

GAO

Report to the Subcommittee on
Readiness and the Subcommittee on
Seapower and Expeditionary Forces,
Committee on Armed Services, House of
Representatives

February 2010

LITTORAL COMBAT SHIP

Actions Needed to Improve Operating Cost Estimates and Mitigate Risks in Implementing New Concepts



GAO

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Why GAO Did This Study

The Navy plans to spend about \$28 billion to buy 55 Littoral Combat Ships (LCS) and at least 64 interchangeable mission packages to perform one of three missions—mine countermeasures, antisubmarine warfare, and surface warfare—in waters close to shore. The Navy has been developing two different LCS seaframes and plans to select one for production in 2010. Due to the small 78-person crew size—40 core crew, 23 for aviation detachment, and typically 15 for mission packages—the Navy is developing new concepts for personnel, training, and maintenance. GAO was asked to assess the extent to which DOD has (1) estimated LCS long-term operating and support costs and (2) developed plans to operate and support LCS. To do so, GAO compared Navy cost estimates to DOD guidance and GAO best practices; and analyzed Navy plans to implement its concepts for personnel, training, and maintenance and the extent these plans included assessments of program risk.

What GAO Recommends

GAO recommends, among other things, that DOD develop an estimate of the long-term operating and support costs which fully reflects best practices and use this estimate in making key program decisions, and conduct and consider the results of a risk assessment before committing to buy LCS ships in the future. DOD generally agreed with the recommendations.

View [GAO-10-257](#) or [key components](#).
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LITTORAL COMBAT SHIP

Actions Needed to Improve Operating Cost Estimates and Mitigate Risks in Implementing New Concepts

What GAO Found

The Navy estimated operating and support costs for LCS seaframes and mission packages in 2009, but the estimates do not fully reflect DOD and GAO best practices for cost estimating and may change due to program uncertainties. GAO's analysis of the Navy's 2009 estimates showed that the operating and support costs for seaframes and mission packages could total \$84 billion (in constant fiscal year 2009 dollars) through about 2050. However, the Navy did not follow some best practices for developing an estimate such as (1) analyzing the likelihood that the costs could be greater than estimated, (2) fully assessing how the estimate may change as key assumptions change, and (3) requesting an independent estimate and comparing it with the program estimate. The estimates may also be affected by program uncertainties, such as potential changes to force structure that could alter the number of ships and mission packages required. The costs to operate and support a weapon system can total 70 percent of a system's costs, and the lack of an estimate that fully reflects best practices could limit decision makers' ability to identify the resources that will be needed over the long term to support the planned investment in LCS force structure. With a decision pending in 2010 on which seaframe to buy for the remainder of the program, decision makers could lack critical information to assess the full costs of the alternatives.

The Navy has made progress in developing operational concepts for LCS, but faces risks in implementing its new concepts for personnel, training, and maintenance that are necessitated by the small crew size. Specifically, the Navy faces risks in its ability to identify and assign personnel given the time needed to achieve the extensive training required. GAO's analysis of a sample of LCS positions showed an average of 484 days of training is required before reporting to a crew, significantly more than for comparable positions on other surface ships. Moreover, the Navy's maintenance concept relies heavily on distance support, with little maintenance performed on ship. The Navy acknowledges that there are risks in implementing its new concepts and has established groups to address how to implement them. However, these groups have not performed a risk assessment as described in the 2008 *National Defense Strategy*. The Strategy describes the need to assess and mitigate risks to executing future missions and managing personnel, training, and maintenance. If the Navy cannot implement its concepts as envisioned, it may face operational limitations, have to reengineer its operational concepts, or have to alter the ship design. Many of the concepts will remain unproven until 2013 or later, when the Navy will have committed to building almost half the class. Having a thorough risk assessment of the new operational concepts would provide decision makers with information to link the effectiveness of these new concepts with decisions on program investment, including the pace of procurement.

