Congressional Budget Office
Nonpartisan Analysis for the U.S. Congress

The Cost of the Coast Guard's Polar Security Cutter

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On April 23, 2019, the Coast Guard awarded a contract to VT Halter Marine to build the first of a class of new heavy polar icebreakers, called the Polar Security Cutter (PSC). The service plans to name the first ship the *Polar Sentinel*. On December 29, 2021, the Coast Guard exercised an option under that contract to have Halter Marine build the second ship of the class. Halter Marine was subsequently purchased by Bollinger Shipyards in November 2022 and renamed Bollinger Mississippi Shipbuilding.

Construction of the lead ship in the PSC program has been plagued by delays and cost overruns. In February 2024, the Coast Guard notified the Congress that the ship would experience cost growth in excess of 20 percent and a schedule delay in excess of one year. Despite a contract awarded five years ago, full construction of the lead ship has not begun, although the service is aiming to start by the end of calendar year 2024.

The Congressional Budget Office was asked by the House Homeland Security Committee to provide independent estimates of the costs of the PSC program—not only for the three-ship program of record (that is, the officially approved program) but also for larger programs including as many as nine ships. This report describes those estimates.

- Using its own weight-based cost model, CBO estimates that the first PSC would cost $1.9 billion in 2024 dollars. Subsequent ships would average about $1.6 billion each. Given those estimates, the three-ship PSC program would cost $5.1 billion—about 60 percent more than the Coast Guard's current estimate.[1]
- The Coast Guard's current official estimate of the cost of acquiring three PSCs is $3.2 billion, but the service is in the process of developing a new estimate, which it expects to release later in 2024.
- CBO estimates that operating and supporting a force of three PSCs would cost $12.4 billion between 2029 and 2063, when those ships would be in service. If the Coast Guard acquires more than three ships, operating costs would be higher and would continue for a longer period.

The Polar Security Cutter Program

The Homeland Security Act of 2002 created the Department of Homeland Security and transferred the Coast Guard from the Department of Transportation to the new department. The law listed 11 specific missions that the service must be prepared to perform.[2] The Coast Guard's polar icebreakers support 9 of those 11 missions in the world's polar regions: marine safety; search and rescue; aids to navigation; fisheries law enforcement; marine environmental protection; ice operations; policing ports and waterways and conducting coastal security;

1. CBO testified on these analytical results on May 7, 2024. See testimony of Eric J. Labs, Senior Analyst for Naval Forces and Weapons, before the Subcommittee on Transportation and Maritime Security, Committee on Homeland Security, U.S. House of Representatives, *The Cost of the Coast Guard's Polar Security Cutter* (April 30, 2024), www.cbo.gov/publication/60168.

2. Sec. 888 of the Homeland Security Act of 2002, Public Law 107-296, 116 Stat. 2135, 2249, https://tinyurl.com/ydux5bw6.

Notes: Unless this report indicates otherwise, all years referred to are federal fiscal years, which run from October 1 to September 30 and are designated by the calendar year in which they end, and all costs are expressed in 2024 dollars. All tonnage numbers are expressed as long tons—or 2,240 pounds—which are also known as imperial tons or displacement tons. Numbers in the text may not add up to totals because of rounding.

defense readiness; and other law enforcement.[3] The icebreakers do not support the missions of drug interdiction or migrant interdiction.[4] The Coast Guard is developing programs to replace its existing polar icebreakers over the next two decades as well as to increase their number.

The Coast Guard's Existing Polar Icebreakers

The Coast Guard currently operates two polar icebreakers: the *Polar Star*, a heavy icebreaker, and the *Healy*, a medium icebreaker. A heavy icebreaker is defined not by its weight or by the amount of water it displaces but by the amount of ice it can break while underway. The Coast Guard's heavy icebreakers can break through 6 feet of ice continuously at a speed of 3 knots and can break through 20 or more feet of ice by backing up and ramming. Medium icebreakers can break through 4.5 feet of ice at 3 knots and 8 feet or more by backing up and ramming.

