

# Coast Guard Acquisitions: Further Cost and Affordability Analysis of Polar Fleet Needed

GAO-25-106822 (Accessible Version)

Q&amp;A Report to the Committee on Transportation and Infrastructure, House of Representatives

December 19, 2024

## Why This Matters

The U.S. views the Arctic region as growing in strategic importance and needing increased U.S. presence. Russia and China are making military and economic investments demonstrating their interest in the area. The 2022 National Strategy for the Arctic Region notes that climate change is amplifying the region's economic importance because the variability in the amount of ice coverage is making it more accessible than ever before. Seasonal ice coverage requires the U.S. to have polar icebreakers to operate in the Arctic to help ensure safe maritime navigation and emergency response.

The U.S. Coast Guard—a maritime military service and component of the Department of Homeland Security (DHS)—has identified that it has insufficient capacity to assure U.S. presence and reliable access to the Arctic. To address this operational shortfall, it plans to potentially quadruple its number of polar icebreakers over the next 20 years, going from two to eight or nine.

You asked us to examine the status of the Coast Guard's efforts to address its short- and long-term gaps in polar icebreakers. This report discusses, among other questions: the Coast Guard's role and how its current polar icebreakers enable it to operate in the Arctic and Antarctic; how the Coast Guard analyzed its polar icebreaking needs; and the extent to which it has considered options to expand the future fleet. We also identify open questions about the polar fleet expansion that the Coast Guard has yet to address, including questions about costs and affordability. We have previously made recommendations that DHS ensure the design of the Polar Security Cutter program—its current icebreaker acquisition program—is sufficiently mature before the Coast Guard starts construction and to improve schedule oversight.

## Key Takeaways

- The Coast Guard is considering multiple efforts to expand its polar icebreaker fleet from the current two to either eight or nine. However, it has yet to determine the mix of medium and heavy polar icebreakers, known as Arctic Security Cutters and Polar Security Cutters, respectively, or the associated costs that are a part of its long-term strategy.
- To address near-term gaps, the Coast Guard plans to extend the service life of its two operational polar icebreakers. It also plans to purchase and convert a commercially available polar icebreaker (CAPI), something it has never done before. But it lacks information on the full cost to do so.
- We recommend that the Coast Guard develop a detailed cost estimate for the CAPI and that it develop an analysis of the cost and sequencing for the planned polar icebreaker fleet expansion within the context of its larger acquisition portfolio and priorities. DHS did not concur with the first recommendation and did concur with the second.

## How will changes in Arctic ice coverage affect maritime activities in the future?

Less Arctic Ocean ice coverage due to climate change is expected to expand the navigable maritime season and increase vessel traffic, which also increases the risk of incidents. The Arctic Ocean is characterized by pack ice—a mass of ice floating on the open ocean—which grows or shrinks depending upon the season and can affect vessel traffic and the potential for incidents.<sup>1</sup>

**Increased vessel traffic.** Ocean warming is anticipated to result in fish migrating to the north and sea ice area decreasing over time. Fish migration can result in fishing vessels operating further north than in the past. Less sea ice could open additional sea routes on the edges of the Arctic icepack and allow vessels to operate in the Arctic in new places and during a longer navigable season. As a result of these opened sea routes, Arctic and trans-Arctic vessel traffic may increase as cargo ships seek to save time and money; using these routes offers up to 40 percent shorter transit times between Europe and Asia.

**Increased likelihood of incidents.** The Coast Guard and other U.S. federal agencies posit that more ships transiting the region increases the risk of environmental disasters, such as oil spills, or the potential need to rescue a stranded ship. Coast Guard officials said that as the Arctic warms, the environment becomes more unpredictable because ice can shift from winds or underlying ocean currents, refreeze, and release icebergs, which even polar icebreakers try to avoid. They said that ships will need to be built to operate in an ice environment to freely transit in the Arctic. But they added that some ship operators may underestimate the risks or operate insufficiently designed vessels, increasing the risk of an incident.

Coast Guard officials said that these changes are driving the need for enhanced Coast Guard missions and operational effectiveness to support additional polar icebreakers, enforce laws, and protect U.S. interests. Other government stakeholders, such as officials from the U.S. Arctic Research Commission, told us that these changes require additional assets to study the effects of ocean warming and protect natural resources.

## What are the Coast Guard's current polar icebreaking capabilities?

The Coast Guard has two operational polar icebreakers (see fig. 1). In the Arctic, the *Healy*, a medium polar icebreaker, is the only Coast Guard icebreaker primarily designated to support scientific research missions. In the Antarctic, the *Polar Star*, a heavy polar icebreaker, contributes to a multi-agency effort to support the National Science Foundation's presence at the McMurdo Station research facility. It does so by breaking ice to allow cargo ships and fuel tankers access during the Antarctic summer.

Figure 1: The Coast Guard's Polar Icebreakers, the *Healy* and *Polar Star*



U.S. Coast Guard Cutter Healy



U.S. Coast Guard Cutter Polar Star

Source: U.S. Coast Guard. | GAO-25-106822

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**Accessible Text for Figure 1: The Coast Guard's Polar Icebreakers, the *Healy* and *Polar Star***

U.S. Coast Guard Cutter *Healy*;

U.S. Coast Guard Cutter *Polar Star*;

Source: U.S. Coast Guard. | GAO-25-106822

These polar icebreakers are aging, and the Coast Guard is in the process of extending their service lives and plans to eventually replace them. The *Healy* is nearing the end of its originally planned service life of 30 years, but the *Polar Star* is more than 47 years old, well past its planned 30-year service life. Both polar icebreakers are homeported in Seattle, WA and require substantial maintenance for part of the year to keep them operational.

**What are the Coast Guard's roles and responsibilities in the Arctic?**

The Coast Guard is the sole U.S. government entity responsible for the nation's polar icebreaking missions.<sup>2</sup> Since the U.S. is one of eight Arctic states, the Coast Guard is also the principal federal agency responsible for maritime safety, security, and environmental stewardship in U.S. ports and waterways in the Arctic, among other responsibilities.<sup>3</sup>

For context, the Arctic Ocean is the smallest of the world's major oceans but has an area 1.5 times as large as the United States (see fig. 2).