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Abbreviations

CAPE	Cost Analysis and Program Evaluation
DOD	Department of Defense
LCS	Littoral Combat Ship

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United States Government Accountability Office
Washington, DC 20548

February 2, 2010

The Honorable Solomon Ortiz
Chairman
The Honorable J. Randy Forbes
Ranking Member
Subcommittee on Readiness
Committee on Armed Services
House of Representatives

The Honorable Gene Taylor
Chairman
The Honorable W. Todd Akin
Ranking Member
Subcommittee on Seapower
and Expeditionary Forces
Committee on Armed Services
House of Representatives

With the ability to maneuver in shallow waters inaccessible to other surface combatants, the Littoral Combat Ship (LCS) is a new class of warship meant to facilitate U.S. Navy access to and operations in the littorals, which are waters close to shore. The Navy plans a major investment in the LCS program, which could cost \$28 billion to buy 55 ships and related, interchangeable combat capability. The planned 55 ships would comprise about 38 percent of the Navy's surface combatants¹ in a 313-ship Navy. The Navy is using two contractors to build differently designed ships, called seaframes. As of October 2009, the Navy had procured two ships (one of each design) and contracted for two more (one of each design). The Navy plans to select one design in fiscal year 2010. To increase flexibility, the LCS's combat capability will be contained in removable, interchangeable mission packages² to perform one of three primary missions—mine countermeasures, antisubmarine warfare, and

¹ Surface combatant is a collective term including destroyers, cruisers, frigates, and the Littoral Combat Ship.

² Each mission package consists of mission systems (such as weapons and sensors), support equipment, crewmembers, and an aviation detachment of manned helicopters and unmanned aerial vehicles.

surface warfare³ concentrating on countering small surface boat attacks. Each LCS ship will carry only one package at any given time. Further, since the cost to operate and support a weapon system traditionally accounts for over 70 percent of the total cost over a system's lifetime, the resources needed to operate and support the LCS seaframes and mission packages could be significant over time.

In 2005, the Navy began developing an LCS concept of operations which broadly describes these unique approaches to personnel, training, and maintenance and outlines the responsibilities of shore organizations to support LCS operations. LCS differs from other Navy ships in three key areas—personnel, training, and maintenance. First, a deployed LCS will have a total of 78 personnel on board comprised of 40 core crewmembers to operate the ship, 15 to operate the mission packages, and 23 for the aviation detachment. A crew of this size is significantly less than on other surface combatants—about 172 for a frigate and about 254 for a destroyer. In order to increase operational availability, the Navy intends to rotate crews about every 4 months to enable each LCS to deploy continuously for up to 18 months. Second, due to the decision to operate the ship with 40 sailors, training will be tailored to each position and include training in skills outside the crewmember's specialty. For example, a fire fighter specialist is also required to be trained in an engineering skill area. Third, the crew will perform minimal maintenance on board the ship and will rely extensively on support from organizations ashore to perform maintenance and administrative functions such as maintaining supply and pay records.

Considering the Navy's unique LCS concept of operations, you asked us to review the Navy's efforts to estimate the program's operating and support costs and to plan for how the ship will be operated and supported considering the small crew size. For this review, we assessed the extent to which the Navy has (1) estimated the long-term operating and support costs for LCS seaframes and mission packages; and (2) developed and implemented plans to operate and support the LCS particularly in the areas of personnel, training, and maintenance.

To assess the extent to which the Navy estimated the long-term operating and support costs for LCS seaframes and mission packages, we reviewed documentation of seaframe and mission package cost estimates prepared

³ The surface warfare package includes a maritime security module which could be employed by itself without the other components of the surface warfare package.

by the Naval Sea Systems Command. We compared the estimates to cost estimating best practices identified by the Office of the Secretary of Defense's Office of the Director of Cost Assessment and Program Evaluation (CAPE)⁴ as well as in our *GAO Cost Estimating and Assessment Guide*.⁵ To assess the extent to which the Navy analyzed the force structure requirements underlying the planned purchase quantities of LCS seaframes and mission packages, we reviewed force structure analysis documents and met with officials of the Assessments and Surface Warfare divisions of the Office of the Chief of Naval Operations. Although, as discussed later in this report, the Navy's estimates did not fully reflect best practices, they were based on a cost estimating process we deemed sufficient for reporting the results of our analysis of the Navy's operating and support cost estimates.

