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Navy Virginia-Class Submarine Program and AUKUS Submarine (Pillar 1) Project: Background and Issues for Congress

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Summary

Virginia-class submarine program. The Navy has been procuring Virginia (SSN-774) class nuclear-powered attack submarines (SSNs) since FY1998, and a total of 40 have been procured through FY2024. From FY2011 through FY2024, they have been procured at a rate of two per year. When procured at that rate, they have an estimated procurement cost of about \$4.5 billion each. Although they have been procured at a rate of two boats per year, the actual production rate has fallen short of 2.0 boats per year, and since 2022 has been limited by shipyard and supplier firm workforce and supply chain challenges to about 1.2 to 1.4 boats per year, resulting in a growing backlog of boats procured but not yet built. The Navy and industry are working to increase the Virginia-class production rate to 2.0 boats per year by 2028, and subsequently to 2.33 boats per year, so as to execute the two-per-year procurement rate, replace three to five Virginia-class boats that are to be sold to Australia under the AUKUS submarine (Pillar 1) project (see below), and reduce the accumulated Virginia-class production backlog. Congress has appropriated billions of dollars of submarine industrial-base funding to support this effort.

The Navy's proposed FY2025 budget requests the procurement of one Virginia-class boat, which would be the 41st boat in the class. Prior-year Navy budget submissions had projected that two boats would be requested for FY2025. The boat requested for FY2025 has an estimated procurement cost of \$5,759.5 million (i.e., about \$5.8 billion), but the Navy states that about \$1 billion of that is for materials and equipment for future Virginia-class boats, making the estimated cost for the requested boat itself roughly \$4.8 billion. The boat has received \$1,871.6 million in prior-year "regular" advance procurement (AP) funding and \$272.0 million in prior-year Economic Order Quantity (EOQ) funding, which is another kind of AP funding. The Navy's proposed FY2025 budget requests the remaining \$3,615.9 million needed to complete the boat's estimated procurement cost, as well as \$2,422.0 million in "regular" AP funding and \$1,298.3 million in EOQ funding for Virginia-class boats to be procured in future fiscal years, and \$293.0 million in cost-to-complete (CTC) funding to cover cost growth on boats procured in prior years.

A key issue for Congress for FY2025 is whether to procure one or two Virginia-class boats in FY2025. The Navy states that procuring two would require adding \$3,225.0 million (i.e., about \$3.2 billion) to the Navy's FY2025 procurement funding request for the program, that the Navy requested one boat rather than two due to limits on the Navy's budget topline and the growing Virginia-class production backlog, and that the request includes a second shipset of selected Virginia-class components so as to provide stability to key submarine supplier firms. Supporters of procuring two boats argue that doing so would provide greater stability for the industrial base and send a stronger signal of resolve to potential adversaries such as China.

AUKUS submarine (Pillar 1) project. In September 2021, the Australian, UK, and U.S. governments announced a significant new security partnership, called AUKUS. Pillar 1 of AUKUS is a project to (1) rotationally deploy four U.S. SSNs and one UK SSN out of a port in Western Australia; (2) more significantly, sell three to five Virginia-class SSNs to Australia and subsequently build three to five replacement SSNs for the U.S. Navy; and (3) have the United States and UK provide assistance to Australia for an Australian effort to build additional three to five SSNs of a new UK-Australian SSN design to complete a planned eight-boat Australian SSN force. Congress approved enabling legislation for Pillar 1 as part of its action on the FY2024 National Defense Authorization Act (NDAA) (H.R. 2670/P.L. 118-31 of December 22, 2023). The potential benefits, costs, and risks of implementing (2) and (3) can be compared with the potential benefits, costs, and risks of an alternative of procuring up to eight additional Virginia-class SSNs that would be retained in U.S. Navy service and operated out of Australia along with the U.S. and UK SSNs that are already planned to be operated out of Australia under (1).

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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
- the submarine (Pillar 1) project under the Australia-UK-U.S. (AUKUS) trilateral security arrangement.

The Navy has been procuring Virginia (SSN-774) class nuclear-powered attack submarines (SSNs) since FY1998, and a total of 40 have been procured through FY2024. From FY2011 through FY2024, they have been procured at a rate of two per year. The Navy's proposed FY2025 budget requests the procurement of one Virginia-class boat, which would be the 41st boat in the class. The Navy's FY2024 budget submission and its budget submissions for prior years had projected that two boats would be requested for procurement in FY2025.

A key issue for Congress for FY2025 is whether to procure one or two Virginia-class boats in FY2025. The Navy states that procuring two would require adding \$3,225.0 million (i.e., about \$3.2 billion) to the Navy's FY2025 procurement funding request for the program. The Navy states that it requested the procurement of one boat rather than two due to limits on the Navy's budget topline and the growing Virginia-class production backlog, and that the Navy's request includes a second shipset of selected Virginia-class components so as to provide stability to key submarine supplier firms. Supporters of procuring two boats argue that doing so would provide greater stability for the industrial base and send a stronger signal of resolve to potential adversaries such as China.

Another issue for Congress concerns the potential benefits, costs, and risks of the intention under the AUKUS Pillar 1 project to sell three to five Virginia-class submarines to Australia and subsequently build three to five additional replacement SSNs for the U.S. Navy, and to have the United States and UK provide assistance to Australia for an Australian effort to build additional three to five SSNs of a new UK-Australian SSN design to complete a planned eight-boat Australian SSN force. The potential benefits, costs, and risks of implementing these elements of Pillar 1 can be compared with the potential benefits, costs, and risks of an alternative of procuring up to eight additional Virginia-class SSNs that would be retained in U.S. Navy service and operated out of Australia along with the U.S. and UK SSNs that are already planned to be operated out of Australia under Pillar 1.

Congress's decisions on these issues could substantially affect U.S. and Australian military capabilities, U.S. Navy funding requirements, and the U.S. shipbuilding industrial base.

The U.S. Navy's SSN(X) next-generation SSN, which is the Navy's intended eventual successor to the Virginia-class SSN, 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 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.

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 nonnuclear power sources such as diesel engines or fuel cells. All U.S. Navy submarines are nuclear-powered. A submarine's use of nuclear or nonnuclear 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 nonnuclear-powered submarine can be armed with nuclear weapons.

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

³ The Navy's four SSGNs are former Trident SSBNs that have been converted (i.e., modified) to carry Tomahawk cruise missiles and SOF rather than SLBMs. Although the SSGNs differ somewhat from SSNs in terms of mission orientation (with the SSGNs being strongly oriented toward Tomahawk strikes and SOF support, while the SSNs are more general-purpose in orientation), SSGNs can perform other submarine missions and are sometimes included in counts of the projected total number of Navy attack submarines. The Navy's SSGNs are discussed in CRS Report RS21007, *Navy Trident Submarine Conversion (SSGN) Program: Background and Issues for Congress*, by Ronald O'Rourke.

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).

With the shift 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. Department of Defense (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 extensive anti-access/area-denial (A2/AD) forces.⁶

U.S. SSN Force Levels

Force-Level Goal

Goal Current Force-Level Goal of 66 Boats

The Navy's preferred new ship force-level goal, which was submitted to Congress in June 2023, calls for achieving and maintaining a fleet of 381 manned ships, including 66 SSNs.⁷ For a review of SSN force-level goals since the Reagan Administration, see **Appendix A**.

Past and Current Force Levels

During most of the 1980s, when plans called for achieving a 600-ship Navy including 100 SSNs, the SSN force included more than 90 boats, peaking at 98 boats at the end of FY1987. The number of SSNs declined after that in a manner that roughly paralleled the decline in the total size of the Navy over the same time period. The Navy currently has about 49 SSNs. The 48 SSNs in service at the end of FY2023 included the following:

- 24 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 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 FY2025 five-year (FY2025-FY2029) shipbuilding plan includes a total of nine Virginia-class boats, including one boat requested for procurement in FY2025 and two boats per year programmed for procurement in FY2026-FY2029. The Navy's FY2025 30-year (FY2025-FY2054) 30-year shipbuilding plan projects that SSNs would continue to be procured at a rate of two boats per year from FY2030 through at least FY2043.

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. To

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 Navy's preferred 381-ship force-level goal, see CRS Report RL32665, *Navy Force Structure and Shipbuilding Plans: Background and Issues for Congress*, by Ronald O'Rourke.

help fill in part of the projected valley, the Navy plans to refuel and extend the service lives of up to seven Los Angeles-class SSNs, while also pursuing “updated service life estimates for the remaining 688s based on current hull by hull utilization.”⁸ Under the Navy’s FY2025 30-year (FY2025-FY2054) shipbuilding plan, the SSN force would decline to 47 boats in FY2030 (marking the bottom of the valley) and then increase to 50 boats by FY2032 and 64 or 66 boats by FY2054. These projected force levels do not account for the impact of selling three to five Virginia-class boats to Australia under the AUKUS submarine (Pillar 1) project discussed later in this report.

The projected SSN valley was first identified by CRS in 1995 and has been discussed in CRS reports and testimony every year since then. 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

Submarine Construction Industrial Base

Overview

U.S. Navy submarines are built by two shipyards—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 16,000 suppliers in all 50 states,¹⁰ 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

⁸ Source: Navy information paper on FY2022 Fiscal Planning Framework and SSN-688 class service life 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.

⁹ China took note of the projected valley. The November 2014 edition of a Chinese military journal, for example, included an article with a passage that translates as follows:

... in 2028, the [U.S. Navy] force of nuclear attack submarines will fall from the current number of 55 down to 41 boats. Some are concerned about whether this force level can meet the requirements of the Asia-Pacific rebalance.

(Lyle Goldstein, “Evolution of Chinese Power Projection Capabilities,” presentation to Center for a New American Security (CNAS) roundtable discussion, September 29, 2016, slide 7 of 41.)

¹⁰ Source: CQ transcript of spoken testimony of Erik Raven, Under Secretary of the Navy, at an October 25, 2023, hearing on the submarine industrial base and its ability to support the AUKUS framework before the Seapower and Projection Forces Subcommittee of the House Armed Services Committee. See also Joint Statement, Honorable Erik K. Raven, Under Secretary of the Navy, VADM William J. Houston, Commander, Naval Submarine Forces, [and] RDML Jonathan Rucker, Program Executive Officer, Attack Submarines, before the House Committee on Armed Services Subcommittee on Seapower and Projection Forces, October 25, 2023, p. 5.

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.

Submarine Construction Industrial Base Enhancement Efforts

Goal

Although Virginia-class SSNs have been procured at a rate of two boats per year from FY2011 through FY2024, the actual Virginia-class production rate has fallen short of 2.0 boats per year, and since 2022 has been limited by shipyard and supplier firm workforce and supply chain challenges to about 1.2 to 1.4 boats per year, resulting in a growing backlog of boats procured but not yet built. The Navy and industry are working to enhance the submarine construction industrial base with a goal of increasing the Virginia-class production rate to 2.0 boats per year by 2028, and subsequently to 2.33 boats per year, the rate the Navy states will be needed to not only execute the two-per-year procurement rate, but also build replacement SSNs for the three to five Virginia-class boats that are to be sold to Australia under the AUKUS submarine (Pillar 1) project discussed later in this report, and to reduce the accumulated Virginia-class production backlog. Congress has appropriated billions of dollars of submarine industrial-base (SIB) funding to support this effort, which is discussed further below.

