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Navy Constellation (FFG-62) Class Frigate Program: Background and Issues for Congress

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Summary

The Navy began procuring Constellation (FFG-62) class frigates (FFGs) in FY2020, and a total of six have been procured through FY2024. Current Navy plans call for procuring a total of at least 20 FFG-62s. The Navy's proposed FY2025 budget requests \$1,170.4 million (i.e., about \$1.2 billion) for the procurement of the seventh ship in the program. The Navy's FY2025 budget submission programs the procurement of an additional six FFG-62s during the period FY2026-FY2029 in annual quantities of 2-1-2-1.

FFG-62s are being built by Fincantieri/Marinette Marine (F/MM) of Marinette, WI. F/MM was awarded a fixed-price incentive (firm target) contract for Detail Design and Construction (DD&C) for up to 10 ships in the program—the lead ship plus nine option ships.

A May 2024 Government Accountability Office (GAO) report on the FFG-62 program states:

To reduce technical risk [in the FFG-62 program], the Navy and its shipbuilder [in designing the FFG-62] modified an existing [Italian-French frigate] design to incorporate [U.S.] Navy specifications and weapon systems. However, the Navy's decision to begin construction [of the first FFG-62] before the design was complete is inconsistent with leading ship design practices and jeopardized this approach....

Delays in completing the ship design have created mounting construction delays. The Navy acknowledges that the April 2026 delivery date, set in the contract at award, is unachievable. The lead frigate is forecasted to be delivered 36 months later than initially planned. The program office tracks and reports design progress, but its design stability metric hinges largely on the quantity—rather than quality—of completed design documents. This limits insight into whether the program's schedule is achievable. If the Navy begins construction on the second frigate without improving this metric, it risks repeating the same errors that resulted in construction disruptions and delays with the lead frigate....

The frigate is using a traditional, linear development approach for design and construction. The Navy has historically experienced schedule delays, cost growth, or both in prior shipbuilding programs using this approach. The Navy has incorporated elements of leading practices into its acquisition strategy. However, further incorporating these practices in an updated acquisition strategy could position the program, when contracting for future frigates, to better respond to evolving mission needs.

The FFG-62 program presents several potential oversight issues for Congress, including the following:

- the estimated 36-month delay in the scheduled delivery of the first FFG-62, which was reported publicly by the Navy in April 2024;
- the potential for cost growth in the FFG-62 program, particularly after the first 10 ships in the program;
- whether and when to introduce a second shipyard into the FFG-62 program;
- the number of vertical launch system (VLS) missile tubes in the FFG-62 design; and
- technical risk in the FFG-62 program.

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Introduction

This report provides background information and discusses potential issues for Congress regarding the Navy's Constellation (FFG-62) class frigate program, a program to procure a new class of at least 20 guided-missile frigates (FFGs). The Navy began procuring FFG-62 class ships in FY2020, and a total of six have been procured through FY2024. The Navy's proposed FY2025 budget requests \$1,170.4 million (i.e., about \$1.2 billion) for the procurement of the seventh ship in the program. FFG-62s are being built by Fincantieri/Marinette Marine (F/MM) of Marinette, WI.

The FFG-62 program presents several potential oversight issues for Congress. Congress's decisions on the program could affect Navy capabilities and funding requirements and the U.S. shipbuilding industrial base.

Background

Navy's Force of Small Surface Combatants (SSCs)

SSCs in General

In discussing its force-level goals and 30-year shipbuilding plans, the Navy organizes its surface combatants into *large surface combatants* (LSCs), meaning the Navy's cruisers and destroyers, and *small surface combatants* (SSCs), meaning the Navy's frigates, Littoral Combat Ships (LCSs), mine warfare ships, and patrol craft.¹ SSCs are smaller, less capable in some respects, and individually less expensive to procure, operate, and support than LSCs. SSCs can operate in conjunction with LSCs and other Navy ships, particularly in higher-threat operating environments, or independently, particularly in lower-threat operating environments.

SSC Force at End of FY2023

The Navy's force of SSCs at the end of FY2023 consisted of 31 ships, including no frigates, 23 LCSs, and 8 mine warfare ships.

SSC Force-Level Goal

The Navy's FY2025 30-year (FY2025-FY2054) shipbuilding plan calls for a future Navy of 381 manned battle force ships, including 73 SSCs, of which 15 are to be LCSs capable of conducting mine warfare operations, plus 58 "FFG / FFG Flt II" ships, meaning 58 frigates and frigates built to a modified (i.e., Flight II) design.² Under its FY2025 budget submission, the Navy wants to maintain a force of 25 (rather than 15) LCSs. This could imply a total of 48 (rather than 58) frigates.

¹ See, for example, CRS Report RL32665, *Navy Force Structure and Shipbuilding Plans: Background and Issues for Congress*, by Ronald O'Rourke.

² U.S. Navy, Report to Congress on the Annual Long-Range Plan for Construction of Naval Vessels for Fiscal Year 2025, March 2024, Table 1 on page 4, column entitled "June 2023 BFSAR [Battle Force Ship Assessment and Requirement] Report.

U.S. Navy Frigates in General

In contrast to cruisers and destroyers, which are designed to operate in higher-threat areas, frigates are generally intended to operate more in lower-threat areas. U.S. Navy frigates perform many of the same peacetime and wartime missions as U.S. Navy cruisers and destroyers, but since frigates are intended to do so in lower-threat areas, they are equipped with fewer weapons, less-capable radars and other systems, and less engineering redundancy and survivability than cruisers and destroyers.³

The most recent class of frigates operated by the Navy was the Oliver Hazard Perry (FFG-7) class (**Figure 1**). A total of 51 FFG-7s were procured between FY1973 and FY1984. The ships were built by three shipyards,⁴ entered service between 1977 and 1989, and were decommissioned between 1994 and 2015. In their final configuration, FFG-7s were about 455 feet long and had full load displacements of roughly 3,900 tons to 4,100 tons. (By comparison, the Navy's Arleigh Burke [DDG-51] class destroyers are about 510 feet long and have full load displacements of roughly 9,700 tons.⁵) Following their decommissioning, a number of FFG-7s, like certain other decommissioned U.S. Navy ships, have been transferred to the navies of U.S. allied and partner countries.

FFG-62 Class Program

Program Name

The FFG-62 program was previously known as the FFG(X) program.⁶ On October 7, 2020, the Navy announced that FFG-62 would be named Constellation, in honor of the first U.S. Navy

³ Compared to cruisers and destroyers, frigates can be a more cost-effective way to perform missions that do not require the use of a higher-cost cruiser or destroyer. In the past, the Navy's combined force of higher-capability, higher-cost cruisers and destroyers and lower-capability, lower-cost frigates has been referred to as an example of a so-called high-low force mix. High-low mixes have been used by the Navy and the other military services in recent decades as a means of balancing desires for individual platform capability against desires for platform numbers in a context of varied missions and finite resources.

Peacetime missions performed by frigates can include, among other things, engagement with allied and partner navies, maritime security operations (such as anti-piracy operations), and humanitarian assistance and disaster response (HA/DR) operations. Intended wartime operations of frigates include escorting (i.e., protecting) military supply and transport ships and civilian cargo ships that are moving through potentially dangerous waters. In support of intended wartime operations, frigates are designed to conduct anti-air warfare (AAW—aka air defense) operations, anti-surface warfare (ASuW) operations (meaning operations against enemy surface ships and craft), and antisubmarine warfare (ASW) operations. U.S. Navy frigates are designed to operate in larger Navy formations or as solitary ships. Operations as solitary ships can include the peacetime operations mentioned above.

⁴ The three shipyards were Bath Iron Works (BIW) of Bath, ME (now referred to as General Dynamics/Bath Iron Works or GD/BIW), Todd Shipyards of Seattle, WA, and Todd Shipyards of San Pedro, CA. Todd Shipyards of Seattle was acquired in 2011 by Vigor Shipyards. (See, for example, "Vigor Shipyards," *Wikipedia*, edited January 22, 2024.) Todd Shipyards of San Pedro was closed in 1989 following the completion of its FFG-7 construction work. (See, for example, "Todd Pacific Shipyards, Los Angeles Division," *Wikipedia*, edited January 26, 2023.)

⁵ This is the displacement for the current (Flight III) version of the DDG-51 design.

⁶ In the designation FFG(X), FF meant frigate, G meant guided-missile ship (indicating a ship equipped with an area-defense anti-air warfare [AAW] system), and (X) indicated that the specific design of the ship had not yet been determined. FFG(X) thus meant a guided-missile frigate whose specific design had not yet been determined.

The designation FF, with two Fs, means frigate in the same way that the designation DD, with two Ds, means destroyer. FF is sometimes translated less accurately as fast frigate. FFs, however, are not particularly fast by the standards of U.S. Navy combatants—their maximum sustained speed, for example, is generally lower than that of U.S. Navy aircraft carriers, cruisers, and destroyers. In addition, there is no such thing in the U.S. Navy as a slow frigate.

(continued...)

ships authorized by Congress in 1794—the six heavy frigates United States, Constellation, Constitution, Chesapeake, Congress, and President. FFG(X)s henceforth became known as Constellation (FFG-62) class ships.

Figure 1. Oliver Hazard Perry (FFG-7) Class Frigate



Source: Photograph accompanying Dave Werner, “Fighting Forward: Last Oliver Perry Class Frigate Deployment,” *Navy Live*, January 5, 2015, accessed September 21, 2017, at <http://navylive.dodlive.mil/2015/01/05/fighting-forward-last-oliver-perry-class-frigate-deployment/>.

Ship Design and Capabilities

FFG-62s (**Figure 2**, **Figure 3**, and **Figure 4**) are to be multimission small surface combatants capable of conducting anti-air warfare (AAW), anti-surface warfare (ASuW), antisubmarine warfare (ASW), and electromagnetic warfare (EMW) operations. They are to be capable of operating in both blue water (i.e., mid-ocean) and littoral (i.e., near-shore) areas, and capable of operating either independently (when that is appropriate for their assigned missions) or as part of larger Navy formations.

The FFG-62 design is based on the design of the Italian-French FREMM (Fregata Europea Multi-Missione) frigate, a ship that has been built in two variants, one for the Italian navy and one for the French navy. The FREMM design, in other words, served as what is known as the “parent” design for the FFG-62 design. The use of a parent design for the FFG-62 program is discussed further in the section below on the FFG-62 program’s acquisition strategy.