**Figure 2: Map of the Arctic Region with Potential Sea Routes and Lowest Extent of Sea Ice in 2023**



- Arctic region - as defined by the Arctic Research and Policy Act<sup>a</sup>
- ..... Northern Sea Route
- ..... Northwest Passage
- Lowest extent of sea ice in 2023 (September)
- Arctic states

Source: Map Resources (map); National Geospatial-Intelligence Agency (sea routes); CIRES/University of Colorado/National Snow and Ice Data Center (sea ice extent). | GAO-25-106822

<sup>a</sup>The Arctic Research and Policy Act of 1984 defines the Arctic as all U.S. and foreign territory north of the Arctic Circle and all U.S. territory north and west of the boundary formed by the Porcupine, Yukon, and Kuskokwim Rivers (in Alaska); all contiguous seas, including the Arctic Ocean and the Beaufort, Bering, and Chukchi Seas; and the Aleutian Chain. Pub. L. No. 98-373, 98 Stat. 1242, 1248 (1984) (codified at 15 U.S.C. § 4111).

The Coast Guard operates throughout the Arctic—even within the ice pack—but conducts different missions depending on the area. Closer to the Pacific Ocean side of the Arctic by Alaska, the Coast Guard executes its statutory missions and duties, such as search and rescue, ice operations, and defense readiness, and supports national priorities and international agreements in Arctic waters within and beyond U.S. jurisdiction. Toward the Atlantic Ocean side of the Arctic, the Coast Guard engages with international partners in joint exercises and works to promote overall Arctic security.

Both areas require use of the Coast Guard’s existing Arctic-oriented polar icebreaker, the *Healy*. According to Coast Guard officials, other non-icebreaking cutters such as National Security Cutters, which are 418-foot open-ocean patrol cutters, may also operate in the Bering Sea in addition to air assets.<sup>4</sup> The Coast Guard also supports scientific research in the Arctic and Antarctic and has

scientific research support capabilities onboard its two polar icebreakers.<sup>5</sup> In the Arctic, the *Healy* supports research by the Navy, the National Oceanic and Atmospheric Administration, the National Science Foundation, and other government agencies and partners in the Arctic scientific community.

### **What other federal entities operate in the maritime Arctic besides the Coast Guard?**

Three entities other than the Coast Guard have ships that operate in the Arctic, but there is only one other polar icebreaker outside of the Coast Guard's fleet and it is research focused. In addition, we previously found that over 40 federal entities helped to inform or implement U.S. activities in the Arctic.<sup>6</sup>

**Department of Defense.** The Navy has ships that are capable of operating in the Arctic for the navigable season, but, according to Northern Command officials these ships are not icebreakers. Further, they said that Navy ships must avoid ice and are limited on where they can go for some parts of the year. They also said that neither the Department of Defense nor the Navy have any requirements to have a specific number of assets in the Arctic at any given time, but the Navy has to be able to operate in the area, if needed.

**National Oceanic and Atmospheric Administration.** The National Oceanic and Atmospheric Administration, a bureau within the Department of Commerce, does not operate icebreakers. However, all 15 research and survey ships it operates can navigate independently through light ice. Some can conduct fish surveys to help manage marine resources. In addition, the National Oceanic and Atmospheric Administration collects data throughout the Arctic region and supports safe navigation by mapping coastlines and the U.S. Exclusive Economic Zone, among other responsibilities and requirements.

**National Science Foundation.** The National Science Foundation owns the *Sikuliaq*, a 261-foot oceanographic research ship that can break ice up to 2.5 feet thick. It is the only ice-capable ship in the U.S. academic fleet. The *Sikuliaq* can access the waters north of Alaska for research activities such as conducting surveys or taking samples of the water. The icebreaker is operated by the University of Alaska Fairbanks.

A March 2024 report published by the White House Office of Science and Technology Policy reported that the U.S. spent approximately \$573 million on Arctic research in fiscal year 2023.<sup>7</sup>

### **How many polar icebreakers does the Coast Guard say it needs to complete its polar missions?**

The Coast Guard has yet to determine exactly how many Polar Security Cutters and Arctic Security Cutters it needs to acquire to complete its polar missions. The Coast Guard and DHS have completed studies and reports over the past 14 years that suggested a range of fleet sizes—expanding from the current two to six or 10 depending on the level of presence. In 2023, the Coast Guard identified eight or nine as its current need. The various fleet sizes are discussed below.

**2010:** The Coast Guard began examining how it might renew its polar icebreaker fleet when it commissioned a High Latitude Region Mission Analysis Report in 2010.<sup>8</sup> The 2010 report was a foundational document that began pre-acquisition activities for the Polar Security Cutter, the Coast Guard's existing heavy polar icebreaker acquisition program to replace the *Polar Star* and expand the polar fleet to operate at both poles. The report also discussed potentially acquiring medium polar icebreakers for the Arctic. The report concluded the Coast Guard's demand for a mix of medium and heavy polar icebreakers would be six to 10



depending on the different presence levels—partial or full-year—for the Arctic and Antarctic.

**2020:** DHS produced a report focused on safeguarding U.S. national interests in the Arctic and Antarctic regions.<sup>9</sup> It noted possible limitations for the Polar Security Cutters operating in the Arctic once they are operational. The portion of the Polar Security Cutter’s hull that extends below the water, known as the draft, would limit the icebreaker’s ability to safely navigate some ports and shallow areas in the Arctic. As a result, the report outlined notional requirements for an Arctic Security Cutter with a shallower draft and overall size that would operate in the Arctic. The report recommended the Coast Guard explore operating with a persistent presence in the two regions of the Arctic in addition to up to 6 months per year of operations in Antarctica. The report concluded that this amount of presence would require a mix of six Polar Security Cutters and three Arctic Security Cutters.<sup>10</sup>

**2022:** The 2022 National Strategy for the Arctic Region and its subsequent 2023 implementation plan support the expansion of the polar icebreaking fleet to support national objectives in the region.<sup>11</sup> However, the strategy and implementation plan did not propose an exact number of polar icebreakers. The implementation plan includes several objectives, including expansion of the Coast Guard’s polar icebreaker fleet to support persistent presence—meaning operating in the Pacific Arctic year-round and able to provide additional presence as needed in the Atlantic Arctic.

**2023:** In 2023, the Coast Guard produced a fleet mix analysis that indicated it needs eight to nine polar icebreakers to address capability gaps in its missions in both areas of the Arctic, but that its acquisition of the Polar Security Cutter would address its Antarctic needs.<sup>12</sup> The analysis did not identify the specific mix of how many Polar Security Cutters and Arctic Security Cutters it would ultimately acquire, a schedule for when it needs them or plans to acquire them, or their likely costs. Coast Guard officials said nine polar icebreakers would provide operational commanders more flexibility than eight, including flexibility to address maintenance issues that could prevent an icebreaker from getting underway.