Funding

Funding for enhancing the SIB began in FY2018 and is projected to continue through at least FY2029. Most of the funding is for the submarine *construction* industrial base; the remainder is for the submarine *maintenance and sustainment* industrial base. The estimated total amount of funding appropriated through FY2024, requested for FY2025, and programmed for FY2026-FY2028 for the submarine *construction* industrial base is about \$9.8 billion.¹² This figure excludes

- billions of dollars in additional funding for the submarine *maintenance and sustainment* industrial base;
- FY2029 funding for the submarine *construction* industrial base, the figure for which was unavailable as of June 2024; and
- \$3.0 billion in funding that Australia is to provide to the United States under the AUKUS submarine (Pillar 1) project for enhancing the U.S. SIB, much of which is to be used for the submarine *construction* industrial base.

Much of the funding for the submarine *construction* industrial base has been appropriated through the line items in the Navy's shipbuilding budget for the Columbia-class SSBN program and the Virginia-class SSN program. Of the funds that have been appropriated for the submarine construction industrial base through FY2024, some were added by Congress in marking up the Navy's annual budget requests.

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 Source: Email from Navy Office of Legislative Affairs to CRS and CBO, June 7, 2024.

Uses of Funding

Funding for enhancing the submarine construction industrial base is being used at both the two submarine construction shipyards (GD/EB and HII/NNS) and at submarine supplier firms. It is being used for both facility improvements (aka capital expenditures, or CAPEX) and workforce development efforts. The Navy states that there are six main areas of investment:

- shipbuilder infrastructure (i.e., facilities),
- strategic outsourcing,¹³
- supplier development,¹⁴
- workforce development,¹⁵
- development of technology opportunities, and
- government oversight.

Using Navy-provided industrial base funding for these efforts can reduce the cost of capital for the submarine shipyards and submarine supplier firms by avoiding a potential need for the shipyards and supplier firms to finance these efforts by borrowing money from banks or capital markets and eventually paying the money back to lenders with interest. In addition, the Navy-provided industrial base funding is largely *not* being incorporated into the stated procurement costs of submarines whose construction is facilitated by this funding. If shipyards and supplier firms were to instead finance these Navy-funded facility improvements and workforce development efforts with funds borrowed from banks or capital markets, the shipyards and supplier firms would seek to recover those borrowed funds and their associated interest costs by incorporating them into the prices they charge the Navy for their work. Fully incorporating this industrial base funding into the stated procurement costs of submarines whose construction is facilitated by this funding would increase the stated procurement costs of those submarines, potentially by hundreds of millions of dollars per boat.

For additional information on Navy and industry efforts to enhance the submarine construction industrial base, see **Appendix B**.

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 16 boats (about 33% of the SSN force) as of FY2023. As also shown in the table, 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.

¹³ Strategic outsourcing refers to using firms other than the shipyards to build sections of submarines that are then transported to the shipyards for incorporation into the submarine as part of the final assembly of the submarine.

¹⁴ This can refer to either increasing the capabilities or capacity of existing supplier firms, or to establishing new supplier firms.

¹⁵ This can include efforts to recruit, train, and retain workers. For an article discussing one such effort—a nationwide advertising campaign for jobs building submarines—see Lauren C. Williams, “Inside the Navy’s Slick Effort to Find Workers to Build Submarines,” *Defense One*, June 5, 2024.

Table I. 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	48	14	2	16	33%	32

Sources: For FY2008-FY2022: Navy information paper dated June 13, 2023, and provided to CRS and Congressional Budget Office (CBO) by Navy Office of Legislative Affairs (NOLA) on June 15, 2023. For FY2023: email from NOLA to CRS and CBO, February 21, 2024.

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.¹⁶ 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, who was then the Vice Chief of Naval Operations, stated that the Navy had adopted the 20% figure as its goal.¹⁷

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 availability of repair parts for SSNs are an additional issue. To address capacity constraints at the

¹⁶ 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*, January 12, 2023; Justin Katz, “As AUKUS Looms, US Navy Sub Leaders Sound Alarms at Home,” *Breaking Defense*, November 4, 2022.

¹⁷ 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.

NSYs, the Navy has increased staffing at the NSYs and in 2018 began a multibillion-dollar investment plan that is to extend at least 20 years, called the Shipyard Infrastructure Optimization Program (SIOP), to modernize the NSYs' facilities.¹⁸ 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 Classes¹⁹

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 FY2023, 38 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

¹⁸ 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.

¹⁹ Source for submarine lengths, beams (i.e., hull diameters), and submerged displacements: U.S. Navy, “Attack Submarines—SSN,” updated March 15, 2024.

hull extension, known as the multi-mission platform, to test new generations of weapons and support Navy SEAL (Sea, Air and Land forces) operations.”²⁰

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.

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.

The Virginia-class design was developed to be less expensive and better optimized for post-Cold War SSN missions than the Seawolf-class design, and has been updated multiple times since FY1998. In addition to the Virginia Payload Module (VPM) (see discussion below), 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.²¹

²⁰ 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.

²¹ 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, (continued...)

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/Hill and states that it shows USS *Montana* (SSN-794) under construction at Hill/NNS.

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 associated torpedo room. Virginia-class boats are also equipped with vertical launch tubes in their bows for carrying and launching an additional 12 Tomahawk cruise missiles.

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). Virginia-class boats equipped with the VPM 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 an additional 28 Tomahawk cruise missiles.

One of the two Virginia-class boats procured in FY2024 is to be built to a special configuration referred to as the “Modified VIRGINIA Class Subsea and Seabed Warfare (Mod VA SSW)” configuration,²² suggesting a configuration that includes a capability for conducting seabed warfare missions.²³

“‘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.

²² *Department of Defense, Fiscal Year (FY) 2024 Budget Estimates, Navy Justification Book Volume 1 of 1, Shipbuilding and Conversion, Navy*, March 2023, p. 113, 115, 119.

²³ 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 (continued...)”

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

When procured at a rate of two boats per year, VPM-equipped Virginia-class SSNs have an estimated procurement cost of about \$4.5 billion per boat.

Annual Procurement Quantities

Table 2 shows annual numbers of Virginia-class boats procured from FY1998 (the lead boat) through FY2024, and the numbers projected for procurement in FY2025-FY2029 under the Navy’s FY2025 budget submission. As shown in the table, a total of 40 Virginia-class boats have been procured through FY2024.

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.)

Table 2. Actual and Projected Virginia-Class Procurement Quantities

Projected quantities for FY2025-FY2029 as shown in Navy’s FY2025 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	1
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	FY29	2

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

Multiyear Contracting

With three exceptions—the one Virginia-class boat that was procured in FY2003 and the two Virginia-class boats that were procured in FY2024—all Virginia-class boats procured to date 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 FY2023).²⁴

The Navy states that deferring the start of the next Virginia-class MYP contract from FY2024 to FY2025 will put the contract into better schedule alignment with contracts for procuring Columbia-class ballistic missile submarines, which can help maximize efficiency and supplier-firm stability for both the Virginia- and Columbia-class programs.²⁵ The two boats procured in FY2024 are to be added as non-MYP options to the FY2019-FY2023 Virginia MYP contract.²⁶

²⁴ 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 sequence of multiyear contracts is as follows:

- 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.

²⁵ Source: Navy briefing on Virginia-class program for CRS and CBO, April 28, 2023.

²⁶ 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.

Joint Production Arrangement

Each Virginia-class boat is 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.²⁷ 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 generally 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.²⁸

Integrated Enterprise Plan (IEP)

Under an arrangement it calls the Integrated Enterprise Plan (IEP),²⁹ the Navy plans to build each Columbia-class ballistic missile submarine jointly at GD/EB and HII/NNS, with all of the final-assembly work (and thus most of the overall volume of 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 will receive a larger share of the final-assembly work for that program than it has received in the past.³⁰

²⁷ See Section 121 of the FY1998 National Defense Authorization Act (H.R. 1119/P.L. 105-85 of November 18, 1997).

²⁸ 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.

²⁹ The IEP was previously called the Submarine Unified Build Strategy, or SUBS.

³⁰ 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

(continued...)

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, including payloads with diameters larger than the 21-inch diameter of a torpedo or Tomahawk missile.³¹ The four additional launch tubes in the VPM can carry a total of 28 additional Tomahawk cruise missiles (seven per tube),³² 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%.³³

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.

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.³⁴ 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.³⁵ The Virginia (SSN-

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.

³¹ 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.

³² Michael J. Conner, "Investing in the Undersea Future," *U.S. Naval Institute Proceedings*, June 2011: 16-20.

³³ 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%.

³⁴ 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.

³⁵ For discussions of recent exceptions, see Christopher P. Cavas, "US Navy Submarine Program Loses Some of Its (continued...)"

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. On April 2, 2024, the Navy announced significant projected delays in several of its shipbuilding programs. As part of this announcement, the Navy stated that deliveries of Virginia-class boats are projected to be delayed 24 to 36 months.³⁶ For additional background information on delays in the Virginia-class program, see **Appendix B**.

As mentioned earlier, although Virginia-class boats have been procured at a rate of two boats per year, the actual production rate has fallen short of 2.0 boats per year, and since 2022 has been limited by shipyard and supplier firm workforce and supply chain challenges to about 1.2 to 1.4 boats per year, resulting in a growing backlog of boats procured but not yet built. As also mentioned earlier, the Navy and industry are working to increase the Virginia-class production rate to 2.0 boats per year by 2028, and subsequently to 2.33 boats per year, the rate the Navy states will be needed to not only execute the two-per-year procurement rate, but also build replacement SSNs for the three to five Virginia-class boats that are to be sold to Australia under the AUKUS submarine (Pillar 1) project that is discussed later in this report, and to reduce the accumulated Virginia-class production backlog.

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**.

FY2025 Funding Request

The Navy’s proposed FY2025 budget requests the procurement of one Virginia-class boat, which would be the 41st boat in the class. The boat requested for FY2025 has an estimated procurement cost of \$5,759.5 million (i.e., about \$5.8 billion), but the Navy states that about \$1 billion of that is for materials and equipment for future Virginia-class boats, making the estimated cost for the requested boat itself roughly \$4.8 billion.³⁷ The boat has received \$1,871.6 million in prior-year “regular” AP funding and \$272.0 million in prior-year Economic Order Quantity (EOQ) funding, which is an additional kind of AP funding. The Navy’s proposed FY2025 budget requests the remaining \$3,615.9 million needed to complete the boat’s estimated procurement cost, as well as \$2,422.0 million in “regular” AP funding and \$1,298.3 million in EOQ funding for Virginia-class

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.

³⁶ For additional discussion of the Navy’s April 2, 2024, announcement, see CRS Report RL32665, *Navy Force Structure and Shipbuilding Plans: Background and Issues for Congress*, by Ronald O’Rourke.

³⁷ The Navy states that “the Total Ship estimate for the FY 2025 hull includes an additional shipset of two year advance procurement funded materials, one year advance procurement funded materials, and one year economic order quantity funded materials. This funding will be used to support contractor furnished equipment and government furnished equipment critical spare material that will be consumed on future hulls to ensure critical sub-tier vendors maintain two submarines per year cadence. As a result, the Gross Weapons System Unit Cost (End Cost) is approximately \$1 billion higher than a single submarine procurement.” (*Department of Defense, Fiscal Year (FY) 2025 Budget Estimates, Navy, Justification Book*, Volume 1 of 1, Shipbuilding and Conversion, Navy, March 2024, p. 115, 117, 121.)

boats to be procured in future fiscal years, and \$293.0 million in cost-to-complete (CTC) funding to cover cost growth on Virginia-class boats procured in prior years.