Procurement Quantities and Schedule

Total Procurement Quantity

The Navy wants to procure at least 20 FFG-62s. Navy budget documents, including the FY2025 budget-justification book for Navy’s shipbuilding account, describe the FFG-62 program as a 20-

Some U.S. Navy surface combatants are equipped with a point-defense AAW system, meaning a short-range AAW system that is designed to protect the ship itself. Other U.S. Navy surface combatants are equipped with an area-defense AAW system, meaning a longer-range AAW system that is designed to protect not only the ship itself, but other ships in the area as well. U.S. Navy surface combatants equipped with an area-defense AAW system are referred to as guided-missile ships and have a “G” in their designation.

ship program. As discussed earlier, the Navy’s FY2025 30-year (FY2025-FY2054) shipbuilding plan calls for a future Navy of 381 manned battle force ships, including 58 “FFG / FFG Flt II” ships, meaning 58 frigates and frigates built to a modified (i.e., Flight II) design.⁷ The reference to a Flight II design might be interpreted as referring to a modified (i.e., Flight II) version of the FFG-62 design. Such an interpretation would imply a combination of 20 (or more) FFG-62s built to the original (i.e., Flight I) FFG-62 design plus 38 (or fewer) additional FFG-62s built to a modified (i.e., Flight II) FFG-62 design. As also mentioned earlier, under its FY2025 budget submission, the Navy wants to maintain a force of 25 (rather than 15) LCSs. This could imply a total of 48 (rather than 58) frigates.

Annual Procurement Quantities

Table 1 shows programmed and actual annual procurement quantities for the FFG-62 program.

Figure 2. Constellation (FFG-62) Class Frigate

Artist’s rendering of F/MM design



Source: Cropped version of illustration accompanying Fincantieri Marinette Marine, “Fincantieri Marinette Marine Awarded Second Constellation-class Frigate,” May 20, 2021.

Procurement Cost

FFG-62s generally have budgeted procurement costs of roughly \$1.1 billion to \$1.2 billion each. The lead ship in the program has a higher estimated procurement cost (\$1,386.7 million, or about \$1.4 billion) than the follow-on ships because it is at the top of the production learning curve for the class, and because the lead ship’s procurement cost incorporates much of the detailed design/nonrecurring engineering (DD/NRE) costs for the class. (It is a traditional Navy budgeting practice to attach most or all of the DD/NRE costs for a new ship class to the procurement cost of the lead ship in the class.)

⁷ U.S. Navy, *Report to Congress on the Annual Long-Range Plan for Construction of Naval Vessels for Fiscal Year 2025*, March 2024, Table 1 on page 4, column entitled “June 2023 BFSAR [Battle Force Ship Assessment and Requirement] Report.

Figure 3. Constellation (FFG-62) Class Frigate

Computer rendering of F/MM design



Source: Fincantieri/Marinette Marine, screen capture from video entitled “Constellation Class Frigate 360° View,” posted at <https://futurefrigate.com/>, accessed December 8, 2020.

Figure 4. Constellation (FFG-62) Class Frigate

Computer rendering of F/MM design



Source: U.S. Navy rendering shown on slide 2 of in Navy briefing entitled “Guided Missile Frigate (FFG 62) Update, Sea Air Space [Exposition],” Captain Kevin Smith, April 5, 2022.

Table I. Programmed and Actual Annual FFG-62 Procurement Quantities

	FY20	FY21	FY22	FY23	FY24	FY25	FY26	FY27	FY28	FY29
Programmed										
FY20 budget submission	1	2	2	2	2					
FY21 budget submission		1	1	2	2	3				
Dec. 9, 2020, document			1	3	3	4	4			
FY22 budget submission			1	n/a	n/a	n/a	n/a			
FY23 budget submission				1	2	1	2	1		
FY24 budget submission					2	1	2	1	2	
FY25 budget submission						1	2	1	2	1
Actual	1	1	1	1	2					

Sources: Table prepared by CRS based on Navy’s FY2020-FY2025 budget submissions; December 9, 2020, long-range Navy shipbuilding document; and enacted National Defense Authorization Acts (NDAAAs) and DOD Appropriations Acts for FY2020 and subsequent years.

Notes: n/a means not available. DOD’s FY2022 budget submission was a single-year budget that did not contain line-item details for subsequent fiscal years.

Acquisition Strategy

Number of Builders

The Navy’s baseline plan for the FFG-62 program envisages using a single builder at any one time to build FFG-62s, but Navy officials have also spoken about the option of bringing a second shipyard into the program at some point, particularly if annual procurement rates for FFG-62s rise above two ships per year. An August 3, 2021, press report quoting a Navy official states

“It’s pre-decisional in the Navy right now but we do have in our contract a Technical Data Package (TDP) that we can exercise that option all the way into the 10th ship. So our intent is that, at some point based on a profile, we can exercise that TDP and then work with candidate yards interested and then start building up on a second source and doing a competition in the future,” [Capt. Kevin Smith, program manager of the new frigate class, PMS-51] said during a briefing at the Navy League’s annual 2021 Sea Air Space expo Monday [August 2] here.⁸

The Navy’s FY2025 30-year (FY2025-FY2054) shipbuilding plan states (emphasis added)

The Navy is mindful that as fleet composition evolves to meet competition and combat requirements, the Navy must examine alternative opportunities within the industrial base. Alternative opportunities include adjusting procurement profiles ensuring stability in shipyard workload to prevent “boom and bust” periods of shipyard activity, and ensuring ample competitive opportunities for current and future platforms (i.e., AS(X), LSM, T-AOL, T-ARC), and **a potential FFG 62 second source for construction once the design and technical data package is mature and risks are reduced and validated.** These opportunities allow the current industrial base to adapt while maintaining the capacity to deliver the capability the nation needs.⁹

⁸ Rich Abott, “Navy Outlines Plan For Second Frigate Shipyard,” *Defense Daily*, August 3, 2021.

⁹ U.S. Navy, *Report to Congress on the Annual Long-Range Plan for Construction of Naval Vessels for Fiscal Year 2025*, March 2024, p. 13.

Parent-Design Approach

As noted earlier, FFG-62s are to be built to a modified version of an existing ship design—an approach, called the parent-design approach, that can reduce design time, design cost, and cost, schedule, and technical risk in building the ship. The Coast Guard and the Navy are currently using the parent-design approach for the Coast Guard’s Polar Security Cutter (i.e., polar icebreaker) program.¹⁰ The parent-design approach has also been used in the past for other Navy and Coast Guard ships, including Navy mine warfare ships¹¹ and the Coast Guard’s new Fast Response Cutters (FRCs).¹²

Some observers have questioned the value of using parent designs in military shipbuilding programs. A 2015 journal article, for example, states

The U.S. Navy has experimented with many approaches to design and build its ships. Using an existing design as the “parent” design, also referred to as “modified-repeat” design, is on its face an attractive option. Many acquisition executives, program managers and some ship design engineers believe that a design based on a parent has fewer technical risks than a new “clean sheet of paper” design and therefore the time and cost to design and build it will be reduced. They assume early in the ship acquisition program that “the design is mature” and because of that fewer problems will be encountered in completing the design and savings will thus be accrued. Yet, a number of naval ships based on a parent design have in fact experienced unanticipated cost and schedule growth during construction as well as technical problems during their in-service life. The authors will examine some of these ship designs which were based on an existing design and/or prototypes and highlight the fallacies of such beliefs and assumptions.¹³

Figure 5 shows a U.S. Navy briefing slide summarizing what the U.S. Navy says are the “primary differences between the FFG 62 Class [design] and the FREMM Parent design.” The Navy states that the design differences “were proposed by [the shipbuilding firm] Fincantieri and incorporated [into Fincantieri’s proposed design for the FFG-62] prior to [the Navy’s] contract award [for the FFG-62 program to Fincantieri].”¹⁴ An August 4, 2021, press report states

The Navy has chosen to elongate and widen the hull of its next-generation Constellation-class frigate relative to the [FREMM] parent design, but the officer overseeing its production says the internal layout will largely remain the same.

“The Italians did a very good job in the design of the internal spaces, and the flow of a lot of those spaces,” Capt. Kevin Smith, program manager for the Constellation class, told attendees at the Sea Air Space exposition on Monday [August 2]. “You could say we bought a bigger house, [but] from a modeling and simulation perspective, it’s exactly the same.”...

¹⁰ For more on the polar security cutter program, including the parent-design approach, see CRS Report RL34391, *Coast Guard Polar Security Cutter (Polar Icebreaker) Program: Background and Issues for Congress*, by Ronald O’Rourke.

¹¹ The Navy’s Osprey (MCM-51) class mine warfare ships are an enlarged version of the Italian Lerici-class mine warfare ships.

¹² The FRC design is based on a Dutch patrol boat design, the Damen Stan Patrol Boat 4708.

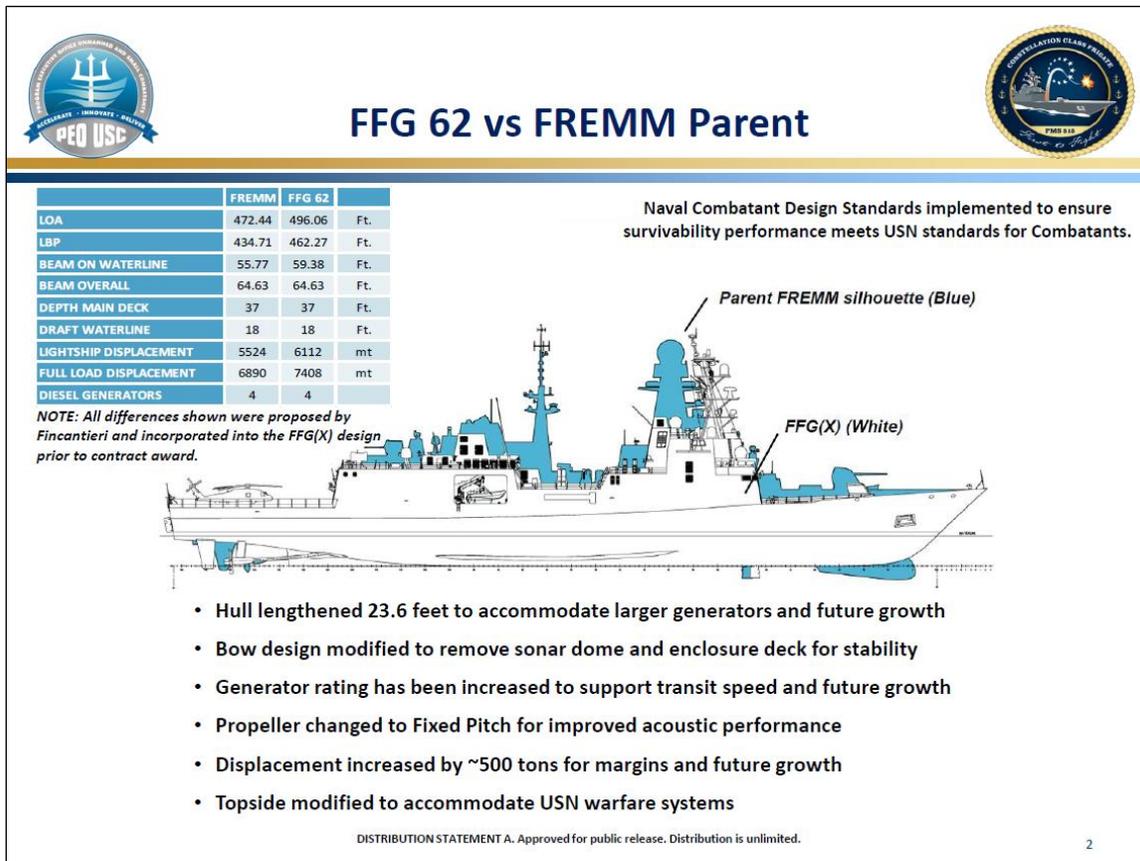
¹³ Robert G. Keane, Jr. and Barry F. Tibbitts, “The Fallacy of Using a Parent Design: ‘The Design Is Mature,’” *Transactions (Society of Naval Architects and Marine Engineers [SNAME])*, 2015, No. 1 (January): 91-104, with additional discussion from the authors and other commentators on pages 105-122. The quoted passage appears at the start of the article, on page 91, where it forms part of an abstract or summary for the article.

