Moore said that Electric Boat likely won't be a provider of submarine maintenance for much longer—aside from an availability for USS Hartford (SSN-768) that starts in

¹²¹ 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.

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.¹²²

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 through Base Realignment and Closures (BRAC), increased Operational Tempo (OPTEMPO), evolution of submarine life cycle maintenance plans, budget reductions, and budget uncertainties that have contributed to the current challenges facing the submarine fleet.

The root cause of submarine idle time and associated loss of operational availability, as discussed in the recent Government Accountability Office (GAO) report 19-229, "Actions Needed to Address Costly Maintenance Delays Facing the Attack Submarine Fleet" (issued November 2018), is largely due to public shipyard capacity not keeping pace with growing maintenance requirements that have been building for a number of years prior to the USS BOISE (SSN 764) FY 2016 Engineered Overhaul (EOH). The workload to capacity mismatch resulted in lower priority attack submarine (SSN) availabilities (as compared to ballistic missile submarines and nuclear-powered aircraft carriers) being delivered late and a bow-waving of workload from one fiscal year to the next that could not be executed. The workload backlog exacerbated the public shipyard workload-to-capacity mismatch and contributed to an increasing trend in late SSN [maintenance] deliveries.

The Navy has taken several actions to improve the workload-to-capacity balance at the public shipyards. Notably, over 20,600 workers were hired from FY 2013 through FY 2018, which after accounting for attrition, increased total end strength from 29,400 to 36,700. However, the accelerated hiring resulted in 56 percent of the production workforce having less than five years of experience. The less experienced workforce requires a greater investment in training, as described in the Navy's Report to Congress on the Naval Shipyard Development Plan (issued March 2018), which offers some near term productivity gains. The Navy has also taken additional actions to balance workload at our

¹²² Megan Eckstein, "NAVSEA Says Attack Sub Repairs Much Improved as USS Boise Enters Yard Following 4-Year Wait," *USNI News*, May 26, 2020.

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 2023.¹²³

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

The Navy has been unable to begin or complete the vast majority of its attack submarine maintenance periods on time resulting in significant maintenance delays and operating and support cost expenditures. GAO's analysis of Navy maintenance data shows that between fiscal year 2008 and 2018, attack submarines have incurred 10,363 days of idle time and maintenance delays as a result of delays in getting into and out of the shipyards. For example, the Navy originally scheduled the USS Boise to enter a shipyard for an extended maintenance period in 2013 but, due to heavy shipyard workload, the Navy delayed the start of the maintenance period. In June 2016, the USS Boise could no longer conduct normal operations and the boat has remained idle, pierside for over two years since then waiting to enter a shipyard.... GAO estimated that since fiscal year 2008 the Navy has spent more than \$1.5 billion in fiscal year 2018 constant dollars to support attack submarines that provide no operational capability—those sitting idle while waiting to enter the shipyards, and those delayed in completing their maintenance at the shipyards.

The Navy has started to address challenges related to workforce shortages and facilities needs at the public shipyards. However, it has not effectively allocated maintenance periods among public shipyards and private shipyards that may also be available to help minimize attack submarine idle time. GAO's analysis found that while the public shipyards have operated above capacity for the past several years, attack submarine maintenance delays are getting longer and idle time is increasing. The Navy may have options to mitigate this idle time and maintenance delays by leveraging private shipyard capacity for repair work. But the Navy has not completed a comprehensive business case analysis as recommended by Department of Defense guidelines to inform maintenance workload allocation across public and private shipyards. Navy leadership has acknowledged that they need to be more proactive in leveraging potential private shipyard repair capacity. Without addressing this challenge, the Navy risks continued expenditure of operating and support funding to crew, maintain, and support attack submarines that provide no operational capability because they are delayed in getting into and out of maintenance.¹²⁴

¹²³ 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.

¹²⁴ 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)¹²⁵ 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)(1)-(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.¹²⁶

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.

¹²⁵ 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.

¹²⁶ 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.¹²⁷

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.¹²⁸

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.

¹²⁷ 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.

¹²⁸ 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.¹²⁹

¹²⁹ 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.

Appendix E. 1987 Letters from Members Regarding Canadian SSN Project

The following are the texts of the bodies of two 1987 letters from Members of Congress regarding Canada's proposed SSN acquisition project, which Canada later canceled.

Letter from Representative Charles E. Bennett

A November 3, 1987, letter from Representative Charles E. Bennett, Chairman, Seapower and Strategic and Critical Materials Subcommittee, House Armed Services Committee,¹³⁰ to Secretary of Defense Caspar W. Weinberger stated

I would like to comment on Secretary of Energy [John S.] Herrington's letter to the committee of October 28, 1987 concerning the Statutory Determination signed by both of you regarding transfer of information by the U.K. to Canada about nuclear propulsion.

In addition to considering the potential defense benefits that a force of Canadian [nuclear-powered] submarines might offer to the West, I believe it is also important for the United States to keep in mind some of the possible drawbacks such a program might involve. One, of course, is the issue of the use of such vessels for enforcement of the disputed Canadian claim of sovereignty over the Northwest Passage. Another is the danger of compromise of our nuclear [propulsion] technology, one of our most prized achievements. And third is the fact that a mishap involving a Canadian nuclear submarine could undermine the public confidence necessary for the successful operation of our own nuclear [-powered] Navy, [which accounts for] over 40 percent of our ships.

