United States Government Accountability Office

Report to the Committee on Armed Services, House of Representatives

April 2021

LITTORAL COMBAT SHIP

Unplanned Work on Maintenance Contracts Creates Schedule Risk as Ships Begin Operations

GAO@100
A Century of Non-Partisan Fact-Based Work

GAO-21-172

GAO@100 Highlights

Highlights of GAO-21-172, a report to the Committee on Armed Services, House of Representatives

April 2021

LITTORAL COMBAT SHIP

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Why GAO Did This Study

The Navy plans to spend approximately $61 billion to operate and maintain LCS, a class of small surface ships equipped with interchangeable sensors and weapons. With limited operations to date, these ships have entered the Navy's maintenance cycle. Since 2005, GAO has reported extensively on LCS issues, including ships delivered late and with increased costs and less capability than planned. The Navy also encountered problems as LCS entered the fleet, including higher than expected costs for contractor maintenance and numerous mechanical failures. In 2020, GAO reported that major maintenance on other surface ships using the same contracting approach as LCS was 64 days late, on average. The Navy acknowledges the importance of reducing maintenance delays in order to improve the readiness of its surface fleet.

A House Report included a provision for GAO to review long-term contracting strategies and challenges for LCS repair and maintenance. This report (1) describes the effect of the LCS program's acquisition and sustainment strategies on its contracted maintenance and (2) assesses the extent to which the Navy is using contracting approaches to address any cost and schedule risks in maintaining LCS. To conduct this assessment, GAO reviewed relevant Navy documentation, including a sample of 18 delivery orders for LCS maintenance from fiscal year 2018 through April 2020 selected to cover each availability type and each LCS variant. GAO also interviewed Navy officials and contractor representatives.

View GAO-21-172. For more information, contact Shelby S. Oakley at (202) 512-4841 or OakleyS@gao.gov.

What GAO Found

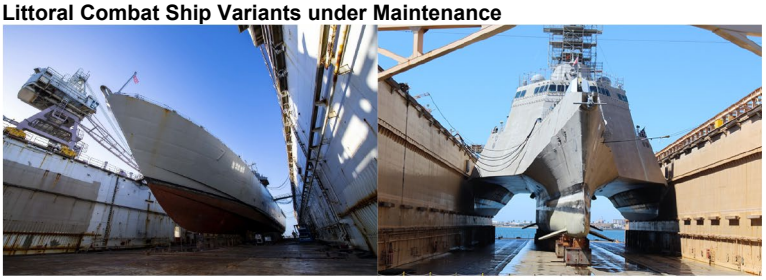
The Littoral Combat Ship (LCS) is a class of small surface ships with two unique design variants. Both LCS variants carry smaller crews and rely more on contractors for maintenance than any other Navy ship. While this strategy was intended to reduce operating costs, it contributes to challenges in the Navy's strategy for contracted maintenance. Specifically:

Contractor travel. U.S. law states that foreign contractors generally cannot conduct certain types of LCS maintenance. This results in the Navy paying for contractors to regularly travel overseas to perform routine maintenance. GAO's sample of 18 delivery orders showed estimated travel costs for the orders reviewed ranged from a few thousand dollars to over $1 million.

Heavy reliance on original equipment manufacturers. LCS includes numerous commercial-based systems that are not used on other Navy ships. However, the Navy lacks sufficient manufacturer technical data to maintain many of these systems. This can lead to longer maintenance periods due to extra coordination needed for the manufacturers to assist with or complete the work.

Although the Navy is establishing teams of its personnel to take on routine maintenance, contractors will continue performing some of this work.

Littoral Combat Ship Variants under Maintenance



Source: (left) U.S. Navy photo by Mass Communication Specialist 3rd Class Nathan T. Beard/Released; (right) U.S. Navy photo by Electronics Technician First Class Adam Ross. | GAO-21-172

The Navy is beginning to implement contracting approaches for LCS maintenance in order to help mitigate schedule risk, while taking steps to avoid it in the future. GAO found in the 18 LCS maintenance delivery orders it reviewed that the Navy had to contract for more repair work than originally planned, increasing the risk to completing LCS maintenance on schedule. A majority of this unplanned work occurred because the Navy did not fully understand the ship's condition before starting maintenance. The Navy has begun taking steps to systematically collect and analyze maintenance data to determine the causes of unplanned work, which could help it more accurately plan for maintenance. The Navy has also recently begun applying some contracting approaches to more quickly incorporate unplanned work and mitigate the schedule risk, such as (1) setting a price for low-dollar value unplanned work to save negotiation time and (2) procuring some materials directly instead of waiting for contractors to do so. Such measures will be important to control cost and schedule risks as additional LCS enter the fleet in the coming years.

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Abbreviations

CLIN	contract line item
CNO	Chief of Naval Operations
FPDS-NG	Federal Procurement Data System-Next Generation
IDIQ	indefinite delivery, indefinite quantity
LCS	Littoral Combat Ship
MAC-MO	Multiple Award Contract, Multi-Order
MET	Maintenance Execution Team
NAVSEA	Naval Sea Systems Command
NAVSUP	Naval Supply Systems Command
NMD	Naval Maintenance Database
OEM	original equipment manufacturer
P2P	Performance to Plan
PMS 505	LCS Fleet Introduction & Sustainment Program Office
RCC	request for contract change
RMC	regional maintenance center
SEA 02	Naval Sea Systems Command Contracts Division
SERMC	Southeast Regional Maintenance Center
SWRMC	Southwest Regional Maintenance Center

GAO@100 U.S. GOVERNMENT ACCOUNTABILITY OFFICE
A Century of Non-Partisan Fact-Based Work

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April 29, 2021

The Honorable Adam Smith
Chairman
The Honorable Mike Rogers
Ranking Member
Committee on Armed Services
House of Representatives

The Navy plans to spend approximately $61 billion to operate and maintain the Littoral Combat Ship (LCS), a class of small surface combatants equipped with modular mission packages to achieve combat capability.[1] These funds are intended to support the 35 ships that the Navy already purchased in previous fiscal years. As of February 2020, the Navy had spent over $16 billion to develop, design, and construct 21 of 35 ships that have been delivered to the fleet. The LCS class consists of two different variants—the Freedom and the Independence—designed and built by two different shipyards. One unique aspect of LCS is its small crew size. Because of its minimal crew size, contractors, instead of the crew onboard, conduct much of the maintenance and support on shore.