¹⁴ Source: Navy information paper dated August 18, 2021, on differences between FFG-62 design and FREMM parent design, provided to CRS and the Congressional Budget Office (CBO) by Navy Office of Legislative Affairs on August 27, 2021.

While some changes are to be expected to meet the Navy’s needs, enlarging the hullform itself has the potential to change where components in the ship must be placed, as well as the overall cost.

Asked about how possible changes in the ship’s hull could affect the internal design, Smith said Fincantieri Marinette Marine, the Constellation’s prime contractor, worked with Naval Surface Warfare Center Carderock to develop a scale model of the ship and that most elements will stay true to the parent design. He cited the bridge and propulsion plant as areas where the Navy has not made any significant changes to the layout.¹⁵

Figure 5. FFG-62 Design Compared to FREMM Design



Source: Navy briefing slide provided to CRS and Congressional Budget Office (CBO) by Navy Office of Legislative Affairs, August 27, 2021, with accompanying Navy information paper dated August 18, 2021.

An April 2, 2024, press report states: “At one point the Constellation design shared about 85 percent commonality with the original FREMM design, but the alterations have brought that commonality down to under 15 percent, a person familiar with the changes told USNI News.”¹⁶ If the FFG-62 design shares less than 15% commonality with the FREMM design, then some

¹⁵ Justin Katz, “Navy Says Constellation Hull Change Won’t Affect Internal Design,” *Breaking Defense*, August 4, 2021.

¹⁶ Mallory Shelbourne and Sam LaGrone, “Constellation Frigate Delivery Delayed 3 Years, Says Navy,” *USNI News*, April 2 (updated April 3), 2024.

observers might characterize the FFG-62 program as having moved over time toward what might be termed a parent design in name only (PDINO) design approach.¹⁷

No New Technologies or Systems

As an additional measure for reducing cost, schedule, and technical risk in the FFG-62 program, the Navy envisages developing no new technologies or systems for FFG-62s—the ships are to use systems and technologies that already exist or are already being developed for use in other programs.

FY2021 Legislation Regarding Land-Based Test Program for Engineering Plant

Section 125 of the FY2021 National Defense Authorization Act (H.R. 6395/P.L. 116-283 of January 1, 2021) requires the Navy to commence, prior to the delivery of the first FFG-62, a land-based test program for the FFG-62 engineering plant (i.e., its propulsion system and related machinery). The provision specifies how the test program is to be conducted and requires the Navy to complete the test program not later than the date on which the first FFG-62 is scheduled to be available for tasking by operational military commanders.¹⁸

Legislation Regarding U.S. Content Requirements for Components

Section 856 of the FY2020 National Defense Authorization Act (S. 1790/P.L. 116-92 of December 20, 2019) states

¹⁷ The phrase *parent design in name only* (with the resulting acronym PDINO) is only one possible shorthand way of referring to the situation. One possible way to pronounce the acronym PDINO would be pa-DEE-no.

¹⁸ Regarding Section 125, the conference report (H.Rept. 116-617 of December 3, 2020) on H.R. 6395/P.L. 116-283 of January 1, 2021 states

Given that the Constellation-class will play a significant role in the Navy battle force for many decades and the current program of record calls for building 20 frigates, the conferees believe a strong technical foundation for this program is critically important.

The conferees note that the winning Constellation-class ship design is based on a foreign design. While recognizing an existing parent design can reduce design, technical, and integration risks, the conferees are concerned that significant risks remain in the FFG-62 program, including: cost realism; shifting to predominantly U.S. component suppliers instead of the mainly foreign suppliers used in the parent vessel design; and a complex Combined Diesel Electric and Gas Hull, Mechanical and Electrical (HM&E) drive train that has not previously been used on U.S. Navy ships.

The conferees believe land based engineering and test sites (LBETS) are critical resources for the Department of Defense, particularly for Navy ship HM&E systems....

Since 1972, NSWCPD LBETS testing has reduced the acquisition risk of five of the seven Navy surface combatant classes (Spruance-class, Oliver Hazard Perry-class, Ticonderoga-class, Arleigh Burke-class, and Zumwalt-class).... The littoral combat ship (LCS) classes, the Freedom- and Independence-classes, are the two recent classes that have not had the benefit of a LBETS. Since lead ship deliveries in 2008 and 2010, both LCS classes have encountered significant, costly, and debilitating engineering failures. The conferees believe many of these LCS engineering failures would have been discovered, analyzed, and corrected faster with less negative operational impact had the Navy established a LCS LBETS.

Accordingly, the provision would require the Secretary of the Navy to establish a FFG-62 class LBETS as soon as possible....

In addition, the conferees direct the Secretary to submit to the congressional defense committees a plan to implement this section with the budget materials that accompany the President's Budget request for fiscal year 2022. This plan shall include the costs, activities, and test plan necessary to meet the requirements under this section. (Pages 1523-1524)

SEC. 856. APPLICATION OF LIMITATION ON PROCUREMENT OF GOODS OTHER THAN UNITED STATES GOODS TO THE FFG–FRIGATE PROGRAM.

Notwithstanding any other provision of law, amounts authorized to carry out the FFG–Frigate Program may be used to award a new contract that provides for the acquisition of the following components regardless of whether those components are manufactured in the United States:

- (1) Auxiliary equipment (including pumps) for shipboard services.
- (2) Propulsion equipment (including engines, reduction gears, and propellers).
- (3) Shipboard cranes.
- (4) Spreaders for shipboard cranes.

Section 8097(b) of the FY2024 DOD Appropriations Act (Division A of H.R. 2882/P.L. 118-47 of March 23, 2024) states

SEC. 8097....

(b) None of the funds provided in this Act for the FFG(X) Frigate program shall be used to award a new contract that provides for the acquisition of the following components unless those components are manufactured in the United States: Air circuit breakers; gyrocompasses; electronic navigation chart systems; steering controls; pumps; propulsion and machinery control systems; totally enclosed lifeboats; auxiliary equipment pumps; shipboard cranes; auxiliary chill water systems; and propulsion propellers: Provided, That the Secretary of the Navy shall incorporate United States manufactured propulsion engines and propulsion reduction gears into the FFG(X) Frigate program beginning not later than with the eleventh ship of the program.

Provisions similar to Section 8097(b) have been included in annual DOD appropriations acts since the FY2020 DOD appropriations act.

Competition and Contract Award

Four industry teams competed for the FFG-62 program. On April 30, 2020, the Navy announced that it had awarded the FFG-62 contract to the team led by Fincantieri/Marinette Marine (F/MM) of Marinette, WI. F/MM was awarded a fixed-price incentive (firm target) contract for Detail Design and Construction (DD&C) for up to 10 ships in the program—the lead ship plus nine option ships. The other three industry teams reportedly competing for the program were led by Austal USA of Mobile, AL; General Dynamics/Bath Iron Works (GD/BIW) of Bath, ME; and Huntington Ingalls Industries/Ingalls Shipbuilding (HII/Ingalls) of Pascagoula, MS.

Under the DD&C contract, the Navy has the option of recompeting the program at any point prior to the 10th ship. The Navy also has the option of seeking to convert the DD&C at some point into a multiyear contract known as a block buy contract to procure the ships.¹⁹

¹⁹ For more on block buy contracting, see CRS Report R41909, *Multiyear Procurement (MYP) and Block Buy Contracting in Defense Acquisition: Background and Issues for Congress*, by Ronald O'Rourke.

Estimated 36-Month Delay in Delivery of First Ship

January 2024 Press Report of Delay of at Least One Year

In January 2024, it was reported that the delivery of the first ship in the program would be delayed by at least one year, primarily due to shortages of workers at F/MM.²⁰

March 2024 Budget Submission Shows Delay of 15 Months

The Navy's FY2025 budget submission, which was submitted to Congress on March 11, 2024, showed the lead ship's scheduled delivery date as December 2027—15 months later than the September 2026 scheduled delivery date shown in the Navy's FY2024 budget submission. The FY2025 budget submission states that delivery dates for the second and subsequent ships in the program are under review.²¹

April 2024 Navy Announcement of 36-Month Delay

On April 2, 2024, as part of an announcement of significant delays to several of its shipbuilding programs caused by shipbuilder workforce challenges, supply chain issues, and other causes, the Navy announced that the estimated delay in the delivery of the first FFG-62 had grown to 36 months. In the Navy's budget submission for FY2020—the submission in which the Navy requested, and Congress funded, the procurement of the first FFG-62—the Navy estimated that the first FFG-62 would have a 72-month period from contract award to delivery, and within that 72-month period, a 48-month period from construction start to delivery. A 36-month delay in the delivery of the first FFG-62 would equate to a 50% addition to the 72-month period and a 75% addition to the 48-month period.

