



Testimony  
Before the Committee on Armed  
Services, U.S. Senate

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# LITTORAL COMBAT SHIP AND FRIGATE

## Congress Faced with Critical Acquisition Decisions

Statement of Paul L. Francis, Managing Director,  
Acquisition and Sourcing Management

# GAO Highlights

Highlights of [GAO-17-262T](#), a testimony before the Committee on Armed Services, U.S. Senate

## Why GAO Did This Study

The Navy envisioned a revolutionary approach for the LCS program: dual ship designs with interchangeable mission packages intended to provide mission flexibility at a lower cost. This approach has fallen short, with significant cost increases and reduced expectations about mission flexibility and performance. The Navy has changed acquisition approaches several times. The latest change involves minor upgrades to an LCS design—referred to now as a frigate. Yet, questions persist about both the LCS and the frigate.

GAO has reported on the acquisition struggles facing LCS and now the frigate, particularly in [GAO-13-530](#) and [GAO-16-356](#). This statement discusses: (1) the evolution of the LCS acquisition strategy and business case; (2) key risks in the Navy's plans for the frigate based on the LCS program; and (3) remaining oversight opportunities for the LCS and small surface combatant programs. This statement is largely based on GAO's prior reports and larger work on shipbuilding and acquisition best practices. It incorporates limited updated audit work where appropriate.

## What GAO Recommends

GAO is not making any new recommendations in this statement but has made numerous recommendations to the Department of Defense (DOD) in the past on LCS and frigate acquisition, including strengthening the program's business case before proceeding with acquisition decisions. While DOD has, at times, agreed with GAO's recommendations, it has taken limited action to implement them.

View [GAO-17-262T](#). For more information, contact Paul Francis at (202) 512-4841 or [francisp@gao.gov](mailto:francisp@gao.gov).

December 1, 2016

# LITTORAL COMBAT SHIP AND FRIGATE

## Congress Faced with Critical Acquisition Decisions

## What GAO Found

The Navy's vision for Littoral Combat Ship (LCS) program has evolved significantly over the last 15 years, reflecting degradations of the underlying business case. Initial plans to experiment with two different prototype ships adapted from commercial designs were abandoned early in favor of an acquisition approach that committed to numerous ships before proving their capabilities. Ships were not delivered quickly to the fleet at low cost. Rather cost, schedule, and capability expectations degraded over time. In contrast, a sound business case would have balanced needed resources—time, money, and technical knowledge—to transform a concept into the desired product.

### Evolution of Expectations for the Littoral Combat Ship (LCS) Program

	Early program	Updated program
<b>Quantity and cost</b>	55 seaframes @ \$220 million each	40 seaframes @ \$478 million each
<b>Schedule</b>	Ship initial operational capability (IOC) in 2007	Ship IOC with partial capability in 2013
<b>Design</b>	Leverage existing designs for reduced cost, rapid fielding	Considerable design changes, under revision throughout early construction
<b>Seaframe</b>	Sprint speed: 40-50 knots; range: 1,000 nautical miles @ 40 knots	Neither seaframe meets combined original speed and range expectations
<b>Mission Packages</b>	IOC for three mission packages by 2010	Revised IOC – one package in 2015; two more planned by 2020

Source: GAO analysis of prior GAO reports and Navy documentation. | [GAO-17-262T](#)

Concerned about the LCS's survivability and lethality, in 2014 the Secretary of Defense directed the Navy to evaluate alternatives. After rejecting more capable ships based partly on cost, schedule, and industrial base considerations, the Navy chose the existing LCS designs with minor modifications and re-designated the ship as a frigate. Much of the LCS's capabilities are yet to be demonstrated and the frigate's design, cost, and capabilities are not well-defined. The Navy proposes to commit quickly to the frigate in what it calls a block buy of 12 ships.

Congress has key decisions for fiscal years 2017 and 2018 that have significant funding and oversight implications. First, the Navy has already requested funding to buy two more baseline LCS ships in fiscal year 2017. Second, early next year, the Navy plans to request authorization for a block buy of all 12 frigates and funding in the fiscal year 2018 budget request for the lead frigate. Making these commitments now could make it more difficult to make decisions in the future to reduce or delay the program should that be warranted. A more basic oversight question today is whether a ship that costs twice as much yet delivers less capability than planned warrants an additional investment of nearly \$14 billion. GAO has advised Congress to consider not funding the two LCS requested in 2017 given its now obsolete design and existing construction backlogs. Authorizing the block buy strategy for the frigate appears premature. The decisions Congress makes could have implications for what aspiring programs view as acceptable strategies.

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Chairman McCain, Ranking Member Reed, and Members of the Committee:

I am pleased to be here today to discuss the Department of the Navy's Littoral Combat Ship (LCS) and frigate programs. The Navy envisioned a revolutionary approach to the LCS program. Unlike other surface combatant programs, LCS consists of two different ship design variants (called seaframes) with interchangeable mission packages carrying equipment for three mission areas—surface and anti-submarine warfare, and mine countermeasures—intended to give the Navy flexibility to rapidly deploy equipment and incorporate new systems. Coupled with this approach, the LCS would have a smaller crew that would rely on shore-based support for its maintenance needs in an effort to reduce life-cycle costs. To execute the program, the Navy deviated from traditional shipbuilding acquisition in hopes of rapidly delivering ships to the fleet. The consequences of this approach are well known today—costs to construct the ships have more than doubled from initial expectations, with promised levels of capability unfulfilled and deliveries significantly delayed. Acknowledging capability and affordability concerns, the Department of Defense (DOD)—in conjunction with the Navy—changed course in February 2014 to pursue a more capable frigate based on the LCS concept.<sup>1</sup>

Today, with 26 ships delivered or under contract, the LCS program again stands at a crossroads, as Congress will decide on funding the last two planned LCS and will be asked early next year to authorize the Navy's plans to procure the remaining 12 ships, including funding the lead frigate. With that context in mind, I will discuss today: (1) the evolution of the LCS acquisition strategy and business case; (2) key risks in the Navy's plans for the frigate based on the LCS program; and (3) remaining oversight opportunities for the LCS and small surface combatant programs.

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<sup>1</sup>The term "frigate" can be applied to ships of different sizes and capability. The now-retired Oliver Hazzard Perry-class frigate (FFG 7) was the last U.S. Navy frigate. Frigates—including the FFG 7—have been identified as typically being open-ocean, multi-role ships capable of performing surface, anti-submarine, and anti-air warfare.