In December 2023, a Coast Guard official testifying before Congress said that the planned polar fleet will consist of three to five Polar Security Cutters and three to five Arctic Security Cutters. The official indicated the Coast Guard had yet to decide on the total number and mix of polar icebreakers.

### What are the Coast Guard’s near-term plans to maintain its current polar icebreaking fleet?

For the near term, the Coast Guard plans to sustain and operate its two existing operational polar icebreakers, the *Healy* and the *Polar Star*.<sup>13</sup> The Coast Guard is planning a service life extension program for the *Healy* from 2027 through 2031 and will complete a similar effort on the *Polar Star* in 2025. In general, this type of program upgrades or replaces specific systems to address major maintenance issues and extend the operational capability of the polar icebreaker beyond the original design service life. The Coast Guard plans the service life extension work on the polar icebreakers to take place between missions each year at the same time as annual maintenance (see table 1).

**Table 1: Coast Guard’s Service Life Extension Programs for the Existing Polar Icebreakers**

Icebreaker (commission year)	Planned work	Estimated cost	Notional additional service life expected
<i>Healy</i> (2000)	2027–2031	\$97 million	At least 4 years, to 2035
<i>Polar Star</i> (1976)	2021–2025	\$75 million	7 to 10 more years, or 2032 to 2035

Note: Additional service life expected is notional until service life extension programs are completed and a reevaluation of the condition of each ship is conducted. For the *Polar Star* this reevaluation is planned for fiscal year 2027.

Coast Guard officials said that neither polar icebreaker has a decommissioning date. Additionally, they said that to determine how much longer each will operate the polar icebreakers will be assessed at the completion of their service life extension program. According to Coast Guard officials, the *Healy* and *Polar Star* are not part of the Coast Guard's long-term planned mix of eight to nine new heavy and medium polar icebreakers. Instead, they are part of the Coast Guard's strategy to provide a near-term capability until more polar icebreakers are operational.

### **What is the Coast Guard's bridging plan to add capability to its polar icebreaking fleet?**

The Coast Guard's bridging plan between its current fleet and future fleet is to purchase and convert a commercially available polar icebreaker (CAPI) with medium polar icebreaking capabilities. According to Coast Guard officials, the CAPI is not part of the eight or nine polar icebreaker fleet the Coast Guard is seeking in the long-term. They further stated that this effort will be the first time the Coast Guard has purchased and operated an existing commercial vessel. Officials said that they plan to purchase this icebreaker by the summer of 2025.

However, an April 2024 notional schedule notes that this plan is event driven and likely to shift. The acquisition would begin adding capability to the Coast Guard's Arctic fleet sooner, but the service has yet to determine the full cost to do so. In September 2021, the National Security Council tasked the Coast Guard and DHS with developing a strategy to acquire a CAPI. DHS subsequently requested funding for such a purchase in its budget request submitted in fiscal year 2023 and received \$125 million in fiscal year 2024 to do so.

In March 2024, the Coast Guard announced it had started taking steps to acquire a CAPI by notifying its intent to award the contract non-competitively because one company had been identified that met their needs. The only vessel that met the Coast Guard's requirements and was available for purchase is named the *Aiviq*. The *Aiviq* was delivered to a commercial entity in 2012 to support oil exploration and drilling in the Arctic. As is visible in figure 3, it is not configured like a traditional Coast Guard polar icebreaker. For example, the *Aiviq's* flight deck is mounted on the front of the icebreaker and not on the back like with other current or planned Coast Guard polar icebreakers and there is no aircraft hangar.

**Figure 3: The *Aiviq* Polar Icebreaker in 2012**



Source: U.S. Coast Guard/Chief Warrant Officer Sara Muir. | GAO-25-106822

**Accessible Text for Figure 3: The *Aiviq* Polar Icebreaker in 2012**

Side view of vessel moving in body of water

Source: U.S. Coast Guard/Chief Warrant Officer Sara Muir. | GAO-25-106822

The Coast Guard is acquiring and modifying the CAPI in two phases separated by a few years. The first phase will include inspecting and purchasing the polar icebreaker, making modifications to ensure it can operate in the Arctic, getting needed certifications, painting it in Coast Guard colors, and placing a commissioned officer in command. The goal of this phase is to reach initial operational capability to begin Arctic operations within 18 to 24 months after receiving the funding, or by the end of March 2026. The second phase will entail yet-to-be determined ship modifications to achieve full operational capability 7 years after the initial operational capability is achieved, or by the end of fiscal year 2033, according to the Coast Guard’s April 2024 notional schedule. After operating the icebreaker a few years, the Coast Guard’s acquisition strategy shows that it will achieve full operational capability after iterative modifications to the ship over the course of up to 5 years. The Coast Guard has yet to determine the extent of these modifications but they may include consideration of structural work like reconfiguring the helicopter pad and, in conjunction with National Oceanic and Atmospheric Administration requirements, add scientific capabilities.

To expedite the acquisition process for the CAPI to achieve operations within 18 to 24 months, the Coast Guard requested and received relief from Congress to acquire the CAPI without completing certain early-stage acquisition steps typically required pursuant to statute for Coast Guard major acquisition programs.<sup>14</sup> The relief also delays requirements for the Coast Guard to produce certain acquisition documentation required for major acquisition programs until after the icebreaker is purchased and achieves its initial operational capability. Some of these documents include operational requirements explaining what the Coast Guard expects the CAPI to be able to do, an acquisition program baseline showing costs and schedule information to modify it further, and a life-cycle cost estimate. The Coast Guard plans to acquire the CAPI without this information.

The Coast Guard developed two rough order of magnitude estimates, or cost analyses, to inform their initial planning. The first covered the cost for the acquisition and modification, including maintenance for the first 7 years. The



second covered the cost for building a permanent homeport for the CAPI in Alaska. Combined, these estimates indicated it would cost at least \$1 billion (see table 2).