To assess the extent to which the Navy has developed and implemented plans to operate and support LCS, particularly in the areas of personnel, training, and maintenance, we reviewed and analyzed the Department of Defense (DOD) and Navy guidance and reviewed key studies and planning documents including the *LCS Wholeness Concept of Operations*.⁶ We also reviewed prior GAO products and DOD guidance on risk management to assess the extent that Navy plans included assessments of program risk. To estimate long term LCS personnel requirements, we analyzed Navy documentation and validated the results with appropriate Navy officials. To compare LCS training days to training days for other surface ships, we first identified a non-probability sample of LCS positions from both seaframes based on criteria for which positions required a wide variety of training or, based on Navy information, might be hard to fill. Then we compared the required training days for these LCS positions with comparable positions on two other surface ships. We validated the data

⁴ This office was formerly known as the Cost Analysis Improvement Group. The functions of that office were transferred to the Office of the Director of Cost Assessment and Program Evaluation by the Weapon Systems Acquisition Reform Act of 2009, Pub. L. No. 111-23 § 101 (2009). See the note at 10 U.S.C. § 139c. Office of the Secretary of Defense, Cost Analysis Improvement Group, *Operating and Support Cost Estimating Guide* (Arlington, Va., October 2007), Office of the Secretary of Defense, Cost Analysis Improvement Group, *Operating and Support Cost Estimating Guide* (Arlington, Va., May 1, 1992).

⁵ GAO, *GAO Cost Estimating and Assessment Guide*, [GAO-09-3SP](#) (Washington, D.C.: March 2009).

⁶ U.S. Fleet Forces Command, *Littoral Combat Ship Platform Wholeness Concept of Operations (Revision C)* (Sept. 24, 2009).

and results with appropriate Navy officials. On the basis of the work described above, we concluded that the data had no limitations and were sufficiently reliable for our purposes.

We conducted this performance audit from October 2008 to February 2010 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.

Results in Brief

The Navy has estimated operating and support costs for LCS seaframes and mission packages, but the estimates do not fully reflect DOD and GAO best practices for cost estimating and may change due to program uncertainties. Our analysis of the Navy's 2009 estimates showed that the operating and support costs for the planned seaframes and mission packages could total \$84.8 billion through about 2050.⁷ However, although the Navy demonstrated some aspects of a high-quality cost-estimating process, we found that it did not follow some key cost-estimating best practices, including analyzing the likelihood that the costs could be greater than estimated, fully assessing how the estimate may change as key assumptions change, and requesting an independent estimate and comparing it to the program estimate. Typically, an independent estimate is prepared for a program's second milestone decision point, referred to as Milestone B,⁸ when lead and initial follow-on ships are normally approved. However, the Navy has not yet passed this milestone decision point or included operating and support costs in its annual reports to Congress on LCS. In addition, the Navy's LCS operating and support cost estimates may change due to program uncertainties such as changes to the operational concepts, or completing and updating analyses of the required quantities of seaframes and mission packages. Specifically, Navy officials said that they had not analyzed the quantities required for one of the mission

⁷ All dollar figures in this report are in constant fiscal year 2009 dollars. The Navy assumes that each LCS seaframe will have a service life of about 25 years. The Navy can expect to pay operating and support costs until the last LCS is retired—the timing of which could vary depending on when the last seaframe enters service.

⁸ Department of Defense Instruction 5000.02. *Operation of the Defense Acquisition System*, Enclosure 2, Figure 1 (Dec. 8, 2008).

packages or updated the quantities required for another package after the contents changed. Also, any changes in key assumptions, such as homeporting or crewing, could change the seaframe quantities required, which in turn could affect estimates of the program's total operating and support costs. Considering that operating and support costs are typically about 70 percent of a program's total costs, the information available to decision makers is limited without an estimate of the long-term operating and support costs that fully reflects best practices and without reporting these costs to DOD and Congress. However, such a complete cost estimate could enhance decision makers' ability to make fully informed trade-off and investment decisions. For example, decision makers could benefit from an analysis of the long-term operating and support costs of each seaframe before deciding which one to buy for the remainder of the program. Also, decision makers could benefit from an analysis of the costs of options for what to do with the two ships of the design that is not selected. In addition, the absence of an independent cost estimate and analyses of how operating and support costs could increase over time limits the ability of decision makers to assess the affordability of LCS within the broader portfolio of Navy and DOD programs and to identify the resources that will be needed over the long term to support the planned investment in the LCS force structure. Further, information available to decision makers could be enhanced by basing estimates of the program's total operating and support costs on complete and current analyses of seaframe and mission package quantities. To enhance decision making, we are recommending that DOD develop, and annually update, an estimate of the LCS program's long-term operating and support costs that fully reflects best practices and use this estimate to make key program decisions such as which seaframe to buy, to annually report the estimated costs to Congress, and to update force structure analyses. DOD agreed to annually report the estimated costs to Congress and to update force structure analyses. Although DOD stated that the Navy will prepare updated costs estimates, one for each seaframe, DOD stated that, since the Navy has not released the solicitation for the fiscal year 2010-2014 purchase of LCS, it is premature to discuss the criteria for selecting one seaframe design. Since operating and support costs constitute over 70 percent of a system's life-cycle costs, we continue to believe that decision makers should consider long-term operating and support costs when deciding which of the two seaframes to buy for the remainder of the program.

