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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 four have been procured through FY2023, at a rate of one ship per year. Current Navy plans call for procuring a total of 20 FFG-62s. The Navy's proposed FY2024 budget requests \$2,173.7 million (i.e., about \$2.2 billion) for the procurement of the fifth and sixth ships in the program. The Navy's FY2024 budget submission programs the procurement of an additional six FFG-62s during the period FY2025-FY2028 in annual quantities of 1-2-1-2.

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.

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

- the Navy's emerging force-level goal for frigates and other small surface combatants, and the potential impact this might have on the total number of FFG-62s to be procured and annual FFG-62 procurement quantities;
- 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 20 guided-missile frigates (FFGs). The Navy's proposed FY2024 budget requests \$2,173.7 million (i.e., about \$2.2 billion) for the procurement of the fifth and sixth ships 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 Level at End of FY2022

The Navy's force of SSCs at the end of FY2022 included no frigates, 24 LCSs, and 8 mine warfare ships.

Current and Potential Future SSC Force-Level Goal

Current SSC Force-Level Goal Within 355-Ship Plan of December 2016

In December 2016, the Navy released a goal to achieve and maintain a Navy of 355 ships, including 52 SSCs, of which 32 are to be LCSs and 20 are to be FFG-62s. Although patrol craft are SSCs, they do not count toward the 52-ship SSC force-level goal, because patrol craft are not considered battle force ships, which are the kind of ships that count toward the quoted size of the Navy and the Navy's force-level goal.²

Successor Force-Level Goal to Replace 355-Ship Goal of 2016

The Navy and the Department of Defense (DOD) have been working since 2019 to develop a successor for the 355-ship force-level goal. The Navy's FY2023 30-year (FY2023-FY2052)

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

² For more on the 355-ship plan and additional discussion of battle force ships, see CRS Report RL32665, *Navy Force Structure and Shipbuilding Plans: Background and Issues for Congress*, by Ronald O'Rourke.

shipbuilding plan, released on April 20, 2022, includes a table summarizing the results of studies that have been conducted on the successor force-level goal. These studies outline potential future fleets with 40 to 60 SSCs.³

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.⁴

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 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 For additional discussion, see CRS Report RL32665, *Navy Force Structure and Shipbuilding Plans: Background and Issues for Congress*, by Ronald O'Rourke.

⁴ 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.

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 has 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. (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 Capabilities and Crewing

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.

To help maximize the time that each ship spends at sea, the Navy reportedly is considering operating FFG-62s eventually with dual crews—an approach, commonly called blue-gold crewing, that the Navy uses for operating its ballistic missile submarines and LCSs.⁷ The Navy plans to operate the first few FFG-62s, however, with single crews.⁸

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”

Navy aircraft carriers, cruisers, and destroyers. In addition, there is no such thing in the U.S. Navy as a slow frigate. 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.

⁷ See, for example, David B. Larter, “The US Navy Is Planning for Its New Frigate to Be a Workhorse,” *Defense News*, January 30, 2018.

⁸ Richard R. Burgess, “CNO: First Few New Frigates to Have Single Crews,” *Seapower*, January 11, 2021.

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.

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.

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.

Procurement Quantities and Schedule

Total Procurement Quantity

The Navy wants to procure 20 FFG-62s, which in combination with a force of 32 LCSs would meet the Navy’s 52-ship SSC force-level goal within the Navy’s current 355-ship plan. A total of 35 LCSs were procured, but the Navy has proposed early retirements for a number of them. Congress has prohibited some of these proposed early retirements but has not blocked others, and as a consequence, the LCS force will be reduced over time to something less than 32 ships.⁹ Given a force of less than 32 LCSs, a 52-ship SSC force-level goal could be met by increasing the planned total number of FFG-62s to something higher than 20 and/or eventually procuring a new SSC design that is different from the LCS or FFG-62 designs.

Annual Procurement Quantities

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

Procurement Cost

FFG-62s generally have a budgeted procurement cost of between \$1.0 billion and \$1.1 billion each. Congress funded the procurement of the first FFG-62 in FY2020 at a cost of \$1,281.2 million (i.e., about \$1.3 billion), the second FFG-62 in FY2021 at a cost of \$1,053.1 million, the third in FY2022 at a cost of \$1,090.9 million, and the fourth at a cost of \$1.135.2 million. The lead ship in the program has a higher estimated procurement cost than the follow-on ships because the lead ship is at the top of the production learning curve for the class, and because the lead ship’s procurement cost incorporates much the detailed design/nonrecurring engineering

⁹ For further discussion of the proposed early retirements of LCSs, see CRS Report RL32665, *Navy Force Structure and Shipbuilding Plans: Background and Issues for Congress*, by Ronald O’Rourke.