**Table 2: Coast Guard’s Rough Order of Magnitude Analysis to Purchase, Maintain, Operate, and Homeport a Commercially Available Polar Icebreaker for the First 7 Years, as of 2024**

Purchase	Initial operational capability	Alaska homeport	Full operational capability	Total
\$105 million	\$112 million	\$395 million	\$409 million	<b>\$1,021 million</b>

Source: Coast Guard documentation. | GAO-25-106822

Note: Costs are cumulative. A rough order of magnitude cost estimate is a conceptual estimate and developed quickly when an estimate is needed and few details are available. Because it is developed from limited data and in a short time, a rough order of magnitude analysis should never be considered a budget-quality estimate. The Coast Guard’s defined initial operational capability for the commercially available polar icebreaker requires that (1) the polar class certification is current, (2) the icebreaker and equipment are functional for safe operations in the Arctic, (3) Coast Guard markings are added, and (4) the ship is commissioned and commanded by a Coast Guard commissioned officer. The full operational capability is yet to be determined but iterative capabilities would be added to the ship over a 5-year period.

The estimate for the CAPI was not based on the *Aiviq* specifically, but was assembled from historical data, technical experts, and market research. This estimate lacks the fidelity of a budget-quality estimate. The *Aiviq* has since been identified as the specific ship that meets the requirements and the Coast Guard plans to inspect the *Aiviq* before purchasing it. But the Coast Guard does not know what modifications it will need to make or how much they will cost before the *Aiviq* is purchased. Coast Guard officials stated that the scope of modifications required will not be known until the Coast Guard thoroughly inspects the *Aiviq* and reviews maintenance information. As of May 2024, Coast Guard officials said they do not have information on the current condition of the ship or the scope of maintenance or upgrades necessary to reach initial or full operational capability. Coast Guard officials said they will continue to evaluate the extent of needed modifications as they begin to operate the *Aiviq* and assess the costs to convert it.

While rough order of magnitude estimates may not be as rigorous as other kinds of cost estimates, they illustrate that the purchase of the icebreaker is likely a small portion of the total amount that will be needed to convert and operate it and just the first step of the program’s yet to be determined cost. We previously reported on the practices of leading companies and found that programs should develop cost tenets to define project goals before allocating initial funding.<sup>15</sup> This is an element of a sound business case. Cost estimating best practices state that developing a reliable cost estimate is crucial for realistic program planning, budgeting, and management.<sup>16</sup> Although the Coast Guard has received funding to purchase the *Aiviq*, it is important to consider further what the full financial commitment will be beyond the purchase price.

The Coast Guard plans to acquire the *Aiviq* without developing an updated detailed cost estimate that incorporates all of the costs associated with modifying the *Aiviq* to get it to full operational capability. The Coast Guard is taking this approach to try to deliver another polar icebreaker to the fleet sooner to begin to address operational gaps to its missions in the Arctic. Coast Guard officials said that after the Coast Guard acquires the *Aiviq* it will conduct a detailed analysis to determine the feasibility and costs of modifying the polar icebreaker further and achieving its full operational capability. As a result, however, the Coast Guard is missing key information on the full cost of the modifications it will undertake once the *Aiviq* is purchased. Furthermore, by planning to purchase the *Aiviq* without this information, the Coast Guard may be committing resources that will compete with other planned and future priority acquisitions, which we have previously reported are already unaffordable.<sup>17</sup> If the Coast Guard continues with this

approach and without updated information it limits the ability of decision-makers to make informed acquisition decisions about portfolio investments. It also risks impacting the Coast Guard's overall acquisition budget, potentially limiting the modifications that can be made to the *Aiviq* if other acquisitions are higher priority and require funding.

### **What is the Coast Guard's long-term acquisition plan to expand its polar icebreaking fleet?**

The Coast Guard plans to expand the polar icebreaker fleet via two acquisition programs over the next 10 to 20 years.

**Heavy polar icebreakers.** The existing Polar Security Cutter contract includes options for up to three heavy polar icebreakers to replace the *Polar Star* and begin expansion of the polar fleet. However, as we reported in July 2023, the program experienced design challenges that have caused significant schedule delays.<sup>18</sup> Since then, in November 2023, the program indicated to DHS that it would breach its acquisition program baseline that year. A November 2023 draft schedule indicated that it will take 1 year longer to build the lead cutter compared to the previous schedule, or over 5 years in total. It also indicated that if the lead cutter started construction by the end of 2024, then the lead and third cutter could be completed by the end of 2029 and 2034, respectively.<sup>19</sup> This is not an official schedule as it is not approved by DHS, and is subject to change, but provides some insight in lieu of a revised, approved baseline.

If this draft schedule comes to pass, the soonest the lead cutter may be operational is 2030. Program officials said there is some risk of additional delays to start construction due to ongoing contract negotiations between the program and the shipbuilder to revise the schedule and agree on the revised cost of each of the first three Polar Security Cutters. Coast Guard officials said that an updated acquisition program baseline schedule will be released after negotiations are completed with the shipbuilder. In August 2024, a DHS briefing indicated that starting construction by the end of 2024 was high risk given the state of the program and rate of design completion, meaning there are likely more delays forthcoming to the program.

The Coast Guard indicated in late 2023 that costs for the three Polar Security Cutters had exceeded 20 percent of the previous baseline of \$3.1 billion. In August 2024, the Congressional Budget Office estimated the cost for the first three Polar Security Cutters may increase as much as 60 percent to \$5.1 billion.<sup>20</sup> The estimate also indicated that each additional Polar Security Cutter beyond the first would cost approximately \$1.6 billion more to build.

Coast Guard officials said that the Coast Guard is considering the possibility of acquiring additional Polar Security Cutters beyond the three currently planned. Acquiring more than three Polar Security Cutters would need to be considered in the context of current design delays, cost growth, and schedule revisions to accurately determine how many additional Polar Security Cutters to acquire, what each will cost, or if the Coast Guard can afford them. As such, the Coast Guard has yet to account for these costs in its budget requests.

**Medium polar icebreakers.** The Coast Guard began pre-acquisition activities that could result in a program to build a new class of medium polar icebreakers, known notionally as Arctic Security Cutters. The Coast Guard has already completed two key pre-acquisition documents—the 2010 High Latitude Region Mission Analysis Report discussed above and a 2023 Arctic Surface Capability Analysis Report. From the latter report, the Coast Guard determined capability gaps will persist if Arctic Security Cutters are not acquired in addition to the current Polar Security Cutter program of record of three heavy polar icebreakers.

The Coast Guard also identified that a smaller polar icebreaker would likely cost less to procure and operate than Polar Security Cutters and that heavy icebreaking capabilities are not needed in the Arctic for part of the year due to ice conditions.