The Navy has made progress, but faces risks in planning to operate and support LCS, particularly in implementing its new concepts for personnel, training, and maintenance. Although the Navy is conducting studies to

determine personnel requirements for LCS, it has not fully identified these requirements for the ship and shore support and faces risks in its ability to identify and assign personnel over the long term. The Navy also faces risks in implementing its concept to achieve the extensive LCS training required as well as implementing its maintenance concept. The Navy acknowledges that there are risks in implementing its new LCS operational concepts and has established some groups that focus on the details of how to implement the concepts. However, these groups have not performed a risk assessment as outlined in the 2008 *National Defense Strategy*.⁹ The Strategy describes the need to assess and mitigate risk including risks relating to the department's capacity to execute future missions and manage personnel, training, and maintenance. If the Navy cannot implement its concepts as envisioned, the Navy may face operational limitations, may have to reengineer its operational concepts, or may have to alter the ship design after committing to building almost half the class. In contrast, having a thorough risk assessment of the new operational approaches to personnel, training, and maintenance would provide decision makers with information to link the effectiveness of these new operational concepts with decisions on program investment, specifically the pace of procurement. To improve decision making, we are recommending that the Navy conduct a risk assessment and consider the results before committing to buy LCS ships in order to link procurement with evidence that the Navy is progressing in its ability to implement its new operational concepts. DOD partially agreed with our recommendation stating that it agrees such risk assessments are appropriate and should be conducted. However, DOD also stated that the acquisition strategy has changed from annual procurements to buying LCS ships in fiscal years 2010, 2012, and 2015 and proposed reviewing the risk assessments at these intervals. We believe that DOD's proposal meets the intent of our recommendation but emphasize that, given the new acquisition approach, it is even more important to conduct the risk assessment and consider the results before making procurement decisions since the department will be committing to several ships in each of the years cited and there will be a gap of several years between each procurement decision. A more detailed discussion of DOD's comments and our responses to these comments follow the Recommendations for Executive Action section of this report.

⁹ Department of Defense, *National Defense Strategy* (June 2008).

Background

Program Description

The LCS is being developed to assure access to the littorals that are threatened from mines, submarines, and surface forces. The LCS program consists of two distinct parts, the ship itself—called a seaframe—and the mission package it carries and deploys to provide combat capability. In addition to the capabilities associated with the mission packages, the LCS may be expected to perform inherent capabilities such as homeland defense, search and rescue, or humanitarian assistance. The Navy is using two contractors to build differently designed seaframes. As of December 2009, the Navy had bought two ships of each design, of which the first ship of each design has been delivered. The Navy plans to select one design in fiscal year 2010 for the remainder of the class. Figure 1 shows each of the seaframes.

Figure 1: Two Littoral Combat Ship Seaframes



USS Freedom (LCS 1)



USS Independence (LCS 2)

Source: The Navy.

By the end of fiscal year 2015, the Navy plans to have bought up to 23 of the planned 55 ships. These ships represent a significant investment in the LCS program not only for procurement but also for long-term operating and support costs. A weapon system's life-cycle costs include research and development, procurement, military construction, operations and

support,¹⁰ and disposal. Since operating and support costs are historically the largest portion (over 70 percent) of a weapon system’s lifetime costs, these costs were the focus of our analysis of the Navy’s LCS cost estimates.