(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.)

The eight ships programmed for procurement during the five-year period FY2024-FY2028 (i.e., the two requested for procurement in FY2024, plus six more programmed for procurement in FY2025-FY2028) have an average programmed procurement cost of \$1,030.3 million each in then-year dollars. The 20-ship program as a whole has a total programmed procurement cost of \$21,421.8 million (i.e., about \$21.4 billion) in then-year dollars, or an average of \$1,071.1 million each.

Table 1. Programmed and Actual Annual FFG-62 Procurement Quantities

	FY20	FY21	FY22	FY23	FY24	FY25	FY26	FY27	FY28
Programmed									
FY2020 budget submission	1	2	2	2	2				
FY2021 budget submission		1	1	2	2	3			
Dec. 9, 2020, shipbuilding document			1	3	3	4	4		
FY2022 budget submission			1	n/a	n/a	n/a	n/a		
FY2023 budget submission				1	2	1	2	1	
FY2024 budget submission					2	1	2	1	2
Actual									
	1	1	1	1					

Source: Table prepared by CRS based on Navy’s FY2020-FY2024 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.

Note: 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. The annual procurement quantities of three and four ships per year that are shown in **Table 1** under the December 9, 2020, long-range Navy shipbuilding document would have been executed by two shipyards.¹⁰ 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,

¹⁰ The December 9, 2020, document states that the shipbuilding plan presented in the document “makes investments in FY2022 in long lead time material and the stand up of a ‘follow yard’ [i.e., a second shipyard] in FY2023 to increase FFG 62 production to three ships in FY2023 and to four ships by FY2025.” (U.S. Navy, *Report to Congress on the Annual Long-Range Plan for Construction of Naval Vessels*, December 9, 2020, p. 6.)

PMS-51] said during a briefing at the Navy League’s annual 2021 Sea Air Space expo Monday [August 2] here.¹¹

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.¹² The parent-design approach has also been used in the past for other Navy and Coast Guard ships, including Navy mine warfare ships¹³ and the Coast Guard’s new Fast Response Cutters (FRCs).¹⁴

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].”¹⁵

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.”...

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.¹⁶

¹¹ Rich Abott, “Navy Outlines Plan For Second Frigate Shipyard,” *Defense Daily*, August 3, 2021.

¹² 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.