An effort to update science mission requirements could affect the Coast Guard's long-term plan to expand the polar fleet. Coast Guard officials said the 2023 Arctic Surface Capability Analysis Report did not consider future science requirements. As a result, these requirements are not noted in the capability gaps above because they are not part of the statutory mission set of the Coast Guard that is a part of its role as a DHS component. However, U.S. Arctic Research Commission officials indicated there is an effort underway among federal agencies, including the Coast Guard, to update science mission requirements for the Arctic. These requirements are broad and could apply to any agency in the federal government, including the Coast Guard. U.S. Arctic Research Commission officials said the effort is expected to be completed in 2025. However, they also said the creation of science requirements for the Arctic does not guarantee any scientific capabilities will end up on a future Coast Guard polar icebreaker. Rather, scientific capabilities on a future polar icebreaker will ultimately be based on funding and the kind of vessel the Coast Guard decides to build.

A further consideration is that the James M. Inhofe National Defense Authorization Act for Fiscal Year 2023 directed the Commandant of the Coast Guard to provide a report, that among other things, would include a comparison and alternatives analysis of the costs and timeline for constructing two additional Polar Security Cutters beyond the three currently planned rather than constructing three Arctic Security Cutters.<sup>21</sup> Further, as provided by the Act, if the Commandant determined that it would be more cost effective to design and build three Arctic Security Cutters than to build additional Polar Security Cutters, or failed to make a determination by June 1, 2024, the Commandant was directed to create the Arctic Security Cutter program office no later than January 1, 2025. As of September 2024, the Coast Guard had not yet completed the report and officials said that they did not meet the June 1, 2024, deadline. Officials said they expect to provide the report by the end of 2024.

### **How long could it take for the Coast Guard to produce a new medium polar icebreaker?**

Based on the Coast Guard's past and current experience acquiring polar icebreakers, it could take as long as the 2040s before a medium polar icebreaker may be operational if similar acquisition durations are matched. Polar icebreakers are complex, large ships with a dense structure that can take a long time to plan, design, and build.

With the previous and current Coast Guard polar icebreaker acquisitions, most of the time between deciding to build the ships and commencing operations is spent in the planning phase, not construction. The Coast Guard's next step is to complete a mission needs statement that identifies how the gaps identified in the 2023 Arctic Surface Capability Analysis Report could be filled by one or more acquisitions. If the Coast Guard chooses to build Arctic Security Cutters, filling the gaps might take a decade or more. It took the Coast Guard approximately 16 years to get from the mission needs statement approval to an operational capability for the *Healy*, and the lead Polar Security Cutter is on track to take approximately 17 years, if executed as planned, based on its draft schedule awaiting DHS approval. Coast Guard officials said that each ship is unique and, until the cost and schedule baseline is completed, the full operational capability

for the lead Polar Security Cutter is tentative. Once in the construction stage, the *Healy* was built in 4.5 years.

Following the historical trends of other polar icebreaker acquisitions, if the Coast Guard gets approval for the Arctic Security Cutter mission needs statement in 2025—which Coast Guard officials have indicated is their goal—the first Arctic Security Cutter may be operational in the early 2040s at the earliest. An approved mission needs statement would be a step towards eventually establishing a new acquisition program.

### **What are some open questions that remain for the Coast Guard to answer as it plans its future polar icebreaker fleet?**

The Coast Guard faces many questions as it expands its polar icebreaking fleet in the coming decades. However, it has already started planning this expansion without a complete understanding of how to achieve its goals. It will gain information to answer some questions as the planning progresses for a potential Arctic Security Cutter program. But other answers are external to that effort and have potential implications for other programs, such as any expansion of the Polar Security Cutter program to build more than three cutters. Some open questions that remain for the Coast Guard related to the polar icebreaker fleet expansion are listed below (see fig. 4).

**Figure 4: Coast Guard Has Yet to Address Open Questions Related to Its Potential Polar Icebreaker Fleet Expansion**

	Polar icebreaker fleet (as of November 2024)	Bridging strategy (~2026 to 2040s)	Future polar icebreaker fleet (starting in 2030s)
<b>Polar icebreaker type</b>			
<b>Heavy</b>	1 - <i>Polar Star</i>	1 - <i>Polar Star</i>	3 to 5 Polar Security Cutters
<b>Medium</b>	1 - <i>Healy</i>	2 - <i>Healy</i> and the CAPI	3 to 5 Arctic Security Cutters
<b>Total polar icebreakers</b>	<b>2</b>	<b>3</b>	<b>8 or 9</b>

Open questions		
Service life for the <i>Healy</i> and <i>Polar Star</i>	Detailed cost estimate and planned modifications to convert the commercially available polar icebreaker (CAPI)	Number of acquisition programs needed to fill capability gaps in the Arctic and their costs and schedules
Costs to operate and maintain the <i>Polar Star</i> until decommissioned	Number of years the CAPI will operate	Exact number of polar icebreakers the Coast Guard will acquire, either 8 or 9
Costs to operate and maintain the <i>Healy</i> until decommissioned	Costs and logistics of crewing and maintaining the CAPI, which was not built as a Coast Guard ship	Exact number of Polar Security Cutters and Arctic Security Cutters the Coast Guard will acquire
	The CAPI's missions once full operational capability is achieved	Costs and schedules for building and operating Polar Security Cutters and Arctic Security Cutters and supporting an increased crew needed for a larger polar fleet
	Temporary homeport of the CAPI until its permanent homeport is ready	Operational requirements, such as scientific capabilities for Arctic Security Cutters
		Location, costs, and schedules to homeport additional polar icebreakers beyond the first three Polar Security Cutters

Source: GAO analysis of Coast Guard documentation and interviews with Coast Guard officials. | GAO-25-106822

Note: The Polar Security Cutter program is currently revising its cost and schedule baseline, which will update its planned operational dates for each icebreaker once completed. The notional Arctic Security Cutter is not yet a program. As such, it does not have a schedule baseline. Estimates above are subject to change and based on GAO analysis of how long past and current polar icebreaker programs have taken to deliver an operational ship as well as pending decisions on how long the Coast Guard will operate existing assets as new polar icebreakers are acquired.