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This testimony largely leverages our past reports on the LCS program from 2005 to 2016.<sup>2</sup> We also draw on some conclusions from our broader work on Navy shipbuilding and acquisition reform initiatives. More detailed information on our objectives, scope, and methodology for that work can be found in the issued reports. We conducted the work on which this statement is based in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives. This statement also includes updates to information, as appropriate, based on program documentation and discussion with DOD officials—work that also was conducted in accordance with generally accepted government auditing standards.

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## The Course of the LCS Program Has Changed Significantly over Time

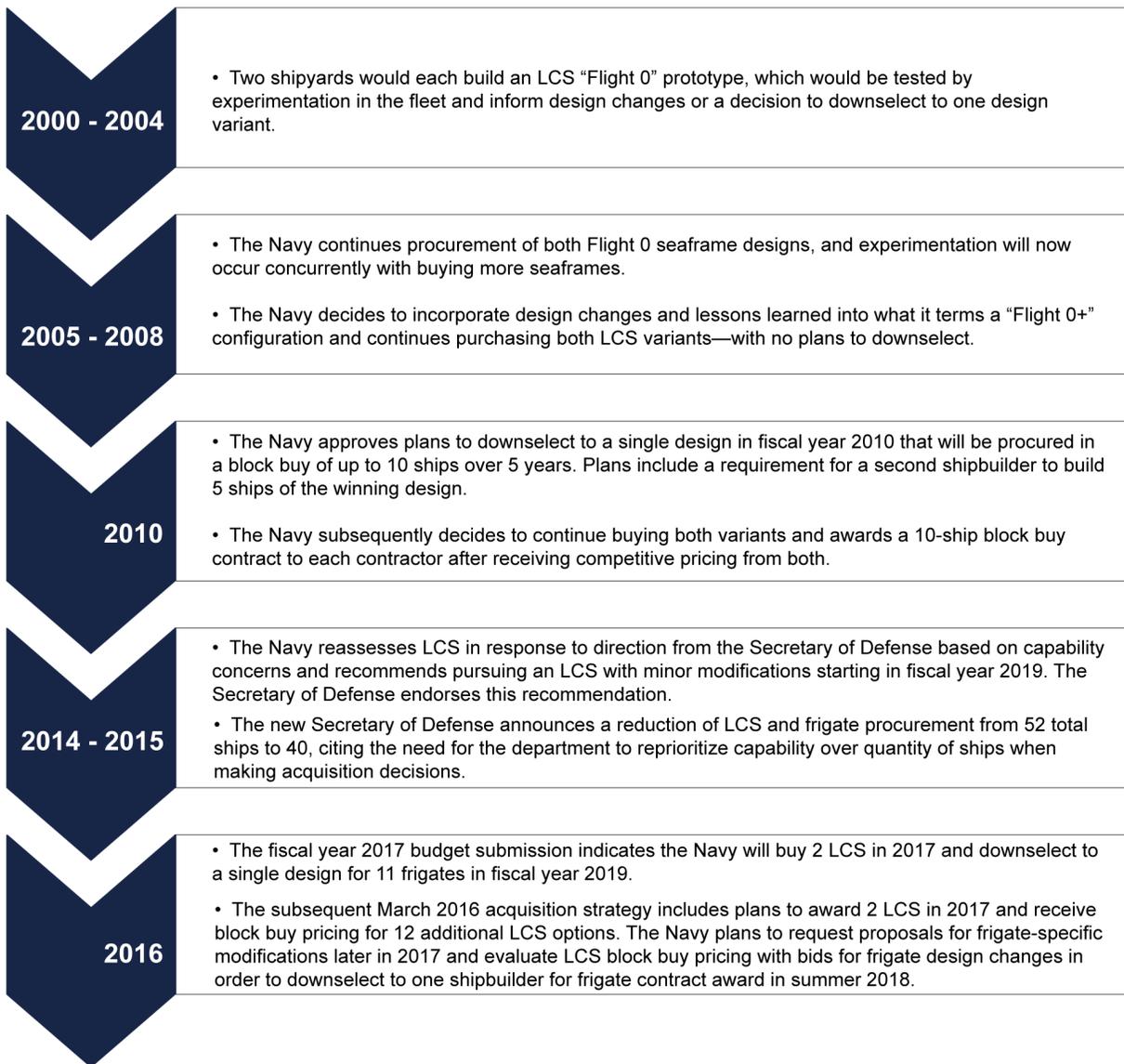
When first conceived, the LCS program represented an innovative approach for conducting naval operations, matched with a unique acquisition strategy that included two nontraditional shipbuilders and two different ships based on commercial designs—Lockheed Martin’s Freedom variant and Austal USA’s Independence variant, respectively.<sup>3</sup> The Navy planned to experiment with these ships to determine its preferred design variant. However, in relatively short order, this experimentation strategy was abandoned in favor of a more traditional acquisition of over 50 ships. More recently, the Secretary of Defense has questioned the appropriate capability and quantity of the LCS. The purpose of the program has evolved from concept experimentation, to LCS, and more recently, to an LCS that will be upgraded to a frigate. The strategy for contracting and competing for ship construction has also changed. This evolution is captured in figure 1.

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<sup>2</sup>GAO, *Littoral Combat Ship: Need to Address Fundamental Weaknesses in LCS and Frigate Acquisition Strategies*, [GAO-16-356](#), (Washington, D.C.: June 9, 2016); *Navy Shipbuilding: Significant Investments in the Littoral Combat Ship Continue Amid Substantial Unknowns about Capabilities, Use, and Cost*, [GAO-13-530](#), (Washington, D.C.: July 22, 2013); and *Defense Acquisitions: Plans Need to Allow Enough Time to Demonstrate Capability of First Littoral Combat Ships*, [GAO-05-255](#), (Washington, D.C.: Mar. 1, 2005).

<sup>3</sup>Lockheed Martin is the prime contractor for LCS 1 and the odd numbered seaframes. For LCS 2 and LCS 4, General Dynamics was the prime contractor for the Austal USA built ships. General Dynamics and Austal USA ended their teaming arrangement in 2010. Austal USA is the prime contractor for the remaining even-numbered seaframes.