Polar icebreakers generally cut a path through ice-covered water by pushing the bow up onto the ice, where the weight of the ship breaks the ice into pieces. In modern icebreakers, the shape of the hull typically folds the broken ice under the adjacent solid ice as the ship passes, leaving a clean channel in its wake. Three characteristics of icebreakers allow them to perform that task: powerful engines, a strongly reinforced hull, and a sloping bow. Together, those features make icebreakers relatively short, wide, and very heavy.

The *Polar Star* was built in the 1970s and displaces 13,200 tons of water when fully loaded (that is, when carrying crew, stores, cargo, ammunition, fuel, and other liquids). Commissioned in 1976, the *Polar Star* is 48 years old—18 years beyond its designed service life. The *Healy*, which entered service in 2000, displaces 16,000 tons when fully loaded. Although the *Healy* is longer and heavier than the *Polar Star*, it is a medium icebreaker because its engines are less powerful, with half the shaft horsepower of the heavy icebreaker and, thus, less icebreaking capability. (Shaft horsepower is the amount of power delivered by a ship's engines to its propeller or turbine shaft.) Although its designed service life ends in 2030, the *Healy* was forced to return to port in August 2024 because of an electrical fire, and the Coast Guard is uncertain when or if the ship will be able to resume normal operations. As a result, the service may have no icebreaker presence in the Arctic this summer.[5]

Plans for Replacing the Existing Polar Icebreakers

In 2013, the Coast Guard proposed a plan to replace its two operational ships with six new polar icebreakers: three heavy icebreakers and three medium icebreakers. The Coast Guard's most recent analysis of its goals for the mix of ships in its fleet (announced in April 2023) calls for increasing the number of new polar icebreakers to a total of eight or nine: four or five heavy icebreakers and four or five medium icebreakers.[6]

The Coast Guard believes that the year-round presence of one icebreaker in the East Arctic and another in the West Arctic, as well as the half-time presence of an icebreaker in the Antarctic, is necessary. The increase in the number of polar icebreakers desired by the Coast Guard in the Arctic is driven by increased commercial activity and economic and geopolitical competition in that region. The service's desire for an icebreaker in the Antarctic stems primarily from the continuing need to resupply McMurdo Station, a U.S. research facility on the continent that is operated by the National Science Foundation.[7] The Coast Guard has stated that maintaining a presence of 2.5 heavy and medium icebreakers in the polar regions will require a total of eight to nine ships when accounting for maintenance and rotating ship patrols.

3. The terms *heavy icebreaker* and *medium icebreaker* in this report refer to *polar* icebreakers. The Coast Guard operates a heavy icebreaker, called the *Mackinaw*, on the Great Lakes, but that ship is much smaller and has much less icebreaking capability than the service's polar icebreakers. For more information on the Coast Guard's current and future icebreaker programs, see Ronald O'Rourke, *Coast Guard Polar Security Cutter (Polar Icebreaker) Program: Background and Issues for Congress*, Report for Congress RL34391, version 264 (Congressional Research Service, updated July 15, 2024), https://tinyurl.com/yj9d5fw7.

4. Ibid., p. 2.

5. Ben Townsend, "Coast Guard's Healy Icebreaker Returns to Seattle Following Fire in Engineering Space," *KNOM Radio Mission* (August 9, 2024), https://tinyurl.com/4p4buc72; Heather Ervin, "Video: Vice Commandant Lunday Says Three USCG Cutters Laid Up by Personnel Shortages," *Marine Log* (August 8, 2024), https://tinyurl.com/e95fzyvw.

6. Department of Homeland Security, United States Coast Guard, *Coast Guard Fleet Mix Analysis: Fiscal Year 2022 Report to Congress* (April 11, 2023).

7. Ronald O'Rourke, *Coast Guard Polar Security Cutter (Polar Icebreaker) Program: Background and Issues for Congress*, Report for Congress RL34391, version 264 (Congressional Research Service, updated July 15, 2024), p. 2, https://tinyurl.com/yj9d5fw7. See also Mike Schuler, "USCGC Polar Star Completes Annual Mission to Antarctica," *gCaptain* (February 26, 2024), https://tinyurl.com/kt5txr5b.