In June 2024, we reported that cost growth on programs, short-term planning, and uncertainty about high priority programs exacerbated the long-term affordability of the Coast Guard's larger portfolio of acquisition programs and obscured the trade-offs it could make.<sup>22</sup> In regard to expanding the polar icebreaking fleet, we found the Coast Guard faces a bow-wave of unaffordable acquisitions in both the near-term and long-term that will compete for funding needed to acquire or build polar icebreakers. Further, we raised questions about how the Coast Guard will be able to afford all its planned programs in a constrained budget environment to accomplish its vitally important missions. In



August 2024, we further highlighted nine of our priority recommendations to DHS that if implemented, will better position the Coast Guard to optimize decisions among competing investments and identify and achieve potential cost savings.<sup>23</sup>

We have frequently reported on the importance of prioritizing needs, adequately defining requirements, and using a solid, executable business case before committing resources to a program.<sup>24</sup> At the heart of a business case is a knowledge-based approach to product development that demonstrates high levels of knowledge before significant commitments are made.

With so many questions unanswered, the Coast Guard has yet to make a business case to adequately support committing resources to expanding its polar fleet to its desired state of eight to nine polar icebreakers. As we have previously found, high levels of uncertainty set up programs for poor outcomes. In this case, any poor outcomes would be compounded because multiple programs are involved. Moving forward without better understanding the commitments, costs, and affordability may bind the Coast Guard to a portfolio that cannot be executed.

## Conclusions

The Coast Guard is working to increase its presence in the Arctic region and expand the polar icebreaking fleet. Polar icebreaker programs take over a decade to deliver a capability, so the Coast Guard is trying to add an existing commercial icebreaker to its fleet sooner by purchasing and converting it within 2 years. But it does not understand the likely cost of this effort, such as the full cost of converting a commercially available polar icebreaker or what modifications it will need to make. The Coast Guard has prepared a rough estimate, which is not sufficient to inform a budget request, and lacks updated information now that a specific polar icebreaker has been identified. To meet its time frame of 2 years, it plans to purchase the icebreaker and figure out the detailed cost estimate for any modifications later.

The Coast Guard is already beset by affordability challenges in its portfolio of major acquisition programs within a constrained budget environment to support the missions it performs. However, it has not yet shown how it could achieve its goal to enlarge the polar fleet to eight or nine polar icebreakers.

It is not too late for the Coast Guard to get more information since it has yet to make financial commitments outside of the first three Polar Security Cutters. As the Coast Guard moves forward, it could develop more detailed cost estimates and determine if it can afford its plans within the context of its larger acquisition portfolio. Doing so could help the Coast Guard take a step in the right direction to determine what it can afford and when, among its many acquisition priorities. Finally, these plans will demonstrate whether the necessary resources will be there when the Coast Guard is ready to move forward or what trade-offs it can make to better position itself to fill its capability gaps.

## Recommendations for Executive Action

The Commandant of the Coast Guard should ensure the Coast Guard develops a detailed cost estimate before purchasing a commercially available polar icebreaker that incorporates the costs of modifications to reach full operational capability. (Recommendation 1)

The Commandant of the Coast Guard should complete an analysis of the cost and sequencing for the polar icebreaker fleet expansion, including how these efforts are affordable within its larger acquisition portfolio. (Recommendation 2)

## Agency Comments and Our Evaluation

We provided a draft of this report to DHS, the Department of Defense, the National Science Foundation, and the Department of Commerce for review and comment. DHS and the Department of Commerce provided technical comments, which we incorporated as appropriate. The Department of Defense and the National Science Foundation did not have any comments. In its written comments, DHS did not concur with the first recommendation and concurred with the second recommendation. DHS comments are reprinted in appendix I.

DHS did not concur with our first recommendation that the Coast Guard develop a detailed cost estimate before purchasing a commercially available polar icebreaker that incorporates the costs of modifications to reach full operational capability. In its comments, DHS stated that the Coast Guard already created the most detailed cost estimate possible without further knowledge of specific vessels and their condition. Further, DHS stated that a more detailed cost estimate requires assessment of current vessel capabilities and condition through system testing and vessel operation, development and approval of full operational capability requirements based on these assessed current capabilities, and then scoping and estimating modifications, as necessary. It indicated that it would do these things after the purchase, acceptance, and initial operation of the vessel.

We stand by our recommendation. As we note in our report, the 2023 funding analysis was generic in nature, lacked the fidelity of a budget-quality estimate, and was not specifically focused on the *Aiviq*, the polar icebreaker the Coast Guard intends to acquire. The Coast Guard prudently plans to inspect the *Aiviq* before acquiring it to inform the purchase price. However, per the DHS response, the Coast Guard will not conduct an assessment of the *Aiviq*'s capabilities or its condition, develop additional operational requirements, if needed, or develop a detailed cost estimate that incorporates the cost of modifications to reach full operational capability until after it acquires and begins to operate the icebreaker. We maintain that this will be too late. Under this approach, the Coast Guard will proceed into a costly acquisition missing key information on the nature and full cost of the modifications or the capabilities that the ship will ultimately be able to provide. Without this information, the Coast Guard may be committing resources that will compete with other priority acquisitions, which we have previously reported are already unaffordable. Obtaining more information before the acquisition would improve the Coast Guard's knowledge of what it is buying and its long-term commitments for the ship.

DHS concurred with our second recommendation to complete an analysis of the cost and sequencing for the polar icebreaker fleet expansion, including how these efforts are affordable within its larger acquisition portfolio. In its response, DHS stated that the Coast Guard was drafting a Polar Fleet Mix Analysis to be completed by the end of July 2025. As discussed in this report, the prior fleet mix analysis that the Coast Guard completed in 2023 contained no specific details on costs or timing. To be responsive to the recommendation, the Coast Guard should ensure its planned analysis provides a robust assessment of quantities and time-phasing, including costs and how its planned approach can be afforded given other priorities.

## How GAO Did This Study

To assess the extent to which the Coast Guard analyzed icebreaking requirements and alternatives to meet needs beyond the current Polar Security Cutter program, we reviewed the Coast Guard's analyses and internal reports, acquisition planning, DHS acquisition policy, memorandums of understanding and congressional reports used to inform the Coast Guard's Arctic acquisitions,

including the Polar Security Cutter program. We interviewed relevant Coast Guard officials from various offices, such as the Offices of Cutter Forces and Requirements and Analysis, to further understand the Coast Guard's planning to expand the polar fleet and the timing and status of ongoing Arctic analyses and documentation that may inform its approach. To understand other federal agencies assets, future acquisition plans, requirements, engagement with the Coast Guard, and own interests that operate in the Arctic, we reviewed documentation and interviewed officials from U.S. Northern Command, the Navy, the National Science Foundation, the National Oceanic and Atmospheric Administration, and the U.S. Arctic Research Commission. In addition, to understand the Coast Guard's planning and their oversight roles and responsibilities about current and planned Coast Guard polar icebreaker fleet expansion efforts, we reviewed documentation and interviewed officials from the DHS Office of Program Accountability and Risk Management.