**Figure 1: A Persistent Pattern of Change to the Littoral Combat Ship (LCS) Acquisition Strategy**



Source: GAO analysis of Department of Defense data. | GAO-17-262T

While one could argue that a new concept should be expected to evolve over time, the LCS evolution has been complicated by the fact that major commitments have been made to build large numbers of ships before

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proving their capabilities. Whereas acquisition best practices embrace a “fly before you buy” approach, the Navy has subscribed to a buy before you fly approach for LCS. Consequently, the business imperatives of budgeting, contracting, and ship construction have outweighed the need to demonstrate knowledge, such as technology maturation, design, and testing, resulting in a program that has delivered 8 ships and has 14 more in some stage of the construction process (includes LCS 21, with a planned December 2016 construction start) despite an unclear understanding of the capability the ships will ultimately be able to provide and with notable performance issues discovered among the few ships that have already been delivered.

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## LCS Business Case Has Eroded as Cost, Schedule, and Performance Expectations Have Not Been Met

The Navy’s vision for the LCS has evolved significantly over time, with questions remaining today about the program’s underlying business case. In its simplest form, a business case requires a balance between the concept selected to satisfy warfighter needs and the resources—technologies, design knowledge, funding, and time—needed to transform the concept into a product, in this case a ship. In a number of reports and assessments since 2005, we have raised concerns about the Navy’s business case for LCS, noting risks related to cost, schedule, and technical problems, as well as the overall capability of the ships. Business case aside, the LCS program deviated from initial expectations, while continuing to commit to ship and mission package purchases.

The LCS acquisition was challenging from the outset. The Navy hoped to deliver large numbers of ships to the fleet quickly at a low cost. In an effort to achieve its goals, the Navy deviated from sound business practices by concurrently designing and constructing the two lead ship variants while still determining the ship’s requirements. The Navy believed it could manage this approach because it considered LCS to be an adaptation of existing commercial ship designs. However, transforming a commercial ship into a capable, survivable warship was an inherently complex undertaking. Elements of the business case further eroded—including initial cost and schedule expectations. Table 1 compares the Navy’s initial expectations of the LCS business case with the present version of the program.

**Table 1: Evolution of Expectations for the Navy’s Littoral Combat Ship (LCS) Program**

	Early program	Updated program
Quantity and cost	<ul style="list-style-type: none"> <li>55 seaframes</li> <li>\$220 million per seaframe</li> </ul>	<ul style="list-style-type: none"> <li>40 seaframes (includes 12 frigates)</li> <li>\$478 million per seaframe</li> </ul>
Schedule	<ul style="list-style-type: none"> <li>Ships rapidly fielded, with initial operational capability (IOC) in 2007, 3 years after program initiation</li> </ul>	<ul style="list-style-type: none"> <li>IOC achieved with partial capability in 2013, 9 years after program initiation</li> </ul>
Design	<ul style="list-style-type: none"> <li>Leverage existing designs to enable a low-cost, rapidly fielded platform</li> </ul>	<ul style="list-style-type: none"> <li>Designs required considerable change and were under revision throughout the first several ships built</li> </ul>
Seaframe Capability	<ul style="list-style-type: none"> <li>Sprint speed: 40-50 knots</li> <li>Range: 4,300-nautical-mile range when operated at a speed of 16 knots and 1,000-nautical miles at 40 knots</li> </ul>	<ul style="list-style-type: none"> <li>Speed: Freedom variant (odd-numbered ships, e.g., LCS 1) can meet speed requirements, but Independence variant (even-numbered ships, e.g., LCS 2) did not meet speed requirements; frigate will have reduced speed</li> <li>Range: In 2009, endurance requirement reduced to 3,500-nautical-mile range at a speed of 14 knots. Freedom variant cannot meet these reduced requirements—with a 2,138-nautical miles range at a speed of 14 knots and 855 nautical miles at 43.6 knots; Independence variant can meet range requirements</li> </ul>
Mission Packages Capability	<ul style="list-style-type: none"> <li>New capabilities would be rapidly fielded as the Navy would integrate existing technologies on to the three types of mission packages—mine countermeasures, surface warfare, and anti-submarine warfare</li> </ul>	<ul style="list-style-type: none"> <li>Some technologies were ultimately less mature than envisioned, leading to significant difficulty developing mission capabilities</li> <li>Only one of three packages (surface warfare) has demonstrated required performance. However, initial operational capability was achieved at a temporarily reduced minimum capability requirement</li> </ul>
Crewing and Logistics Constructs	<ul style="list-style-type: none"> <li>LCS would be minimally manned (55-60 crew), with many support functions transferred to shore facilities</li> <li>LCS was initially intended to have a 3-2-1 crewing construct, where 3 crews would support 2 LCS, and 1 LCS would remain forward deployed</li> </ul>	<ul style="list-style-type: none"> <li>Crew size has increased over time to 70</li> <li>The Navy is transitioning to a blue/gold crew concept for LCS, where two crews will rotate on and off the same hull</li> </ul>