Since 2005, we have reported extensively on acquisition challenges with the LCS program. For example, we found that breakdowns of critical systems resulted in ships delivered to the fleet late and with less capability than initially planned. The Navy also encountered problems as it began to operate and maintain LCS, including higher than expected costs for contractor maintenance and numerous mechanical failures on early deployments. Multiple LCS have encountered issues with their propulsion systems, particularly with the combining gears, during deployments. In March 2020, we reported that the Navy designed and built LCS without conducting analysis to understand and mitigate risks in its unique contractor-based maintenance approach, resulting in costly problems as the ships entered operations and maintenance.[2] We also reported that the average LCS costs $21 million (in fiscal year 2019

[1]The LCS consists of two distinct parts—the ship itself (called a seaframe) and the package of sensors, weapons, and aircraft that it carries and deploys, which enables one of the three primary missions. Modular mission packages include antisubmarine warfare, mine countermeasures, and surface warfare.

[2]GAO, *Navy Shipbuilding: Increasing Focus on Sustainment Early in the Acquisition Process Could Save Billions,* GAO-20-2 (Washington, D.C.: Mar. 24, 2020).

dollars) per year per hull to maintain—an increase of more than $13 billion over the projected cost if these higher costs continue over the life of the ship class.[3]

Given the issues with the LCS program and the importance of affordably operating and sustaining the ships, House Report 116-120 accompanying the National Defense Authorization Act for Fiscal Year 2020 includes a provision for us to review LCS long-term contracting strategies for ship repair and maintenance.[4] This report: (1) describes the effects of the LCS program's acquisition and sustainment strategies on its contracted maintenance and (2) assesses the extent to which the Navy is using contract approaches to address any cost and schedule risks in maintaining LCS.

To describe the effects of the LCS acquisition and sustainment strategies on contracted maintenance, we analyzed relevant LCS operations and support strategy documents and the Navy's 2016 LCS Program Review. To answer both objectives, we reviewed the LCS acquisition strategy and interviewed Navy officials responsible for overseeing LCS operations and sustainment and contractor representatives. Additionally, we leveraged past GAO reports from 2014 to 2017 on the LCS program as well as from our broader work on Navy shipbuilding and contracting.

From a total of 275 delivery orders, we selected a non-generalizable sample of 18 LCS delivery orders for maintenance periods—called availabilities—from fiscal year 2018 through April 2020. Our selection included maintenance on both LCS variants, as well as major, non-major, and routine maintenance, and maintenance executed at U.S. homeports and overseas. We analyzed the contract terms from the delivery orders, and used the Navy Maintenance Database to analyze contract changes for the selected delivery orders. We assessed the reliability of this database by comparing information in the database to contract documents for our selected delivery orders. In addition, to further assess the extent to which the Navy is using contracting approaches to address cost risk, we analyzed the number of offers per order for all 338 delivery orders from fiscal years 2017 through 2020, including those awarded after

[3]To reduce maintenance and operation costs, among other reasons, the Navy plans to retire the first four LCS in 2021 after completing three deployments. The design and required maintenance of these initial ships significantly differs from follow on ships, as the Navy incorporated design changes and lessons learned after building the first four ships.

[4]House Report 116-120 also includes a provision for us to review additional aspects of LCS program operations and sustainment. This separate GAO engagement is ongoing.

our initial sample selection. Further details on our objectives, scope, and methodology can be found in appendix I.

We conducted this performance audit from March 2020 to April 2021 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.

Background

The Navy designed LCS to operate in shallow waters close to shore in conjunction with other Navy forces. LCS has two variant designs that reflect different contractor solutions to meeting the same set of performance requirements. For this reason, the variants have different key systems—including combat systems (i.e., different collections of built-in sensors, computers, software, and tactical displays), radar and communication systems, and propulsion systems—some produced by different original equipment manufacturers (OEM). The most notable difference is that the Freedom variant (see fig. 1) is a single hull design with a steel hull and aluminum superstructure, while the Independence variant is an aluminum trimaran design (see fig. 2).[5]

[5]A trimaran is a ship that has three separate hulls.

Figure 1: Littoral Combat Ship, Freedom Variant

Source: U.S. Navy photo by Mass Communication Specialist 1st Class James R. Evans/Released. | GAO-21-172

Figure 2: Littoral Combat Ship, Independence Variant

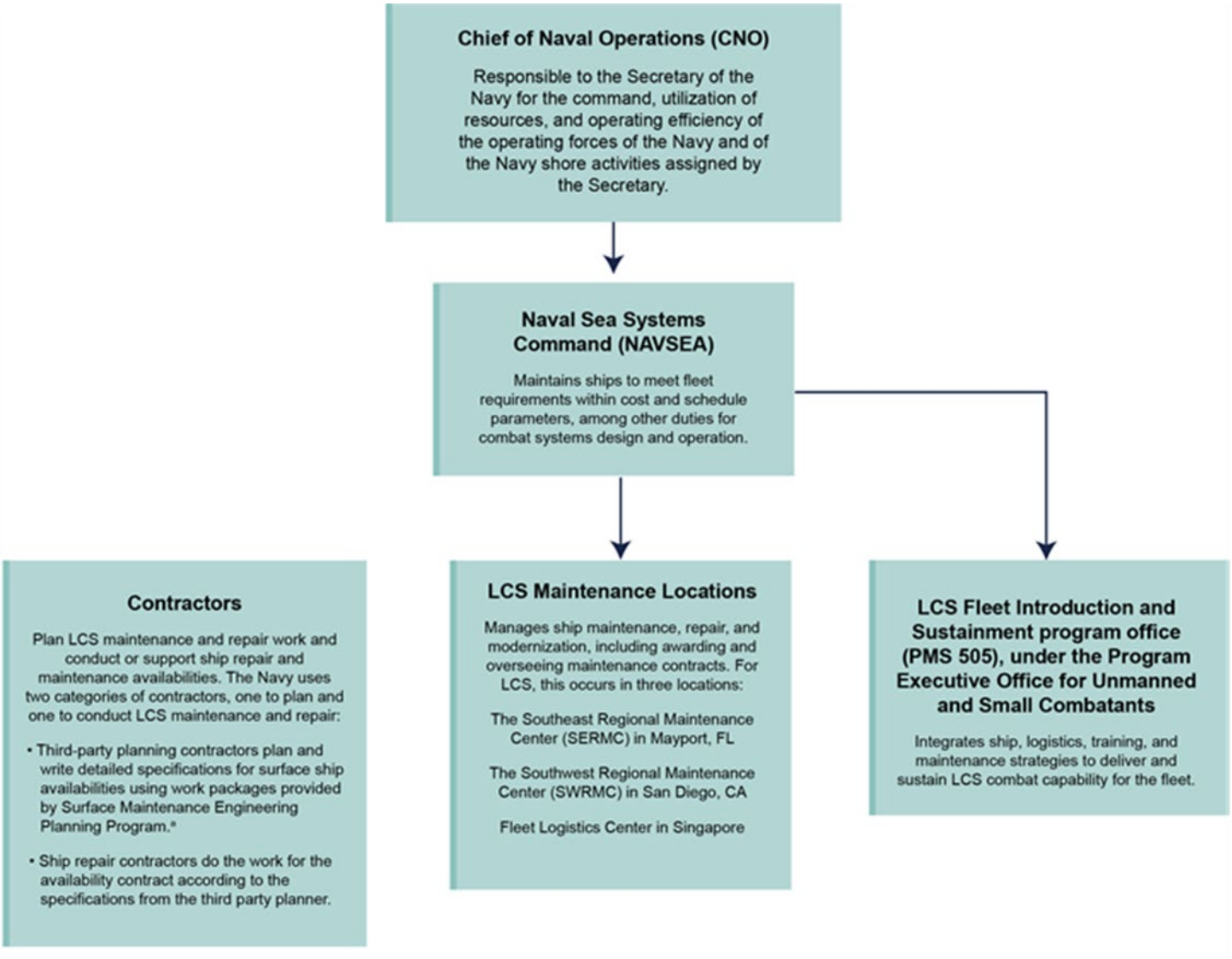
Source: U.S. Navy photo by Chief Mass Communication Specialist Shannon Renfroe/Released. | GAO-21-172