AUKUS Submarine (Pillar 1) Project

Overview

In September 2021, the Australian, UK, and U.S. governments announced a significant new security partnership, called AUKUS (pronounced *AW-kus*, rhyming with *caucus*).³⁸ One major initiative under AUKUS, referred to as Pillar 1, is a project to rotationally deploy four U.S. SSNs and one UK SSN out of a port in Western Australia; more significantly, to sell three to five Virginia-class SSNs to Australia and subsequently build three to five additional replacement SSNs for the U.S. Navy; and to have the United States and UK provide assistance to Australia for an Australian effort to build additional three to five SSNs of a new UK-Australian SSN design called SSN AUKUS to complete a planned eight-boat Australian SSN force.

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.³⁹ The United States reportedly has turned down requests from certain other U.S. allies to provide similar assistance. Under Pillar 1, Australia is to become the second country to receive U.S. assistance in naval nuclear propulsion and nuclear-powered submarines, and the first country to purchase a complete nuclear-powered submarine from the United States.

On October 25, 2023, the Seapower and Projection Forces Subcommittee of the House Armed Services Committee held a hearing on the submarine industrial base and its ability to support the AUKUS framework. The witnesses, all from DOD and the Navy, testified in support of Pillar 1 and the supplemental funding for the submarine industrial base that was requested on October 20, 2023.⁴⁰

Congress approved enabling legislation for Pillar 1 as part of its action on the FY2024 National Defense Authorization Act (NDAA) (H.R. 2670/P.L. 118-31 of December 22, 2023). Sections 1321-1354 of the FY2024 NDAA address various matters relating to the AUKUS partnership, including Pillar 1. Pillar 1 is covered in particular in Sections 1351-1354, which are referred to collectively as the AUKUS Submarine Transfer Authorization Act.

³⁸ For more on the AUKUS agreement, see CRS In Focus IF12113, *AUKUS and Indo-Pacific Security*, by Derek E. Mix and Bruce Vaughn; CRS Report R47599, *AUKUS Pillar 2: Background and Issues for Congress*, by Patrick Parrish and Luke A. Nicastro; CRS In Focus IF11999, *AUKUS Nuclear Cooperation*, by Paul K. Kerr and Mary Beth D. Nikitin; and CRS In Focus IF12483, *U.S. Arms Transfer Restrictions and AUKUS Cooperation*, by Paul K. Kerr and Ilana Krill.

³⁹ 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.

⁴⁰ The prepared statements of the witnesses are available at <https://docs.house.gov/Committee/Calendar/ByEvent.aspx?EventID=116514>. The CQ transcript of the hearing is available (subscription required) at <https://plus.cq.com/doc/congressionaltranscripts-7864570?3>. A video of the hearing is available at <https://armedservices.house.gov/hearings/spf-hearing-submarine-industrial-base-and-its-ability-support-aukus-framework>.

Key Elements

Key elements of Pillar 1 include the following:⁴¹

- **Embedding of Australian personnel.** In 2023, Australian military and civilian personnel began to 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. Also in 2023, the U.S. Navy began to increase SSN port visits to Australia, with Australian sailors joining U.S. crews for training and development.⁴² The UK is to increase SSN port 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 are to 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 are to be rotationally deployed out of HMAS Stirling under the arrangement, which is referred to as Submarine Rotational Force-West (SRF-West).
- **Sale of three to five Virginia-class boats to Australia.** The United States is to sell Australia three Virginia-class submarines, with the potential to sell up to two more if needed. The first two boats, which are to be sold in FY2032 and FY2035, would be existing boats with 18 to 27 years each of remaining expected service life. The third boat, which is to be sold in FY2038, would be a new boat taken directly from the U.S. production line, and thus have a full 33-year expected service life. In combination, the sale of these three boats would transfer more than 70 boat-years of SSN capability from the U.S. Navy to Australia's navy.
- **Replacement SSNs to be built for U.S. Navy.** The U.S. Navy anticipates eventually building three to five additional SSNs in the 2030s as replacements for the three to five Virginia-class boats that are to be sold to Australia. Until the replacement boats are built, selling three to five Virginia-class boats to Australia would reduce the size of the U.S. Navy's SSN force. The reduction in the U.S. SSN force would begin in FY2032 (when the first Virginia-class boat would be sold) and (as estimated by CRS and the Congressional Budget Office [CBO]) would last until sometime between 2040 and 2049. For additional discussion of this reduction, see **Appendix E**.

⁴¹ 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); Megan Eckstein, "Here's When the US Navy Plans to Sell Subs to Australia Under AUKUS," *Defense News*, November 16, 2023; Rich Abott, "Sub Boss Outlines Schedule of Virginia-Sub Sales to Australia Under AUKUS," *Defense Daily*, November 9, 2023; Mallory Shelbourne, "Australia Will Announce AUKUS Nuclear Attack Boat Build Partner Next Year," *USNI News*, November 9, 2023; Justin Katz, "US Navy Sub Boss Reveals New Details on AUKUS Virginia Class Sub Sales to Australia," *Breaking Defense*, November 8, 2023; 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.

⁴² For additional discussion of Pillar 1 activities in 2023 and 2024, see Megan Eckstein, "What Has the AUKUS Alliance Accomplished in the Last Year?" *Defense News*, May 9, 2024; Department of Defense, "AUKUS Defense Ministers' Joint Statement," April 8, 2024.

- **UK and Australia construction of SSN AUKUS boats incorporating U.S. technology.** The UK and Australia, with U.S. assistance, are to design and build a new class of SSN AUKUS (sometimes pronounced *SNAW-kus*) boats incorporating U.S. submarine and naval nuclear propulsion technology. The UK is to build SSN AUKUS boats for use in the UK's navy, and Australia is to build SSN AUKUS boats for use in Australia's navy. The first UK-built SSN AUKUS boat is to be delivered to the UK's navy in the late 2030s, and the first Australian-built SSN AUKUS boat is to be delivered to Australia's navy in the early 2040s. If the Australian SSN AUKUS construction effort encounters delays, a fourth and perhaps fifth Virginia-class boat would be sold to Australia to permit Australia to continue the buildup of its SSN force. Australia by the mid-2050s is to operate a force of eight SSNs, including three to five Virginia-class boats and five to three SSN AUKUS boats.
- **Australian investments in U.S. and UK submarine industrial bases.** Australia is to invest at least \$3 billion in its own industrial base to establish an Australian capacity for building and maintaining SSNs. In addition to that \$3 billion, and for the purpose of supporting implementation of Pillar 1, Australia is to make a \$3 billion contribution to U.S. submarine industrial base,⁴³ and a \$3 billion to the UK submarine industrial base.⁴⁴ The precise timing of Australia's contribution to the U.S. submarine industrial base has not been publicly announced.

Previous Countries That Requested but Did Not Receive U.S. Naval Nuclear Propulsion Technology

U.S. submarine technology 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 by the United States. 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.

Given both its high degree of importance to overall U.S. national security strategy and U.S. technical superiority in the field, 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 weapons and other nuclear-related matters dating back to the Manhattan project in World War II.

During the Cold War, when the United States and its allies were engaged in an extended, high-stakes, and costly strategic competition against the Soviet Union and Warsaw Pact allies, the United States reportedly turned down requests from four U.S. treaty allies other than the UK—

⁴³ See Parliament of Australia, Foreign Affairs, Defence, and Trade Legislation Committee, October 25, 2023, transcript of committee meeting, accessed December 13, 2023, at https://www.aph.gov.au/Parliamentary_Business/Hansard/Hansard_Display?bid=committees/estimate/27450/&sid=0000.

⁴⁴ See Colin Clark, "Australia Sends \$4.6B AUD to Bolster UK Sub Industry for SSN AUKUS as Shipbuilders Named," *Breaking Defense*, March 21, 2024; Lewis Jackson, "Australia Earmarks Billions for Naval Infrastructure as BAE Wins AUKUS Submarine Work," *Reuters*, March 21, 2024; Nic Fildes and Sylvia Pfeifer, "Australia and UK Sign Defence Treaty in Face of Rising Chinese Power," *Financial Times*, March 21, 2024; Shaun Turton and Sophie Mak, "Australia to Funnel \$3bn to U.K. for AUKUS Sub Reactors, Designs," *Nikkei Asia*, March 22, 2024. (A figure of \$4.6 Australian dollars [AUD] equates to about \$3.0 billion U.S. dollars.)

France, Italy, the Netherlands, and Japan—to share U.S. naval nuclear propulsion technology. The United States also reportedly turned down earlier requests from Australia. A sixth U.S. treaty ally—Canada—also requested but did not receive this technology. Canada canceled its SSN project before the United States acted fully on Canada’s request. A seventh country, Pakistan, also reportedly requested but did not receive the technology. For additional details regarding these six cases, see **Appendix F**.

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

An alternative to Pillar 1 as currently structured 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 capabilities for performing non-SSN 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 (to name only some examples) nuclear weapons, space assets, and ISR capabilities.

Under a U.S.-Australia military division of labor for performing SSN missions and non-SSN missions

- the forward rotations of U.S. and UK SSNs to Australia planned under Pillar 1—SRF-West—would still be implemented;
- up to eight additional Virginia-class SSNs would be built, and instead of three to five of them being sold to Australia, these additional boats would instead be retained in U.S. Navy service and operated out of Australia along with the five U.S. and UK SSNs that are already planned to be operated out of Australia under Pillar 1 as SRF-West; and
- Australia, instead of using funds to purchase, build, operate, and maintain its own SSNs, would instead invest those funds in other military capabilities—such as, for example, long-range anti-ship missiles, drones, B-21 long-range bombers, or other long-range strike aircraft—so as to create an Australian capacity for performing non-SSN military missions for both Australia and the United States.⁴⁵

⁴⁵ For more on the B-21 program, see CRS Report R44463, *Air Force B-21 Raider Long-Range Strike Bomber*, coordinated by John R. Hoehn.

For an article discussing the B-21 as an alternative to SSNs, see Michael Shoebridge, “An AUKUS Remix Delivering Greater Military Power Faster: the B-21 Raider,” *Defence Connect*, November 15, 2023. (Also posted as Michael Shoebridge, “AUKUS Plan B: Delivering Greater Military Power Faster—The B-21 Raider,” *Real Clear Defense*, November 16, 2023.) For further discussion of the option of Australia purchasing B-21s, see Marcus Hellyer and Andrew Nicholls, *‘Impactful Projection’: Long-Range Strike Options for Australia*, Australian Strategic Policy Institute (ASPI), December 2022, 53 pp.

For an article discussing a long-range strike aircraft other than the B-21, such as the P-8 maritime patrol aircraft, see Peter Briggs, “To B-21 or Not to B-21: What Are Australia’s Best Long-Range Strike Options?” *Strategist*, December 6, 2022.

For a study that recommends increased procurement of long-range anti-ship missiles as a high-priority for improving U.S. and allied capabilities for countering Chinese aggression in a U.S.-China conflict over Taiwan, see Mark F. Cancian, Matthew Cancian, and Eric Heginbotham, *The First Battle of the Next War, Wargaming a Chinese Invasion of Taiwan*, Center for Strategic and International Studies (CSIS), January 2023, 158 pp., which states on page 4 (emphasis as in original)

Recommendation: Increase the arsenal of long-range anti-ship cruise missiles. Bombers capable of launching standoff, anti-ship ordnance offer the fastest way to defeat the invasion with (continued...)

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

- Under one variation, 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 eight boats (i.e., the planned eventual number of SSNs that Australia had planned to acquire).

As noted above, under both variations of this potential alternative, U.S. Navy SSNs that would perform Australian SSN missions could be operated out of a port in Australia, in an arrangement perhaps similar to the SRF-West arrangement that forms another part of Pillar 1, or to the arrangement under which U.S. Navy nuclear-powered ballistic missile submarines (SSBNs) from 1961 to 1991 underwent inter-deployment refits at a forward-located facility in Holy Loch, Scotland.⁴⁶ **Table 3** summarizes certain features of Pillar 1 as currently structured and the two above-described variations of the potential alternative of a U.S.-Australia division of labor for performing SSN missions and non-SSN missions.