Source: GAO analysis of prior GAO reports and Navy documentation. | GAO-17-262T

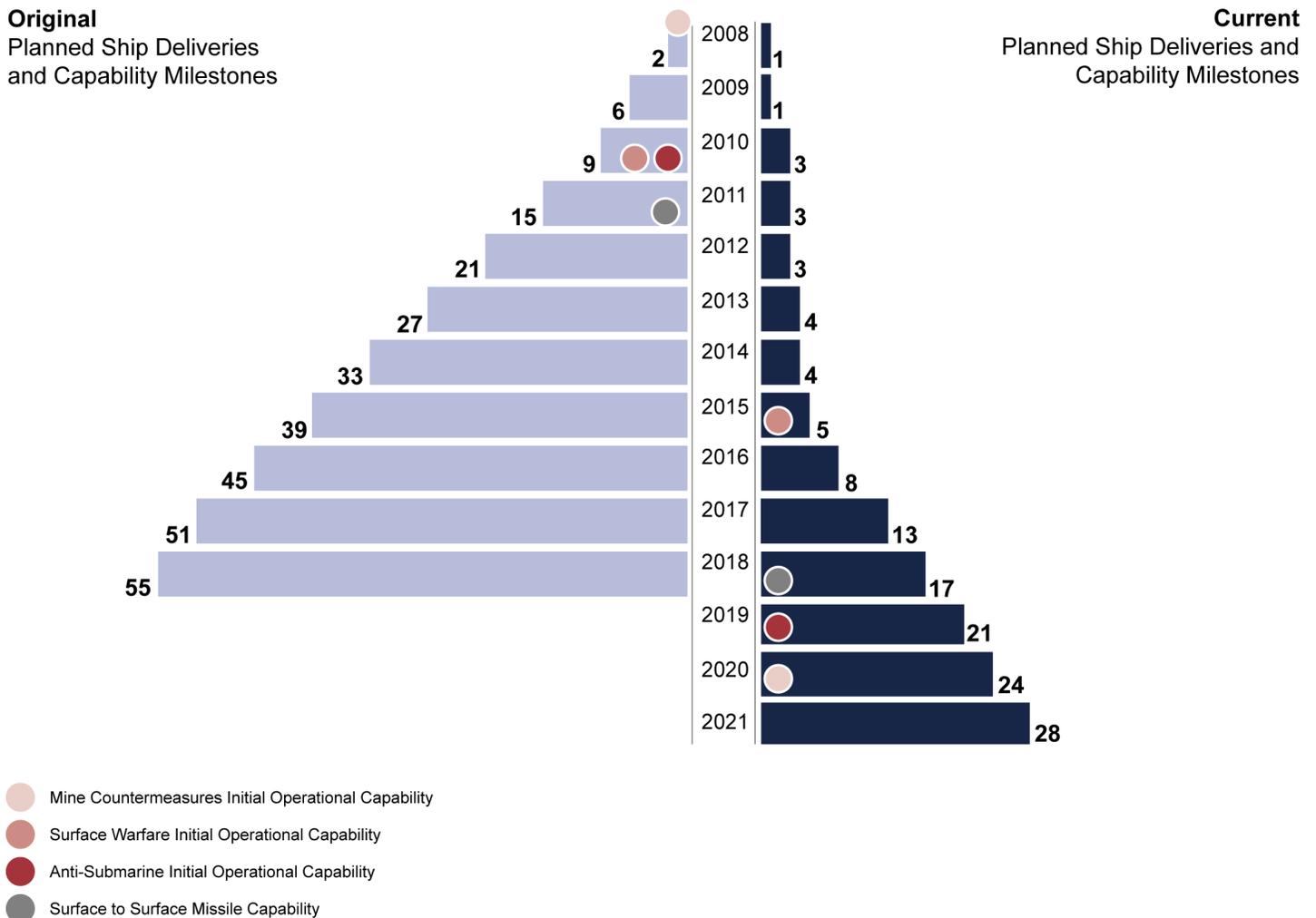
Note: Costs are in fiscal year 2005 dollars.

Our recent work has shown that the LCS business case continues to weaken. LCS ships under construction have exceeded contract cost targets, with the government responsible for paying for a portion of the cost growth. This growth has prompted the Navy to request \$246 million in additional funding for fiscal years 2015-2017 largely to address cost overruns on 12 LCS seaframes. Similarly, deliveries of almost all LCS under contract (LCS 5-26) have been delayed by several months, and, in some cases, closer to a year or longer. Navy officials recently reported that, despite having had 5 years of LCS construction to help stabilize ship delivery expectations, the program would not deliver four LCS in fiscal year 2016 as planned. Whereas the program expected to deliver all 55

ships in the class by fiscal year 2018, today that expectation has been reduced to 17 ships.

LCS mission packages, in particular, lag behind expectations. The Navy has fallen short of demonstrating that the LCS with its mission packages can meet the minimum level of capability defined at the beginning of the program. As figure 2 shows, 24 LCS seaframes will be delivered by the time all three mission packages achieve a minimum capability.

**Figure 2: Littoral Combat Ship Mission Package Operational Capability Delays Since 2007**



Source: GAO analysis of Department of Defense data. | GAO-17-262T

Since 2007, delivery of the total initial mission package operational capability has been delayed by about 9 years (from 2011 to 2020) and the Navy has lowered the level of performance needed to achieve the initial capability for two packages—surface warfare and mine countermeasures. In addition to mission package failures, the Navy has not met several seaframe objectives, including speed and range. For example, Navy testers estimate that the range of one LCS variant is about half of the minimum level identified at the beginning of the program. As the Navy continues to concurrently deliver seaframes and develop mission packages, it has become clear that the seaframes and mission package technologies were not mature and remain largely unproven. In response, the Navy recently designated the first four LCS as test ships to support an aggressive testing schedule between fiscal years 2017 and 2022. Additional deficiencies discovered during these tests could further delay capability and require expensive changes to the seaframes and mission packages that have already been delivered.

As the cost and schedule side of the business case for LCS has grown, performance and capabilities have declined. Changes in the LCS concept of operations are largely the consequence of less than expected lethality and survivability, which remain mostly unproven 7 years after delivery of the lead ships. LCS was designed with reduced requirements as compared to other surface combatants, and over time the Navy has lowered several survivability and lethality requirements further and removed some design features—making the ships less survivable in their expected threat environments and less lethal than initially planned. This has forced the Navy to redefine how it plans to operate the ships. Our previous work highlighted the changes in the LCS’s expected capability, as shown in table 2.

**Table 2: Evolution of Littoral Combat Ship (LCS) Capability**

Concept	Initial	Current
LCS’s capability against adversaries	LCS was primarily planned to be used in major combat operations, enter contested spaces, and be employable and sustainable throughout the battlespace regardless of anti-access or area denial environments.	The Navy acknowledges current LCS weapon systems are underperforming and offer little chance of survival in a combat scenario. LCS lacks the ability to operate independently in combat and should not be employed outside a benign, low-threat environment unless escorted by a multi-mission combatant providing credible anti-air, anti-surface, and anti-submarine protection.
How LCS will deploy	LCS will be a self-sufficient combatant designed to fight and win in shallow water and near-land environments without risking larger combatants in constricted areas.	LCS’s dependencies in combat require it to be well-protected by multi-mission combatants. Multiple LCS will likely have to operate in a coordinated strike attack group fashion for mutual support.

Concept	Initial	Current
How mission packages swaps will be utilized	Mission packages will be quickly swapped out in an expeditionary theater in a matter of days.	Mission packages can be swapped within 72 hours only if all the equipment and personnel are in theater. An LCS executing a package swap could be unavailable for between 12-29 days. The Navy now expects mission package swaps will be more infrequent than initially envisioned.