A key feature of the LCS design is the smaller crew size compared to other surface combatant ships. Rather than relying on sailors, the LCS design was predicated on using automation to monitor the ship and shore-based contractors, instead of sailors, to maintain and repair the ships. By reducing the number of sailors, the Navy intended to lower operating and support costs over the ships' life cycles, compared to legacy frigates. While integrating the core and mission crew in 2016 helped increase the core crew size to 70 sailors from 40 sailors in 2003, the number remains smaller than other surface ships, which have average crew sizes from as small as 200 to more than 300.

Roles and Responsibilities of Organizations Involved in LCS Maintenance

The Navy oversees the planning and execution of LCS repair, maintenance, and modernization through several organizations. Figure 3 shows these organizations and describes their responsibilities.

Figure 3: Navy Organizations Involved in Littoral Combat Ship (LCS) Maintenance



Source: GAO analysis of Navy data. | GAO-21-172

[a]QED Systems is the third-party planner for LCS maintained at SWRMC. SERMC provides Navy planning staff to draft ship repair specifications for the LCS it maintains.

Note: This is not an exhaustive list of all organizations involved.

Availability Types

An availability is a scheduled period for repairs, maintenance, and modernization during which the ship is temporarily unavailable for operations. Ship repair availabilities can range from a few weeks to years

depending on the extent of work required and degree of complexity. The types of availabilities include the following:

- **Major availabilities**, called Chief of Naval Operations (CNO) availabilities, accomplish major repair work, such as structural, mechanical, and electrical repairs.[6] These may include modernization work to upgrade a ship's capabilities along with repair work, and can last for over a year. For example, in certain types of maintenance, ships are taken out of the water and put into a dry dock to perform maintenance on below-water parts of the ship. Larger contractors typically execute these types of availabilities rather than small businesses.[7]
- **Non-major availabilities**, consist of availabilities to accomplish non-major repair work requiring relatively little time compared to CNO availabilities—typically only weeks to a few months in duration. Non-major availabilities include:
  - **Continuous maintenance availabilities** that accomplish planned, non-major repair work, for example, repainting parts of a ship or repairing the nonskid surfaces on a flight deck. For LCS, these availabilities are normally scheduled every 4 months. Small business contractors commonly execute this type of availability, but, at some ports, larger companies that have contracts for CNO availabilities also take on this type of work.
  - **Emergent maintenance availabilities** that accomplish unplanned repair work of an urgent nature when the risk of prolonged disruption to a ship's operations makes higher payments for repair acceptable. These availabilities are only completed on an as-needed basis in order to keep a ship operating.
- **Routine maintenance** are planned maintenance availabilities that are scheduled monthly. These availabilities are typically only 5 days in duration and are unique to the LCS program because they are conducted by contractors in port rather than by the ship's crew. Several types of lower-level maintenance are completed during these availabilities:

[6]CNO availabilities include Selected Restricted Availabilities, Depot Modernization Periods, and Phased Maintenance Availabilities.

[7]The U.S. Small Business Administration defines a shipbuilding and repairing "small business" as being a company that has 1,250 or fewer employees.

- Preventative maintenance includes system inspections, operability tests and diagnostics, lubrication, calibration, and cleaning.
- Corrective maintenance consists of repairing or replacing degraded or failed components or structure to regain lost function. This repair work includes electronic troubleshooting and changing out components.
- Facilities maintenance consists of cleaning the ship and corrosion control—coating maintenance and repair to exterior and interior surfaces due to normal environmental conditions.

Navy Efforts to Improve Ship Maintenance Outcomes

The Navy is working to improve ship maintenance cost and schedule outcomes through the Multiple Award Contract, Multi-Order (MAC-MO) strategy and the Performance to Plan (P2P) initiative. The Navy implemented these plans to address widespread cost and schedule challenges related to ship maintenance across surface ship classes, which had contributed to a decline in readiness across the fleet. Under the MAC-MO strategy, which was implemented in 2015, the Navy generally uses firm-fixed-price contract delivery orders for individual ship availabilities competed among pre-qualified contractors at Navy regional maintenance centers. The Navy's prior strategy, called Multi-Ship, Multi-Option, used cost-reimbursement contracts, to contract for ship maintenance with the private sector. Under a cost-reimbursement contract, the government does not contract for the performance of a specified amount of work for a predetermined price, but instead agrees to pay the contractor's reasonable costs (up to a ceiling price) regardless of whether the work is completed.

Navy leadership determined that the business case for the Multi-Ship, Multi-Option strategy had deteriorated, as ship availabilities were incurring excessive cost and schedule growth. This situation led the Navy to switch to the firm-fixed price MAC-MO strategy. In addition, the MAC-MO contracting strategy features the use of indefinite delivery, indefinite quantity (IDIQ) contracts, for ship repair. IDIQ contracts do not specify exact times for delivery or precise quantities of supplies or services at contract award; those are established with orders during contract performance. The MAC-MO strategy also introduced the use of a third-party planning contractor to define contract specifications, rather than relying on ship repair contractors. We reported in May 2020 that other surface ships experienced limited cost growth under the new MAC-MO

strategy, but schedule delays persisted.[8] While the Navy generally awards ship maintenance contracts under this strategy using firm-fixed-price terms, the MAC-MO contracting strategy for LCS allows the Navy to also use cost-reimbursement contracts. Under this type of contract, Navy officials told us that growth work, which the Navy defines as additional work that is identified or authorized after contract award and is related to a work item included in the original contract, may be authorized after the government and contractor negotiate the cost of the growth item.