Table 3. Pillar 1 as Currently Structured and Potential Alternative

	Pillar 1 as currently structured	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.

the least amount of U.S. losses. Procuring such missiles and upgrading existing missiles with this anti-ship capability needs to be the top procurement priority.

⁴⁶ For a short history of the Holy Loch arrangement, see Ronald D. Gumbert, “History of Submarine Squadron Fourteen,” *Submarine Review*, January 1992: 72-77, accessed June 12, 2024, at <https://archive.navalsubleague.org/1992/history-of-submarine-squadron-fourteen>.

Issues for Congress

Whether to Procure 1 or 2 Virginia-Class Boats in FY2025

A key issue for Congress for FY2025 is whether to procure one or two Virginia-class boats in FY2025. The Navy states that procuring two would require adding \$3,225.0 million (i.e., about \$3.2 billion) to the Navy's FY2025 procurement funding request for the program. This is the Navy's estimate of the *net* increase in funding that would be needed to convert a one-boat buy to a two-boat buy. The second boat would cost more than \$3,225 million, but some of the second boat's materials and equipment are already funded in prior-year budgets or requested to be procured under the Navy's FY2025 budget submission, and adding the second boat would reduce the cost of the first boat due to increased production economies of scale.

The Navy states that it requested the procurement of one boat rather than two for FY2025 due to limits on the Navy's budget topline and the growing Virginia-class production backlog,⁴⁷ and that the Navy's request includes a second shipset of selected Virginia-class components so as to provide stability to key submarine supplier firms. The Department of the Navy's FY2025 budget highlights book states

Aligned with Congressional intent, this budget request delivers the most ready and lethal Naval Forces feasible under the FRA [Fiscal Responsibility Act—H.R. 3746/P.L. 118-5 of June 3, 2023] budget caps. These caps, paced well below even historical inflation targets, force hard choices. Due to the residual effects of inflationary pressures of the past few years, workforce challenges, plus increased labor and supply costs across the defense enterprise, all drove costs associated with our shipbuilding account up roughly 20% over the last couple of years. Hard choices were made, particularly in the procurement accounts. An analytic review of production performance identified areas where we could take risk to comply with the congressional fiscal caps. The Department requests only 1 Virginia Class submarine in PB25 [the President's (proposed) budget for FY2025], dropping the total number of ships requested down one from what we estimated we would request in FY 2025 during last year's budget.⁴⁸

The Navy's FY2025 budget-justification book for its shipbuilding account states that the FY2025 funding request for the Virginia-class program

includes an additional shipset of two year advance procurement funded materials, one year advance procurement funded materials, and one year economic order quantity funded materials. This funding will be used to support contractor furnished equipment and government furnished equipment critical spare material that will be consumed on future hulls to ensure critical sub-tier vendors maintain two submarines per year cadence.⁴⁹

A March 14, 2024, press report stated

During the rollout of the Pentagon's fiscal 2025 request senior DoD officials pointed to \$3.9 billion set for submarine industrial base investment in the next fiscal year, some of which is long lead procurement so parts are ready and waiting....

"We see [advanced procurement funding] as incredibly important in terms of supporting the supplier base to set ourselves up for the needed production rate both for Virginia-

⁴⁷ Source: Navy FY2025 budget rollout briefing for CBO and CRS, March 12, 2024.

⁴⁸ Department of the Navy, *Highlights of the Department of the Navy FY 2025 Budget*, 2024, pp. 1-12 to 1-13.

⁴⁹ *Department of Defense, Fiscal Year (FY) 2025 Budget Estimates, Navy, Justification Book Volume 1 of 1, Shipbuilding and Conversion*, Navy, March 2024, pp. 115, 117, 121.

class... [and] we include support for Columbia-class,” Navy Undersecretary Erik Raven said. Raven elsewhere said the service anticipates the Virginia-class program will hit the two-sub-per-year delivery cadence by 2028.

Pentagon comptroller Mike McCord said the Pentagon cut to one submarine buy so it would not keep doing the same thing over and over, which had not resulted in an appreciable production increase.

“The boats that are delivering ... this year are averaging over 30 months late, and we have more than a dozen on order that are still in production already. So the question was really: ‘What can we do to get a better result [rather] than keep doing the same thing and hoping for a different result?’”⁵⁰

Supporters of procuring one Virginia-class boat in FY2025 could, like the Navy, cite limits on the defense budget topline, the Virginia-class production backlog, and the funding requested for a second shipset of selected Virginia-class components. They could also cite the potential impacts of funding reductions to other DOD programs that might be needed to offset increasing FY2025 procurement funding for the Virginia-class program by \$3,225 million.

Supporters of procuring two Virginia-class boats in FY2025 argue that doing so would provide greater stability for the industrial base and send a stronger signal of resolve to potential adversaries such as China. For example, at an April 17, 2024, hearing before the Seapower and Projection Forces subcommittee of the House Armed Services Committee on Department of the Navy FY2025 seapower and projection forces programs, Representative Joe Courtney, the ranking member of the subcommittee, stated in his opening remarks:

This [FY2025 Navy shipbuilding budget] request includes six battle force ships, a sharp deviation from last year’s Future Years Defense Plan [FYDP] and 30-year shipbuilding plan.

At the same time, 19 battle force ships are being decommissioned, as [subcommittee] Chairman [Trent] Kelly just noted [in his own opening remarks]. [Of] particular note, it [i.e., the FY2025 Navy shipbuilding budget request] seeks to reduce procurement of the Virginia-class submarine program from 13 consecutive years of steady two-per-year cadence down to just one submarine in fiscal year 2025. This decision to cut procurement in the Virginia[-class] program contradicts our own combatant commanders that have emphasized the need for more attack submarines to deter the intensifying threats in the undersea domain.

During our posture hearings in the last month, we have consistently heard from combatant commanders from INDOPACOM, EUCOM, and NORTHCOM—Admiral [John] Aquilino, General [Christopher] Cavoli, [and] General [Glen VanHerck]—that their requirements for attack submarines are—are far higher beyond [sic] the number of boats in the Navy’s inventory.

Equally concerning is that Congress has already appropriated in the last two years nearly \$1 billion in advance procurement [funding] for the second submarine that the Navy now seeks to eliminate. This unexpected change in demand signal has and will cause serious reverberations throughout the industrial base and friends overseas who based on my conversations in those arenas are frankly incredulous.

I’ve already shared those concerns with you and we will explore that in further depth today. The Navy’s public justification for dropping a submarine is that the sizable investments in the submarine industrial base, known as the SIB in the budget, will offset its cut in

⁵⁰ Colin Clark, “AUKUS Critics Jump on Virginia-class Sub Budget Plan, but Canberra Sanguine,” *Breaking Defense*, March 14, 2024.

procurement and fleet size. As a member who has secured Congressional increases in the SIB starting in 2018, I wholly support the Navy's embrace of that effort.

However, I reject the ivory tower theory that SIB investment is a substitute for a consistent demand signal for orders and business. The two enterprises have to incur in tandem. Over the Easter break, I had the opportunity to meet with several supply chain companies and the message was clear, submarine industrial base investments as welcome as they are don't pay the bills and are [sic] particularly for these firms that doesn't—particularly for those firms that don't qualify for SIB assistance.

It is important to remember that cutting [submarine] procurement going back to the 1990s is precisely the reason why the submarine industrial base has eroded over the last 30 years. Indeed, Undersecretary Robert LaPlante testified to that point before the House Armed Services Committee few weeks ago. The decades of financial trauma the industrial base has experienced due to the Navy's consistently inconsistent procurement profiles is still deeply seared in the supply chain companies and metal trades unions that represent the welders, electricians, machinists, and pipefitters that are hard at work today, as we sit here in this committee room.⁵¹

Prior to the submission of the Navy's proposed FY2025 budget, a January 17, 2024, letter to President Biden from the chairman and ranking member of the House Armed Services Committee (Representative Mike Rogers and Representative Adam Smith, respectively) and the chairman and ranking member of the Seapower and Projection Forces subcommittee of the House Armed Services Committee (Representative Trent Kelly and Representative Joe Courtney, respectively) stated

We, the undersigned, are writing to you as a bipartisan coalition that supported advancement of the recently enacted Fiscal Year (FY) 2024 National Defense Authorization Act (NDAA). One of the most significant provisions of the new law are several authorities to enable execution of the trilateral AUKUS security agreement amongst the United States, Australia, and the United Kingdom....

... Now that AUKUS is codified, we are writing to express our conviction that the U.S. Navy and Congress maintain continued procurement of two Virginia-class submarines per year, as detailed in the Navy's FY2024 30-Year Shipbuilding Plan.

Our belief is based on the promising increase in U.S. submarine production tonnage in 2023. Part of this growth is due to investments from the Navy and Congress in workforce and supply chain development over the last five years, which requires continuous support to mature and stabilize the health of the industrial base. Even more importantly, this growth is dependent on the persistent two-per-year demand signal to the nationwide submarine industrial base that Congress has defended since 2011. That commitment has driven suppliers to make critical capital investments and expand capacity based on a predictable forecast in expected work. It has also driven metal trades workers, designers, and engineers to choose shipbuilding as promising careers in record numbers. Deviation from projected procurement rates in the FY2025 budget request would upend the faith of a steady procurement profile in the Future Years Defense Plan by our suppliers, as well as any plans for future capital investments in the supply chain.

In March 2023, the joint announcement of the AUKUS Optimal Pathway by the heads of government of the United States, Australia, and the United Kingdom triggered a robust discussion in Congress that generated significant support and increased international attention to the critical need for, and challenges facing, the Virginia-class program. The

⁵¹ Source: CQ transcript of hearing. The passage as presented includes some typographical corrections made by CRS. See also Mallory Shelbourne and Sam LaGrone, "Navy's Single Sub Buy Plan Raises Concerns with Congress," *USNI News*, April 18 (updated April 24), 2024; Justin Katz, "Top Seapower Hawk Rep. Courtney Rejects Navy's Pitch for 1 Virginia-Class Sub Buy," *Breaking Defense*, April 17, 2024.

AUKUS partnership relies on our nation to sustain a consistent build rate for attack submarines required to fulfill our obligation to successfully transfer, via sale, Virginia-class submarines to Australia while meeting our own force structure requirements. It is imperative to maintain a steady two-per-year procurement rate to assure our partners in our ability to meet commitments and address concerns about our nation’s undersea capabilities.

Simply put, now is not the time to insert instability in the supply chain with uncertainty in procurement rates. The FY2025 budget will come at a pivotal time for the Virginia-class submarine program and sustaining our unmatched edge in the undersea domain. Any deviation from the planned cadence of the construction and procurement of two submarines per year will reverberate both at home and abroad, with allies and competitors alike.⁵²

Whether to Implement Certain Elements of AUKUS Pillar 1

Overview

Another issue for Congress is whether to implement certain elements of the AUKUS submarine (Pillar 1) project, specifically, the intention to sell three to five Virginia-class submarines to Australia and subsequently build three to five replacement SSNs for the U.S. Navy, and to have the United States and UK provide assistance to Australia for an Australian effort to build additional three to five SSNs of a new UK-Australian SSN design to complete a planned eight-boat Australian SSN force. The potential benefits, costs, and risks of implementing these elements of Pillar 1 can be compared with the potential benefits, costs, and risks of the alternative division-of-labor approach for performing SSN missions and non-SSN missions outlined earlier, in which up to eight additional Virginia-class SSNs would be procured and retained in U.S. Navy service and operated out of Australia along with the U.S. and UK SSNs that are already planned to be operated out of Australia under Pillar 1, while Australia invested in military capabilities (such as, for example, long-range anti-ship missiles, drones, B-21 long-range bombers, or other long-range strike aircraft) for performing non-SSN missions.