I have recently had an "op-ed" piece published on this matter in the Toronto *Globe and Mail*, which I am enclosing.¹³¹ I hope you will find these views helpful as you continue your deliberations on this important issue. I have sent a similar letter to Secretary Herrington.

Letter from Representative Melvin Price

A November 5, 1987, letter from Representative Melvin Price¹³² to Secretary of Defense Caspar W. Weinberger and Secretary of Energy John S. Herrington stated

I have recently learned that the Government of Canada is seeking access to U.S. naval nuclear propulsion technology via the United Kingdom. Apparently Canada wants to develop its first nuclear submarine. Since Congress and previous administrations have considered similar proposals in the past from other countries, I believe it is important that I convey to you the thoughts expressed in this letter.

As a charter member and former chairman of the Joint Committee on Atomic Energy, I was privileged to participate in the shaping of our national Naval [nuclear] Propulsion Program. The safety and performance record of our nuclear [-powered] ships is the payoff for engineering excellence. We gained our naval nuclear propulsion technology by

¹³⁰ Charles E. Bennett was a Member of Congress from January 3, 1949 to January 3, 1993. (Source: <https://bioguide.congress.gov/search/bio/B000371>.)

¹³¹ Charles E. Bennett, "Tough Questions Rise to the Surface," *Globe and Mail*, October 29, 1987.

¹³² Melvin Price was a Member of Congress from January 3, 1945 until his death on April 22, 1988. He was Chairman of the Joint Committee on Atomic Energy in the 93rd Congress (1973-1974) and Chairman of the House Armed Services Committee in the 94th through 98th Congresses (1975-1984). (Source: <https://bioguide.congress.gov/search/bio/P000522>.)

spending taxpayer dollars wisely under highly disciplined managerial and technical direction.

It is important to appreciate that there is nothing new about an ally wanting our naval nuclear propulsion technology—or about the consistently strong U.S. policy against its releases. Over the years, we have turned down requests from a number of countries, including France, Italy, and the Netherlands. Heretofore, the United States' position has been clear and firm.

As you know, applicable law tightly controls any disclosure of naval nuclear propulsion technology. Congress authorized the 1958 DREADNOUGHT¹³³ agreement with Great Britain only because of special circumstances. The British, having already embarked in developing their own naval nuclear propulsion plant, encountered problems and requested the assistance of the United States. The United States decided to help in nuclear propulsion and provide nuclear weapons technology because we needed to have British nuclear submarines and weapons on line in a strategic location at the earliest date. We also took into account the special relationship we had with the British and our close cooperation on nuclear matters during the war [i.e., World War II], including the Manhattan project.

Technical data alone did not prove to solve Britain's problems, so the United States ended up providing an entire U.S. nuclear propulsion plant. U.S. assistance, however, was limited to the propulsion plant on the lead ship to help ensure that the United Kingdom would not become dependent on the United States. We considered the requirement for self-sufficiency to be essential for the establishment of the type of discipline necessary for the safe application of naval nuclear propulsion. In addition to strict security precautions, the agreement provides that this technology may not be transferred to third parties without prior U.S. approval.

Over the years, earnest diplomats have urged that we share our sensitive nuclear submarine technology for purposes of worthwhile objectives. Congress rejected those proposals, recognizing the significant differences between exporting sensitive nuclear propulsion and exporting airplanes or tanks. It is one thing to share very sensitive intelligence between two allies; quite another to expose in a commercial environment the technology that has enabled us to hold a military advantage over a much larger Soviet submarine fleet.

Your decision to authorize the United Kingdom to release certain naval nuclear propulsion information to Canada is a softening of U.S. policy and invites further interest by Canada and similar propositions from other nations. The considerations that persuaded us to grant an exception for the British simply do not exist today with respect to Canada or other allies.

In one of its last reports, (Naval Nuclear Propulsion Program—1970) the Joint Committee on Atomic Energy addressed this issue succinctly:

“The Joint Committee noted with concern the testimony regarding persistent efforts of elements within the Executive Branch to disseminate sensitive and strategically vital U.S. naval nuclear propulsion technology among foreign governments as diplomatic ‘currency’ in cooperative arrangements of marginal military value. The committee has reviewed the arguments favoring such cooperation repeatedly in the past, and has found them lacking in appreciation for both the technical complexities and strategic value of this critical technology.”

“The committee strongly recommends that no further consideration be given to cooperative arrangements in the field of naval nuclear propulsion for the indefinite future.”

The Joint Committee's recommendation is as sound today as it was then.

¹³³ The UK's first nuclear-powered submarine—the one built with a transferred U.S. Navy submarine propulsion plant—was HMS Dreadnought.

Incidentally, the bilateral agreement with Canada on Cooperation for Mutual Defense Purposes, in paragraph E of Article II which you are proposing to implement, states that the “extent” and “means” of the exchange of classified information are to be agreed upon by the U.S. and Canada, presumably in advance. In view of the extreme sensitivity of this matter, if and when such agreement is reached it should be submitted to the Armed Services Committees of both Houses of Congress.

In any event, I want to state unequivocally my opposition to the transfer of any U.S. naval nuclear propulsion technology to Canada, because I believe it would be contrary to the best interests of our own submarine program and our national security.

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