An April 2, 2024, press report about the Navy's announcement stated

During a media roundtable with reporters on Tuesday [April 2], Naval Sea Systems Command chief Vice Adm. James Downey told reporters that the detail design for the frigate—which is based on Fincantieri Marinette Marine's FREMM parent design that's in service with the Italian and French navies—still isn't complete. The goal is to finalize the detail design this year and the service and contractors are nearing 80 percent completion, Downey said.²²

“Some of the mix of the contracting roles have changed between prime and sub,” Downey told reporters. “And finishing the design has been critical for us. That's why we've co-located the design force from Fincantieri and their sub with the government in a collaboration center up there to finish.”

In August of 2022, when the Navy green lit Fincantieri to begin building the first frigate, Rear Adm. Casey Moton, then the program executive officer for unmanned and small combatants, said the detail design was just over 80 percent complete.

Asked what's driving the delays at Marinette, Downey cited the yard's increased workload, difficulty hiring and keeping talent, and the varying stages of the three programs currently

²⁰ Mallory Shelbourne and Sam LaGrone, “First Constellation Frigate Delayed At Least a Year, Schedule Assessment ‘Ongoing,’” *USNI News*, January 11, 2024. See also Megan Eckstein, “Frigate Program Delayed as Shipyard Is a ‘Few Hundred’ Workers Short,” *Defense News*, January 11, 2024.

²¹ *Department of Defense, Fiscal Year (FY) 2025 Budget Estimates, Navy, Justification Book Volume 1 of 1, Shipbuilding and Conversion, Navy*, March 2024, p. 234.

²² As a best practice for shipbuilding, the Navy generally aims for the detail design of a new class of Navy ship to be 80%-85% complete before beginning construction of the first ship in the program.

under construction there. The yard is finishing the end of the Littoral Combat Ship line, while also building Saudi Arabia’s multi-mission surface combatant and the U.S. Navy’s new frigate.

Downey said the attrition at Marinette is “significantly different” with the yard building those three programs compared to when it was only building the LCS....

To tackle the workforce shortfalls, the Navy plans to give Marinette \$50 million for the surface combatant industrial base.²³ The yard is using those funds to incentivize both its blue and white collar workforce with bonuses to stay at Marinette.²⁴

An April 12, 2024, press report stated:

The shipyard producing the US Navy’s new frigate has been hobbled by a failure to “achieve engineering and skilled workforce levels” for the medium-sized vessel, according to a service document on the project that’s now forecast to run as much as three years late.

Fincantieri Marinette Marine has experienced “unprecedented poor workforce retention—high attrition rates,” according to an unreleased Navy briefing slide prepared for senior service and Pentagon officials late last month. It spelled out the shipyard’s woes in more detail than the publicly released findings of top Navy programs released last week.

The company will require more than 1,600 skilled workers next year, up from more than 900 today, according to the slide....

Navy Secretary Carlos Del Toro acknowledged the frigate builder’s retention issue in a brief interview after congressional testimony on Wednesday [April 10]. He said the service has provided incentive fees for workers to stay on the job — \$5,000 if they stay a first year and \$5,000 “if they stay throughout construction of the first ship,” he said. “We’ve been trying to work with industry to get them to a better place,” he said....

Vice Admiral James Downey, head of Naval Sea Systems Command, told reporters last week that in addition to workforce hiring and retention issues, the frigate delay stemmed in part from the ship’s incomplete design and to Fincantieri working on three programs simultaneously at its Wisconsin yard, including a vessel for Saudi Arabia.

Fincantieri spokesman Eric Dent said in a statement that “we understand” the 36-month delay is a worst-case scenario.

“We know we are on the clock, so challenge accepted,” he said. “We need to improve on a range of workforce issues for sure, and we need a Navy-approved design. We will get there, but we cannot do it alone.”²⁵

May 2024 GAO Report

A May 2024 Government Accountability Office (GAO) report on the FFG-62 program stated:

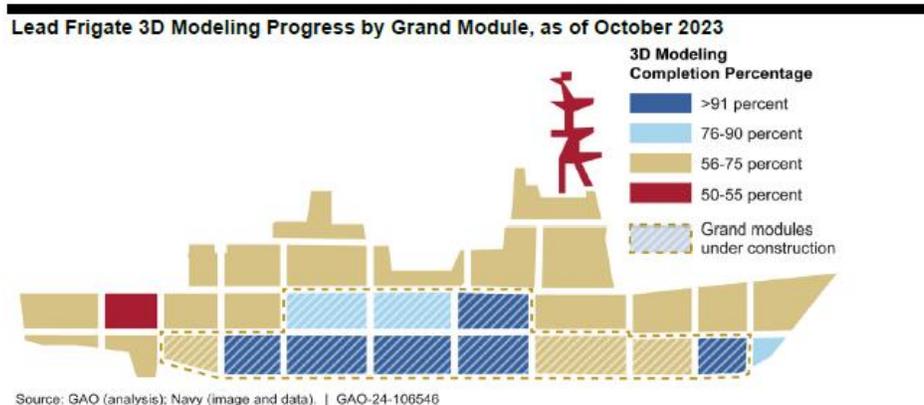
To reduce technical risk [in the FFG-62 program], the Navy and its shipbuilder [in designing the FFG-62] modified an existing [Italian-French frigate] design to incorporate [U.S.] Navy specifications and weapon systems. However, the Navy’s decision to begin construction [of the first FFG-62] before the design was complete is inconsistent with leading ship design practices and jeopardized this approach. Further, design instability has

²³ As part of its action on the Navy’s proposed FY2023 budget, Congress added \$50 million to the FFG-62 line item in the Navy’s shipbuilding account for “frigate industrial base and workforce development.” It is not clear whether this is the same \$50 million being referred to in the press report.

²⁴ Mallory Shelbourne and Sam LaGrone, “Constellation Frigate Delivery Delayed 3 Years, Says Navy,” *USNI News*, April 2 (updated April 3), 2024. See also Megan Eckstein, “US Navy Ship Programs Face Years-Long Delays amid Labor, Supply Woes,” *Defense News*, April 2, 2024.

²⁵ Anthony Capaccio, “US Navy’s New Warship Is Plagued by Worker Turnover,” *Bloomberg*, April 12, 2024.

caused weight growth. The figure shows the frigate’s 3D design—a component of design stability—as incomplete over 1 year after construction began.



Delays in completing the ship design have created mounting construction delays. The Navy acknowledges that the April 2026 delivery date, set in the contract at award, is unachievable. The lead frigate is forecasted to be delivered 36 months later than initially planned. The program office tracks and reports design progress, but its design stability metric hinges largely on the quantity—rather than quality—of completed design documents. This limits insight into whether the program’s schedule is achievable. If the Navy begins construction on the second frigate without improving this metric, it risks repeating the same errors that resulted in construction disruptions and delays with the lead frigate.

The frigate is using many mission systems already proven on Navy ships. However, the Navy has yet to demonstrate two systems—the propulsion and machinery control systems. A planned update to the frigate test plan—combined with the opportunity afforded by schedule delays—could offer the Navy the chance to conduct land-based testing of these two unproven systems. This testing would reduce the risk of discovering issues after the ship is at sea.

The frigate is using a traditional, linear development approach for design and construction. The Navy has historically experienced schedule delays, cost growth, or both in prior shipbuilding programs using this approach. The Navy has incorporated elements of leading practices into its acquisition strategy. However, further incorporating these practices in an updated acquisition strategy could position the program, when contracting for future frigates, to better respond to evolving mission needs.²⁶

Issues for Congress

Estimated 36-Month Delay in Delivery of First Ship

One potential oversight issue for Congress concerns the estimated 36-month delay in the delivery of the first ship in the program. Potential oversight questions for Congress include the following:

- What impact will the delay have on the delivery schedules for follow-on ships in the program?

²⁶ Government Accountability Office, *Navy Frigate[.] Unstable Design Has Stalled Construction and Compromised Delivery Schedules*, GAO-24-106546, May 2024, highlights page. See also Richard Thomas, “Could US Navy’s Constellation-Class Frigates Share Littoral Combat Ship Fate?” *Naval Technology*, June 11, 2024; Joseph Trevithick, “Navy’s New Constellation Class Frigate Is A Mess,” *The War Zone*, May 30, 2024.

- What actions do the shipyard and the Navy plan to take to address the reported worker shortages at the shipyard? How long will it take for those actions to produce results, and how confident are the shipyard and the Navy that these actions will be sufficient to eliminate the reported worker shortages? If these actions include increasing pay and benefits for workers at the shipyard, what impact will that have on the cost of FFG-62s (or other Navy ships) built at the shipyard in coming years?
- To what degree do worker shortages at the shipyard reflect circumstances unique to the shipyard? To what degree do they reflect circumstances affecting shipyards across the country?
- What lessons for future Navy shipbuilding efforts, if any, can the shipbuilding industry and the Navy learn from the delay in the delivery of the first ship?

Potential for Cost Growth, Particularly After First 10 Ships

CRS and CBO Analyses in 2020 and 2023

Another potential issue for Congress concerns the potential for cost growth in the FFG-62 program, particularly after the first 10 ships in the program, which are to be procured under a fixed-price incentive (firm target) contract. As discussed in greater detail in earlier versions of this CRS report,²⁷ CRS and CBO analyses done in 2020 suggested that if FFG-62s were to wind up costing about the same to construct per thousand tons of displacement as other recent U.S. military surface combatants, then FFG-62s could cost substantially more to build than their budgeted unit procurement costs. The preliminary CRS analysis, done by CRS following the Navy's April 30, 2020, contract award in the FFG-62 program, suggested that if FFG-62s were to wind up costing about the same to construct per thousand tons of displacement as other recent U.S. military surface combatants, then the third and subsequent FFG-62s could cost 17% to 56% more than the budgeted estimates for those ships in the Navy's FY2021 budget submission. A follow-on and more refined analysis of the issue that was done by CBO and released on October 13, 2020,²⁸ and which also compared the Navy's FFG-62 budgeted cost estimate to actual costs for building other recent U.S. military surface combatants, estimated that the first 10 FFG-62s would cost 40% more to build than the Navy estimates. An October 2023 CBO report on the cost of the Navy's FY2024 30-year shipbuilding plan, based on updated Navy and CBO figures, estimated that FFG-62s on average will cost 10% to 20% more than the updated Navy estimates.²⁹

²⁷ See, for example, the version dated December 21, 2022, or earlier versions dating back to the version of May 4, 2020.

²⁸ Congressional Budget Office, *The Cost of the Navy's New Frigate*, October 2020, 11 pp.