In comparing the potential benefits, costs, and risks of these elements of Pillar 1 with the potential benefits, costs, and risks of the division-of-labor alternative, key factors that Congress may consider include, but are not necessarily limited to, the following:

- **deterrence and warfighting cost-effectiveness**—costs relative to resulting deterrence and warfighting capability;
- **technology security**—the potential impact on the risk of China, Russia, or some other country gaining access to U.S. submarine or naval nuclear propulsion technology; and
- **risk of accident and public acceptability of U.S. Navy nuclear-powered ships**—the risk of an accident involving an Australian-owned SSN 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 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.

⁵² Letter dated January 17, 2024, to The Honorable Joseph R. Biden President of the United States, from Representative Mike Rogers, Representative Adam Smith, Representative Trent Kelly, and Representative Joe Courtney, accessed June 12, 2024, at <https://s3.documentcloud.org/documents/24367170/011724-hasc-fc-spf-fy25-virginia-class-submarine-letter-final.pdf>. See also Mallory Shelbourne and Sam LaGrone, “House Members Send Warning to White House Over AUKUS, Attack Submarine Procurement,” *USNI News*, January 18, 2024.

Of the three factors listed above, the first is one is typically involved in considering the merits of defense programs, while the second and third arose in connection with Congress’s consideration of the merits of a project that Canada began in 1987 and canceled in 1989 to acquire a force of 10 to 12 UK- or French-made SSNs (see **Appendix G** and **Appendix I**).⁵³

Arguments for Implementing Pillar 1 Elements

Supporters of selling three to five Virginia-class submarines to Australia and subsequently building three to five replacement SSNs for the U.S. Navy, and of having the United States and UK provide assistance to Australia for an Australian effort to build additional three to five SSNs of a new UK-Australian SSN design to complete a planned eight-boat Australian SSN force, can make various arguments, including those outlined below.

Deterrence and Warfighting Cost-Effectiveness

Arguments relating to deterrence and warfighting cost-effectiveness include 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 UK⁵⁴—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. 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 thereby present China much sooner with a second allied decisionmaking center (along with the United States) for SSN operations in the Indo-Pacific. This would enhance deterrence of potential Chinese aggression in the Indo-Pacific by complicating Chinese military planning. In this regard, selling Virginia-class boats to Australia would be broadly comparable to
 - the help that the United States provided to the UK’s nuclear-powered submarine program starting in 1958, which accelerated the creation of the UK’s SSN force, thereby presenting the Soviet Union much sooner with a second allied decisionmaking center (along with the United States) for SSN operations in the European theater, which enhanced deterrence of potential Soviet aggression in Europe by complicating Soviet military planning; and
 - 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 present the Soviet Union much sooner with three

⁵³ For additional discussion, 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.

⁵⁴ To help the UK build its first SSN, the United States transferred to the UK a U.S. SSN propulsion plant (i.e., the “back half” of a U.S. SSN), but the UK designed and built the forward part (the “front half”) of the boat and married it to the U.S.-supplied propulsion plant.

decisionmaking centers—the United States, the UK, and France—that were armed with effective strategic nuclear deterrent forces.⁵⁵

- 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.
- Australia’s promised \$3 billion investment in the U.S. submarine industrial base would help accelerate the date by which replacement SSNs, strictly construed, could be built for the U.S. Navy, and thereby minimize the time during which the size of the U.S. SSN force is reduced due to the sale of Virginia-class 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 Pillar 1 would have a net positive impact on Australia’s overall military capabilities for deterring potential Chinese aggression.

Technology Security

Arguments relating to technology security include the following:

- 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 posture to deliver an uncompromised SSN program, as a responsible steward of nuclear technology.”⁵⁶
- In a February 28, 2024, address presenting his annual threat assessment for 2024, Mike Burgess, Australia’s Director-General of Security, stated: “Our adversaries are willing to commit to complex, multi-year efforts to acquire our cutting-edge technologies, aggressively using espionage in all its forms—cyber, human intelligence, technical collection, exploiting public information. And yes, we have seen the A-team [of adversary intelligence personnel] offering Australian defence industry employees money in return for reports on AUKUS, submarine technology, missile systems and many other sensitive topics. My colleagues in

⁵⁵ 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>.

⁵⁶ Commonwealth of Australia, *The AUKUS Nuclear-Powered Submarine Pathway, A Partnership for the Future*, undated, released ca. March 13, 2023, p. 38.

[Australia’s Department of] Defence know all this; they are well aware of the scale and sophistication of the threat and are working with ASIO [the Australian Security Intelligence Organisation] to calibrate their responses accordingly. They know BAU [business as usual] just won’t do.”⁵⁷

- At an October 25, 2023, hearing on the submarine industrial base and its ability to support the AUKUS framework before the Seapower and Projection Forces Subcommittee of the House Armed Services Committee, Under Secretary of the Navy Erik Raven stated, “We’re working very closely with Australia and the UK to make sure that there’s a common set of security principles that governs all the AUKUS security work we’re deeply engaged with. Also, NCIS [Naval Criminal Investigative Service] is establishing a presence in Australia to manage a lot of the—the counterintelligence and other concerns, but certainly part of AUKUS again is going towards an integrated industrial base so that when we talk security, we’re speaking the same language.”⁵⁸

Risk of Accident

Arguments relating to the risk of an accident include the following:

- 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 ships⁵⁹ 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 U.S. Navy nuclear-powered ships.
- Australia fully understands that avoiding accidents can be important to maintaining access for U.S. Navy nuclear-powered ships to ports around the world, because Australia itself in 1971 suspended visits by U.S. Navy and other nuclear-powered ships to Australian ports pending a review of the safety implications of such visits.⁶⁰

⁵⁷ Australian Government, Australian Security Intelligence Organisation, “Director-General’s Annual Threat Assessment 2024,” February 28, 2024. See also Rod McGuirk, “State-Sponsored Online Spies Likely to Target Australian Submarine Program, Spy Agency Says,” *Associated Press*, November 15, 2023; Matthew Cranston, “ASIO on High Alert as Middle East Explodes,” *Australian Financial Review*, October 19, 2023; Matthew Knott, “ASIO Agents Embedded in Defence to Protect AUKUS Secrets from Foreign Spies,” *Sydney Morning Herald*, May 23, 2023.

⁵⁸ Source: CQ transcript of hearing. Under Secretary Raven’s statement was made in reply to a question from Representative Donald Norcross, who asked: “If you could just touch base on a bit of a twist, that when we step up to the nuclear facilities classification and being able to clear a workforce, which Australia has a certain level, but certainly nowhere close to where it has to be. The challenges that they’re going to face from a domestic workforce and then their challenge like us, they’re bringing in many others from around the world to be part of that workforce. How are they going to address that challenge?”

⁵⁹ 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.

⁶⁰ 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 November 8, 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>.

- Under Pillar 1, Australian personnel would be trained in the same philosophy and procedures used by the U.S. Navy to minimize the risk of such an accident. Given the limited scale of Australia’s existing nuclear-reactor infrastructure—Australia currently operates only one nuclear reactor, a research reactor that uses low-enriched uranium (LEU)⁶¹—U.S. Navy personnel who train Australian personnel would not face a significant task in overcoming preexisting, ingrained Australian practices that might be inconsistent with U.S. Navy philosophy and procedures.
- In November 2023, the Australian government introduced into Australia’s parliament the Australian Naval Nuclear Power Safety Bill 2023, which is a bill to “establish a new, independent regulator to ensure Australia applies the highest standards of nuclear safety across its nuclear-powered submarine enterprise and can continue to implement AUKUS without delay.”⁶²

Arguments for Implementing Alternative Division-of-Labor Approach

Supporters of the alternative division-of-labor approach for performing SSN missions and non-SSN missions outlined earlier—in which up to eight additional Virginia-class SSNs would be procured and retained in U.S. Navy service and operated out of Australia along with the U.S. and UK SSNs that are already planned to be operated out of Australia under Pillar 1, while Australia invested in military capabilities (such as, for example, long-range anti-ship missiles, drones, B-21 long-range bombers, or other long-range strike aircraft) for performing non-SSN missions—can make various arguments, including those outlined below.

Deterrence and Warfighting Cost-Effectiveness

Arguments relating to deterrence and warfighting cost-effectiveness include the following:

⁶¹ For more on this reactor, see Australia’s Nuclear Science and Technology Organisation (ANSTO), “OPAL Multi-Purpose Reactor,” accessed December 13, 2023, at <https://www.ansto.gov.au/facilities/opal-multi-purpose-reactor>.

⁶² The Australian government further states that

The new Australian Naval Nuclear Power Safety Regulator will draw on the experience of the US and the UK to deliver international best practice in nuclear safety, as the Government delivers Australia’s conventionally armed, nuclear-powered submarine capability.

The Regulator will be an independent, statutory agency within the Defence portfolio and operate within Australia’s existing system of regulation.

The legislation will also establish a fit-for-purpose regulatory framework that imposes strict nuclear safety duties and licensing requirements for activities related to nuclear-powered submarines.

It will also impose new offences for breaches of nuclear safety duties, including serious criminal and civil penalties.

(Australian Government, Defence, “New Legislation to Ensure Naval Nuclear Power Safety,” media release dated November 16, 2023. See also Australian Government, Defence, “Australian Naval Nuclear Power Safety Bill 2023,” undated; Parliament of Australia, “Australian Naval Nuclear Power Safety Bill 2023 [and] Australian Naval Nuclear Power Safety (Transitional Provisions) Bill 2023,” Bills Digest No. 32, 2023–24, November 24, 2023; Parliament of Australia, Bills of the Current Parliament, “Australian Naval Nuclear Power Safety Bill 2023,” posted at <https://parlinfo.aph.gov.au/parlInfo/search/display/display.w3p;query=Id%3A%22legislation%2Fbillhome%2Fr7104%22>; Australian Government, Defence, *Discussion Paper: The Legal and Regulatory Framework to Support Naval Nuclear Power Safety*, undated, 18 pp.; Kirsty Needham, “Australia to create navy nuclear safety watchdog for AUKUS,” *Reuters*, December 12, 2023.)

- 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.⁶³ Selling three to five Virginia-class SSNs to Australia would thus convert those SSNs from boats that would be available for use in a U.S.-China crisis or conflict into boats that might not be available for use in a U.S.-China crisis or conflict. This could weaken rather than strengthen deterrence and warfighting capability in connection with a U.S.-China crisis or conflict. The reduced certainty of whether boats sold to Australia would be available for use in a U.S.-China crisis or conflict would be, in effect, the flip side of the argument made by supporters of Pillar 1 about having Australia become a second allied decisionmaking center (along with the United States) for SSN operations in the Indo-Pacific. Selling Virginia-class boats to Australia could also 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.⁶⁴

⁶³ 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.

⁶⁴ An October 2023 CBO report states

Would China be less deterred if the United States reduced the number of its attack submarines to help Australia develop its submarine force? Because the United States and Australia have a strong alliance, improving the Australian Navy’s [SSN] capability could help offset the U.S. Navy’s potential loss of [SSN] capability. That loss might even be more than offset because the Australian submarines would be based in the Western Pacific region and therefore could respond more quickly to any conflict with China involving Taiwan or other issues in the South China Sea. However, Australia would control its own submarines, and their participation in any particular conflict would not be guaranteed. In fact, in March 2020, the Australian defense minister stated that his country did not promise to support the United States in the event of a conflict involving Taiwan and the People’s Republic of China.”