Source: GAO analysis of Navy documentation. | GAO-17-262T

Further capability changes may be necessary as the Navy continues to test the seaframes and mission packages, as well as gain greater operational experience. For example, the Navy has not yet demonstrated that LCS will achieve its survivability requirements and does not plan to complete survivability assessments until 2018—after more than 24 ships are either in the fleet or under construction. The Navy has identified unknowns related to the Independence variant’s aluminum hull, and conducted underwater explosion testing in 2016 but the Navy has yet to compile and report the results. Both variants also sustained some damage in trials in rough sea conditions, but the Navy has not completed its analytical report of these events. Results from air defense and cybersecurity testing also indicate capability concerns.

## Business Case for Frigate Program Remains Uncertain

The Navy elected to pursue a frigate concept based on a minor modified LCS. The frigate, as planned, will provide multi-mission capability that is an improvement over LCS and offers modest improvements to some other capabilities, such as the air search radar. Still, many questions remain to be settled about the frigate’s design, cost, schedule, and capabilities—all while the Navy continues to purchase additional LCS. Despite the uncertainties, the Navy’s acquisition strategy involves effectively demonstrating a commitment to buy all of the planned frigates—12 in total—before establishing realistic cost, schedule, and technical parameters—because the Navy will ask Congress to authorize the contracting approach for the 12 frigates (what the Navy calls a block buy contract) in 2017.<sup>4</sup> Further, the frigate will inherit many of the

<sup>4</sup>The Navy plans to request authorization in 2017 to use what it calls a block buy contract to purchase the frigate—the same contracting approach used for LCS—and funding in the fiscal year 2018 budget request for the lead frigate. Our past analysis of the LCS contracts found that a block buy approach could affect Congress’s funding flexibility. For example, the LCS block buy contracts provide that a failure to fully fund a purchase in a given year would make the contract subject to renegotiation, which could result in the government paying more for ships. If similar terms are included in the frigate contract, the same potential effect may apply.

shortcomings or uncertainties of the LCS, and does not address all the priorities that the Navy had identified for its future frigate.

**Frigate Cost Uncertainty and a Compressed Schedule Contribute to Gaps in Program Knowledge**

The costs for the frigate are still uncertain. Navy officials have stated that the frigate is expected to cost no more than 20 percent—approximately \$100 million—more per ship than the average LCS seaframes. However, the Navy will not establish its cost estimate until May 2017—presumably after the Navy requests authorization from Congress in its fiscal year 2018 budget request for the block buy contracting approach for 12 frigates—raising the likelihood that the budget request will not reflect the most current costs for the program moving forward.

In addition to the continued cost uncertainty, the schedule and approach for the frigate acquisition have undergone substantial changes in the last year, as shown in table 3.

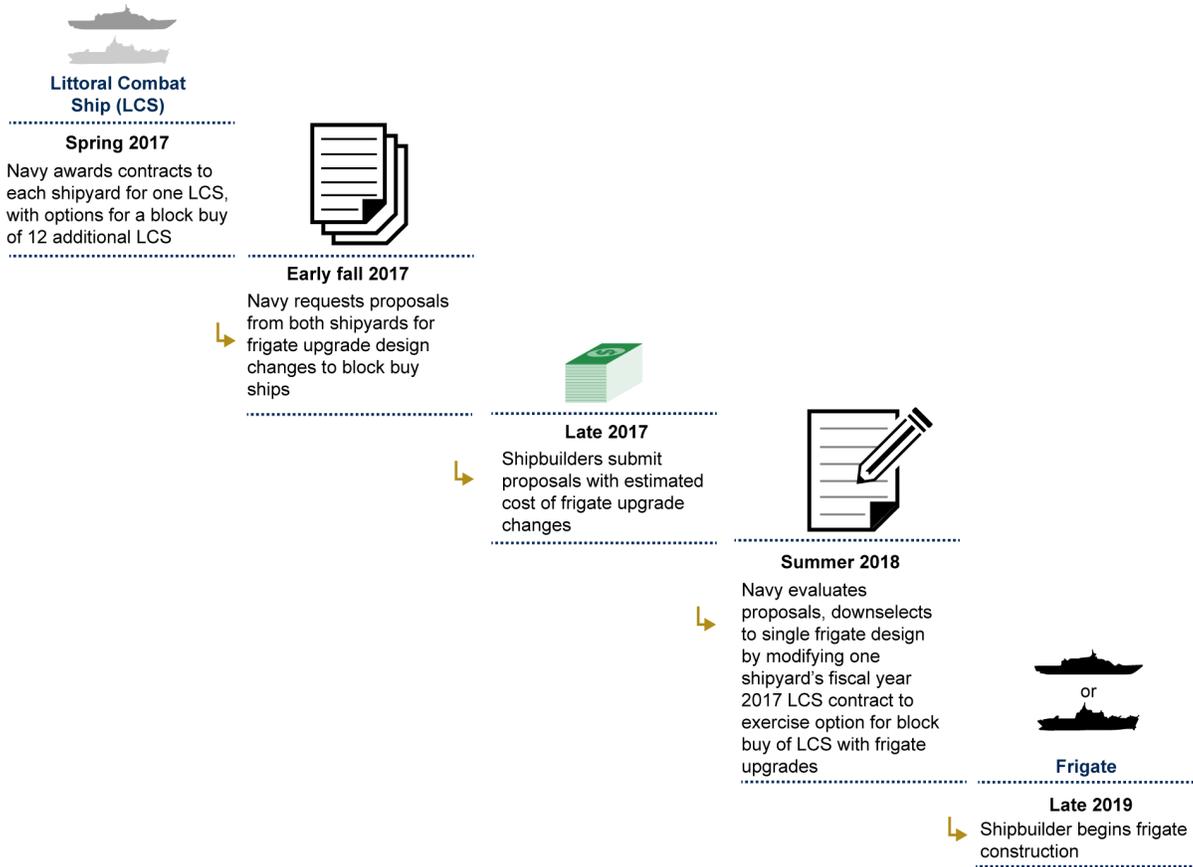
**Table 3: Changes in Frigate Acquisition Plan**

<b>Previous plan (December 2015)</b>	<b>Current plan (October 2016)</b>
Dual contract award in fiscal year 2019	Downselect award to one shipbuilder in summer 2018
20 frigates (10 per shipbuilder)	12 frigates
Government-led, prescribed design	Contractor-driven design process based on build specifications; increased government furnished equipment
Multiple frigate upgrade packages, with a fiscal year 2019 bid to mature frigate design	Single frigate upgrade package expected from each contractor in fiscal year 2018
Detail design in fiscal year 2018 to increase design knowledge prior to contract award	Detail design begins after downselect award in 2018