The LCS seaframe’s combat capability will be provided by one of three interchangeable mission packages. Each mission package will also include an aviation detachment of manned helicopters and unmanned aerial vehicles. Currently the Navy plans to buy 64 mission packages for three mission areas—24 for mine countermeasures, 16 for antisubmarine warfare, and 24 for surface warfare. The surface warfare mission package also includes a module for maritime security, primarily to provide capability for boarding other ships. The Navy has not yet decided how many maritime security modules it will buy.¹¹ Table 1 below describes the basic mission of each mission package.

Table 1: Description and Quantity of LCS Mission Packages		
Mission package	Planned quantity	Package mission
Mine Countermeasures	24	Detect and neutralize mines
Anti-submarine Warfare	16	Detect submarines and protect forces in transit
Surface Warfare	24	Detect, track and engage small boat threats

Source: GAO analysis of Navy information.

The Navy plans to incrementally add capability to these packages over time, and, according to Navy officials, may develop additional mission packages as needed.

¹⁰ Operating and support costs are the resources required to operate and support a weapon system and include maintenance of equipment/infrastructure, operations of forces, training and readiness, base operations, personnel, and logistics.

¹¹ Although the Navy reported to congress that its objective is to buy 55 maritime security modules, Navy officials stated that future analysis could result in the Navy actually buying fewer of these modules. Naval Sea Systems Command, Program Executive Officer for Littoral and Mine Warfare, *Report to Congress: Littoral Combat Ship Mission Packages*, (Washington, D.C.: May 2009).

Rotational Crewing for LCS

The Navy intends to rotationally crew LCS to enable each seaframe to remain deployed for up to 18 months. The Navy plans to have four crews for every three ships with one of the three ships being deployed at any one time. Since the LCS crew is smaller than the crews on many other surface ships, the Navy plans to rotate the core crews after about 4 months (117 days) to help reduce crew fatigue. During the 2-week turnover period, the crews and contractors will perform preventive and corrective maintenance and resupply the ship. Navy officials stated that one benefit to having more crews than ships is that the Navy is able to quickly replace a deployed crew member who becomes sick or injured with a comparably trained sailor. The primary benefit of rotational crewing will be the ability to maintain a deployed seaframe for up to 18 months continuously while allowing the crews to relieve one another and return to their homeport without undue hardship. The seaframes would be rotated every 18 months with a 30-day overlap period.

Navy Organizations Are Intended to Monitor Development of and Resolve Implementation Issues with the LCS Concept of Operations

Given the challenges in implementing new concepts for personnel, training, and maintenance, the Navy established several groups to identify and resolve challenges it faces. These groups include an Oversight Board, a Council of Captains, and two cross-functional teams. These groups are comprised of members from across the Navy and, collectively, these groups identify and review issues and barriers to implementing the LCS concepts articulated in the *Wholeness Concept of Operations* and work together to jointly develop solutions.

- Oversight Board: The board is chaired by the Commander Naval Surface Forces and the membership includes executive-level representatives from program executive offices, program sponsors, and other major stakeholders from across the Navy. The board is supported by a senior executive-level working group called the Council of Captains. The board meets quarterly to consider key issues that require high-level decisions. For example, issues discussed this past year included the need to support development of distance support capabilities, and the need to fund aviation crews for the detachments that will support LCS operations.
- Cross functional teams: Two cross functional teams support the Oversight Board—one focused on manning and training issues and the other focused on maintenance and logistics issues. For example, the manning and training team is working on issues such as upgrading the shore-based trainers and the need to determine the appropriate level of shore support personnel. Also, the maintenance and logistics team has raised issues, such as remotely monitoring the condition of ship systems and funding for distance support development.

In addition, the LCS Program Office, an office within the Naval Sea Systems Command, chairs the Risk Management Board. The board's work is predominately contained within the LCS Program Office and focuses on identifying, measuring, and mitigating technical, schedule, and cost risks. Navy officials stated that the board differs from the other groups in that the risks it manages are almost exclusively focused on development and production—issues within the program office's control. The few operationally related risks that the board has identified to date include: personnel operating the launch and recovery equipment, personnel transporting supplies on board, potential for increased crew fatigue caused by the ship's motion, and crew training. According to Navy officials, the mitigation for the training issues is the ongoing study to develop a long-term LCS training plan and the mitigation for the personnel issues is to observe and learn from the ongoing test and trials period and initial deployments and then make adjustments, if needed.