The Polar Security Cutter is the Coast Guard's proposed new heavy icebreaker. It will break ice in the manner described above but with improved capabilities relative to the *Polar Star*. Specifically, the PSC will also be able to break ice when moving astern (that is, in reverse). The ship's propulsion system uses azimuth propulsors, which are propellers mounted on a steerable pod powered by electricity from the ship's generators. By rotating the propulsors, the PSC will be able to direct thrust astern or to the side and break ice with the stern of the ship. Icebreakers with traditional propulsion systems and rudders, such as the *Polar Star* and the *Healy*, cannot break ice when moving in reverse.

The new medium icebreaker that the service plans to build at some point in the future has been designated the Arctic Security Cutter. The medium icebreaker will have a shallower draft (the vertical distance from the waterline to the lowest point on the bottom of the ship) than the PSC and will therefore be able to conduct patrols and visit ports in shallower areas that are inaccessible to the deeper-drafted heavy icebreaker.

The Coast Guard is also buying a commercial icebreaker, the *Aiviq*, which was built as a support ship for Arctic oil exploration. The service plans to convert it into another medium icebreaker, but that process will take at least two years.[8]

The Design of the New Heavy Polar Icebreaker

On February 17, 2017, the Coast Guard awarded contracts to five shipyards to develop and analyze designs for a heavy polar icebreaker that can carry out missions set by the service and to reduce the ship's acquisition costs and production time. Those firms were Bollinger Shipyards of Lockport, Louisiana; Fincantieri Marine Group of Washington, D.C.; General Dynamics's National Steel and Shipbuilding Company of San Diego, California; Huntington Ingalls Industries of Pascagoula, Mississippi; and VT Halter Marine, also of Pascagoula, Mississippi, which was owned by Singapore Technologies Engineering.

After those studies were completed, the Coast Guard solicited bids for the new icebreaker. Bids were submitted by Bollinger; Philly Shipyard of Philadelphia, Pennsylvania, partnered with Fincantieri Marinette Marine of Marinette, Wisconsin; and Halter Marine, partnered with TAI Associates of New Orleans, Louisiana. On April 23, 2019, the Coast Guard awarded a fixed-price contract with incentives to Halter Marine, now Bollinger Mississippi Shipbuilding, to build the first Polar Security Cutter, with options to build a second and third ship. On December 29, 2021, the Coast Guard exercised the option to have Halter Marine build the second PSC but limited it for now to procurement of long-lead-time materials. The Coast Guard is working with the Navy to manage the program and acquire the ships.

In the five years since the contract was awarded, the development and design of the PSC has progressed, but little work on building the first ship has been completed. In that time, the Coast Guard's estimate of the ship's lightship displacement—a key indicator of costs—grew by 40 percent, while its cost estimate for a three-ship program increased by just 16 percent. (Lightship displacement measures the weight of the water a ship displaces without its crew, stores, cargo, ammunition, fuel, and other liquids.) In February 2024, the Coast Guard notified the Congress that the PSC lead ship would experience cost growth of more than 20 percent and its production would be delayed by more than a year. The service is hoping that the shipyard will begin substantial construction on the lead ship by the end of this year, with an estimated delivery date in 2029. The Coast Guard also expects to release a revised estimate of the cost of the three-ship PSC program by the end of this year.

As both the Congressional Research Service and the Government Accountability Office have reported, work on the design of the PSC has been much slower than expected.[9] Halter Marine and the ship design firm that it contracted with, TAI Associates, based their design for the PSC on the replacement for a German icebreaker used for marine research. The replacement, currently called the new *Polarstern*, is expected to enter service in 2027.[10] To

8. Heather Mongilio, "Coast Guard Names Juneau as Home Port for New Icebreaker," *USNI News* (August 15, 2014), https://tinyurl.com/muym5h5y.

9. Ronald O'Rourke, *Coast Guard Polar Security Cutter (Polar Icebreaker) Program: Background and Issues for Congress*, Report for Congress RL34391, version 264 (Congressional Research Service, updated July 15, 2024), https://tinyurl.com/yj9d5fw7; Government Accountability Office, *Navy Shipbuilding: Increased Use of Leading Design Practices Could Improve Timeliness of Deliveries*, GAO-24-105503 (May 2, 2024), www.gao.gov/products/gao-24-105503; and Government Accountability Office, *Coast Guard Acquisitions: Polar Security Cutter Needs to Stabilize Design Before Starting Construction and Improve Schedule Oversight*, GAO-23-105949 (July 27, 2023), www.gao.gov/products/gao-23-105949.