Source: GAO analysis of Navy documentation. | GAO-17-262T

According to frigate program officials, under the current acquisition approach the Navy will award contracts in fiscal year 2017 to each of the current LCS contractors to construct one LCS with a block buy option for 12 additional LCS—not frigates. Then, the Navy plans to obtain proposals from both LCS contractors in late 2017 that would upgrade the block buy option of LCS to frigates using frigate-specific design changes and modifications. The Navy will evaluate the frigate upgrade packages and then exercise the option—now for frigates—on the contract that provides the best value based on tradeoffs between price and technical factors. This downselect will occur in summer 2018. Figure 3 illustrates how the Navy plans to modify the fiscal year 2017 LCS contract to convert the ships in the block buy options to frigates.

**Figure 3: Navy Block Buy Option Contract Modification Process for Frigate Procurement**



Source: GAO analysis of Navy data. | GAO-17-262T

The Navy's current plan, which moves the frigate award forward from fiscal year 2019 to fiscal year 2018, is an acceleration that continues a pattern of committing to buy ships in advance of adequate knowledge. Specifically, the Navy has planned for its downselect award of the frigate to occur before detail design of the ship begins. As we previously reported, awarding a contract before detail design is completed—though common in Navy ship acquisitions—has resulted in increased ship prices.<sup>5</sup> Further, in the absence of a year of frigate detail design, the

<sup>5</sup> GAO-16-356 and GAO, *Defense Acquisitions: Improved Management Practices Could Help Minimize Cost Growth in Navy Shipbuilding Programs*, GAO-05-183 (Washington, D.C.: Feb. 28, 2005).

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Navy plans to rely on a contractor-driven design process that is less prescriptive. This approach is similar to that espoused by the original LCS program, whereby the shipyards were given performance specifications and requirements, selecting the design and systems that they determined were best suited to fit their designs in a producible manner. Program officials told us that this new approach should yield efficiencies; however, history from LCS raises concern that this approach for the frigate similarly could lead to the ships having non-standard equipment, with less commonality with the other design and the rest of the Navy.

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**Frigate Does Not Address All Navy Priorities and Will Likely Carry Forward Some of the Limitations of the LCS Designs**

As LCS costs grew and capabilities diluted, the Secretary of Defense directed the Navy to explore alternatives to the LCS to address key deficiencies. In response, the Navy created the Small Surface Combatant Task Force and directed it to consider new and existing frigate design options, including different types of modified LCS designs. The task force concluded that the Navy's desired capability requirements could not be met without major modifications to an LCS design or utilizing other non-LCS designs. When presented with this conclusion, senior Navy leadership directed the task force to explore what capabilities might be more feasible on a minor modified LCS. This led the task force to develop options with diminished capabilities, such as reduced speed or range, resulting in some capabilities becoming equal to or below expected capabilities of the current LCS. Ultimately, the department chose a frigate concept based on a minor modified LCS in lieu of more capable small surface combatant options because of LCS's relatively lower cost and quicker ability to field, as well as the ability to upgrade remaining LCS.

Table 4 presents an analysis from our past work, which found that the Navy's proposed frigate will offer some improvements over LCS. For example, the Navy plans to equip the frigates with the mission systems from both the surface and anti-submarine mission packages simultaneously instead of just one at a time like LCS. However, the Navy's planned frigate upgrades will not result in significant improvements in survivability areas related to vulnerability—the ability to withstand initial damage effects from threat weapons—or recoverability—the ability of the crew to take emergency action to contain and control damage.

**Table 4: Proposed Frigate Capability Changes**

Proposed change	Description	Significance
Switch from single to multi-mission capability	Frigate will be able to embark surface and anti-submarine warfare mission packages at one time instead of just a single mission package, like LCS.	A multi-mission capability was recognized in Navy analysis as a key characteristic of a frigate. A frigate will be able to engage different types of threats at all times, unlike LCS which depends on the mission package embarked.
Improve air warfare systems	Frigate will be equipped with an improved air search radar and defensive countermeasures.	This reduces susceptibility to attacks from air-based threats (e.g. aircraft or missiles). The Navy also is considering these improvements for LCS.
Add armor to vital spaces and magazines. Improve shock hardening in anti-air missile system	Armor reduces vulnerability; intended to lessen risk of magazine detonation. Shock hardening reduces vulnerability of missile system.	LCS already has some armor in these areas; shock hardening is limited to anti-air missile system. The Navy believes adjusting the concept of operations for the frigate is more cost-effective and feasible than a further increase in armor and shock hardening.

Source: GAO analysis of Navy documentation. | GAO-17-262T

Further, the Navy sacrificed capabilities that were prioritized by fleet operators. For example, fleet operators consistently prioritized a range of 4,000 nautical miles, but the selected frigate concept is as much as 30 percent short of achieving such a range.

The Director, Operational Test and Evaluation has noted that the Navy's proposed frigate design is not substantially different from LCS and does not add much more redundancy or greater separation of critical equipment or additional compartmentation, making the frigate likely to be less survivable than the Navy's previous frigate class. Further, the Navy plans to make some similar capability improvements to existing and future LCS, narrowing the difference between LCS and the frigate. We found that the proposed frigate does not add any new offensive anti-submarine or surface warfare capabilities that are not already part of one of the LCS mission packages, so while the frigate will be able to carry what equates to two mission packages at once, the capabilities in each mission area will be the same as LCS. While specific details are classified, there are only a few areas where there are differences in frigate warfighting capability compared to the LCS.

Since it will be based on the LCS designs, the frigate will likely carry forward some of the limitations of the LCS designs. For example, LCS was designed to carry a minimally-sized crew of approximately 50. The Navy has found in various studies that the crew is undersized and made some modest increases in crew size. A frigate design based on LCS may not be able to support a significant increase in crew size due to limited space for berthing and other facilities. Additionally, barring Navy-directed changes to key mechanical systems, the frigate will carry some of the

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more failure-prone LCS equipment, such as some propulsion equipment, and will likely carry some of the non-fleet-standard, LCS-unique equipment that has challenged the Navy's support and logistics chain. Uncertainties or needs that remain with the surface and anti-submarine warfare mission packages, such as demonstrating operational performance of the surface-to-surface missile and the anti-submarine warfare package, also pose risk for the frigate.