(Congressional Budget Office, *An Analysis of the Navy’s Fiscal Year 2024 Shipbuilding Plan*, October 2023, p. 29.)

A February 1, 2024, opinion piece states

While Australia is a top US ally, it isn’t guaranteed that Canberra will join Washington in responding to a China-related contingency. Shortly after the March 2023 “optimal pathway” announcement, Australia’s Defence Minister Richard Marles said his government had “absolutely not” made a deal with the United States to join a fight over Taiwan as part of AUKUS. Indeed, a core selling point for AUKUS supporters in Australia is that Canberra will retain full sovereign control over how, where, and when it deploys its SSNs.

Washington and Canberra are strategically aligned, but that doesn’t mean there isn’t or won’t be daylight between them at times. Closing these gaps will require a deeper level of defence planning and military coordination to jointly uphold deterrence and manage crises – something which should be done whether SSNs are sold to Australia or not. Yet, regardless of how advanced US-Australia defence coordination becomes, US policymakers can’t afford to transfer a scare capability that it would have no sovereign control over during a crisis.

(Matthew C. Mai, “Is AUKUS Pillar I unworkable?” *Interpreter*, February 1, 2024.)

A February 17, 2024, opinion piece states

The fact remains that the AUKUS plan would weaken America’s submarine forces in a war with China. Even if Australia promised that its RAN [Royal Australian Navy] Virginia-class subs would fight alongside American boats in a war with China, our inexperienced crews would not operate them as effectively as US crews. And could the US be certain of our commitment? Canberra has

(continued...)

- Australian officials have stated consistently that, in line with Australia’s commitments as a non-nuclear-weapon state under the Treaty on the Non-Proliferation of Nuclear Weapons (NPT),⁶⁵ Australia’s SSNs would be armed only with conventional weapons. Selling three to five Virginia-class SSNs to Australia would thus convert those SSNs from boats that could in the future be armed with the U.S. nuclear-armed sea-launched cruise missile (SLCM-N) with an aim of enhancing deterrence⁶⁶ into boats that would never be armed with SLCM-N. This reduction in the number of SLCM-N-capable Virginia-class boats could weaken rather than strengthen deterrence capability in connection with a U.S.-China or U.S.-Russia crisis or conflict.
- Some observers are concerned about potential Chinese aggression against Taiwan over the next few years, a period sometimes characterized as the Davidson window (the time between now and 2027) or decade of concern (the time between now and 2030).⁶⁷ Pillar 1 as currently structured would not increase the total number of SSNs available for performing U.S., UK, and Australian SSN missions above what it otherwise would have been until sometime in the 2040s, when the first replacement SSN for the U.S. Navy or the first SSN AUKUS boat for the Australian navy (whichever comes first) enters service. Pillar 1 as currently structured would, however, absorb resources over the next few years that could instead be invested in Australian military capabilities that could be fielded sooner, and in some cases (e.g., drones) soon enough to address the Davidson window or decade of concern.⁶⁸ This could weaken rather than strengthen deterrence within the Davidson window or decade of concern.
- More generally, the costs for Australia of Pillar 1 could reduce, perhaps significantly, funding within Australia’s military budget for other Australian military capabilities, particularly if SSN acquisition, operation, and maintenance costs turn out to be higher than expected. If this were to occur, there could be a

refused to make that promise.

It is hard to see how the AUKUS plan can survive this yawning gap between American expectations and Australian commitments.

(Hugh White, “Sinking Feeling: Is the AUKUS Plan Feasible?” *Australian*, February 17, 2024.)

See also Andrew Greene, “Australia Won’t Be Automatically Dragged into Future China Conflicts, US General Says,” *ABC.net.au*, May 23, 2024, reporting on remarks by Lieutenant General Stephen Sklenka, Deputy Commander of U.S. Indo-Pacific Command (USINDOPACOM).

⁶⁵ For more on Australia’s commitments under the NPT, see “Treaty on the Non-Proliferation of Nuclear Weapons (NPT) in “Nuclear Weapons,” Australian Government, undated, accessed June 10, 2024, at <https://www.dfat.gov.au/international-relations/security/non-proliferation-disarmament-arms-control/nuclear-weapons#treaty>. For more on the NPT, see CRS Report R41216, *2010 Non-Proliferation Treaty (NPT) Review Conference: Key Issues and Implications*, coordinated by Paul K. Kerr and Mary Beth D. Nikitin.

⁶⁶ For more on the SLCM-N program, see CRS In Focus IF12084, *Nuclear-Armed Sea-Launched Cruise Missile (SLCM-N)*, by Anya L. Fink.

⁶⁷ For additional discussion of the Davidson window and decade of concern, see CRS Report RL33153, *China Naval Modernization: Implications for U.S. Navy Capabilities—Background and Issues for Congress*, by Ronald O’Rourke.

⁶⁸ For examples of opinion pieces arguing this point, see Nishank Motwani, “AUKUS’s Three Pillars of Uncertainty: Sovereignty, Strategy and Costs,” Australian Strategic Policy Institute (ASPI), October 23, 2023; Michael Shoebridge, “An AUKUS Remix Delivering Greater Military Power Faster: the B-21 Raider,” *Defence Connect*, November 15, 2023. (Also posted as Michael Shoebridge, “AUKUS Plan B: Delivering Greater Military Power Faster—The B-21 Raider,” *Real Clear Defense*, November 16, 2023.)

- net negative impact on Australia’s overall military capabilities for deterring potential Chinese aggression.⁶⁹
- The U.S. Navy’s FY2025 30-year shipbuilding plan (like previous editions of the Navy’s annual 30-year shipbuilding plan) projects that there will be a shortfall of U.S. SSNs relative to the Navy’s 66-boat SSN force-level goal during the 2030s and 2040s. Selling three to five Virginia-class boats will reduce the size of the U.S. SSN force below the projected levels shown in the FY2025 30-year shipbuilding plan (which does not account for sales of Virginia-class boats to Australia), increasing this projected shortfall until replacements for the sold boats enter service. This could reduce the Navy’s capacity to perform SSN missions of interest to the United States but not Australia, including potentially missions in the Arctic, the North Atlantic, and the Mediterranean for countering Russia or other potential adversaries in those regions. This could weaken deterrence of potential aggression by Russia or those other potential adversaries. Given the challenges that the U.S. submarine industrial base is experiencing in achieving a construction rate of 2.0 Virginia-class boats per year to meet U.S. Navy needs, the ability of the submarine industrial base to achieve the higher target rate of 2.33 boat per year, so as to build replacement SSNs for the U.S. Navy, 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.
 - There is little indication that, prior to announcing the AUKUS Pillar 1 project in September 2021, an analysis of alternatives (AOA) or equivalent rigorous comparative analysis was conducted to examine whether Pillar 1 would be a more cost-effective way to spend defense resources for generating deterrence and warfighting capability than potential alternative courses of action, such as a U.S.-Australian division of labor for performing SSN missions and non-SSN missions.⁷⁰ Such an AOA or equivalent rigorous comparative analysis (or a

⁶⁹ One observer has argued that “for the [Australian] Government, the AUKUS subs are a magic pudding, so far away you don’t have to spend any real money on them, and so impressive sounding they convince people you’re doing something on defence when you’re doing nothing. And if a few lefties complain, all the better. But it still produces no defence capability for Australia over the next ten years, and quite possibly nothing after that either.” (Greg Sheridan, “Pantomime World of the Albanese Government’s Defence Policy,” *The Australian*, November 28, 2023.)

⁷⁰ A July 1, 2024, press report stated

In interviews with insiders with intimate knowledge of the process, the Financial Review can reveal: Australia’s pathway to a nuclear submarine capability was intended to be an exclusively British one [without direct U.S. involvement]; [Australia’s Department of the] Treasury and the Department of Foreign Affairs were excluded from the process; and serious risk and feasibility studies were largely sacrificed in the name of securing a politically symbolic deal....

As is now well known, the project to buy and build nuclear submarines for Australia under the AUKUS agreement arose from a crisis in the contract with France [for acquiring a new class of non-nuclear-powered submarines for Australia]....

As a result, the [AUKUS Pillar 1] project emerged hurriedly, almost on the back of an envelope, and in top secret. The lead was taken by politicians in the National Security Committee of cabinet and a closed group of officials and advisers in Scott Morrison’s office. For secrecy and political reasons, they could not draw upon the depth of strategic thinking in defence nor on experts knowledgeable of the serious issues in both the US and British submarine construction industries....

The Australian Labor Party, for fear of being [politically] wedged, bought into Scott Morrison’s AUKUS deal, but did not de-risk the proposals nor include new and essential strategic analysis.

(continued...)

summary of one) has not been released. Performing an AOA or equivalent rigorous comparative analysis can test the validity of beliefs or presumptions about the cost-effectiveness of an envisioned course of action, and can produce unexpected or counter-intuitive results. Programs initiated in the absence of an AOA or an equivalent rigorous comparative analysis can lack a sound business case. The Government Accountability Office (GAO) has stated that “a program should not go forward into product development unless a sound business case can be made,” and that “weapon systems without a sound business case are at greater risk for schedule delays, cost growth, and integration issues.” The U.S. Navy’s Littoral Combat Ship (LCS) program, for example, was initiated without a prior

(James Curran, “Morrison’s ‘Longest Night’: Inside the Making of AUKUS,” *Australian Financial Review*, July 1, 2024.)

A July 2, 2024, press report (Part 2 of the July 1, 2024, press report quoted above) stated

The situation raises the pressing question of why the risk and feasibility studies leading to the original AUKUS announcement in September 2021 did not include basic strategic questioning, such as: which is the best submarine for Australia of those proposed? What are the tasks the submarine will be required to undertake? How quickly can Australia move on from the Collins-class submarines? What is the true capacity of the Australian submarine-building industry and is it really possible to build up a crew of one thousand submariners in 15 years? And how does AUKUS maintain Australian sovereignty?

(James Curran, “A Cruel Joke’: Why AUKUS Might Leave Australia Stranded,” *Australian Financial Review*, July 2, 2024.)

Another July 2, 2024, press report (a companion piece to the two articles quoted above) states

What emerges from the investigation into the construction plan of AUKUS and the problems it now faces on the “optimal pathway” is just how perilous a course the Albanese government is taking.

It has done so not on the basis of rigorous, contested policy work and debate. Rather it has inherited a flawed and hasty decision-making process of the previous government and proceeded in like manner.

(James Curran, “AUKUS ‘Moonshot’ May Be a Tragically Expensive Failure,” *Australian Financial Review*, July 2, 2024.)

A November 15, 2023, opinion piece from a different author stated

In a different world, where [Australia’s Department of] Defence was meeting its core obligations to provide cogent, well-founded advice to support government decision making, we would expect that there had been a proper analysis of alternative ways of increasing Australia’s deterrent capabilities and long-range strike against the backdrop of a dangerous region centred on an aggressive China.

But it is almost certain that this did not happen in the lead-up to the AUKUS announcement.

Instead, the same key defence leadership that has self-proclaimed its failures in an analogous chain of advice and decision making [for Australia’s Hunter-class frigate program] was a part of a tiny coterie of people around the then prime minister who were solely focused on “How can Australia acquire nuclear submarines?”

Looking at deterrence and strike [capability] through a straw that only lets the answer be a submarine is an oddly blinkered position to take on something that is about an essential element in our national defence.

It also doesn’t let you think clearly about the huge opportunity costs involved in the financial and human capital tied up in the AUKUS subs plan and the consequences these have for the rest of our military power.