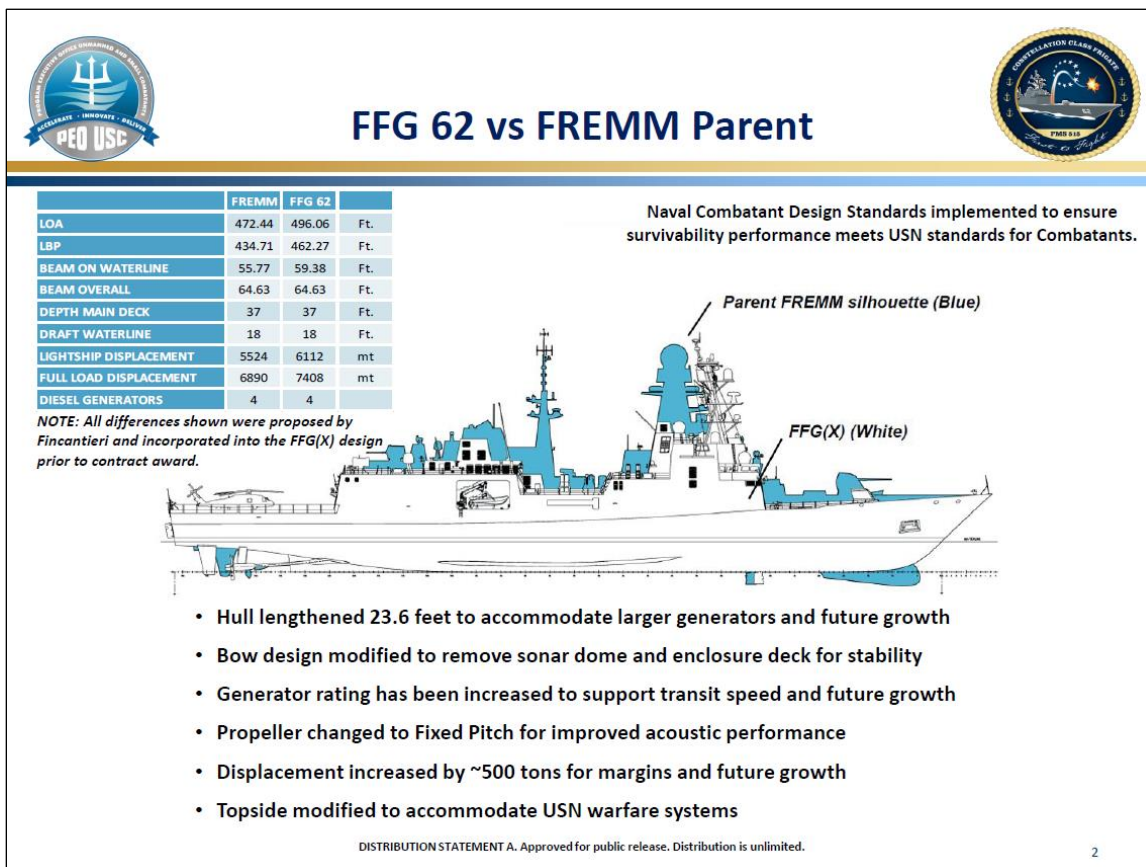
¹³ The Navy’s Osprey (MCM-51) class mine warfare ships are an enlarged version of the Italian Lerici-class mine warfare ships.

¹⁴ The FRC design is based on a Dutch patrol boat design, the Damen Stan Patrol Boat 4708.

¹⁵ 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.

¹⁶ Justin Katz, “Navy Says Constellation Hull Change Won’t Affect Internal Design,” *Breaking Defense*, August 4, 2021.

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.

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.¹⁷

¹⁷ 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 (continued...)

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

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 8100(b) of Division C of the FY2023 DOD Appropriations Act (H.R. 2617/P.L. 117-328 of December 29, 2022) states:

SEC. 8100...

(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

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)

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 8100(b) were included in the FY2020, FY2021, and FY2022 DOD Appropriations Acts.¹⁸

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

Issues for Congress

Future SSC Force-Level Goal

One issue for Congress concerns the Navy’s emerging force-level goal for frigates and other small surface combatants, and the potential impact this emerging force-level goal might have on the total number of FFG-62s to be procured and annual FFG-62 procurement quantities. As noted earlier, the Navy and the Department of Defense (DOD) have been working since 2019 to develop a successor for the 355-ship force-level goal. The Navy’s FY2023 30-year (FY2023-FY2052) shipbuilding plan, released on April 20, 2022, includes a table summarizing the results of studies that have been conducted on the successor force-level goal. These studies outline potential future fleets with 40 to 60 SSCs. An SSC force-level goal closer to the high end of that range could increase the likelihood of the Navy increasing its desired number of FFG-62s to something higher than 20, and its desired FFG-62 procurement rate to something more than two ships per year.

Potential for Cost Growth, Particularly After First 10 Ships

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,²⁰ CRS and CBO analyses done in 2020 suggested that that if FFG-62s were to

¹⁸ See Section 8113(b) of the FY2020 DOD Appropriations Act (Division A of H.R. 1158/P.L. 116-93 of December 20, 2019) and Section 8113(b) of the FY2021 DOD Appropriations Act (Division C of H.R. 133/P.L. 116-260 of December 27, 2020), and Section 8103(b) of the FY2022 DOD Appropriations Act (Division C of H.R. 2471/P.L. 117-103 of March 15, 2022).

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.

²⁰ See, for example, the version dated December 21, 2022, or earlier versions dating back to the version of May 4, 2020.

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, 2020,²¹ 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.

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.²² 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 FY2024 budget submission, the 11th ship in the program is to be the second of the two ships that are programmed for procurement in FY2028.

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 destroyers²³ in terms of displacement, and with installed capabilities that are in many cases similar to those of DDG-51s—can be procured for about 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 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?

²¹ Congressional Budget Office, *The Cost of the Navy's New Frigate*, October 2020, 11 pp.