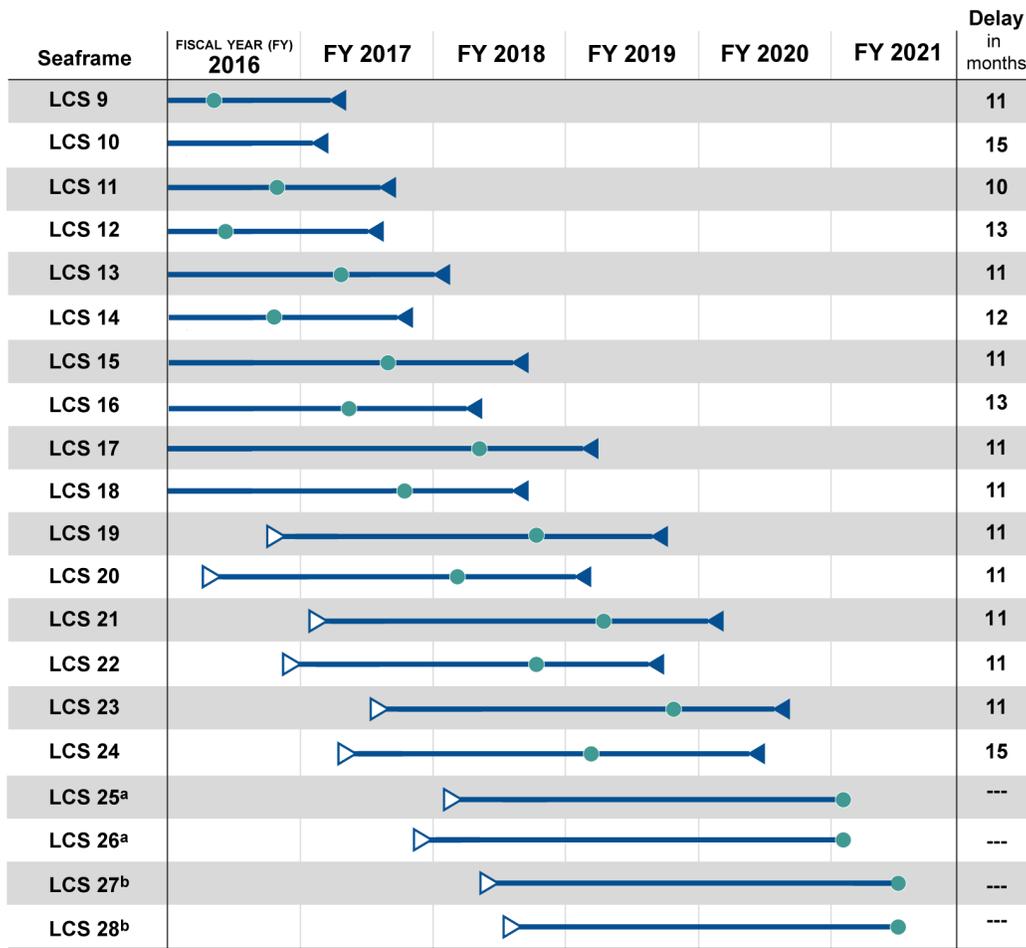
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## Limited Opportunities Remain to Shape LCS and Frigate Programs

The Navy's plans for fiscal years 2017 and 2018 involve significant decisions for the LCS and the frigate programs, including potential future commitments of approximately \$14 billion for seaframes and mission packages. First, the Navy plans to buy the last two LCS in fiscal year 2017, even though DOD and the Navy recognize that the LCS does not meet needs. Second, the Navy is planning to seek congressional authorization for a block buy of all planned frigates and funding for the lead frigate as soon as next year—2017—despite significant unknowns about the cost, schedule, and capability of the vessel. The Navy's acquisition approach for the frigate raises concerns about overcommitting to the future acquisition of ships for which significant cost, schedule, and technical uncertainty remains. Similar to what we previously have advised about LCS block buy contracting, a frigate block buy approach could reduce funding flexibility. For example, the LCS contracts provide that a failure to fully fund the purchase of a ship in a given year would make the contract subject to renegotiation. Following this reasoning, such a failure to fund a ship in a given year could result in the government paying more for remaining ships under the contract, which provides a notable disincentive to take any action that might delay procurement, even when a program is underperforming.

The Navy requested funding for two LCS in its fiscal year 2017 budget request. We previously suggested that Congress consider not funding any requested LCS in fiscal year 2017 because of unresolved concerns with lethality and survivability of the LCS design, the Navy's ability to make needed improvements, and the lagging construction schedule of the shipyards. As figure 4 depicts, even if no ships were funded in fiscal year 2017, delays that have occurred for previously funded ships have resulted in a construction workload that extends into fiscal year 2020.

**Figure 4: Construction Demands for Littoral Combat Ship (LCS) Shipyards**



Current start construction date  
 Original delivery date  
 Modified delivery date

LCS = Littoral Combat Ship

Source: GAO analysis of Navy contract data and budget documents. | GAO-17-262T

<sup>a</sup>The delivery dates for LCS 25 and 26—awarded in March 2016—have not been modified.

<sup>b</sup>The Navy has not awarded contracts for construction of LCS 27 or 28.

In all, 8 ships have been delivered (LCS 1-8) and 14 are in various phases of construction (LCS 9-22), with 3 more (LCS 23, 24, and 26) set to begin construction later in fiscal year 2017. Although the Navy has argued that pausing LCS production would result in loss of production work and start-up delays to the frigate program, the schedule suggests

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that the shipyards in Marinette, Wisconsin, and Mobile, Alabama, will have sufficient workload remaining from prior LCS contract awards that offsets the need to award additional LCS in fiscal year 2017. The Navy's concern also does not account for any other work that the shipyards may have from other Navy or commercial contracts and the possibility of continued delays in the delivery of LCS.

On the heels of the decision to fund fiscal year 2017 LCS will be the decision on whether to authorize the frigate contracting approach and fund the lead frigate. As I noted above, the current acquisition plans for the frigate have been accelerated during the past year. If these plans hold, Congress will be asked in a few months to consider authorizing a block buy of 12 frigates and funding the lead frigate when the fiscal year 2018 budget is proposed—before detail design has begun and the scope and cost of the design changes needed to turn an LCS into a frigate are well understood. The frigate acquisition strategy also reflects a proclivity by the Navy to use contracting approaches such as block buys and multiyear procurement for acquisition programs, which may have the cumulative effect of inuring the programs against changes—such as in quantities bought.