²⁹ Congressional Budget Office, *An Analysis of the Navy's Fiscal Year 2024 Shipbuilding Plan*, October 2023, Table 8 on pp. 26-27. CBO states that the new estimated difference between CBO and the Navy of 10% to 20%, as opposed to the 40% difference from CBO's October 2020 report, is due to four factors: (1) an increase by the Navy since October 2020 in its estimated costs for building FFG-62s; (2) a decrease by CBO since October 2020 in its estimated costs for building FFG-62s due to an updated treatment of inflation; (3) a shift by CBO from estimating the cost of ships 1 through 10 in CBO's October 2020 report to ships 5 through 20 in CBO's October 2023 report, which among other things eliminated from the analysis the cost of the lead ship, where there is a fairly substantial difference between the CBO and Navy estimates; and (4) the rounding off in CBO's reports of Navy and CBO estimates to the nearest tenth of a billion dollars per ship, which can shift resulting calculations of the percent difference in cost. (Source: CBO telephone call with CRS, November 14, 2023.)

May 2024 GAO Report

The May 2024 GAO report on the FFG-62 program stated that in October 2023, the FFG-62 shipbuilder reported “unplanned weight growth in the frigate design—an increase of over 10 percent above the shipbuilder’s June 2020 weight estimate.”³⁰ Since ship procurement costs are generally proportional to ship displacement (i.e., weight), this weight growth suggests a potential for cost growth beyond the above-discussed figures in the 2020 and 2023 CRS and CBO analyses. The May 2024 GAO report stated: “In December 2023, the Navy initiated a separate review of frigate weight growth to assess risk. The Navy disclosed to us in April 2024 that it is considering a reduction in the frigate’s speed requirement as one potential way, among others, to resolve the weight growth affecting the ship’s design.”³¹

Potential Consequences of Cost Growth

Depending on the exact terms of the fixed-price incentive (firm target) contract that the Navy awarded to F/MM for the first 10 ships in the FFG-62 program, some portion (perhaps much) of any cost growth that might occur on the first 10 FFG-62s could be borne by F/MM rather than the Navy, although F/MM under such a circumstance might also have the option of seeking some form of contractual relief from the Navy, which if granted could shift at least some of the cost growth back to the government.³² If F/MM were to bear most or all of any cost growth that might occur on the first 10 FFG-62s, then cost growth in the FFG-62 program, if it were to occur, might not affect Navy budgeting substantially until the 11th ship in the program. Under the Navy’s FY2025 budget submission, the 11th ship in the program is to be the first of the two ships that are programmed for procurement in FY2028.

Potential Oversight Questions

Potential oversight questions for Congress include the following:

- What is the Navy’s basis for its view that FFG-62s—ships that are to be about three-quarters as large as U.S. Navy’s new Flight III Arleigh Burke (DDG-51) class destroyers³³ in terms of displacement, and with installed capabilities that are in many cases similar to those of DDG-51s—can be procured for less than one-half the cost of Flight III DDG-51s?
- Under the terms of the fixed-price incentive (firm target) contract that the Navy awarded to F/MM for the FFG-62 program, what portion of any cost growth that

³⁰ Government Accountability Office, *Navy Frigate[:] Unstable Design Has Stalled Construction and Compromised Delivery Schedules*, GAO-24-106546, May 2024, p. 17.

³¹ Government Accountability Office, *Navy Frigate[:] Unstable Design Has Stalled Construction and Compromised Delivery Schedules*, GAO-24-106546, May 2024, p. 18.

³² For example, in 2019, Eastern Shipbuilding Group of Panama City, FL, requested and received contractual relief for Offshore Patrol Cutters (OPCs) that it is building for the Coast Guard. The relief was granted under P.L. 85-804 as amended (50 U.S.C. 1431-1435), a law that authorizes certain federal agencies to provide certain types of extraordinary relief to contractors who are encountering difficulties in the performance of federal contracts or subcontracts relating to national defense. ESG reportedly submitted a request for extraordinary relief on June 30, 2019, after ESG’s shipbuilding facilities were damaged by Hurricane Michael, which passed through the Florida panhandle on October 10, 2018. For additional discussion of the OPC program, including the contractual relief provided under P.L. 85-804, see CRS Report R42567, *Coast Guard Cutter Procurement: Background and Issues for Congress*, by Ronald O’Rourke. See also Congressional Budget Office, *The Cost of the Navy’s New Frigate*, October 2020, p. 11.

³³ For more on the DDG-51 program, see CRS Report RL32109, *Navy DDG-51 and DDG-1000 Destroyer Programs: Background and Issues for Congress*, by Ronald O’Rourke.

might occur on the first 10 FFG-62s might be borne by F/MM, and what portion might be borne by the Navy?

- If the budgeted procurement costs of FFG-62s rise substantially starting with the 11th ship in the program, what impact, if any, would that have on the Navy's ability to afford other Navy program priorities? What impact, if any, would it have on the cost effectiveness of the FFG-62 program relative to other Navy investments?

Whether and When to Introduce a Second Shipyard into Program

Another issue for Congress is whether and when to introduce a second shipyard into the FFG-62 program. The Navy's FFG-7s, which were procured at annual rates of as high as eight ships per year, were built at three shipyards. In considering whether to build FFG-62s at a single shipyard or at two shipyards, Congress may consider several factors, including but not limited to the annual FFG-62 procurement rate, shipyard production capacities and production economies of scale, the potential costs and benefits in the FFG-62 program of employing recurring competition between multiple shipyards, and how the number of FFG-62 builders might fit into a larger situation involving the production of other Navy and Coast Guard ships, including Navy DDG-51 destroyers, Navy amphibious ships, and Coast Guard Offshore Patrol Cutters (OPCs).³⁴

The Navy stated in 2022 that in terms of having a technical data package ready for a second builder, the Navy could introduce a second builder into the FFG-62 program with a ship procured as early as FY2024.³⁵ At an April 18, 2023, hearing before the Senate Armed Services Committee on the Navy's proposed FY2024 budget, the following exchange occurred:

SENATOR ROGER WICKER (continuing):

And Secretary Del Toro, let's talk briefly about frigates. Now we're building those in Wisconsin now.

THEN-SECRETARY OF THE NAVY CARLOS DEL TORO:

That's correct, sir.

WICKER:

And—and the decision has been made to—to build the frigates there and at another shipyard. Is that correct?

DEL TORO:

No, sir, not as of right now. The decis—

WICKER:

—That has not been made?

DEL TORO:

No, sir. That decision has not been made.

WICKER:

³⁴ For more on the DDG-51 program, see CRS Report RL32109, *Navy DDG-51 and DDG-1000 Destroyer Programs: Background and Issues for Congress*, by Ronald O'Rourke. For more on Navy amphibious shipbuilding programs, see CRS Report R43543, *Navy LPD-17 Flight II and LHA Amphibious Ship Programs: Background and Issues for Congress*, by Ronald O'Rourke. For more on the OPC program, see CRS Report R42567, *Coast Guard Cutter Procurement: Background and Issues for Congress*, by Ronald O'Rourke.

³⁵ Source: Navy FY2023 program briefing for CRS and CBO, May 10, 2022.

Ok, well, where are we on that?

DEL TORO:

We're actually waiting for the completion of the [FFG-62] technical design package, which is expected by the end of this year. Once that technical design package is fully mature and submitted for review, we will review it. And at that point, we'll make a decision on whether we have the ability to actually take that technical data package and make sure that it's mature enough to actually compete, perhaps compete with another shipyard, so that we can have two shipyards building the Constellation class—

WICKER:

Well, we're going to need four years, is that right?

DEL TORO:

I'm sorry, sir?

WICKER:

We're going to need four frigates a year. And that—that concept is a way to get that, is that correct?

DEL TORO:

No, sir. Right now, the president's budget recommends [a] sawtooth [FFG-62 procurement] pattern [with annual quantities] of two, one, two, one, moving forward. So it's two frigates a year that we will initially need.

WICKER:

How—Admiral Gilday, how important would it be to—to move to [a procurement rate of] four [per year]?

THEN-CHIEF OF NAVAL OPERATIONS MICHAEL M. GILDAY:

I think very important, based on the comments both you and the chairman [made] at the opening of the committee [hearing]. If we could get to a second shipyard, and [procure] two a year from each shipyard, [while also procuring from other shipyards] two destroyers, two to three destroyers a year, we'd be in a much better place. We are catching up, and you can't buy back time, sir, with the seven shipyards that we have [currently involved in building the Navy's larger and more complex ships], relative to the 30 [shipyards that existed in the United States] that we had years ago.

WICKER:

It's going to be hard to get to four a year, without designating two shipyards, do you agree?

GILDAY:

I agree. I also agree with—with the secretary's comments. I think two—two shipyards is in the plan. We want to make sure that we're measuring twice and cutting once [regarding the correctness of the details of the FFG-62 design] before that decision is made.³⁶

The explanatory statement for the FY2022 DOD Appropriations Act (S. XXXX) that the Senate Appropriations Committee released on October 18, 2021, stated (emphasis added)

While the Committee recognizes the significant role that CCF [Constellation-class frigate] will have in the future Navy battle force, and is based on a proven hull design and mature

³⁶ Source: CQ transcript. See also Sam LaGrone, "CNO: 'Very Important' to Add 2nd Constellation-class Shipyard, Build 4 Frigates a Year," *USNI News*, April 18, 2023; Rich Abott, "CNO Says 'Very Important To Get Second Frigate Shipyard and Build Four Per Year,'" *Defense Daily*, April 19, 2023.

shipboard technologies, it remains a new class and presents typical first-in-class production challenges. The Committee notes the past challenges of the Navy and shipbuilding industrial base in managing costs, technical concurrency, design changes, and schedule of lead ships of a class. The Committee is concerned that prematurely adding a second CCF shipyard before the first shipyard has identified and corrected technical and production issues will inject unneeded risk and complexity into the program. **Therefore, prior to award of a contract for a second CCF shipyard, the Committee directs the Secretary of the Navy to prioritize the following objectives: technology maturation and risk reduction for critical shipboard components; major systems integration; full ship technical data package creation; and successful operationally realistic testing for the first ship.** The Committee also understands that setting up the CCF manufacturing capacity, workforce, and supply chain requires consistent year-over-year funding to meet the demand for production ramp up. Therefore, the Committee directs the Secretary of the Navy to submit a report not later than 90 days prior to awarding a contract for the second CCF shipyard to the congressional defense committees outlining the acquisition strategy for achieving the full Frigate Program of Record and meeting these technology maturation and risk reduction objectives. (PDF page 108 of 253)

The Navy stated in 2022 that the above report language, particularly the requirement for successful operationally realistic testing for the first ship, could be read as barring the introduction of a second builder into the FFG-62 until sometime after the first FFG-62 ship is delivered.³⁷ Another possible perspective on the above report language is that it would bar the introduction of a second builder into the program until the Secretary of the Navy *prioritizes the objective* of successful operationally realistic testing of the first ship, which is not the same as *conducting* successful operationally realistic testing. Under this interpretation, prioritizing this objective (i.e., designating it as an important objective) is something that the Secretary of the Navy could do immediately.