The Navy began the P2P initiative in 2019 to, among other goals, develop solutions to improve availability timeliness and reduce maintenance schedule delays by addressing growth work using data and metrics. The Navy, through this initiative, designated the Commander of Naval Surface Forces and the Commander of Naval Sea Systems Command (NAVSEA), with responsibility for improving performance of ship maintenance in private and public shipyards.[9]

New Navy Approach to LCS Sustainment Will Reduce, but Not Eliminate, the Reliance on Contractors

LCS has a unique acquisition and sustainment strategy that results in a heavy reliance on contractors, rather than sailors, for all types of maintenance. Although the Navy is in the process of making changes to LCS's operations and sustainment approach, contracted maintenance remains a key feature. Specifically, LCS design and sustainment strategy affects contracted maintenance in three key ways:

- requiring the use of contractors for routine maintenance,
- requiring contractors to travel overseas to complete non-voyage repair work, and
- requiring a heavy reliance on commercial systems manufacturers.

[8]GAO, *Navy Ship Maintenance: Evaluating Pilot Program Outcomes Could Inform Decisions to Address Persistent Schedule Challenges*, GAO-20-370 (Washington, D.C.: May 11, 2020).

[9]In August 2020, we recommended that NAVSEA identify a time frame for completing the development of metrics for its Shipyard Performance to Plan initiative and complete the development of metrics to address the main factors contributing to maintenance delays and improve the timely completion of ship maintenance at Navy shipyards. The Navy agreed with this recommendation and said it will continue identifying drivers of delays and associated metrics through Performance to Plan. See GAO, *Navy Shipyards: Actions Needed to Address the Main Factors Causing Maintenance Delays for Aircraft Carriers and Submarines*, GAO-20-588 (Washington, D.C.: Aug. 20, 2020).

Despite transitioning some maintenance to Navy personnel, the Navy will continue to use contractors for a share of routine maintenance. Still, statute generally prohibits foreign shipyards from maintaining LCS with U.S. homeports, requiring U.S. contractors to travel overseas to conduct non-voyage repair, and the Navy is beginning to take steps to mitigate the reliance on commercial systems manufacturers.[10]

LCS's Updated Sustainment Strategy Still Includes Contracting for Routine Maintenance

While the Navy is introducing Navy-led Maintenance Execution Teams (MET) to take over some routine maintenance duties typically conducted by contractors, contractors will continue to play a role in the maintenance of LCS. The Navy is developing METs, which will consist only of Navy personnel separate from the LCS crew, to reduce the Navy's reliance on contractors for LCS maintenance. The Navy expects that the METs will increase the self-reliance and flexibility of the ships to meet operational schedules and shift routine maintenance responsibility onto the Navy. Nevertheless, Navy officials stated that contractors will continue to have a role in routine maintenance in the near and long term as the METs are being stood up and after they are in place.

The Navy is still determining, however, the specific maintenance activities the METs will perform. According to Navy officials, METs will be primarily responsible for preventative maintenance on the seaframes. The Navy also plans to assign METs to the regional maintenance centers (RMC) to assist with routine maintenance. Navy officials said contractors will still play a role in LCS routine maintenance, though the Navy has yet to determine the extent.[11] Navy officials also told us that they do not expect that the introduction of the METs will alter the type or structure of maintenance contracts for LCS. Instead, Navy officials stated that they expect that the METs would eventually reduce the total number and value of the contracts because there will be less routine maintenance

[10]Under subsection 8680(a) of title 10, a naval vessel the homeport of which is in the United States or Guam may not be overhauled, repaired, or maintained in a shipyard outside the United States or Guam, other than in the case of voyage repairs. In the case of a naval vessel classified as a Littoral Combat Ship and operating on deployment, however, corrective and preventive maintenance or repair (whether intermediate or depot level) and facilities maintenance may be performed on the vessel-(i) in a foreign shipyard; (ii) at a facility outside of a foreign shipyard; or (iii) at any other facility convenient to the vessel, provided that the work is performed by U.S. government personnel or U.S. contractor personnel. Facilities maintenance for LCS operating on a deployment may be performed by a foreign contractor on a vessel only as approved by the Secretary of the Navy.

[11] Navy officials stated that contractors will perform a small share of routine maintenance, but did not provide further context.

completed by contractors. However, this reduction may not lead to a reduction in total costs for LCS maintenance. The Navy will have to pay personnel costs for the METs, and Navy officials told us that travel costs to the ships for maintenance for METs and contractors would be similar. However, Navy officials stated that the Navy can leverage routine government transportation to reduce travel costs. In addition, the work requirements for routine LCS maintenance will remain the same whether completed by METs or contractors. Routine maintenance for LCS will always operate differently than other surface ships because the small crew size of LCS means that the crew does not have the capacity to perform all preventative maintenance themselves.

Domestic Contractors Generally Travel to Conduct Maintenance When LCS Are in Foreign Ports

Under statute, LCS generally cannot use foreign contractors to conduct corrective and preventative maintenance or repair, and facilities maintenance, when the ships are overseas. Since fiscal year 2017, the Navy has been able to approve foreign contractors to conduct facilities maintenance for LCS. The Navy sought this legislative change because, according to officials, it determined it was not cost-effective to have U.S.-based contractors travel for these routine ship cleaning and corrosion control tasks. However, program officials stated that, at the time of our analysis, the Navy had yet to use this exception for ships homeported in Mayport because all availabilities for facilities maintenance have occurred at U.S. ports in Cuba and Puerto Rico.

Currently, the Navy is paying “fly-away teams,” meaning U.S. based-contractors who travel overseas to conduct routine and non-major LCS maintenance, a higher cost unique to the LCS program. For example, Navy officials stated that starting in late 2020, they began sending fly-away teams to Panama to support LCS operating in the region. The Navy will continue to use fly-away teams of contractors at least until the METs are implemented, which the Navy expects to take approximately 5 years. Navy officials stated that they are still determining the balance of contractors and METs for future LCS maintenance.[12]

Maintenance officials stated that the requirement to use U.S. personnel for most LCS maintenance overseas will result in increased travel costs as LCS are increasingly deployed for longer periods of time. The Navy estimates travel costs for fly-away teams of contractors based on the deployment schedule and includes these costs in the delivery order for

[12]GAO currently has other ongoing work on LCS operations and support.

maintenance. Program office officials stated that because there are limited locations where maintenance can take place while LCS is deployed, the Navy is able to estimate those travel costs.[13] For example, officials told us that overseas routine maintenance takes place in only a few ports in foreign countries, such as in Japan, Singapore, and Vietnam, in which there are existing Navy maintenance activities.

Contracts for availabilities using fly-away teams for routine maintenance include a cost-reimbursement contract line item (CLIN) for travel that is based on expected costs of the scheduled deployment. Officials stated that if unplanned maintenance is required, such as if a critical system breaks, the Navy would have to pay contractors for these additional, unexpected travel costs. Two delivery orders out of our sample of 18, both for maintenance on *USS Montgomery* in Singapore, showed estimated travel costs for both routine and unplanned maintenance can vary from a few thousand dollars to at least $1.2 million.