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## Summary

To the extent that both the LCS and the frigate successfully demonstrate their ability to conduct their intended missions, it is reasonable to assume they will provide useful capability to the Navy. By the same token, the LCS's weakened business case raises a basic oversight question: does a program that costs twice as much but delivers less capability than planned still warrant an additional investment of nearly \$14 billion?

Congress has two key decisions remaining for LCS and the frigate that, once made, will put a set of commitments in place that will make it difficult for Congress to alter in the future. The first decision is whether to fund additional LCS in fiscal year 2017, in light of the backlog of work already in the shipyards and the fact that these ships are baseline LCS, not the frigate. Second—and more importantly—is the decision on whether to authorize a block buy of 12 frigates, which would conclude the entire buy of 40 LCS and frigates. If Congress were to authorize the block buy, those ships would still require annual appropriations. While Congress could still thus conduct oversight of the program through the appropriations process, it could be more difficult to make decisions to reduce or delay the program should that become warranted, as the Navy may point to losses in favorable block buy prices, like it has done previously with LCS. At a minimum, holding the Navy to the plan it set

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forth in the fiscal year 2017 budget submission, which provided for detail design activities in advance of a contract award in fiscal year 2019, affords more time to reduce LCS uncertainties that directly affect the frigate and to build design knowledge to reduce technical and cost risks. Additionally, forgoing a frigate award in fiscal year 2018 offers the Navy an opportunity to better demonstrate to Congress whether the frigate's estimated cost and expected capabilities warrant the additional investment.

GAO has reported extensively about what we refer to as the defense acquisition culture, a prevailing set of incentives that encourages decisions to go forward with programs before they are ready and a willingness to accept cost growth and schedule delays as the likely byproduct of such decisions. This Committee has been particularly concerned with repeated acquisition problems and has actively advocated for legislative solutions. As I testified last year on the Ford-class Aircraft Carrier, Congress has a very important role to play in shaping the acquisition culture, particularly in what it sanctions via funding approvals. If programs that propose optimistic or rushed acquisition strategies win funding approval, those strategies are, in effect, sanctioned. The upcoming decisions on the LCS and the frigate represent opportunities for Congress to take a stand on what it is willing to fund and what that means for maintaining—or changing—the defense acquisition culture.

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Chairman McCain, Ranking Member Reed, and Members of the Committee, this completes my prepared statement. I would be pleased to respond to any questions that you may have at this time.

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## GAO Contact and Staff Acknowledgments

If you or your staff has any questions about this statement, please contact Paul L. Francis at (202) 512-4841 or [francispl@gao.gov](mailto:francispl@gao.gov). Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this statement. GAO staff who made key contributions to this testimony are Michele Mackin (Director), Diana Moldafsky (Assistant Director), Pete Anderson, Jacob Leon Beier, Laurier Fish, Kristine Hassinger, C. James Madar, Sean Merrill, LeAnna Parkey, and Robin Wilson.

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# Related GAO Products

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*Littoral Combat Ship: Need to Address Fundamental Weaknesses in LCS and Frigate Acquisition Strategies.* [GAO-16-356](#). Washington, D.C.: June 9, 2016.

*Littoral Combat Ship: Knowledge of Survivability and Lethality Capabilities Needed Prior to Making Major Funding Decisions.* [GAO-16-201](#). Washington, D.C.: December 18, 2015.

*Littoral Combat Ship: Additional Testing and Improved Weight Management Needed Prior to Further Investments.* [GAO-14-827](#). Washington, D.C.: September 25, 2014.

*Littoral Combat Ship: Navy Complied with Regulations in Accepting Two Lead Ships, but Quality Problems Persisted after Delivery.* [GAO-14-749](#). Washington, D.C.: July 30, 2014.

*Littoral Combat Ship: Deployment of USS Freedom Revealed Risks in Implementing Operational Concepts and Uncertain Costs.* [GAO-14-447](#). Washington, D.C.: July 8, 2014.

*Navy Shipbuilding: Opportunities Exist to Improve Practices Affecting Quality.* [GAO-14-122](#). Washington, D.C.: November 19, 2013.

*Navy Shipbuilding: Significant Investments in the Littoral Combat Ship Continue Amid Substantial Unknowns about Capabilities, Use, and Cost.* [GAO-13-738T](#). Washington, D.C.: July 25, 2013.

*Navy Shipbuilding: Significant Investments in the Littoral Combat Ship Continue Amid Substantial Unknowns about Capabilities, Use, and Cost.* [GAO-13-530](#). Washington, D.C.: July 22, 2013.

*Defense Acquisitions: Realizing Savings under Different Littoral Combat Ship Acquisition Strategies Depends on Successful Management of Risks.* [GAO-11-277T](#). Washington, D.C.: December 14, 2010.

*National Defense: Navy's Proposed Dual Award Acquisition Strategy for the Littoral Combat Ship Program.* [GAO-11-249R](#). Washington, D.C.: December 8, 2010.

*Defense Acquisitions: Navy's Ability to Overcome Challenges Facing the Littoral Combat Ship Will Determine Eventual Capabilities.* [GAO-10-523](#). Washington, D.C.: August 31, 2010.

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*Littoral Combat Ship: Actions Needed to Improve Operating Cost Estimates and Mitigate Risks in Implementing New Concepts.* [GAO-10-257](#). Washington, D.C.: February 2, 2010.

*Best Practices: High Levels of Knowledge at Key Points Differentiate Commercial Shipbuilding from Navy Shipbuilding.* [GAO-09-322](#). Washington, D.C.: May 13, 2009.

*Defense Acquisitions: Overcoming Challenges Key to Capitalizing on Mine Countermeasures Capabilities.* [GAO-08-13](#). Washington, D.C.: October 12, 2007.

*Defense Acquisitions: Plans Need to Allow Enough Time to Demonstrate Capability of First Littoral Combat Ships.* [GAO-05-255](#). Washington, D.C.: March 1, 2005.

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## Strategic Planning and External Liaison

James-Christian Blockwood, Managing Director, [spel@gao.gov](mailto:spel@gao.gov), (202) 512-4707  
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