Number of VLS Tubes

Another potential oversight issue for Congress—one discussed in this CRS report since April 2019³⁸—concerns the number of vertical launch system (VLS) missile tubes in the FFG-62 design. The VLS is the FFG-62's principal (though not only) means of storing and launching missiles. FFG-62s are to each be equipped with 32 Mark 41 VLS tubes. (The Mark 41 is the Navy's standard VLS design.)

Supporters of requiring each FFG-62 to be equipped with a larger number of VLS tubes, such as 48, might argue that FFG-62s are to be roughly three-quarters as large as the Navy's DDG-51 class destroyers, and might therefore be more appropriately equipped with at least 48 VLS tubes, which is one-half the number on recent DDG-51s. They might also argue that in a context of renewed great power competition with potential adversaries such as China, which is steadily improving its naval capabilities,³⁹ it might be prudent to equip each FFG-62 with 48 rather than 32 VLS tubes each, and that doing so might only marginally increase FFG-62 unit procurement costs. They might also argue that equipping each FFG-62 with 48 rather than 32 VLS tubes will permit the Navy to more fully offset a substantial reduction in VLS tubes that the Navy's surface fleet is projected to experience when the Navy's 22 Ticonderoga (CG-47) class cruisers, which

³⁷ Source: Navy FY2023 program briefing for CRS and CBO, May 10, 2022.

³⁸ See page 11 of the April 19, 2019, update of this CRS report.

³⁹ For more on China's naval modernization effort, see CRS Report RL33153, *China Naval Modernization: Implications for U.S. Navy Capabilities—Background and Issues for Congress*, by Ronald O'Rourke.

are each equipped with 122 VLS tubes, are retired,⁴⁰ and provide a hedge against the possibility that Navy plans to field VLS tubes on Large Unmanned Surface Vehicles (LUSVs)⁴¹ will be slowed or curtailed for technical or other reasons.

Supporters of having each FFG-62 be equipped with 32 VLS tubes might argue that the analyses indicating a need for 32 VLS tubes already took improving adversary capabilities (as well as other U.S. Navy capabilities) into account. They might also argue that FFG-62s, in addition to having 32 VLS tubes, will also have separate, deck-mounted box launchers for launching 16 anti-ship cruise missiles, as well as a separate, 21-cell Rolling Airframe Missile (RAM) AAW missile launcher; that Navy plans continue to call for eventually deploying additional VLS tubes on LUSVs, which are to act as adjunct weapon magazines for the Navy's manned surface combatants; and that increasing the number of VLS tubes on each FFG-62 from 32 to 48 would increase (even if only marginally) the procurement cost of a ship that is intended to be an affordable supplement to the Navy's cruisers and destroyers.

A May 14, 2019, Navy information paper on the cost impact of expanding the FFG-62 VLS capacity from 32 cells to 48 cells states

To grow from a 32 Cell VLS to a 48 Cell VLS necessitates an increase in the length of the ship with a small beam increase and roughly a 200-ton increase in full load displacement. This will require a resizing of the ship, readdressing stability and seakeeping analyses, and adapting ship services to accommodate the additional 16 VLS cells.

A change of this nature would unnecessarily delay detail design by causing significant disruption to ship designs. Particularly the smaller ship designs. Potential competitors have already completed their Conceptual Designs and are entering the Detail Design and Construction competition with ship designs set to accommodate 32 cells.

The cost is estimated to increase between \$16M [million] and \$24M [million] per ship. This includes ship impacts and additional VLS cells.⁴²

Compared to an FFG-62 follow-on ship unit procurement cost of roughly \$1.1 billion to \$1.2 billion, the above estimated increase of \$16 million to \$24 million would equate to an increase in unit procurement cost of about 1.3% to about 2.2%.⁴³ The estimated figure of \$16 million to \$24 million, however, dates to 2019. Inflating it to current costs would produce a percentage increase in total ship procurement cost that would be somewhat greater than 1.3% to 2.2%.

Technical Risk

Another potential oversight issue for Congress concerns technical risk in the FFG-62 program.

⁴⁰ See, for example, Megan Eckstein and Joe Gould, "Lawmakers Crunching the Numbers on Potential Surface Navy Additions to FY22 Spending Plan," *Defense News*, June 17, 2021; Mallory Shelbourne, "Lawmakers Probe Navy's Plan to Decommission Cruisers, Navy Says Cuts Will Save \$5B Across FYDP," *USNI News*, June 17 (updated June 18), 2021; Megan Eckstein, "Lawmakers Are Worried About the US Navy's Spending Plan and a Near-Term China Threat," *Defense News*, June 15, 2021; Mallory Shelbourne, "CNO Gilday: Flat or Declining Navy Budgets 'Will Definitely Shrink' the Fleet," *USNI News*, June 15, 2021; Blake Herzinger, "The Budget (and Fleet) That Might Have Been," *War on the Rocks*, June 10, 2021; David B. Larter, "As the US Navy Scrambles to Field More Missiles in Asia, a Tough Decision Looms for Aging Cruisers," *Defense News*, April 12, 2021.

⁴¹ For more on the LUSV program, see CRS Report R45757, *Navy Large Unmanned Surface and Undersea Vehicles: Background and Issues for Congress*, by Ronald O'Rourke.

⁴² Navy information paper entitled "FFG(X) Cost to Grow to 48 cell VLS," dated May 14, 2019, received from Navy Office of Legislative Affairs on June 14, 2019.

⁴³ For additional discussion, see Joseph Trevithick and Tyler Rogoway, "Does The Navy's New Constellation Class Frigate Have Enough Vertical Launch Cells?" *The Warzone*, January 31, 2024.

May 2024 GAO Report

Regarding GAO’s perspective on technical risk in the FFG-62 program, see the quoted passage from the May 2024 GAO report on the FFG-62 program that is presented earlier in this CRS report, in the section on the estimated 36-month delay in the delivery of the first FFG-62.

June 2024 GAO Report

In addition to the above-cited May 2024 GAO report, a June 2024 GAO report—the 2024 edition of GAO’s annual report surveying DOD major acquisition programs—stated the following about the FFG-62 program:

Technology Maturity, Design Stability, and Production Readiness

The Navy identified no critical technologies for the frigate program. Frigate capabilities rely predominantly on successful incorporation of mission systems already developed and deployed in the Navy’s fleet. For example, the frigate design includes the Enterprise Air Surveillance Radar and Aegis combat system—both currently fielded on other ship classes. Nonetheless, integrating these systems into the frigate design has necessitated changes to the scaling of hardware and development of new software code. The Navy is mitigating resulting integration risk by leveraging data from ongoing tests aboard Gerald R. Ford class aircraft carriers and Arleigh Burke class destroyers, coupled with land-based tests that began in 2023.

While the program is predominately leveraging existing mission systems to mitigate risk, two planned newly developed systems pose high technical and integration risks. The frigate will field new propulsion and machinery control systems never used by the Navy. In response to statute, the Navy is building a Land Based Engineering Site (LBES) to test these systems to mitigate development and integration risks. LBES was not expected to be fully operational prior to the previously forecasted December 2026 delivery date, according to Navy officials.

Completing functional design and 3D modeling continues to take longer than the Navy anticipated and remains incomplete over a year after beginning lead ship construction. As of October 2023, the functional design was 92 percent complete and 3D modeling was 84 percent complete. Program officials stated that they set a goal to complete 80 percent of the functional design by construction start. However, the program’s approach is inconsistent with shipbuilding leading practices, which call for completion of these design activities prior to construction start.

Ongoing delays have resulted from challenges adapting a foreign ship design to meet Navy survivability requirements, outstanding vendor-furnished information needed to inform the design, and workforce issues. The Navy increased on-site coordination efforts with its shipbuilder and industry stakeholders to remedy and approve deficient design products, but progress remains limited. As a result, the shipbuilder constructed early modules using an incomplete design and, more recently, slowed construction activities to await design stability.

As a result of the delays, the shipbuilder will not meet either its April 2026 contract delivery date or its more-recently estimated December 2026 delivery date for the lead frigate, according to the program. In December 2023, the Navy reported that the lead ship will be delayed at least 1 year, but an estimated delivery date for the lead and follow-on ships will not be confirmed until the Navy completes an ongoing schedule assessment. In January 2024, the Secretary of the Navy directed a separate assessment of the shipbuilding portfolio due, in part, to concerns with the frigate program.

Software and Cybersecurity

The program is using a modern software development approach, including Agile, DevOps, and DevSecOps to develop, deliver, and test various subsystem software, such as Aegis and the machinery control system.

Initial developmental testing of Aegis software started in August 2023 at land-based test sites, with follow-on tests scheduled to occur every 1 to 3 months. Testing provides system operators with the opportunity to test radar and Aegis equipment on simulators. Machinery control system software development is planned over three software releases, comprised of six builds. The contractor has released four of these builds to date with two more planned to follow, scheduled through January 2025.

The program completed its second cyber tabletop exercise in April 2023. It also plans to conduct a vulnerability identification assessment and adversarial cybersecurity development test and evaluation in April 2024 and April 2025, respectively. Additional cybersecurity tests are planned prior to initial operational capability in 2029.

Program Office Comments

We provided a draft of this assessment to the program office for review and comment. The program office provided technical comments, which we incorporated where appropriate.

The Navy stated that it chartered an independent review team to perform a holistic assessment of the shipbuilder's production schedules, identify key issues, and recommend actions. Additionally, the Navy reported that it increased design and production efforts by bringing in both Navy and contracted engineering design support personnel at the shipbuilder's site to bolster and accelerate design stability completion and ramp-up of production.

In April 2024, after our cutoff date for new information, the Navy announced that the delivery of the lead ship was expected to be delayed approximately 3 years past the April 2026 contract delivery date.⁴⁴

January 2024 DOT&E Report

A January 2024 report from DOD's Director, Operational Test and Evaluation (DOT&E)—DOT&E's annual report for FY2023—stated the following regarding the FFG-62 program:

TEST ADEQUACY

In March 2023, DOT&E published a classified FFG 62 EOA [early operational assessment] report based on evaluations conducted between February 2022 and July 2022 and detailed in the FY22 Annual Report. Evaluations were adequate to determine potential FFG 62 design risks that could affect operational effectiveness and suitability of the delivered ship. The EOA provides the FFG 62 Program with an opportunity to consider modifications to the ship design. The FFG 62 Program will also use the EOA to inform development of the next TEMP [test and evaluation master plan] revision expected to be completed in FY25. The Navy conducted the EOA in accordance with a DOT&E-approved test plan, and it was observed by DOT&E.