(Michael Shoebridge, “An AUKUS Remix Delivering Greater Military Power Faster: The B-21 Raider,” *Defence Connect*, November 15, 2023. Also posted as Michael Shoebridge, “AUKUS Plan B: Delivering Greater Military Power Faster—The B-21 Raider,” *Real Clear Defense*, November 16, 2023.)

- rigorous AOA. The LCS program subsequently became controversial, was widely criticized, and was ultimately truncated.⁷¹
- The enabling legislation for Pillar 1 that was included in the FY2024 National Defense Authorization Act (NDAA) (H.R. 2670/P.L. 118-31 of December 22, 2023) includes a provision (§1352(d)(2)) that was requested by the Administration as part of a package of requested legislative proposals for the FY2024 NDAA relating to the AUKUS agreement.⁷² The provision provides a waiver for a certification to be made by the Chief of Naval Operations under 10 U.S.C. 8678. The text of 10 U.S.C. 8678 is as follows:

§8678. Chief of Naval Operations: certification required for disposal of combatant vessels

Notwithstanding any other provision of law, no combatant vessel of the Navy may be sold, transferred, or otherwise disposed of unless the Chief of Naval Operations certifies that it is not essential to the defense of the United States.

- Prior to the 2040s, Pillar 1 as currently structured will contribute to deterrence and warfighting capability primarily via the positional advantage of operating Virginia-class boats from Australia, which is something can be done without selling the boats to Australia. Operating up to 12 U.S. Navy Virginia-class boats from Australia—the four boats that are to be operated there under Pillar 1’s SRF-West arrangement, plus up to eight additional U.S. Navy Virginia-class boats—would send a strong signal of U.S.-Australian alliance solidarity and resolve, in part because it would make Australia second only to Japan in terms of numbers of U.S. Navy forward-homeported or forward-operating ships.⁷³ Australian shipyards could perform maintenance, overhaul, and repair work on the up-to-eight additional U.S. Navy boats, as currently planned under Pillar 1 for the four Virginia-class boats that are to operate out of Australia as part of SRF-West.
- It would be more cost-effective to pursue a U.S.-Australia division of labor for SSN missions and non-SSN missions.⁷⁴ Such a division of labor would follow the general model of military divisions of labor that exist between the United States and some or all of its NATO and other allies for naval capabilities such as aircraft carriers, SSNs, large surface combatants, and amphibious ships, and for non-

⁷¹ For further discussion of AOAs, business cases (including the GAO statements quoted here), and the LCS program, see **Appendix H**.

⁷² For the text of this legislative package, which was sent to Congress on May 2, 2023, see the section entitled “May 2023 DOD Legislative Package Relating to AUKUS Agreement” on pages 44-47 of the June 12, 2024, version of this CRS report. The requested provision relating to 10 U.S.C. 8678 appears on page 45.

⁷³ In terms of number of homeported U.S. Navy ships, Japan is the U.S. Navy’s largest overseas homeporting location, and since the early 1970s has homeported a U.S. Navy aircraft carrier strike group. As of 2023, U.S. Navy ships homeported in Japan included one nuclear-powered aircraft carrier, 11 cruisers and destroyers, three amphibious ships, four mine countermeasures ships, and eight command, auxiliary, and support ships.

⁷⁴ In connection with a project that Canada initiated in 1987 (and canceled in 1989) 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 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, GPO, 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.*])*

naval capabilities such as (to name only some examples) nuclear weapons, space assets, and ISR capabilities. Pillar 1 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.⁷⁵

Technology Security

Arguments relating to technology security include the following:

- Chinese cyber and other espionage in the past reportedly has been successful on multiple occasions in acquiring U.S. military information and technology,⁷⁶ including information relating to undersea warfare. A June 8, 2021, press report about China's acquisition of undersea warfare technology states that "China fields increasingly advanced and 'smart' technologies, including torpedoes, mines, and UUVs [unmanned underwater vehicles]. As highlighted by the case of Qin Shuren, at least some of these advances are being made with the help of U.S. technology. Sometimes the technology is purchased on the open market and other times it is gained through illicit means that range from cyber theft to old-fashioned espionage and smuggling."⁷⁷ In 2018, Chinese hackers reportedly 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

⁷⁵ 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.

⁷⁶ See, for example, "Survey of Chinese Espionage in the United States Since 2000," Center for Strategic and International Studies (CSIS), undated, accessed November 12, 2023, at <https://www.csis.org/programs/strategic-technologies-program/archives/survey-chinese-espionage-united-states-2000>; Xiaoshan Xue, "US Experts Urge More Efforts to Thwart China's Acquisition of US Military Technology," *VOA*, March 17, 2023; Nicholas Yong, "Industrial Espionage: How China Sneaks Out America's Technology Secrets," *BBC*, January 16, 2023; Jeffrey B. Jones, *Confronting China's Efforts to Steal Defense Information*, Belfer Center for Science and International Affairs, Harvard Kennedy School, May 2020, 34 pp.; Ellen Ioanes, "China Steals US Designs for New Weapons, and It's Getting Away with 'the Greatest Intellectual Property Theft in Human History,'" *Business Insider*, September 24, 2019.

⁷⁷ Ma Xiu and Peter W. Singer, "How China Steals US Tech to Catch Up in Underwater Warfare," *Defense One*, June 8, 2021.

in Newport, RI.⁷⁸ Some observers have expressed concern about the cybersecurity readiness of defense contractors.⁷⁹

- 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, 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.⁸⁰ 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.
- Hackers linked to China reportedly are highly active in attempting to penetrate Australian government and contractor computers.⁸¹ A March 1, 2023, 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 cybersecurity company CrowdStrike as stating that the AUKUS agreement “has been in the crosshairs of Australia’s cybersecurity adversaries since it was announced.”⁸²
- A July 15, 2024, press report states: “The US earlier this year failed to certify that Australia and the UK have adequate procedures to protect classified information.”⁸³

⁷⁸ 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.

⁷⁹ See, for example, Eric Noonan, “The US Just Got Serious About Cybersecurity. Contractors Aren’t Ready,” *Federal Times*, November 3, 2023.

⁸⁰ 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/>.)

⁸¹ 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 Stole a Treasure Trove of Information from an Australian Defence Contractor Including Top-Secret Weapon and Military Data,” *Daily Mail*, July 21, 2020.

⁸² Justin Vallejo, “Extent of Hacks Against Australia After AUKUS Deal Revealed,” *Herald Sun*, March 1, 2023.

⁸³ Courtney McBride and Ben Westcott, “Biden’s Australia-UK Arms Deal Facing Pressure Over Delay Fears,” *Bloomberg*, July 15, 2024.

Risk of Accident

Arguments relating to the risk of an accident include the following:

- 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 or building for Australia AUKUS SSNs that incorporate U.S. naval nuclear propulsion technology would unavoidably make another country (Australia) responsible for preventing an accident with an SSN that might call into question for third-party observers the safety of U.S. Navy nuclear-powered ships.
- The second variation of a U.S.-Australian division of labor outlined earlier—the variation under which U.S. SSNs perform Australian SSN missions indefinitely—would keep all U.S.-made SSNs under the control of the U.S. Navy, which has a proven record extending back to 1954⁸⁴ of safely operating its nuclear-powered ships.

Legislative Activity for FY2025

Summary of Congressional Action on FY2025 Funding Request

The Navy’s proposed FY2025 budget requests the procurement of the 41st Virginia-class boat. The boat has an estimated procurement cost of \$5,759.5 million (i.e., about \$5.8 billion). The boat has received \$1,871.6 million in prior-year “regular” AP funding and \$272.0 million in prior-year Economic Order Quantity (EOQ) funding, which is an additional kind of AP funding that can occur under an MYP contract. The Navy’s proposed FY2025 budget requests the remaining \$3,615.9 million needed to complete the boat’s estimated procurement cost, and \$2,422.0 million in “regular” AP funding for Virginia-class boats to be procured in future fiscal years, \$1,298.3 million in EOQ funding, and \$293.0 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 FY2025 to \$7,629.2 million (i.e., about \$7.6 billion).

The Navy states that procuring two would require adding \$3,225.0 million (i.e., about \$3.2 billion) to the Navy’s FY2025 procurement funding request for the program. This is the Navy’s estimate of the *net* increase in funding that would be needed to convert a one-boat buy to a two-boat buy. The second boat would cost more than \$3,225 million, but some of the second boat’s materials and equipment are already funded in prior-year budgets or requested to be procured under the Navy’s FY2025 budget submission, and adding the second boat would reduce the cost of the first boat due to increased production economies of scale.

Table 4 summarizes congressional action on the Navy’s FY2025 funding request for the procurement of Virginia-class boats in FY2025 and subsequent years.

⁸⁴ The U.S. Navy’s first nuclear-powered ship, the attack submarine *Nautilus* (SSN-571), was commissioned into service on September 30, 1954.

Table 4. Congressional Action on FY2025 Funding Request

Millions of dollars, rounded to nearest tenth

	Request	Authorization			Appropriation		
		HASC	SASC	Enacted	HAC	SAC	Enacted
Procurement	3,615.9	4,315.9			3,615.9		
Advance procurement (AP) (including both “regular” AP and EOQ))	3,720.3	3,720.3			3,720.3		
(Quantity)	(1)	(2)			(1)		
Cost-to-complete	293.0	293.0			293.0		
Total	7,629.2	8,329.2			7,629.2		

Sources: Table prepared by CRS based on Navy’s original FY2025 budget submission, committee and conference reports, and explanatory statements on FY2025 National Defense Authorization Act and FY2025 DOD Appropriations Act. Figures may not add due to rounding.

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).

FY2025 National Defense Authorization Act (H.R. 8070)

House

The House Armed Services Committee, in its report (H.Rept. 118-529 of May 31, 2024) on H.R. 8070, recommended the funding levels shown in the HASC column of **Table 4**.

The recommended net increase of \$700.0 million in procurement funding includes a recommended reduction of \$300.0 million for “Cost growth” and a recommended increase of \$1.0 billion for “One additional ship.” (Pages 425-426)

Section 1018 of H.R. 8070 would provide authority to use incremental funding for procuring a Virginia-class submarine in FY2025.

Section 1058 would direct the Navy to submit a report on the price elasticity of the labor supply for the industrial base for building and maintaining naval vessels that is to include, among other things, an assessment of and recommendation for any extraordinary relief that may be appropriate for fixed-price, MYP contracts for Virginia-class submarines in order to increase pay and benefits for workers at shipyards and supplier firms under those contracts.

H.Rept. 118-529 states:

Virginia class submarine

The committee continues to be perplexed by the Navy’s inconsistent funding of shipbuilding and specifically that of Virginia class submarines. For the second time in less than 5 years, the Navy has surprised both Congress and industry by removing a submarine from the budget request that had previously been planned for inclusion. This sporadic funding will only further stress an already stressed industrial base while also delaying the time it will take to reach the Navy’s stated goal of 66 fast attack submarines (SSNs). The Navy claims that by continuing to fund the advanced procurement line at the two SSN rate per year they will mitigate the impact to suppliers and the overall industrial base. However, in their response to committee questions they state that “the previously purchased

contractor and government furnished equipment will be used as critical material that will be consumed on future hulls”. Navy budget documents and committee briefings fail to identify what future hull will receive these components leading to further uncertainty for the industrial base. The committee can only conclude that it is the Navy’s plans to reduce advanced procurement (AP) funding at a future date of which they are incapable of or refuse to identify. This is the worst way to project future work to industry and will only cause reluctance in their decisions to invest in their workforce, facilities, and tooling due to their lack of confidence in Navy budgeting. The Navy also fails to recognize the impact of removing one SSN in fiscal year 2025 has on the suppliers that only receive funding that is provided in the full funding line. This will most likely result in stable suppliers becoming at-risk suppliers.