Navy Is Taking Steps to Address Contracted Maintenance Challenges due to LCS's Heavy Reliance on Commercial Systems

The Navy has encountered challenges maintaining LCS commercial systems: including:

- coordinating with multiple third parties,
- coordinating with original equipment manufacturers (OEM) of commercial systems based in foreign countries, and
- accessing proprietary data.

These challenges put pressure on the planned maintenance schedule for LCS and the effects are likely to be exacerbated as a greater number of ships begin operations and enter the maintenance cycle. As part of the LCS acquisition strategy, the Navy planned to use numerous commercial-based systems for LCS and allowed the contractors to determine the systems to use in their designs. As a result, the contractors utilized many systems that are unique to the LCS class. Some of these commercial-based systems are also unique by LCS variant.

First, the LCS maintenance strategy requires coordination between multiple contractors, numerous OEMs, and the regional maintenance centers. Specifically, the Navy contracts with the third-party planners and primary repair contractors, who then subcontract with the OEMs for

[13]Navy officials also told us that there is a set per diem for the fly-away team based on location.

maintenance on these major systems, according to Navy officials. Other surface ships rely less on OEMs and contractors for maintenance and therefore, according to Navy officials, require less complex coordination that could potentially affect maintenance timelines. Navy officials said that they can face challenges with repair contractors and OEMs working together effectively. For example, Navy officials said they have seen issues with OEMs that prefer not to work with small businesses and issues with delays stemming from contractor-OEM negotiations.

Second, vendors from foreign countries provide a number of LCS systems, and Navy maintenance officials said it can be especially difficult to bring in foreign OEMs to execute ship repairs when LCS work is performed overseas during deployments. Specifically, officials said it is challenging to arrange access for foreign OEM technicians to board a U.S. Navy ship due to restricted travel during the COVID-19 pandemic. These logistics become more complex when foreign OEMs are needed in a different foreign country. Navy maintenance officials said this difficulty has only occurred with unplanned maintenance so far, but they foresee this as a challenge for routine and non-major availabilities going forward. The Navy's most recent LCS program review in 2016 stated that critical systems, such as engines, have been shipped to foreign OEMs for repairs in cases where there is no U.S.-based company to repair these systems. This reduces the Navy's flexibility and presents a risk of schedule delays. Navy maintenance officials stated that working with foreign OEMs increases the time necessary to complete maintenance because it adds complexities in comparison to working with domestic OEMs.

Finally, the Navy and other contractors do not consistently have access to technical information necessary to maintain many systems and therefore need OEM support. As we reported in March 2020, the LCS program planned to use contracted maintenance, and as a result, program officials stated that they did not purchase the technical documentation necessary to maintain the systems used on the ship.[14] This limited access to information is in contrast with other ship classes that have systems that provide the Navy greater access to technical data to inform maintenance tasks. Consequently, the LCS program lacks access to information to maintain many systems, making contracting for and executing critical systems repairs more complex, and contributing to challenges completing LCS maintenance as planned. Navy officials told us that repair

[14]GAO-20-2.

contractors subcontract with OEMs to conduct maintenance on these systems and are able to access the necessary information through the OEMs directly. LCS program officials stated that maintenance delays can occur because there are often insufficient OEM technicians to complete necessary repairs, especially when a system needs maintenance on multiple ships, and the Navy lacks the technical data to troubleshoot and repair the systems itself. Maintenance officials stated that the availability of technicians requires the maintenance community to coordinate to prioritize workloads. For example, maintenance officials told us that the Navy has a weekly working group to discuss the availability of the OEM technicians to repair the combining gear.

The shortage of OEM technicians for the number of LCS currently in operation may increase the risk of schedule delays in the future as more LCS become operational. For example, maintenance officials stated that a commercial system had a broken part that required repairs and the OEM did not have a procedure to fix it. As a result, the Navy had to take the part from another ship to fix the first ship and put the broken part in storage. The officials stated the Navy has had to extend the delivery order until the OEM develops the procedure and has a technician fix the part or provides the procedure for the Navy to fix the part. LCS program officials also noted that in some cases OEMs place markings on data that can obscure key information. The Navy has had to work with its legal team to remove these markings and to obtain needed rights to the information. This requires more time and extends the maintenance process.

The Navy has recently begun to take actions to address challenges associated with LCS's reliance on commercial systems. Specifically, the Navy recently started working with some OEMs to purchase maintenance data. In the past 3 years, the Navy has been able to procure data to troubleshoot problems on some OEM systems remotely before requiring OEM technicians to travel to the ship. In addition, the Navy created an LCS strike team in July 2020 to address system failures on LCS and ensure that LCS are operational. Among the strike team goals is to develop a plan to replace some commercial systems with Navy-owned systems through modernization efforts. The Navy has only recently begun funding these efforts and the strike team is currently in negotiations with several OEMs regarding data access. Navy officials said the LCS strike team review will also examine schedule delays that resulted from the shortage of OEM technicians.

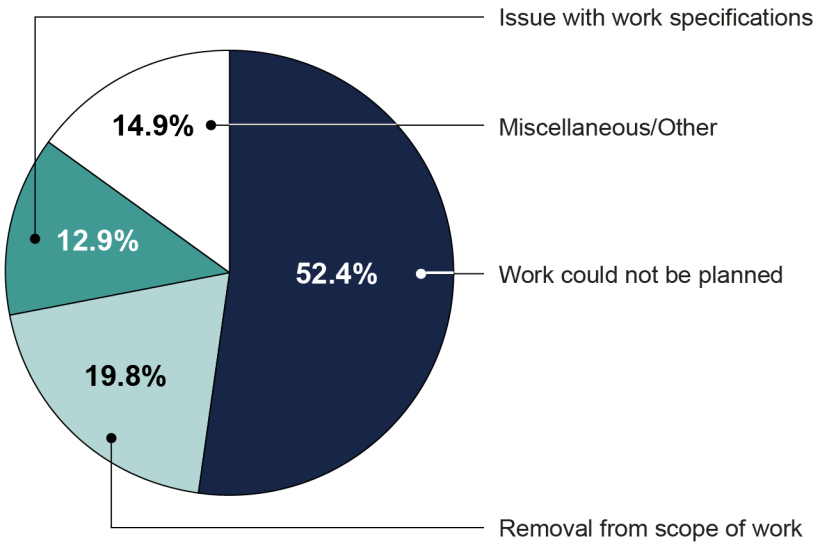
Navy Is Beginning to Use Contract Approaches to Address Some Schedule and Cost Challenges for LCS Maintenance

The Navy is beginning to implement contracting approaches for LCS maintenance in order to help mitigate any risks to cost and schedule outcomes, while taking steps to avoid these risks in the future. We found significant unplanned work in our sample of 18 delivery orders from fiscal year 2018 through April 2020, indicating a greater likelihood of cost and schedule risk in completing LCS maintenance. The Navy has recently begun taking steps to determine the cause of the unplanned work by beginning to systematically collect and analyze maintenance data. The Navy is also using several CLINs to add unplanned work onto maintenance contracts more quickly to help mitigate schedule risk. In addition, the Navy has recently begun implementing two other contract approaches in order to improve timely access to materials and increase the number of offers received: (1) procuring time sensitive material directly from suppliers; and (2) awarding multiple availabilities together. Such measures will be important to control cost and schedule risks as additional LCS enter the fleet in the coming years.