In FY23, the Navy conducted testing against a large scale-model of a generic ship incorporating characteristics typical of Navy standard ship structure and a responding mid-deck plate to generate response data for under-bottom explosions. This test was similar to the test detailed in the FY22 Annual Report but focused on different structure response. Data from these tests provide validation data for survivability models used to predict the magnitude and extent of damage from underwater threat weapons. The Navy conducted

⁴⁴ Government Accountability Office, *Weapon Systems Annual Assessment[:]* DOD Is Not Yet Well-Positioned to Field Systems with Speed, GAO-24-106831, June 2024, p. 138.

this test in accordance with the DOT&E-approved test plan, and it was observed by DOT&E.

In FY23, the FFG 62 Program approved the FFG 62 Verification, Validation, and Accreditation (VV&A) Plans for the Advanced Survivability Assessment Program (ASAP) and Navy Enhanced Sierra Mechanics (NESM) M&S [modeling and simulation] tools. These plans are adequate to determine the sufficiency of these M&S within the LFT&E [live fire test and evaluation] test strategy. Further, the Navy continued M&S modification that incorporates new capabilities, including improvements in the blast and whipping codes. The Navy is working closely with DOT&E on the development of M&S plans to support the Detail Design Survivability Assessment Report that the FFG 62 Program expects to publish in FY26.

PERFORMANCE

EFFECTIVENESS

No data are available to determine FFG 62 operational effectiveness due to FFG 62 being in development. However, the FFG 62 design presents risks to operational effectiveness in each of its primary mission areas: air warfare, anti-submarine warfare, and surface warfare. Classified risks to operational effectiveness are in the FFG 62 EOA report. Unclassified risks to operational effectiveness include that the FFG 62 design does not have a tracker illuminator system, which is typically installed on other Aegis platforms, and that the design crew size will be highly reliant on currently unproven system automation and human system interfaces. The Navy acknowledges the risk of the current crewing strategy for FFG 62 and is working with the appropriate stakeholders to mitigate and eliminate the associated risk to mission performance. Further, the FFG 62 Program reports that they currently have sufficient access to technical information on the Thales CAPTAS-4 [variable-depth sonar] needed to effectively integrate it with the AN/SQQ-89(V)16 [undersea warfare] system.

SUITABILITY

No data are available to determine FFG 62 operational suitability due to FFG 62 being in development. Further, reliability, maintainability, and availability data for hull, mechanical, and electrical systems are not yet available to identify associated risk in the FFG 62 design.

SURVIVABILITY

No data are available to determine the cyber survivability of FFG 62 due to its early stage of development. Cyber survivability was not assessed during the EOA.

Insufficient data are available to determine FFG 62 survivability due to ongoing LFT&E. The Navy continued to close outstanding vulnerability knowledge gaps and support validation of survivability M&S through additional large-scale underwater explosion testing in FY23.

RECOMMENDATIONS

The Navy should:

1. Provide an update to the FFG 62 TEMP that includes the strategy to test anti-air warfare mission capability.
2. Continue to monitor the development of the mission system autonomy/automation components in the ship design to minimize risk to mission performance and system maintenance capability, and if necessary, complete a reassessment of the adequacy of crew

sizing to allow opportunity to incorporate modifications of the ship design, should additional crewing be required to support all intended missions.⁴⁵

Press Reports

An April 13, 2022, press report stated

The Navy will begin construction on the first Constellation-class frigate this summer or fall, later than the program’s goal to begin construction in April.

The program won’t start construction until the critical design review is completed, according to Capt. Kevin Smith, the frigate program manager.

“You may say, ‘you’ve been working on design for a while.’ We want to make sure we get it right before we start cutting steel. Lead ships are hard,” Smith said last week at the Navy League’s Sea-Air-Space conference.⁴⁶

A March 31, 2022, press report stated

Following an announcement earlier this week that the Navy would cancel a key anti-submarine warfare effort bound for the Littoral Combat Ship, the service today also said it would replace that technology with an alternative system onboard the new Constellation-class frigate.

Rear Adm. Casey Moton, a senior officer overseeing both ship classes, told a small group of reporters that “following an assessment,” the Navy chose the CAPTAS-4 variable depth sonar (VDS) made by Advanced Acoustics Concepts, a subsidiary of DRS and Thales, as the new frigate VDS.

“The Navy assessed CAPTAS-4 as a low risk VDS option for FFG-62 due to its proven performance, overall technical readiness level, low risk integration with the SQQ-89 ASW combat system, ability to integrate with the frigate platform design and ability to meet the in-yard need date for FFG-62,” Moton said....

The consequences for the last-minute change to the Navy’s contract with Raytheon are still being worked out, Moton said, but he added that the company had been “professional” throughout the process to date. The admiral also said he does not anticipate “very much of a change” to the ship’s cost as a result of the new VDS.⁴⁷

A January 2022 press report about whether changes made to FREMM parent design introduce technical risk to the FFG-62 program stated

Experts told Breaking Defense that not all changes [from a parent design] are as inherently risky as they might seem, and the Navy appears to have heeded lessons from previous controversies....

“In terms of changes from a parent design... as you start to drive further away from a parent design, there is the risk of cost increase, especially if you have immature equipment that requires testing or fails testing,” said Steven Wills, a Navy strategy and policy expert at CNA, a federally funded research and development center that provides advice to the Pentagon....

⁴⁵ Director, Operational Test & Evaluation, *FY 2023 Annual Report*, January 2024, pp. 200-201.

⁴⁶ Audrey Decker, “Frigate Construction Pushed Back from April Target Start Date,” *Inside Defense*, April 13, 2022.

⁴⁷ Justin Katz, “Navy to Swap Sonar on New Frigate Following Years of Struggles with Testing,” *Breaking Defense*, March 31, 2022. See also Megan Eckstein, “US Navy to Terminate DART Sonar Development with Raytheon,” *Defense News*, March 31, 2022; Rich Abott, “Navy Cites Reasons For Ditching DART Sonar For LCS, Frigate,” *Defense Daily*, September 1, 2022.

When asked this month at the Surface Navy Association’s annual symposium about how those changes could impact the program’s risk calculus, Capt. Kevin Smith, the Constellation-class program manager, said the parent design is a starting point, but nothing more.

“I think it was clear to everyone in Navy leadership as well as congressional leadership that the parent is there as just that... think of it as a DNA,” he said. “But you do have to take US Navy standards and apply those, and also the requirements.”...

“The only thing that we’ve [the Navy] done actually—it’s a change to the requirements—is buy American, because that was a statute from Congress,” Smith said, referring to legislation mandating certain parts and percentages of US warships be manufactured domestically....

But CNA’s Wills said one major difference between the FREMM and the Constellation, the elongated hull form, is not surprising because of differences in how Europeans and the United States go about building warships.

“You don’t incur a lot of costs in making the ship bigger. That shouldn’t slow you down. That shouldn’t cause testing to fail,” he said. “You’re going to have to buy more steel and there will be some changes. The benefit that they seem to be going for... is they’re looking for some additional margins throughout the life of the ship.”

Matthew Collette, who teaches naval architecture and marine engineering at the University of Michigan, said fully adopting a parent design without modification is “exceptionally rare” especially for the US Navy, which has developed standards for internal layouts and adheres to congressional policy dictating supply chain options.

“Changing the overall dimensions of the ship is probably lowering the overall risk to the program, not raising it,” Collette told *Breaking Defense*. “Given that we are changing the internals of the design, adhering strictly to the old hull form would actually increase the overall risk to the program, as you end up adding complexity by trying to shoehorn in components in a less-than-ideal layout.”

He cited the Ticonderoga-class cruisers and Whidbey Island-class dock landing ships as examples where Navy programs have historically suffered because the service attempted to maintain the ships’ external design while altering its internal layout.

Collette said there are three principles a shipbuilding program should follow to reduce the risk of modifying a parent design. The first is choosing proven systems when swapping out components. In the Constellation’s case, the Navy has done just that by choosing systems such as Aegis, the Mk 41 Vertical Launching System and the SLQ-32 from the Surface Electronic Warfare Improvement Program.

The second principle is to thoroughly test new components ashore, a requirement Congress codified in law after finding out the Navy failed to do this on other systems that proved troublesome for the Ford.

The last principle is having a completed definition of the parent design, such as a 3D model, a parameter for which Collette and other analysts have no way of assessing from outside the Navy’s program office.

“Even with some changes, the program is still benefiting from access to the original design models, and the knowledge gained in building and operating vessels that are highly similar, but no longer exactly the same, to the US Navy variant,” Collette said.⁴⁸

⁴⁸ Justin Katz, “For Navy’s New Frigate, Design Changes Carry Risks and Rewards,” *Breaking Defense*, January 24, 2022.

See also the **Appendix** regarding the Navy’s use of a guaranty rather than a warranty in the Detail Design and Construction (DD&C) contract for the first 10 ships in the FFG-62 program.

Legislative Activity for FY2025

Summary of Congressional Action on FY2025 Funding Request

Table 2 summarizes congressional action on the Navy’s FY2025 funding request for the FFG-62 program.

Table 2. Congressional Action on FY2025 Procurement Funding Request

Millions of dollars, rounded to nearest tenth.

	Request	Authorization			Appropriation		
		HASC	SASC	Enacted	HAC	SAC	Enacted
Procurement	1,170.4	0			0		
Advance procurement (AP)	0	37.5			0		
<i>(Procurement quantity)</i>	<i>(1)</i>	<i>(0)</i>			<i>(0)</i>		

Sources: Table prepared by CRS based on FY2025 Navy budget submission, committee and conference reports, and explanatory statements on the FY2025 National Defense Authorization Act and the FY2025 DOD Appropriations Act.

Notes: **HASC** is House Armed Services Committee; **SASC** is Senate Armed Services Committee; **HAC** is House Appropriations Committee; **SAC** is Senate Appropriations Committee.