The committee also notes Congress’ considerable efforts last year to enact the needed legislation that enabled the Australia-United Kingdom-United States (AUKUS) trilateral security pact. The foundation of the agreement was an acknowledgement by the Department of Defense, the Navy, Congress and industry that we are all collectively committed to 2 SSNs and 1 Columbia per year, commonly referred to as 2+1. To renege on that commitment in just the first year after achieving the needed enabling legislation sends an inconsistent message to our allies and a talking point for our adversaries propaganda.

Finally, the committee remains committed to providing the maximum amount of undersea capacity to the Navy fleet, a consistent message to our workforce and unwavering support of the AUKUS pact. Therefore, the committee directs the Secretary of the Navy to provide a briefing to the House Committee on Armed Services not later than February 1, 2025 on how the Navy plans to mitigate the impact to suppliers of reducing the amount of AP in future budgets. (Pages 26-27)

H.Rept. 118-529 also states:

Comptroller General Review of Submarine Force Generation

The Navy’s attack submarines provide the United States an asymmetric advantage to gather intelligence undetected, attack enemy targets, and insert special forces, among other things. These capabilities make attack submarines some of the most requested assets by the global combatant commanders. The 2022 National Defense Strategy states that the Department of Defense will prioritize a future force that is lethal, sustainable, resilient, survivable, and agile to strengthen and sustain deterrence and prevail in conflict, if necessary. Between fiscal years 2014 and 2020, however, attack submarines incurred 9,568 days of idle time and maintenance delays resulting in the Navy spending more than \$1.50 billion in fiscal year 2018 constant dollars to support attack submarines that provided no operational capability while waiting for maintenance. Sustainably maximizing operational availability depends on the Navy adhering to its schedules for maintenance, training, and deployment. Submarines were the last to implement the Navy’s new force generation process, the Optimized Fleet Response Plan, and their ability to meet the goals under this revised process has not been independently evaluated.

Therefore, the committee directs the Comptroller General of the United States to assess the readiness and availability of the Navy’s attack submarine fleet. This review should address the following:

- (1) to what extent have Navy attack submarines met the intended goals (such as meeting desired operational availability, timely maintenance, adequate crewing, and training to fight advanced adversaries) of the Optimized Fleet Response Plan;
- (2) what factors, if any, affect submarine readiness and how has the Navy mitigated any readiness challenges; and

(3) how does the Navy’s approach to submarine force generation compare to that of strategic competitors and what insights, if any, can be leveraged to enhance the Navy’s attack submarine fleet.

The committee directs the Comptroller General to provide a briefing to the House Committee on Armed Services not later than April 1, 2025, on the Comptroller General’s preliminary findings and present final results in a format and timeframe agreed to at the time of the briefing. (Page 116)

FY2025 DOD Appropriations Act (H.R. 8774)

House

The House Appropriations Committee, in its report (H.Rept. 118-557 of June 17, 23024) on H.R. 8774, recommended the funding levels shown in the HAC column of **Table 4**.

Section 8010 of H.R. 8774 would provide authority for using multiyear procurement (MYP) for procuring Virginia-class submarines.

H.Rept. 118-557 states:

SUBMARINE CONSTRUCTION

The Committee is dismayed by delays in construction of the lead Columbia-class submarine. The program is the Navy’s top priority and fundamental to the nuclear triad. The Committee recognizes the strategic importance of the Columbia-class program and has fully funded every shipbuilding construction request to ensure on time delivery of the lead boat and overall success of the program. The Committee is troubled that the Navy lacked the appropriate oversight of a program of such significance that it only learned of the year delay to the program in recent months.

Further, the Committee notes the delays in the Columbia-class program will undoubtedly impact Virginia-class submarine construction. Virginia-class construction remains challenged with production hovering at a 1.2 submarine per year cadence versus the necessary cadence of two per year. The Committee believes that given the findings of the 45-day Shipbuilding Review showing a delay of upwards of 3 years in Virginia-class submarine construction, that the Committee recommendation of one Virginia-class submarine, coupled with robust investment in the submarine industrial base, appropriately reflects the current capacity for submarine construction and deliberately targets funding to the industrial base to achieve long-term sustainable production.

The Committee believes that providing significant and strategic investment in the Submarine Industrial Base (SIB) is necessary to achieving the “1+2” production rate for the Columbia and Virginia-class programs. Therefore, the Committee recommendation includes \$4,004,400,000 for the SIB, including \$2,134,000,000 in the Shipbuilding and Conversion account. This funding is in addition to the \$3,013,400,000 included in the Indo-Pacific Security Supplemental Appropriations Act, 2024 and the \$1,188,000,000 provided in the Department of Defense Appropriations Act, 2024. The Committee believes investment in supplier capacity and capability, strategic domestic outsourcing, workforce development, and technology and infrastructure is key to achieving and sustaining the required submarine production cadence in the long-term and maintaining international commitments under the trilateral Australia, United Kingdom, United States (AUKUS) security partnership. (Pages 131-132)

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.⁸⁵ 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 2012.⁸⁶

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.⁸⁷ 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."⁸⁸ 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."⁸⁹

⁸⁵ 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.

⁸⁶ 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.

⁸⁷ Secretary of Defense Les Aspin, U.S. Department of Defense, *Report on the Bottom-Up Review*, October 1993, pp. 55-57.

⁸⁸ Secretary of Defense William S. Cohen, U.S. Department of Defense, *Report of the Quadrennial Defense Review*, May 1997, pp. 29, 30, 47.

⁸⁹ 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."⁹⁰

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.⁹¹

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.⁹²

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.⁹³

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. As noted earlier in this report, the Navy's preferred new ship force-level goal, which was submitted to Congress in June 2023, calls for achieving and maintaining a fleet of 381 manned ships, including 66 SSNs.

⁹⁰ U.S. Department of Defense, *Quadrennial Defense Review*, September 2001, p. 23.

⁹¹ 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.

⁹² 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.

⁹³ 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. Submarine Construction Industrial Base Capacity and Enhancement Efforts

This appendix presents information on the capacity of the submarine construction industrial base and Navy and industry efforts to enhance that capacity.

Overview

A major concern relating to the Columbia- and Virginia-class submarine programs relates to the ability of the submarine construction industrial base to execute the work associated with procuring one Columbia-class SSBN plus two VPM-equipped Virginia-class SSNs per year (a procurement rate referred to in short as 1+2). (In the “1+2” nomenclature, the 2 refers to being able to produce 2.0 Virginia-class boats per year.) Policymakers and other observers have expressed concern about the industrial base’s capacity for executing a 1+2 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 Virginia Payload Module [VPM]-equipped Virginia-class boats and one Columbia-class boat).⁹⁴ In other words, the challenge for the industrial base is to quintuple the pre-2011 volume of annual production by 2028. The challenge is depicted in the Navy graph shown in **Figure B-1**.

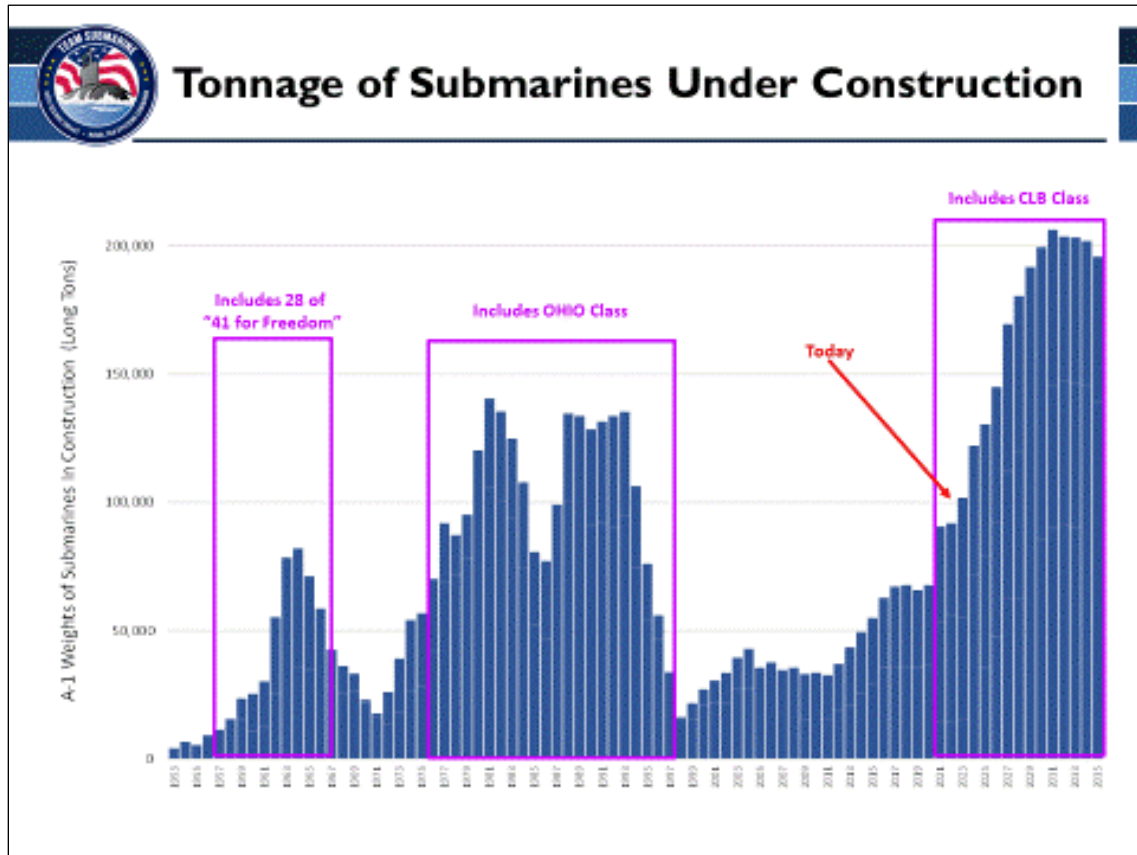
Concerns about the ability of the submarine construction industrial base to execute the workload resulting from a sustained 1+2 procurement rate were heightened starting in 2019 by reports about challenges faced by the two submarine-construction shipyards and associated supplier firms in meeting scheduled 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.⁹⁵

⁹⁴ Starting in FY2019, the Navy began to procure a lengthened version of the Virginia-class design that incorporates the Virginia Payload Module (VPM), 84-foot-long, mid-body section equipped with four large-diameter, vertical launch tubes for storing and launching additional Tomahawk missiles or other payloads. If building a “regular” 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 ($1.25 + 1.25 + 2.5 = 5.0$).

⁹⁵ 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.

Figure B-1. Navy Graph Showing Projected Growth in Submarine Tonnage Under Construction

Red arrow indicates date of November 2023



Source: Navy graph provided to CRS and CBO by Navy Office of Legislative Affairs, November 16, 2023.

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.⁹⁶ 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 per year.⁹⁷ At an April 28, 2023, briefing on the Virginia-class program for CRS and CBO, Navy officials stated that the rate as of that date was about 1.3 boats per year.⁹⁸ 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.⁹⁹ 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

⁹⁶ 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.

⁹⁷ 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.

⁹⁸ Navy briefing on Virginia-class program for CRS and CBO, April 28, 2023.

⁹⁹ Sam LaGrone, “Navy Estimates 5 More Years for Virginia Attack Sub Production to Hit 2 Boats a Year,” *USNI News*, March 31, 2023.

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