Navy Is Studying Causes of Growth Work While Using Contract Approaches to Mitigate Resulting Schedule Risks

Even for routine maintenance, LCS is experiencing numerous instances of unplanned maintenance work, called growth work, which puts the program at greater risk of cost growth and schedule delays. A senior Navy maintenance official stated that the amount of growth work for LCS is “unbelievable.” In our analysis of 18 delivery orders, including 16 for non-major and routine maintenance, we found 760 requests for contract changes across both variants, with 651 requests due to growth work. Of those changes for growth work, the most common category—341 (52 percent)—was work that the Navy determined could not have been planned prior to the availability such as work that required inspecting the ship after the availability started. Figure 4 shows the breakdown of these categories in our sample.

Figure 4: Categories of Requested Changes due to Growth Work in 18 Selected Delivery Orders for Littoral Combat Ship Maintenance, Fiscal Year 2018 through April 2020



Source: GAO analysis of Navy data. | GAO-21-172

Note: "Work could not be planned" describes requests for contract changes for work that the Navy determined could not be identified prior to the availability and includes requests due to work that could only be discovered after opening and inspecting parts on the ship. "Removal from scope of work" describes requests where the Navy removed a work item from the contract due to growth work. "Issue with work specifications" describes requests linked to faults with the planned maintenance instructions. "Miscellaneous/Other" includes requests that the Navy described as "Other" or due to remaining causes, such as requests resulting from issues with technical documentation.

Growth work, as we found in our sample, has historically been a contributing factor to increasing costs and delays that sideline a ship from operational availability. In May 2020, we reported that while major availabilities under the MAC-MO strategy for surface ships limited cost growth and increased opportunities for competition, growth work remained a contributing factor to schedule delays of surface ship maintenance. These availabilities were 64 days late, on average, and we reported that these delays can occur when the Navy needs to negotiate the cost of the growth work before the repairs can begin.[15]

Of the 18 delivery orders from our sample, 13 were complete at the time of our analysis. We found that only seven were completed as originally negotiated in the contracts, while two could not be determined because of

[15]GAO-20-370.

delayed starts. Five were still ongoing, and two of those were already past their scheduled completion date. This means that at most, 10 of the 18 could be completed as contractually scheduled, which suggests that LCS is at risk of maintenance delays.

As of August 2020, the Navy had completed only one major availability under the MAC-MO strategy, and it ended 55 days after the contractor was originally scheduled to complete maintenance. The Navy concluded that growth work, found upon inspecting the ship, created schedule risk. However, the Navy changed the estimated completion date after the availability began and does not consider this a maintenance delay. In this example, the Navy also paid a higher labor rate for the growth work, which contributed to cost growth. After this availability, the Navy suggested mitigating this risk in the future by limiting the amount of growth and new work added to the contract after the availability was 25 percent complete and deferring all work that was not technically required to a future availability.

Analysis of Growth Work

While some growth work is unavoidable, avoiding most growth work and the resulting cost and schedule risk requires that the Navy understand the condition of LCS for accurate planning and forecasting. As we reported in May 2020, Navy officials stated that certain tasks are difficult to fully scope within the work package and the original contract.[16] According to NAVSEA officials, the Navy's P2P is a data driven process to mitigate schedule delays for surface ship maintenance by identifying factors preventing the Navy meeting schedule goals and useful metrics for measuring progress.[17] For LCS, the Navy is monitoring the percent of time that LCS is mission capable as part of its P2P effort. In October 2020, the LCS strike team identified that LCS has only been mission capable 46 percent of the time, with both planned and unplanned maintenance included in the downtime. To improve the percent of time LCS is mission capable, the strike team identified the systems, such as the waterjet systems and the combining gear, commonly affecting the amount of time LCS is mission capable and then identified potential causes. For example, the strike team identified corrosion and material failure of some waterjet system parts as a cause of system failures and identified potential solutions, including using replacement parts made of

[16]GAO-20-370.

[17]GAO-20-588. We reported in August 2020 that NAVSEA, through its Shipyard P2P initiative, has taken steps to address unplanned work, but had made limited progress on developing metrics.

different material. Navy officials responsible for the sustainment of LCS stated that the limited operations of LCS hinders their opportunities to understand its growth work because they need to collect data from maintenance availabilities to study the effects of growth work on LCS maintenance. The Navy has only recently begun its efforts to collect this information and analyze the causes of growth work for LCS. By implementing the P2P framework, the Navy plans to be better able to avoid the increased costs and schedule risks associated with growth work for LCS maintenance availabilities.

Contract Approaches to Address Growth Work

The Navy has different approaches as a part of the MAC-MO strategy to more efficiently contract for LCS growth work after it occurs. As we reported in May 2020, the Navy added two tools to the MAC-MO strategy to contract for growth work and mitigate schedule risk. In addition, the Navy added one more tool to the contracting strategy specifically for LCS.[18]

- **Small-dollar value growth.** The first tool is small-dollar value growth, which includes a set price that the Navy and the repair contractor agree upon during availability planning. Then, the Navy puts any contract changes under $25,000 on contract at the predetermined price to save negotiation time during maintenance. In our sample of 18 delivery orders, we found that 289 of the change orders for growth (38 percent) were under $25,000. We found that the Navy had added the small-dollar value growth tool in the two delivery orders in our sample that were for major availabilities.
- **Level of effort to completion.** The second tool is known as level of effort to completion. At the time of award, the delivery order includes a price for a separate, level of effort to completion CLIN. The Navy obligates funds for estimated growth work at the time of award, rather than having to spend time obligating funds after repair work begins. The Navy can then use those labor-hours and materials under the level of effort CLIN for individual growth work items over the course of the availability. We found that the Navy had this CLIN in the two delivery orders in our sample that were major availabilities.
- **Cost-reimbursement CLIN for LCS**. A third tool the Navy uses on LCS maintenance contracts are cost-reimbursement CLINs to execute poorly defined work requirements, which contribute to growth work. While the Navy now generally uses fixed-price-type contracts for maintenance, the cost-reimbursement CLINs reduce the contractor's

[18]GAO-20-370.

risk by providing for the payment of allowable incurred costs for growth work, to the extent prescribed in the contract. Navy maintenance officials stated that the Navy is just starting to implement these CLINs for some routine maintenance that has had large numbers of changes for growth work. In our sample of LCS delivery orders, we found one example of a cost-reimbursement CLIN to execute LCS maintenance.