The Navy's Operating and Support Cost Estimates Do Not Fully Reflect Best Practices and May Change Due to Program Uncertainties

The Navy Estimated Operating and Support Costs for the LCS Program

The Navy has estimated operating and support costs that include most elements of the LCS program.¹² Our analysis of the Navy's 2009 estimates showed that the operating and support costs for the planned seaframes and mission packages could total \$84.8 billion which amounts to about

¹² Due to the upcoming decision to select one of the two seaframes that the Navy will buy for the remainder of the program, the details of the Navy's estimates are considered business sensitive.

\$61.7 million per seaframe annually to operate and support both the seaframes and mission packages.¹³

For the seaframes, the Navy's 2009 estimate of operating and support costs projected a total of \$64.1 billion based on a 25-year service life.¹⁴ According to Navy officials, this estimate assumed a nearly even split of the two seaframe types as the seaframes have different operating and support cost profiles. However, the Navy has announced that it will choose one of the two seaframe designs in 2010 so the associated operating and support costs will likely change depending on the design selected.

For the mission packages, operating and support costs could total \$20.8 billion. The Navy provided us with its estimate of the average annual operating and support costs of each mission package. Therefore, to calculate the total operating and support costs, we multiplied the average annual estimates by the number of packages of each type with an expected 30-year service life. The Navy's most recent estimates were prepared to support the fiscal year 2010 budget but did not include the antisubmarine package since its contents are under development; therefore, we used the prior year's estimate to calculate the operating and support costs for this mission package.

¹³ Since significant LCS operational capabilities are derived from the mission packages—the ability to counter mines, submarines, and small surface boats, and to conduct maritime security operations—and since the mission packages are part of the LCS program, we calculated the average annual operating and support cost by dividing the \$84.8 billion by the number of seaframes and the expected seaframe service life.

¹⁴ The Navy can expect to pay operating and support costs until the last LCS is retired. Therefore, if the last LCS is purchased in 2025, then, based on the 25-year expected service life of each seaframe, the Navy could expect to pay operating and support costs through about 2050.

Operating and Support Cost Estimates Do Not Fully Reflect Best Practices

Although the Navy has estimated operating and support costs, we found that the Navy had not fully implemented cost estimating best practices. According to DOD and GAO best practices for cost estimating,¹⁵ a credible cost estimate should include the following three steps:

- analyze the likelihood that the costs could be greater than estimated,
- assess how the cost estimate may change in response to changes in key program assumptions, and
- compare the estimate to an independently developed estimate.