10. Alfred-Wegener-Institut, "New Polarstern" (updated March 21, 2024), https://tinyurl.com/bdh6uvwv.

Table 1.

Characteristics of Selected Classes of Coast Guard and Navy Ships

	Polar Security Cutter	*Polar Star* WAGB-10	*Healy* WAGB-420	San Antonio LPD-17 Flight II
Type	Heavy icebreaker	Heavy icebreaker	Medium icebreaker	Amphibious transport dock
Year authorized	2019[a]	1971[a]	1990	2018
Year commissioned	2029[b]	1976	2000	2026[b]
Displacement (long tons)				
Full-load	22,900	13,200	16,000	24,900
Lightship	18,100	10,900	11,500	17,500
Dimensions (feet)				
Length	460	399	420	684
Beam	88	84	82	105
Draft	35	28	29	23
Crew	136	142	137	396
Maximum sustained speed (knots)	15	18	17	22
Installed power (bhp)	59,400	78,000	46,000	41,600
Maximum shaft horsepower (shp)	45,200	60,000	30,000	40,500
Designed service life (years)	30	30	30	40

Data source: Congressional Budget Office, using data from the Coast Guard and the Department of the Navy. See www.cbo.gov/publication/60170#data.

bhp = brake horsepower.

a. CBO interprets the year when the bulk of the money for any polar icebreaker was appropriated as the year of its authorization.

b. Projected.

meet the needs of the U.S. Coast Guard, the ship's design required substantial modifications. As of July 2024, the design of the PSC was only 59 percent complete.

CBO's Estimates of the Costs to Procure and Operate the Polar Security Cutter

CBO independently estimated the costs of the Polar Security Cutter program—both the costs to procure the ships and the costs to operate and support those ships over the course of their expected service life. The agency examined other ships that the Navy and the Coast Guard have built to develop a weight-based estimate of the costs of the PSC. CBO relied on data on the operating costs of other Coast Guard ships to develop estimates of the operation and support costs for the PSCs over their notional 30-year service life.[11]

Procurement Costs

CBO compared the Polar Security Cutter with the Coast Guard's heavy icebreaker, the *Polar Star*; its medium icebreaker, the *Healy*; and some of the Navy's amphibious ships that are similar in size to the PSC—namely, the San Antonio LPD-17 class amphibious transport docks (see Table 1). None of those analogues are ideal for the analysis. As a heavy icebreaker, the *Polar Star* would seem to be the best fit, but it is also the oldest of the ships, having been completed in 1976. The Coast Guard was unable to provide any cost history of the ship as a result. The *Healy* was completed in 2000, but it is a medium icebreaker and, therefore, is not built for quite the same set of missions that the PSC will perform. The LPD-17s, which are still being produced, are almost the same size as the PSC. The Navy and the Coast Guard are including various cost-estimating relationships from that class as part of their update to the PSC cost estimate.[12] However, the internal design of the PSC will be considerably different from that of the LPD-17s.

11. CBO analyzed operation and support costs over the notional service life of the ships—but in practice, the Coast Guard often operates ships well beyond their initially planned service life. The Coast Guard's existing heavy icebreaker, the *Polar Star*, was designed to be used for 30 years; with upgrades and overhauls over the course of its life, it is currently 48 years old. Operation and support costs would be higher than CBO's estimate if the ships operated for longer.

12. A cost-estimating relationship is a mathematical formula that describes the per-unit cost of a ship's components, materials, or performance characteristics.

Box 1.

Conditions in the Naval Ship Construction Industry

Naval ship construction in the United States today is operating in a challenging environment. Nearly all of the major shipyards are having difficulty hiring workers and retaining those workers once they are hired. A generation of longtime senior shipyard workers have retired or will soon be retiring. As a result, the workforces in many of those yards are, overall, less experienced than they were in the past. In addition, the Navy, the Coast Guard, and the shipyards that build their ships are facing higher prices for many materials. In the case of the Navy, those higher prices have resulted in substantially higher costs for some ships, such as the DDG-51 guided missile destroyer.