To assess the extent to which the Coast Guard considered options to sustain and expand its medium polar icebreaker fleet, we reviewed Coast Guard documentation including budgetary justifications, 5-year investment plans, and analyses and planning related to polar icebreaker fleet planning and the sustainment of current capabilities. We reviewed cruise reports for the *Healy* and *Polar Star* and various assessments on the condition and operations of the cutters that helped to inform activities and planning for both of their service life extension programs. We conducted interviews with Coast Guard officials to better understand the process to consider potential options, decision-making, and the status and plans for the Coast Guard's various polar icebreaker fleet sustainment and expansion efforts. To understand the acquisition of a commercially available medium polar icebreaker, we reviewed Coast Guard planning documentation including congressional briefs and reports, and their request for statutory relief from producing certain acquisition planning documentation. We also reviewed responses to requests for information for existing commercially available polar icebreakers and acquisition strategy documentation. We interviewed DHS and Coast Guard officials who would assist in implementing and overseeing these efforts.

We conducted this performance audit from May 2023 to December 2024 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

## Appendix I: Comments from the Department of Homeland Security

U.S. Department of Homeland Security  
Washington, DC 20528



**Homeland  
Security**

BY ELECTRONIC SUBMISSION

November 15, 2024

Shelby S. Oakley  
Director, Contracting and National Security Acquisitions  
U.S. Government Accountability Office  
441 G Street, NW  
Washington, DC 20548-0001

Re: Management Response to Draft Report GAO-25-106822, "Coast Guard Acquisitions:  
Future Cost and Affordability Analysis of Polar Fleet Needed"

Dear Ms. Oakley:

Thank you for the opportunity to comment on this draft report. The U.S. Department of Homeland Security (DHS, or the Department) appreciates the U.S. Government Accountability Office's (GAO) work in planning and conducting its review and issuing this report.

DHS leadership is pleased to note GAO's recognition that the U.S. Coast Guard plans to potentially quadruple its number of polar icebreakers over the next 20 years to assure U.S. presence and reliable access to the Arctic. The U.S. Coast Guard remains committed to maturing its current icebreaker acquisition program (Polar Sea Cutter Program) to meet emerging mission demands in this strategically and economically important region.

The draft report contained two recommendations, one with which the Department non-concurs (Recommendation 1) and one with which the Department concurs (Recommendation 2). Enclosed find our detailed response to each recommendation. DHS previously submitted technical comments addressing several accuracy, contextual, and other issues under a separate cover for GAO's consideration, as appropriate.

Again, thank you for the opportunity to review and comment on this draft report. Please feel free to contact me if you have any questions. We look forward to working with you again in the future.

Sincerely,

JIM H CRUMPACKER  
Digitally signed by JIM H  
CRUMPACKER  
Date: 2024.11.15 16:08:38 -05'00'

JIM H. CRUMPACKER  
Director  
Departmental GAO-OIG Liaison Office

Enclosure

**Enclosure: Management Response to Recommendations  
Contained in GAO-25-106822**

GAO recommended that the Commandant of the U.S. Coast Guard:

**Recommendation 1:** Ensure the Coast Guard develops a detailed cost estimate before purchasing a commercially available polar icebreaker that incorporates the costs of modifications to reach full operational capability.

**Response:** Non-concur. The Coast Guard already created the most detailed cost estimate possible without further knowledge of specific vessels and their condition. Specifically, a 2023 Coast Guard funding analysis<sup>1</sup> states that the estimated costs for modifying, operating, sustaining, and homeporting a commercially available polar icebreaker totals \$674.7 million over five years post-acquisition. A more detailed cost estimate requires assessment of current vessel capabilities and condition through system testing and vessel operation, development and approval of full operational capability (FOC) requirements based on these assessed current capabilities, and then scoping and estimating modifications, as necessary. However, following acceptance and initial operation of such a vessel, the Coast Guard—led by the Office of Cutter Forces, CG-71—will be able to: (1) assess the vessel’s individual capabilities and condition; (2) develop additional operational requirements if needed; and (3) develop a detailed cost estimate that incorporates costs of modification to reach full operational capability. We request that GAO consider this recommendation resolved and closed.

**Recommendation 2:** Complete an analysis of the cost and sequencing for the polar icebreaker fleet expansion, including how these efforts are affordable within its larger acquisition portfolio.

**Response:** Concur. The Coast Guard is drafting a Polar Fleet Mix Analysis in accordance with Section 11421 of the Don Young Coast Guard Authorization Act of 2022 which—once complete—will document the fleet mix needed to accomplish the Coast Guard’s mission for this region. We anticipate delivery of the Analysis to Congress by the end of July 2025. In alignment with the Polar Fleet Mix Analysis, the Coast Guard will work to ensure that funding to support the polar icebreaker expansion will be factored into future Capital Investment Plans (CIP) and Future Years Homeland Security Plans (FYHSP), as appropriate. Estimated Completion Date: July 31, 2025.

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<sup>1</sup> “Commercially Available Icebreaker Brief,” dated July 11, 2023.

## **Accessible Text for Appendix I: Comments from the Department of Homeland Security**

U.S. Department of Homeland Security  
Washington, DC 20528

BY ELECTRONIC SUBMISSION

November 15, 2024

Shelby S. Oakley  
Director, Contracting and National Security Acquisitions  
U.S. Government Accountability Office  
441 G Street, NW  
Washington, DC 20548-0001



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JIM H. CRUMPACKER

Director

Departmental GAO-OIG Liaison Office

Enclosure

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### List of Addressees

The Honorable Sam Graves  
Chairman  
The Honorable Rick Larsen  
Ranking Member  
Committee on Transportation and Infrastructure  
House of Representatives

We are sending copies of this report to the Secretary of Homeland Security, the Secretary of Defense, the Secretary of Commerce, and the Office of the Director of the National Science Foundation, among other interested parties. In addition, the report is available at no charge on the GAO website at <https://www.gao.gov>.

### GAO Contact Information

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**Staff Acknowledgments:** James Madar (Assistant Director), Patrick Breiding (Analyst-in-Charge), Rose Brister, Lori Fields, Tonya Humiston, and Jacob Wu made key contributions to this report. Other key contributors included Breanne Cave, Scott Heacock, Dawn Hoff, Min-Hei (Michelle) Kim, and Jason T. Lee.