²² 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.

²³ 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.

Number of FFG-62 Builders

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).²⁴

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 FY2024.²⁵ 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:

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

²⁴ 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.

²⁵ Source: Navy FY2023 program briefing for CRS and CBO, May 10, 2022.

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.²⁶

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 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**

²⁶ 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.

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,²⁷ which is scheduled under the Navy's FY2024 budget submission for September 2026. Under that schedule, operationally realistic testing of the ship might begin in 2027, a year when Congress will consider the Navy's proposed FY2028 budget. 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 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, and at least half as expensive to procure, 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,²⁸ 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 are each equipped with 122 VLS tubes, are

²⁷ Source: Navy FY2023 program briefing for CRS and CBO, May 10, 2022.

²⁸ 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.

retired,²⁹ and provide a hedge against the possibility that Navy plans to field VLS tubes on Large Unmanned Surface Vehicles (LUSVs)³⁰ 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 expanding 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.³¹

Compared to an FFG-62 follow-on ship unit procurement cost of about \$1.0 billion, the above estimated increase of \$16 million to \$24 million would equate to an increase in unit procurement cost of about 1.6% to about 2.4%.

Technical Risk

Another potential oversight issue for Congress concerns technical risk in the FFG-62 program. The Navy can argue that the program's technical risk has been reduced by use of the parent-design approach, by the decision to use only systems and technologies that already exist or are already being developed for use in other programs, rather than new technologies that need to be developed, and by the congressionally mandated requirement to conduct a land-based test program for the ship's engineering plant. Skeptics, while acknowledging these points, might

²⁹ 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.

³⁰ 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.

³¹ 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.

argue that lead ships in Navy shipbuilding programs nevertheless pose technical risk, because they serve as the prototypes for their programs.

June 2023 GAO Report

A June 2023 GAO report on the status of various DOD acquisition programs states the following about the FFG-62 program:

Technology Maturity, Design Stability, and Production Readiness

The Navy identified no critical technologies for FFG 62. The program uses existing mature systems for its combat and mission systems. However, the Navy expects that integrating its new Enterprise Air Surveillance Radar (EASR) with the latest baseline of the Aegis combat system on FFG 62 may present challenges. To mitigate the risks associated with integration, the Navy procured an EASR emulator to integrate and test with relevant Aegis system equipment in a lab environment. The program office stated it also expects to use lessons learned from planned integration and testing of EASR capabilities on multiple other ship classes—such as the Ford class aircraft carriers—before the radar’s installation on FFG 62. Once the radar is installed on the lead ship, the program plans to begin testing the radar interfaces and interoperability with other systems in early 2025. Even with these tests, as we previously reported, the program’s test plan and 2026 delivery schedule for the lead ship leaves little margin to address any issues identified in onboard integration testing without risk of costly and time-intensive rework.

Since the Navy competitively awarded a detail design and construction contract for the lead ship in April 2020, the FFG 62 program has been working to complete the functional and detail design of the ship. The overall design incorporates significant changes compared with the parent design for FFG 62. As we reported last year, these changes include a lengthened hull, revised bow, and other changes to incorporate combat and mission systems.

Program officials stated that over 90 percent of the FFG 62 functional design and 80 percent of the detail design—which adds 3D modeling to show the configuration of equipment on the ship—were completed when construction began on the lead ship in August 2022. They noted that these results align with the Navy’s general expectations for design maturity needed before construction begins. However, beginning construction with an incomplete functional design is inconsistent with leading practices and increases the risk of costly design changes and rework. Such cost risk adds to existing cost growth challenges with the lead ship. Specifically, the program office stated the contract’s estimated cost for the lead ship has increased above the contract’s ceiling price due to a variety of factors, including defense industrial base issues. March 2023 cost reporting shows the contract’s estimated costs for the second and third ships are trending in a similar direction.

Program officials stated that the majority of the remaining functional design work is related to incomplete software. They added that, before the program begins construction for any of the ship’s 31 design zones, it will complete the detail design of the zone.

Software and Cybersecurity

Program officials stated that planned approval of the software development plan—which we reported last year was delayed 11 months to February 2022—is now delayed to spring 2023. They noted that a lack of required information on contractor-furnished equipment contributed to this additional delay. They also stated that they are working with the shipbuilder on refining the plan based on Navy feedback.