Moreover, the number of shipyards that produce Navy and Coast Guard ships has declined substantially since 1976, when the last heavy icebreaker was built. The shipyards that built the *Polar Star* and the *Healy* have closed, and no existing shipyard in the United States has built a heavy polar icebreaker since before 1970. There are also fewer suppliers of parts and components for naval ships today, to the extent that for some ships, such as the Navy's submarines, approximately 70 percent of the suppliers of critical components have no competitors. Those factors can make costs higher than they were during periods when there were more shipbuilders and more ships being built—and, thus, more competition among suppliers.

Overall, CBO found that the best analogue for the Polar Security Cutter was the *Healy*, with some adjustments to account for the design of the PSC as a double-hulled heavy icebreaker (and not a single-hulled medium icebreaker) and for the challenging conditions in today's naval ship construction industry (see Box 1). Using the *Healy* as the primary analogue for the PSC, CBO estimates the cost to procure the lead ship to be $1.9 billion, or 37 percent more than the Coast Guard's current estimate. On the basis of information from the Coast Guard, CBO assumed that subsequent ships would be built every two years. As a result, the average cost of two follow-on ships would be $1.6 billion, in CBO's estimation—75 percent more than the Coast Guard's estimate for those two ships. Thus, CBO's estimate of the cost of the three-ship PSC program of record is $5.1 billion, about 60 percent more the Coast Guard's current estimate.

A significant source of uncertainty about the cost of the PSC program is how many PSCs the Coast Guard will buy. Although the current program of record calls for three ships, senior Coast Guard officials have stated that in the future, they may need four or five heavy icebreakers. CBO was also asked by the Congress to assess the costs of a program of six or nine PSCs. In CBO's estimation, the average cost of each additional ship would be about $1.6 billion (see Table 2). The efficiencies gained by building one PSC every two years would cause the costs of the ships to fall as the shipyard produced additional ships—but those savings would be offset by real (inflation-adjusted) growth in costs in the naval shipbuilding industry.[13] (CBO's method for estimating the costs of the program is discussed in a subsequent section of this report.) The Coast Guard has not produced an estimate for a program with more than three ships.

Another source of uncertainty about the cost of the PSC program is the possibility that the Coast Guard may want to bring a second shipyard into the program. If Bollinger is unable to build the ships, or if the service wants more PSCs faster than the shipyard can build them, then the costs of the program will probably be higher because the new yard will be building its own lead ship, which is a notoriously difficult task, and because each yard will experience less learning from building fewer ships.

Operation and Support Costs

CBO estimates that the average annual operation and support cost for a single Polar Security Cutter would be about $100 million in 2024 dollars if the PSC comes into service in 2029, as currently planned. (That estimate is based on data that the Coast Guard provided about the actual operating costs of several different types of ships in its fleet.) However, like shipbuilding costs, that cost would grow in real terms over time if the costs of operating military equipment and paying military personnel continue to rise faster than economywide inflation. (Although Coast Guardsmen are not part of

13. For an explanation of how CBO models the cost of new ships, as well as a detailed example of that process applied to a particular ship, see Congressional Budget Office, *How CBO Estimates the Cost of New Ships* (April 2018), www.cbo.gov/publication/53785.

Table 2.

CBO's Estimates of the Costs of the Coast Guard's Polar Security Cutter Program

	Acquisition		Operation and support	
	Cost (billions of 2024 dollars)	Duration[a]	Cost (billions of 2024 dollars)	Duration[b]
Lead ship	1.9	2017–2029	4.0	2029–2059
Three-ship program of record	5.1	2017–2033	12.4	2029–2063
Four-ship program	6.8	2017–2035	16.7	2029–2065
Five-ship program	8.4	2017–2037	21.2	2029–2067
Six-ship program	10.0	2017–2039	25.7	2029–2069
Nine-ship program	15.0	2017–2045	39.9	2029–2075

Data source: Congressional Budget Office. See www.cbo.gov/publication/60170#data.

a. Based on projected timelines for construction. CBO's projections reflect the assumption that once construction begins, each ship would take at least five years to complete.

b. Based on ships' designed 30-year service lives. If the ships remained in the Coast Guard's service for longer, their operation and support costs would be higher and would continue for a longer period.

the Department of Defense in peacetime, they have the same pay and benefits as comparable Department of Defense personnel.) As a result, the cost to operate the lead PSC over its 30-year service life would be $4.0 billion, in CBO's estimation. The cost to operate three ships over the course of their 30-year service life would be $12.4 billion.