While these approaches help to prevent the schedule effects of growth work, they may introduce cost risk if the Navy increasingly relies on the use of small-dollar value growth or level of effort to completion without the historical data to accurately forecast growth work and price change orders. As noted above, Navy officials stated that they continue to build these data with each LCS availability. Continuing to collect these data will help the Navy estimate the prices for small dollar value growth and level of effort to completion.

Cost-reimbursement CLINs also introduce cost risk. We reported in November 2016 that the Navy experienced poor cost outcomes for surface ship maintenance by using cost-reimbursement contracts, and that the intent of the MAC-MO strategy was to use fixed-price contracts and competition to control costs.[19] As we reported in May 2020, major surface ship availabilities under the MAC-MO strategy experienced limited cost growth.[20] The Navy may introduce additional cost risks if it increasingly relies on cost-reimbursement CLINs for LCS maintenance.

Navy Is Procuring Time-Sensitive Material but Faces Problems Buying LCS-Specific Items

We found that the Navy has begun implementing two new contract approaches—reducing the contractor's responsibility for acquiring long lead-time material and revising planning milestones—in order to provide materials on time. Long lead-time material is material that takes longer than 30 days to procure. As with the other surface ship classes, the third-party planner, QED Systems, originally procured LCS long lead-time material for the Southwest Regional Maintenance Center (SWRMC).[21] According to Navy officials, in March 2020, the Navy began to procure long lead-time material that is less than $10,000 or material available through the Navy's supply system, while QED continues to procure long

[19]GAO, *Navy Ship Maintenance: Action Needed to Maximize New Contracting Strategy's Potential Benefits,* GAO-17-54 (Washington, D.C.: Nov. 21, 2016).

[20]GAO-20-370.

[21]The Southeast Regional Maintenance Center handles its own planning and does not rely upon QED Systems to procure long lead-time material.

lead-time material over $10,000 or material outside the Navy's system at the direction of the Navy. Navy officials stated that the Navy is shifting to furnish more LCS material itself rather than through contractors in order to improve material delivery timeliness. According to RMC officials, the Navy can save long-term costs by building data in the Navy supply system and procuring material itself.

Navy officials stated that they have had challenges with timely and correct delivery of LCS materials. In our sample of 18 delivery orders, we found 69 contract changes that together totaled just over $1 million in growth work due to material issues, such as delays or misidentifying the necessary material. We reported in May 2020 that the Navy was trying to increase the timeliness of long lead-time material delivery on other surface ships by improving the Navy's supply system, since it identified material timeliness as a factor in schedule delays.[22]

Though the Navy took over some procurement responsibility for LCS, it faces the same pressures as the contractors in acquiring material unique to the LCS on time. Officials from the Naval Supply Systems Command (NAVSUP) stated that because the Navy is in the process of transitioning some procurement responsibilities from contractors to NAVSUP, they have to build data, such as the frequency and the lead time of individual parts, for LCS material needs. NAVSUP provides the Navy with supply chain management and sources spare parts needed to ensure operational availability of each ship. This includes procuring new items that are unique to LCS. NAVSUP officials stated that they are behind in getting needed parts to the RMCs while they build up data on spare parts necessary to repair LCS, work that was formerly done by contractors. For example, NAVSUP officials told us that they had trouble procuring the waterjet for the Freedom variant on time due to lack of demand data. In that situation, NAVSUP worked with the Surface Maintenance Engineering Planning Program to resolve the issue by conducting analysis and developing requirements to forecast demand.

There are additional challenges with procuring parts for commercial systems. For instance, SWRMC officials told us that the OEM for the Independence variant's propulsion system does not allow the Navy to purchase parts for that system with a government purchase card. The Navy must negotiate a contract for those parts with the OEM separately, which adds time to the repair process. As we discussed above, Navy

[22]GAO-20-370.

program officials told us that one of the goals of LCS modernization is to replace OEM systems with government-furnished material.

The Navy has also adjusted planning milestone dates to help ensure that long lead-time materials are procured on time for major availabilities. As we reported in May 2020, the Navy shifted some planning milestones in August 2019, including awarding maintenance contracts 120 days before maintenance begins.[23] The Navy awarded the first MAC-MO delivery order at 120 days prior to the start of work in January 2020. This change was designed to provide more time to buy long lead-time material. Navy maintenance officials stated that they are still working to implement this milestone, as availability planning typically takes 2 years, and that availabilities already in the planning process may be unable to meet the new milestone. None of the major availabilities in our sample of 18 delivery orders were awarded after the Navy's implementation of the milestone change in January 2020. Though the intent behind the milestone change was to allow more time to purchase material and review the specifications, we have previously reported that the 120-day time frame also allows more time for maintenance needs to occur after the Navy plans for and awards the contract, which can lead to growth work.[24]

Navy Is Starting to Award Single Contracts of Multiple Routine LCS Maintenance Availabilities to Increase Number of Offers

We found that the Navy has embarked on a new strategy of awarding multiple maintenance availabilities in a single contract. This approach is intended to obtain more offers on solicitations for LCS maintenance by providing contractors with visibility into and confidence regarding future ship repair workloads. While LCS follows the same MAC-MO process as other ship programs, there are fewer offers on solicitations for LCS availabilities compared to those of other ship classes. We found that of the 338 delivery orders for LCS maintenance from fiscal years 2017 through 2020, the Navy had received two or more offers for 186 (55 percent). In contrast, we reported in May 2020 that for 78 percent of MAC-MO delivery orders for other surface ships, the government had received two or more offers over a 4-year period. In May 2020, we reported that the MAC-MO contract strategy increased the number of

[23]GAO-20-370.

[24]GAO-20-370.

offers received for availabilities on other surface ships, especially among small businesses, in order to control costs for maintenance.[25]

The Navy has faced challenges obtaining offers on solicitations for LCS availabilities due to port workloads and lack of participating contractors at the homeports, among other factors, according to Navy officials. In May 2016, we found that wide swings in port workload can have a negative effect on the private-sector industrial base, including expected erosion to the ship-repair industrial base's skilled workforce.[26] In May 2020, we reported that large contractors did not have a high level of confidence or visibility into future work that the Navy would award to their companies under MAC-MO. RMC officials told us that at least one large contractor will only submit offers on solicitations for larger LCS availabilities, while another contractor will only submit an offer if it does not already have planned work on other programs. In addition to workload challenges, officials at one RMC stated that some eligible contractors do not have a presence at that homeport.

Navy officials stated that they are exercising a contracting approach to bundle routine maintenance availabilities under one delivery order to increase number of offers received. The Navy has not bundled any of the three major LCS maintenance availabilities awarded so far. However, the Navy officials told us that they plan to bundle the next major LCS maintenance availabilities, on *USS Gabrielle Giffords* and *USS Omaha*. While the availabilities for which the government obtained one offer may receive some benefits from being solicited in a competitive environment, Navy officials told us that, in order to increase the number of offers on solicitations for routine maintenance, they are now employing this approach with routine and non-major availabilities. For one delivery order in our sample for routine and non-major maintenance the Navy received four offers with this approach. This order bundled six months of availabilities for six ships with options for an additional six ships over different periods. This was the same order in our sample that used cost-reimbursement CLINs for maintenance. As noted earlier, while these CLINs introduce cost risk, the Navy is able to bundle availabilities together with firm-fixed-price CLINs as well.