Program officials said that they plan to inform software development with feedback from formal testing performed by system operators. The program office added that it is using

early integration testing efforts and a land-based test site for hull, mechanical, and electrical systems to manage potential software development risks.

The program office stated that it revised FFG 62 test plans to include a combined war game-like exercise in late 2022 that tested cyber capabilities and supported an interoperability assessment for ship systems. The program also scheduled early integration testing events in fiscal years 2024 and 2025 at available land-based test sites. According to the program, these events are intended to assess network cybersecurity controls and reduce shipboard integration risks for government- and contractor-furnished equipment. The program plans to complete a major subsystem cybersecurity assessment in fall 2024 and a full system assessment in 2027 following delivery of the lead ship.

Program Office Comments

We provided a draft of this assessment for program office review and comment. The program office provided technical comments, which we incorporated where appropriate. The program office stated that the critical design review and production readiness review—both conducted in 2022—validated the design and shipyard readiness before moving into the production phase in August 2022 with the start of construction on the first ship. It added that these reviews assessed sufficient design maturity—with an 80 percent overall level of completion—and assessed that the shipyard was ready to begin construction. According to the program office, the second ship of the class will begin construction in mid-2023.

The program office also stated that it is establishing various test sites to demonstrate FFG 62 propulsion systems and to reduce combat system development and schedule risk through systems integration testing. It added that it is implementing a system to enhance ship maintenance and supply planning. The program office also noted its implementation of a collaborative DOD initiative focused on the development and implementation of data analysis and sustainment technology capabilities.³²

January 2023 DOT&E Report

A January 2023 report from DOD’s Director, Operational Test and Evaluation (DOT&E)—DOT&E’s annual report for FY2022—stated the following regarding the FFG-62 program:

PERFORMANCE

EFFECTIVENESS

Not enough data are yet available to assess operational effectiveness due to the ship’s early stage of development.

Preliminary assessment from the EOA [early operational assessment] suggest:

- Reduced developmental risk primarily due to the inclusion of previously fielded systems in the FFG 62 ship design.
- Some areas that could provide integration and/or performance challenges:
 - FFG 62 will not include a tracker illuminator system typically installed on other Aegis platforms.
 - In FY22, the Navy modified the FFG 62 design to include the foreign-designed, Thales CAPTAS-4 system, a variable depth sonar. While the Navy believes the integration of the CAPTAS-4 to the AN/SQQ-89 [antisubmarine warfare system] and the platform is low risk, DOT&E is unable to assess the integration risk at this time.

³² Government Accountability Office, *Weapon Systems Annual Assessment[:] Programs Are Not Consistently Implementing Practices That Can Help Accelerate Acquisitions*, GAO-23-106059, June 2023, p. 148.

– FFG 62 crew size is limited to an estimated 193 officers and enlisted sailors with an additional 27 personnel that serve in the embarked aviation detachment. Mission success and sustainability will depend upon effective system autonomy/automation and human system interfaces.

DOT&E will submit a classified EOA report upon completion of analysis, expected in 2QFY23 [the second quarter of FY2023].

SUITABILITY

Not enough data are yet available to assess operational suitability due to the ship's early stage of development.

SURVIVABILITY

Not enough data are yet available to assess ship survivability.

Ongoing LFT&E [live fire test and evaluation] testing, which include near-contact explosive testing, extended distance multiple plate ballistic testing, and large scale underwater explosion testing, have closed outstanding vulnerability knowledge gaps and are expected to enable M&S validation.

In FY22, the Navy continued to update M&S [modeling and simulation] to incorporate new capabilities, including improvements to their blast and whipping codes. DOT&E continues to work with the Navy on M&S plans that will support validation and accreditation of these tools to support the Detail Design Survivability Assessment Report in FY25.

RECOMMENDATIONS

The Navy should:

1. Provide an update to the FFG 62 TEMP [test and evaluation master plan] that includes the strategy to test anti-air warfare mission capability by FY24.
2. Procure available and appropriate CAPTAS-4 technical data to mitigate performance risk and potentially reduce scope of operational testing.
3. In collaboration with operators and operational testers, closely monitor the development of the mission system autonomy/automation components in the ship design to minimize risk to mission performance and system maintenance capability.³³

2022 Press Reports

April 2022 Press Report Regarding Date for Starting Construction

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.³⁴

³³ Department of Defense, Director, Operational Test & Evaluation, *FY2022 Annual Report*, January 2023, pp. 187-188.