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## Endnotes

<sup>1</sup>The Arctic contrasts with the southern pole in Antarctica which is a continent surrounded by ocean.

<sup>2</sup>The Coast Guard's 11 authorized missions, some of which support its activities in the polar regions, are divided into non-homeland security missions (marine safety; search and rescue; aids to navigation; living marine resources; marine environmental protection; and ice operations) and homeland security missions (ports, waterways, and coastal security; drug interdiction; migrant interdiction; defense readiness; and other law enforcement). 6 U.S.C. § 468.

<sup>3</sup>The Arctic countries all have territory north of the Arctic circle. They include Canada, the Kingdom of Denmark, Finland, Iceland, Norway, the Russian Federation, Sweden, and the United States.

<sup>4</sup>The term cutter identifies a Coast Guard vessel 65 feet in length or greater. This report will refer to Coast Guard ships that meet these criteria as cutters but also use the term interchangeably with ship and polar icebreaker for readability. According to the Coast Guard, the term heavy polar icebreaker refers to cutters capable of breaking greater than 6 feet of ice and the term medium polar icebreaker to those capable of breaking 4.5 to 6 feet of ice.

<sup>5</sup>Primary duties of the Coast Guard include icebreaking and oceanographic research of the high seas and in waters subject to the jurisdiction of the U.S. 14 U.S.C. § 102(4), (6).

<sup>6</sup>GAO, *Arctic Region: Factors That Facilitate and Hinder the Advancement of U.S. Priorities*, [GAO-23-106002](#) (Washington, D.C.: Sept. 6, 2023).

<sup>7</sup>Office of Science and Technology Policy, *Arctic Research Crosscut Budget Report FY 2022-2024* (Mar. 2024).

<sup>8</sup>Department of Homeland Security, *United States Coast Guard High Latitude Region Mission Analysis Capstone Summary* (July 2010). In 2017, the Coast Guard produced an updated addendum confirming the original findings and initial recommendations of the 2010 study.

<sup>9</sup>Department of Homeland Security, *Safeguarding U.S. National Interests in the Arctic and Antarctic* (Aug. 10, 2020).

<sup>10</sup>The Coast Guard uses the term persistent presence to refer to how many ships it needs to maintain a year-round presence in an area to allow for factors such as transit, maintenance, and training. One area requires three ships to rotate with each covering a portion of the year.

<sup>11</sup>The White House, *National Strategy for the Arctic Region* (Oct. 2022); The White House, *Implementation Plan for the 2022 National Strategy for the Arctic Region* (Oct. 2023).

<sup>12</sup>The Coast Guard produced the 2023 fleet mix analysis in response to a provision in the explanatory statement to the Consolidated Appropriations Act, 2022. See 168 Cong. Rec. H1709, H2404 (Mar. 9, 2022) (explanatory statement to the Consolidated Appropriations Act, 2022, div. F, Dept. of Homeland Security Appropriations Act, 2022).

<sup>13</sup>The Coast Guard also has a second heavy polar icebreaker, the *Polar Sea*, which has not operated since 2010 after a catastrophic engine failure. In 2017, the Coast Guard estimated that it would take at least 8 years and approximately \$500 million to reactivate the *Polar Sea*. The Coast Guard is not planning to reactivate the *Polar Sea*, as many of its parts are no longer produced and others have been used to support keeping the *Polar Star* operational.

<sup>14</sup>See the James M. Inhofe National Defense Authorization Act for Fiscal Year 2023, Pub. L. No. 117-263, § 11223 (2022). As provided in the Act, this authority and relief from specific documentation requirements will expire in December 2025. DHS defines major acquisition programs as those with life-cycle cost estimates of \$300 million or more. In some cases, DHS may define a program with a life-cycle cost estimate less than \$300 million as a major acquisition if it has significant strategic or policy implications for homeland security, among other things. See Department of Homeland Security, DHS Directive 102-01, *Acquisition Management Directive* (July 28, 2015) (incorporating change 1, Feb. 25, 2019); DHS Instruction 102-01-001, *Acquisition Management* (Jan. 10, 2023) (incorporating change 1, Apr. 17, 2024).

<sup>15</sup>GAO, *Leading Practices: Agency Acquisition Policies Could Better Implement Key Product Development Principles*, [GAO-22-104513](#) (Washington, D.C.: Mar. 10, 2022).

<sup>16</sup>GAO, *Cost Estimating and Assessment Guide: Best Practices for Developing and Managing Program Costs*, [GAO-20-195G](#) (Washington, D.C.: Mar. 2020).

<sup>17</sup>GAO, *Coast Guard Acquisition: Actions Needed to Address Affordability Challenges*, [GAO-24-107584](#) (Washington, D.C.: June 12, 2024).

<sup>18</sup>GAO, *Coast Guard Acquisitions: Polar Security Cutter Needs to Stabilize Design Before Starting Construction and Improve Schedule Oversight*, [GAO-23-105949](#) (Washington, D.C.: July 27, 2023).

<sup>19</sup>The second Polar Security Cutter would be delivered between the first and third but the draft schedule did not specify the timing.

<sup>20</sup>Congressional Budget Office, *The Cost of the Coast Guard's Polar Security Cutter* (Apr. 30, 2024).

<sup>21</sup>Pub. L. No. 117-263, § 11218 (2022). The Act also directed the Commandant to determine no later than 90 days after the submission of the report whether constructing additional Polar Security Cutters is more cost effective and efficient than constructing 3 Arctic Security Cutters.

<sup>22</sup>[GAO-24-107584](#).

<sup>23</sup>GAO, *Priority Open Recommendations: Department of Homeland Security*, [GAO-24-107251](#) (Washington, D.C.: Aug. 19, 2024).

<sup>24</sup>GAO, *Navy Shipbuilding: Increased Use of Leading Design Practices Could Improve Timeliness of Deliveries*, [GAO-24-105503](#) (Washington, D.C.: May 2, 2024); *Coast Guard Recapitalization: Actions Needed to Better Manage Acquisition Programs and Address Affordability Concerns*, [GAO-23-106948](#) (Washington, D.C.: July 27, 2023); and *Defense Acquisitions: Improved Business Case Is Needed for Future Combat System's Successful Outcome*, [GAO-06-367](#) (Washington, D.C.: Mar. 14, 2006).