If the Coast Guard operated a larger fleet of heavy icebreakers, it would face higher costs. To illustrate that, CBO produced estimates of operation and support costs for programs that range between one and nine ships (see Table 2). The costs of operating the new icebreakers would be partly offset when the *Polar Star* retires. In CBO's estimation, the Coast Guard's total cost of operating polar icebreakers will fall by about $70 million per year when that ship is no longer in service.

CBO's estimates of the PSC's operation and support costs, which were developed using the actual costs of other Coast Guard ships, appear to be much higher than the Coast Guard's published estimate for the PSC. In 2022, the Coast Guard estimated the average annual operation and support cost of a single PSC at $56 million in 2018 dollars. The notional service life of the PSC is 30 years; thus, the total operation and support costs for a program of three ships would be $5.1 billion in 2018 dollars. CBO converted those figures into 2024 dollars, which results in an annual cost of about $70 million for a single icebreaker and total life-cycle operation and support costs of $6.2 billion for the three-ship program.

The Coast Guard's estimates appear to reflect only the direct costs of operating the ships, not any indirect or overhead costs associated with supporting the ships over a long period of time.[14] CBO does not have a way to estimate the indirect or overhead costs of the Coast Guard's cutters, including its icebreakers. It is possible, however, that CBO's estimates, which are based on the costs of comparable Coast Guard cutters and adjusted to reflect differences in displacement and crew size, capture a greater share of operation and support costs (including the modernization of many systems) than the service's life-cycle cost estimates for the PSC. Operation and support costs typically account for most of the total life-cycle cost of a weapon system.

14. In comparison, in estimating the total operation and support cost of Navy ships, CBO uses a detailed model based on data from the Department of Defense's (DoD's) Future Years Defense Program to estimate costs in three categories: direct costs, indirect costs, and overhead costs. Direct costs include crew salaries, fuel, supplies, and repairs and maintenance that crews perform. Indirect costs include expenditures for support units and organizations that allow combat units to fight effectively. Overhead costs are other expenditures that support combat units, such as training, major maintenance, and medical care. For the Coast Guard, CBO has data on direct costs only. For more information on CBO's approach to modeling DoD's operation and support costs, see Congressional Budget Office, *The U.S. Military's Force Structure: A Primer, 2021 Update* (May 2021), www.cbo.gov/publication/57088.

How CBO Estimated the Program's Acquisition Costs

CBO estimated the costs of purchasing Polar Security Cutters in the same way it estimates the costs of purchasing new naval ships.[15] Specifically, CBO identified ships acquired in the past that were similar to the PSC and calculated the cost-to-weight ratio of the most analogous ship; the agency then used that ratio to estimate the cost of the PSC. The challenge in estimating the cost of the PSC is that no U.S. shipbuilder has built a heavy icebreaker in 50 years. The *Healy*, a medium icebreaker, was built in the 1990s, when the naval shipbuilding industry was larger and producing a greater variety of ships than it is today. Nevertheless, CBO found that the best analogue for the PSC was the *Healy*.

In estimating the cost of the PSC, CBO first estimated the cost per thousand tons of lightship (rather than full-load) displacement, using data on the ship provided by the Coast Guard. For PSCs produced after the lead ship, CBO adjusted its estimates to reflect the effect of learning (that is, the efficiencies that shipyards gain as they produce additional ships of a given type).[16] CBO also made an adjustment to account for the more robust construction of the PSC compared with the *Healy*. Finally, CBO adjusted its estimates to reflect its expectation that the costs of labor and materials would continue to grow at a rate that is 1 percentage point faster in the naval shipbuilding industry than in the economy as a whole, as they generally have for several decades.[17]

The cost of building the PSC could be higher or lower than CBO estimates. As noted above, the design of the ship is only 59 percent complete. Changes in the design could lead to a differently sized ship and correspondingly higher or lower costs. In addition, lead ship programs in the Navy often experience substantial cost growth well after construction begins (see Figure 1). If that pattern were to persist with the PSC, its costs could grow further once Bollinger begins the full construction of the ship.