³⁴ Audrey Decker, "Frigate Construction Pushed Back from April Target Start Date," *Inside Defense*, April 13, 2022.

March 2022 Press Report Regarding Ship's Variable Depth Sonar

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.³⁵

January 2022 Press Report Regarding Changes to Parent Design

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....

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.

³⁵ 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.

“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.³⁶

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.

³⁶ Justin Katz, “For Navy’s New Frigate, Design Changes Carry Risks and Rewards,” *Breaking Defense*, January 24, 2022.

Legislative Activity for FY2024

Summary of Congressional Action on FY2024 Funding Request

Table 2 summarizes congressional action on the Navy’s FY2024 funding request for the FFG-62 program.

Table 2. Congressional Action on FY2024 Procurement Funding Request

Millions of dollars, rounded to nearest tenth.

	Request	Authorization			Appropriation		
		HASC	SASC	Final	HAC	SAC	Final
Procurement	2,173.7	2,163.7	2,173.7		2,133.9	2,223.7	
Advance procurement (AP)	0	0	0		0	0	
(Procurement quantity)	(2)	(2)	(2)		(2)	(2)	

Source: Table prepared by CRS based on FY2024 Navy budget submission, committee and conference reports, and explanatory statements on the FY2024 National Defense Authorization Act and the FY2024 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.

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

House

The House Armed Services Committee, in its report (H.Rept. 118-125 of June 30, 2023) on H.R. 2670, recommended the funding levels shown in the HASC column of **Table 2**. The recommended reduction of \$10.0 million is for “Insufficient justification.” (Page 445)

Senate

The Senate Armed Services Committee, in its report (S.Rept. 118-58 of July 12, 2023) on S. 2226, recommended the funding levels shown in the SASC column of **Table 2**.

S.Rept. 118-58 states:

Frigate second shipyard study

The committee notes that the Department of the Navy will not be able to reach the policy goal of 355 battle force ships unless it expands production. The U.S. Navy’s 30-year shipbuilding plan, dated December 9, 2020, anticipated standing up a second shipyard for the FFG–62 Constellation-class frigate in fiscal year 2023 and procuring four frigates in fiscal year 2025. The committee further notes that the statement accompanying the Consolidated Appropriations Act for Fiscal Year 2022 (Public Law 117–103) paused plans for a second shipyard until the U.S. Navy proved the frigate design. With the first four ships of the class due to start construction before the close of fiscal year 2024, the committee believes the time is appropriate to study the requirements and schedule for a second shipyard.

The committee directs the Secretary of the Navy to develop a plan for a second shipyard to produce the Constellation-class frigate. The plan shall address: (1) The stability of

program requirements and maturity of ship design; (2) A schedule for ordering a mature technical data package; (3) The contracting strategy to include how the U.S. Navy plans to compete the second shipyard; (4) Funding requirements by fiscal year; and (5) Capacity of the shipbuilding industrial base to support two construction yards for frigates to include available workforce.

The Secretary of the Navy shall provide an interim briefing on such a plan to the congressional defense committees not later than February 1, 2024. (Page 229)

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

House

The House Appropriations Committee, in its report (H.Rept. 118-121 of June 27, 2023) on H.R. 4365, recommended the funding levels shown in the HAC column of **Table 2**. The recommended reduction of \$39.837 million is for “GFE [government-furnished equipment] unjustified growth” (\$30.287 million) and “Change orders unjustified growth” (\$9.550 million). (Page 145)

Section 8093(b) of H.R. 4365 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.

Senate

The Senate Appropriations Committee, in its report (S.Rept. 118-81 of July 27, 2023) on S. 2587, recommended the funding levels shown in the SAC column of **Table 2**. The recommended increase of \$50.0 million is for “Program increase: Frigate industrial base and workforce development.” (Page 135)

Section 8095(b) of S. 2587 states:

SEC. 8095....

(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.

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.³⁷

As discussed in another CRS report,³⁸ 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.”³⁹

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

³⁷ 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.

³⁸ See CRS Report RL32665, *Navy Force Structure and Shipbuilding Plans: Background and Issues for Congress*, by Ronald O'Rourke.

³⁹ 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.⁴⁰

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.⁴¹

⁴⁰ 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.

⁴¹ 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.⁴²

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⁴² 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.