[25]GAO-20-370.

[26] GAO, *Military Readiness: Progress and Challenges in Implementing the Navy's Optimized Fleet Response Plan*, GAO-16-466R (Washington, D.C.: May 2, 2016).

Agency Comments

We provided a draft of this report to the Navy for review and comment. Technical comments provided by the Navy are included as appropriate.

We are sending copies of this report to the appropriate congressional committees, the Secretary of Defense, and the Acting Secretary of the Navy. In addition, the report is available at no charge on the GAO website at https://www.gao.gov.

If you or your staff have any questions about this report, please contact me at (202) 512-4841 or at OakleyS@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff who made key contributions to this report are listed in appendix II.

Shelby S. Oakley
Director, Contracting and National Security Acquisitions

Appendix I: Objectives, Scope, and Methodology

This report (1) describes the effect of the Littoral Combat Ship (LCS) program's acquisition and sustainment strategies on its contracted maintenance and (2) assesses the extent to which the Navy is using contracting approaches to address any cost and schedule risks in maintaining LCS.

Effects of Contracting Strategy

To describe the effect of the LCS acquisition and sustainment strategies on contracted maintenance, we interviewed officials responsible for overseeing, planning, administering, and funding the Navy's ship repair contracts. We interviewed representatives from the following organizations: the Naval Sea Systems Command (NAVSEA) including the LCS Fleet Introduction & Sustainment Program Office (PMS 505) and the Contracts Division (SEA 02); the Naval Supply Systems Command; the Southwest Regional Maintenance Center (SWRMC) in San Diego, California; and the Southeast Regional Maintenance Center (SERMC) in Mayport, Florida. We also interviewed management representatives of the third-party planner and planning yard contractor for LCS.

Additionally, we analyzed relevant LCS operations and support strategy documents to obtain information about the effect of the unique aspects of LCS, as well as to corroborate evidence gathered from interviews. These documents included Navy reports to Congress, the LCS acquisition strategy, the 2016 LCS Program Review, and LCS Life Cycle Sustainment Plan. We also leveraged past GAO reports on the LCS program from 2014 to 2017, as well as from our broader work on Navy shipbuilding and contracting.

We also selected a non-generalizable sample of 18 delivery orders for LCS maintenance availabilities from fiscal year 2018 through April 2020. To select the availabilities, we used a list of Multiple Award Contract, Multi-Order (MAC-MO) indefinite delivery, indefinite quantity (IDIQ) contract numbers reported to Congress by the Naval Sea Systems Command, and confirmed with the Navy. We used the Federal Procurement Data System - Next Generation (FPDS-NG) to identify 275 delivery orders for LCS maintenance. We used these data on orders to identify and collect the descriptions of contract actions to determine the ship and availability type, estimated cost, contractor, and place of performance. From this, we selected 18 delivery orders that included all types of maintenance, both LCS variants, and maintenance executed at both U.S. homeports as well as overseas availabilities. We selected both of the awarded major availabilities, and then sorted by award date to identify recent awards. We selected 10 non-major availabilities covering each type to get a variety of ships, and then selected six routine

maintenance availabilities for the remainder. We obtained the 18 delivery orders and relevant IDIQ contracts, and a sample of modifications for each order.

To identify effects of the LCS sustainment and acquisition strategies, we reviewed the statements of work, line items, terms of delivery, and modifications for the selected delivery orders. We reviewed this sample of delivery orders to corroborate testimonial statements from our interviews. We also used the sample of delivery orders to determine the travel costs for LCS maintenance availabilities. We reviewed our sample of 18 LCS delivery orders and identified all the delivery orders that included contract line items for travel and reviewed modifications for adjustments to those costs.

Use of Contracting Approaches to Address Cost and Schedule Risks

To help identify some cost and schedule risks, we interviewed contracting officials from SWRMC and SERMC, as well as leveraged prior work on surface ship maintenance. We then requested data from the Naval Maintenance Database (NMD) on the availabilities associated with our sample of delivery orders. We requested availability start and completion dates, briefings executed upon completion for major availabilities, and each request for contract change (RCC) for those delivery orders. For each RCC, we requested the number identifying the request; whether or not it represented growth work or new work; a description of the request; the cost of the request; the disposition of the request; and the government code classifying the reason for the request. We used these codes and prior work to create broader categories to assign to each RCC stemming from growth work. We used the cost of each request to calculate the total cost growth for the RCCs, as well as cost growth for subsets of the RCCs like those stemming from growth work.

To assess the reliability of the data, we used the contract documents from our sample to corroborate information related to the dates of the availabilities, and identifiers of the availabilities and some RCCs.

To assess the Navy's use of contracting approaches to address any cost and schedule risks in LCS maintenance, we interviewed contracting officials from SEA 02, SERMC, and SWRMC, and leveraged prior work to identify contract approaches available. We then reviewed our sample delivery orders and modifications to identify the use of these approaches, specifically small-dollar value growth, level of effort to completion, and cost-reimbursement line items.

To examine the number of offers for LCS maintenance delivery orders, we analyzed the universe of 338 delivery orders for all of the MAC-MO availabilities from fiscal years 2017 through 2020, including those awarded after our initial sample selection. We used FPDS-NG data to determine the number of offers received for each order. To assess the reliability of the number of offers, we performed a logic check to confirm the number of offers received for the delivery order was generally different from the number of offers received for the base contract. We also reviewed the FPDS-NG data dictionary, FPDS-NG data validation rules, and Fiscal Year 2013-2018 Federal Procurement Data Quality Summary, which contains results of agency testing of selected fields in FPDS-NG. We determined the FPDS-NG data were reliable for the purpose of assessing the number of offers for LCS maintenance delivery orders under the MAC-MO strategy.

We conducted this performance audit from March 2020 to April 2021 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Appendix II: GAO Contact and Staff Acknowledgements

GAO Contact

Shelby S. Oakley at (202) 512-4841 or OakleyS@gao.gov

Staff Acknowledgments

In addition to the contact named above, GAO staff who made key contributions to this report include Diana Moldafsky (Assistant Director), Cale Jones (Analyst-in-Charge), Jessica Karnis (Analyst-in-Charge), Rose Brister, Suellen Foth, Kurt Gurka, Jean McSween, William Reed, Kimberly Schuster, Robin Wilson, and Nate Young. In addition, Clarine Allen, Diana Maurer, Sally Newman, Tara Porter, Herbert Tinsley, and Richard Winsor supported the report.