The Coast Guard's Estimates of the Program's Cost

The Coast Guard's current estimate of the cost of a three-ship Polar Security Cutter program is about $3.2 billion. That estimate is based on the service's most recent life-cycle cost estimate. The Coast Guard has produced three life-cycle cost estimates for the PSC program: the first in November 2017, the second in January 2020, and the third in February 2022.

The first life-cycle cost estimate was based on an indicative design that the Coast Guard developed for the PSC. An indicative design is a notional design in which the design agent (in this case, the Coast Guard with support from the Navy) lays out a set of general parameters for the ship's design based on the missions the ship will perform. For example, the agent indicates the ship's size, speed, displacement, and general capabilities, and from those specifications, an estimate of what that ship might cost can be developed.

As noted above, when the Coast Guard awarded the contract for the first PSC to VT Halter Marine, the shipbuilder based its bid on the design of the new *Polarstern*. Basing the ship on the German vessel and accounting for changes required by the Coast Guard resulted in Halter Marine proposing a ship with a lightship displacement of 18,000 tons—nearly 40 percent more than the 13,000 tons specified in the Coast Guard's indicative design. That larger size was incorporated into the 2020 and 2022 life-cycle cost estimates, which were produced after the fixed-price contract for the lead ship was awarded.

Despite an almost 40 percent increase in the ship's displacement, the Coast Guard's cost estimate for the revised design grew by only about 16 percent. Because Halter Marine proposed that larger design and the contract had already been awarded, the Coast Guard did not substantially change its cost estimate for the ship. The increase of 16 percent reflected changes the Coast Guard wanted that were not part of the awarded contract. However, Bollinger has told CBO that the contract agreed to by Halter Marine grossly underestimated the cost and timeline to build the lead ship, especially in the

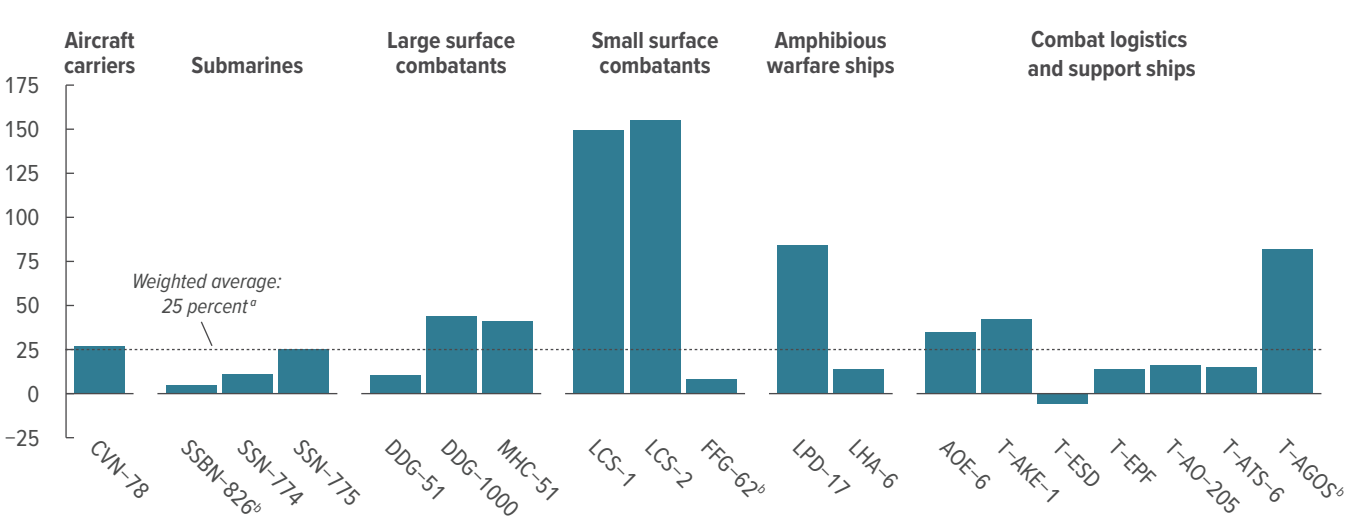
15. For an explanation of how CBO combines the different factors in its cost model, as well as a detailed example of that process applied to a particular ship, see Congressional Budget Office, *How CBO Estimates the Cost of New Ships* (April 2018), www.cbo.gov/publication/53785.