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

House

The House Armed Services Committee, in its report (H.Rept. 118-529 of May 31, 2024) on H.R. 8070, recommended the funding levels shown in the HASC column of **Table 2**. The recommended reduction of \$1,170.4 million in procurement funding (the entire requested amount) is for “Program delay.” The recommended increase of \$37.5 million in advance procurement (AP) funding is for “Frigate industrial base and workforce development.” (Page 426)

H.Rept. 118-529 states:

United States Navy constellation class frigates program

The committee recognizes the importance of frigates to fill a gap in the U.S. Navy’s fleet and be capable of conducting anti-air warfare, anti-surface warfare, anti-submarine warfare, and electromagnetic warfare operations in both blue water and littoral areas. The committee recognizes the importance of national security in the proposed selected homeports, Naval Station Everett and Naval Station Mayport. The committee is concerned with the reported 3-year delay in the delivery of the lead ship due to design instability and workforce shortage but remains supportive of the mission and the capability it will bring once delivered to the fleet. (Page 26)

FY2025 DOD Appropriations Act (H.R. 8774)

House

The House Appropriations Committee, in its report (H.Rept. 118-557 of June 17, 2024) on H.R. 8774, recommended the funding levels shown in the HAC column of **Table 2**. The recommended reduction of \$1,170.4 million in procurement funding (the entire requested amount) is for “Program delay.” (Page 129)

Section 8093(b) of H.R. 8774, a recurring provision, states:

SEC. 8093....

(b) None of the funds provided in this Act for the FFG(X) Frigate program shall be used to award a new contract that provides for the acquisition of the following components unless those components are manufactured in the United States: Air circuit breakers; gyrocompasses; electronic navigation chart systems; steering controls; pumps; propulsion and machinery control systems; totally enclosed lifeboats; auxiliary equipment pumps; shipboard cranes; auxiliary chill water systems; and propulsion propellers: Provided, That the Secretary of the Navy shall incorporate United States manufactured propulsion engines and propulsion reduction gears into the FFG(X) Frigate program beginning not later than with the eleventh ship of the program.

H.Rept. 118-557 states:

FRIGATE CONSTRUCTION

The Committee notes that despite findings in the 45-day Shipbuilding Review that show the Constellation-class frigate is at least three years behind schedule, the Navy continues to request funding to construct frigates at a rate that the program has demonstrated it is unable to meet. In addition to the delays found with lead-ship construction, the Committee notes the delivery dates for the three follow-on frigates currently under contract are unknown. The Committee is concerned by persisting design instability for the lead ship that may further impact construction. Therefore, the Committee recommendation provides no funding for the procurement of a frigate in fiscal year 2025. (Page 132)

Appendix. Guaranty vs. Warranty in Construction Contract

This appendix presents background information regarding the Navy's use of a guaranty rather than a warranty in the Detail Design and Construction (DD&C) contract for the first 10 ships in the FFG-62 program. An August 2019 GAO report on the FFG-62 program states

The Navy plans to use a fixed-price incentive contract for FFG(X) detail design and construction. This is a notable departure from prior Navy surface combatant programs that used higher-risk cost-reimbursement contracts for lead ship construction. The Navy also plans to require that each ship has a minimum guaranty of \$5 million to correct shipbuilder-responsible defects identified in the 18 months following ship delivery. However, Navy officials discounted the potential use of a warranty—another mechanism to address the correction of shipbuilder defects—stating that their use could negatively affect shipbuilding cost and reduce competition for the contract award. The Navy provided no analysis to support these claims and has not demonstrated why the use of warranties is not a viable option. The Navy's planned use of guarantees helps ensure the FFG(X) shipbuilder is responsible for correcting defects up to a point, but guarantees generally do not provide the same level of coverage as warranties. GAO found in March 2016 that the use of a guaranty did not help improve cost or quality outcomes for the ships reviewed. GAO also found the use of a warranty in commercial shipbuilding and certain Coast Guard ships improves cost and quality outcomes by requiring the shipbuilders to pay to repair defects. The FFG(X) request for proposal offers the Navy an opportunity to solicit pricing for a warranty to assess the cost-effectiveness of the different mechanisms to address ship defects.⁴⁹

As discussed in another CRS report,⁵⁰ in discussions of Navy (and also Coast Guard) shipbuilding, a question that sometimes arises is whether including a warranty in a shipbuilding contract is preferable to not including one. The question can arise, for example, in connection with a GAO finding that “the Navy structures shipbuilding contracts so that it pays shipbuilders to build ships as part of the construction process and then pays the same shipbuilders a second time to repair the ship when construction defects are discovered.”⁵¹

Including a warranty in a shipbuilding contract (or a contract for building some other kind of defense end item), while potentially valuable, might not always be preferable to not including one—it depends on the circumstances of the acquisition, and it is not necessarily a valid criticism of an acquisition program to state that it is using a contract that does not include a warranty (or a weaker form of a warranty rather than a stronger one).

Including a warranty generally shifts to the contractor the risk of having to pay for fixing problems with earlier work. Although that in itself could be deemed desirable from the government's standpoint, a contractor negotiating a contract that will have a warranty will incorporate that risk into its price, and depending on how much the contractor might charge for doing that, it is possible that the government could wind up paying more in total for acquiring the

⁴⁹ Government Accountability Office, *Guide Missile Frigate[:] Navy Has Taken Steps to Reduce Acquisition Risk, but Opportunities Exist to Improve Knowledge for Decision Makers*, GAO-19-512, August 2019, summary page.

⁵⁰ See CRS Report RL32665, *Navy Force Structure and Shipbuilding Plans: Background and Issues for Congress*, by Ronald O'Rourke.

⁵¹ See Government Accountability Office, *Navy Shipbuilding[:] Past Performance Provides Valuable Lessons for Future Investments*, GAO-18-238SP, June 2018, p. 21. A graphic on page 21 shows a GAO finding that the government was financially responsible for shipbuilder deficiencies in 96% of the cases examined by GAO, and that the shipbuilder was financially responsible for shipbuilder deficiencies in 4% of the cases.

item (including fixing problems with earlier work on that item) than it would have under a contract without a warranty.

When a warranty is not included in the contract and the government pays later on to fix problems with earlier work, those payments can be very visible, which can invite critical comments from observers. But that does not mean that including a warranty in the contract somehow frees the government from paying to fix problems with earlier work. In a contract that includes a warranty, the government will indeed pay something to fix problems with earlier work—but it will make the payment in the less-visible (but still very real) form of the up-front charge for including the warranty, and that charge might be more than what it would have cost the government, under a contract without a warranty, to pay later on for fixing those problems.

From a cost standpoint, including a warranty in the contract might or might not be preferable, depending on the risk that there will be problems with earlier work that need fixing, the potential cost of fixing such problems, and the cost of including the warranty in the contract. The point is that the goal of avoiding highly visible payments for fixing problems with earlier work and the goal of minimizing the cost to the government of fixing problems with earlier work are separate and different goals, and that pursuing the first goal can sometimes work against achieving the second goal.⁵²

DOD's guide on the use of warranties states the following:

Federal Acquisition Regulation (FAR) 46.7 states that “the use of warranties is not mandatory.” However, if the benefits to be derived from the warranty are commensurate with the cost of the warranty, the CO [contracting officer] should consider placing it in the contract. In determining whether a warranty is appropriate for a specific acquisition, FAR Subpart 46.703 requires the CO to consider the nature and use of the supplies and services, the cost, the administration and enforcement, trade practices, and reduced requirements. The rationale for using a warranty should be documented in the contract file....

In determining the value of a warranty, a CBA [cost-benefit analysis] is used to measure the life cycle costs of the system with and without the warranty. A CBA is required to determine if the warranty will be cost beneficial. CBA is an economic analysis, which basically compares the Life Cycle Costs (LCC) of the system with and without the warranty to determine if warranty coverage will improve the LCCs. In general, five key factors will drive the results of the CBA: cost of the warranty + cost of warranty administration + compatibility with total program efforts + cost of overlap with Contractor support + intangible savings. Effective warranties integrate reliability, maintainability, supportability, availability, and life-cycle costs. Decision factors that must be evaluated include the state of the weapon system technology, the size of the warranted population, the likelihood that field performance requirements can be achieved, and the warranty period of performance.⁵³

⁵² It can also be noted that the country's two largest builders of Navy ships—General Dynamics (GD) and Huntington Ingalls Industries (HII)—derive about 60% and 96%, respectively, of their revenues from U.S. government work. (See General Dynamics, *2016 Annual Report*, page 9 of Form 10-K [PDF page 15 of 88] and Huntington Ingalls Industries, *2016 Annual Report*, page 5 of Form 10-K [PDF page 19 of 134].) These two shipbuilders operate the only U.S. shipyards currently capable of building several major types of Navy ships, including submarines, aircraft carriers, large surface combatants, and amphibious ships. Thus, even if a warranty in a shipbuilding contract with one of these firms were to somehow mean that the government did not have pay under the terms of that contract—either up front or later on—for fixing problems with earlier work done under that contract, there would still be a question as to whether the government would nevertheless wind up eventually paying much of that cost as part of the price of one or more future contracts the government may have that firm.

⁵³ Department of Defense, *Department of Defense Warranty Guide*, Version 1.0, September 2009, accessed July 13, 2017, at [https://www.acq.osd.mil/dpap/pdi/uid/docs/departmentofdefensewarrantyguide\[1\].doc](https://www.acq.osd.mil/dpap/pdi/uid/docs/departmentofdefensewarrantyguide[1].doc).

In response to a draft version of GAO's August 2019 report, the Navy stated

As a part of the planning for the procurement of detail design and construction for FFG(X), the Navy determined that a guaranty, rather than a commercial-type warranty, will be implemented for the program. As a part of the FFG(X) detail design and construction request for proposals [RFP] released on June 20, 2019, the Navy asked contractors to include a limit of liability of at least \$5 million per ship and a guaranty period of 18 months beyond preliminary acceptance of each ship. Further, the solicitation allows offerors to propose an additional limit of liability amount beyond the required \$5 million amount, up to and including an unlimited liability. This arrangement represents an appropriate balance between price considerations and risks, ensuring that the shipbuilder is accountable for the correction of defects that follow preliminary acceptance, while allowing each shipbuilder to use its own business judgment in proposing the value of the limit of liability. The Navy released the solicitation prior to this GAO recommendation and is unable to modify the current solicitation because it would cause an unacceptable delay to the FFG(X) program.

To support the GAO recommendation to request pricing for an unlimited warranty, the Navy will request pricing for unlimited warranty before exercising the first ship option and evaluate the business case.⁵⁴

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⁵⁴ Government Accountability Office, *Guide Missile Frigate[:] Navy Has Taken Steps to Reduce Acquisition Risk, but Opportunities Exist to Improve Knowledge for Decision Makers*, GAO-19-512, August 2019 (revised September 5, 2019 to include an omitted page in the report section, [and] comments from the Department of Defense), pp. 44-45.