16. CBO also adjusts its estimates of the cost of new naval ships to reflect the effect of the rate of production when more than one ship is ordered per year. That adjustment accounts for a reduction in the average overhead cost for each ship when shipyards build multiple ships of the same type simultaneously. Since only one PSC will be ordered every two years, the rate effect does not apply.

17. Congressional Budget Office, *The Shipbuilding Composite Index and Its Rates of Change Compared With Economywide Inflation Rates* (April 2024), www.cbo.gov/publication/59026.

Figure 1.

Cost Growth in the Navy's Lead Ships, 1985 to 2024



Data source: Congressional Budget Office, using data from the Department of the Navy. See www.cbo.gov/publication/60170#data.

The lead ship is the first ship of its class. For most ships, CBO calculated cost growth using the first and last mentions of a ship in the books that accompany each year's budget: *Justification of Estimates, Shipbuilding and Conversion, Navy.* For AOE-6, DDG-51, MHC-51, and T-EPF, CBO relied on information papers provided by the Navy for the final estimates and on the *Budget Appendixes* for the years those ships were authorized.

AOE = fast combat support ship; CVN = nuclear-powered aircraft carrier; DDG = guided missile destroyer; FFG = guided missile frigate; LCS = littoral combat ship; LHA = amphibious assault ship; LPD = amphibious transport dock; MHC = coastal mine hunter; SSBN = ballistic missile submarine; SSN = attack submarine; T-AGOS = ocean surveillance ship; T-AKE = dry cargo ship; T-AO = oiler; T-ATS = towing, salvage, and rescue ship; T-EPF = expeditionary fast transport; T-ESD = expeditionary transfer dock.

a. CBO calculated the weighted average cost growth by adding the initial costs for all ships in the dataset and comparing the result with the sum of all final costs for the ships in the dataset. For ships still in an early phase of construction, their weight in the average was adjusted by the percentage of the ship that was complete. The unweighted average cost growth is 40 percent.

b. These ships are still in an early phase of construction, and further cost growth is likely.

current conditions of the naval shipbuilding industry. As a result, the Coast Guard and Bollinger, with support from the Navy, are developing a new estimate of the cost of the PSC program. The service expects to release that estimate later in 2024.

Through 2023, the Congress appropriated about $1.9 billion for the first and second PSCs, but it rescinded $150 million of that total in the 2024 Department of Homeland Security appropriation act. Thus, through 2024, the Coast Guard has received about $1.7 billion for the procurement of its new heavy icebreaker. At this point, it is unclear what additional appropriations will be needed to complete the program. The Coast Guard and Bollinger are working through the revised design to produce more accurate cost estimates for all three ships of the class. Although Bollinger inherited the fixed-price contract from Halter Marine, the Coast Guard recognizes that the contract will need to be revised to reflect the higher costs of the program. In a May 7, 2024, hearing before the House Committee on Homeland Security's Subcommittee on Transportation and Maritime Security, the Coast Guard promised to update the Congress on that issue by December 2024.

The Congressional Budget Office prepared this report at the request of the Chairmen of the House Committee on Homeland Security and the Subcommittee on Transportation and Maritime Security. In keeping with CBO's mandate to provide objective, impartial analysis, the report makes no recommendations.

Eric J. Labs prepared the report with guidance from David Mosher. Aaron Krupkin, David Newman, Aldo Prosperi, and Joyce Shin provided useful comments. Ronald O'Rourke of the Congressional Research Service commented on an earlier draft. The assistance of an external reviewer implies no responsibility for the final product; that responsibility rests solely with CBO.

Mark Doms and Jeffrey Kling reviewed the report. Christine Browne edited it, and Jorge Salazar created the graphics and prepared the text for publication. The report is available at www.cbo.gov/publication/60170.

CBO seeks feedback to make its work as useful as possible. Please send comments to communications@cbo.gov.

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