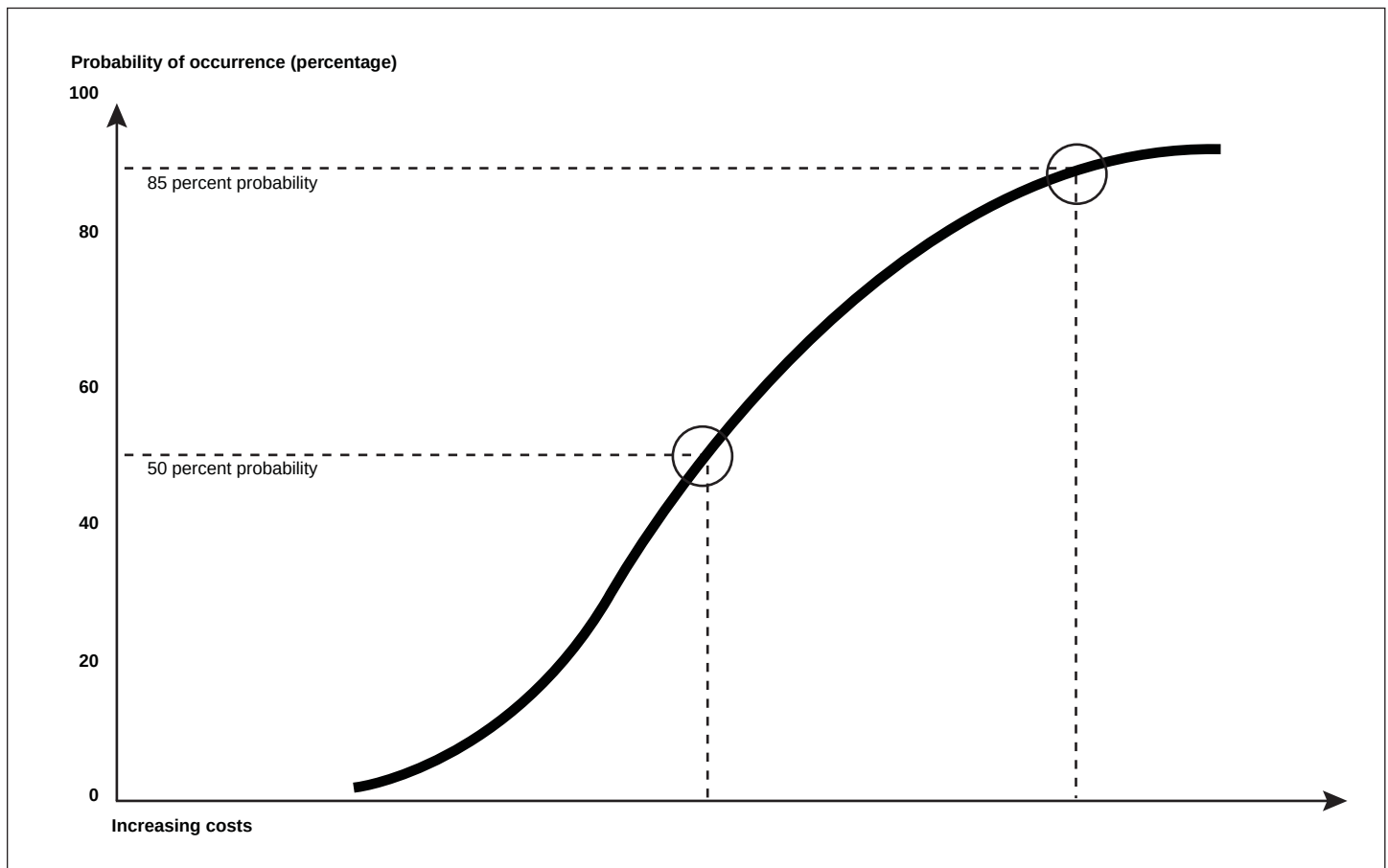
The Navy's estimates showed some aspects of a high-quality cost estimating process. For example, the estimates included most cost categories recommended by DOD's cost estimating best practices—such as personnel, maintenance, and sustaining support—and documented ground rules and assumptions, methodologies, and data sources. However, our assessment of the Navy's operating and support cost estimates showed that the Navy did not take two of the three steps listed above to ensure the estimates' credibility, and only partially completed the other step.

First, the Navy did not perform an analysis to assess the likelihood that the operating and support costs for either the seaframe or mission packages could be greater than estimated. This analysis, known as a risk analysis, estimates the likelihood that operating and support costs could rise beyond what was projected and the degree of the possible increase. We reported in 2009 that out of 10 of DOD's largest acquisition programs, 5 had increased overall acquisition costs from their first full cost estimate.¹⁶ Of those that didn't, three programs sharply reduced procurement quantities, and unit costs increased for all but one of the systems. According to best practices, a credible cost estimate should include a risk analysis that shows the range of possible costs and the likelihood that costs could increase to particular levels. The results of a risk analysis are usually shown in a cumulative probability distribution or "S-curve." Figure 2 below shows a notional example of an S-curve.

¹⁵ Office of the Secretary of Defense, Cost Analysis Improvement Group, *Operating and Support Cost Estimating Guide*, (Arlington, Va., October 2007), Office of the Secretary of Defense, Cost Analysis Improvement Group, *Operating and Support Cost Estimating Guide* (Arlington, Va., May 1, 1992), and GAO, *GAO Cost Estimating and Assessment Guide*, [GAO-09-3SP](#) (Washington, D.C.: March 2009).

¹⁶ GAO, *Defense Acquisitions: Assessments of Selected Weapon Programs*, [GAO-09-326SP](#) (Washington, D.C.: Mar. 30, 2009).

Figure 2: Notional Example of Risk Analysis Results Displayed in an S-curve Showing the Range and Likelihood of Possible Cost Increases



Source: GAO analysis.

This notional example shows that the higher the cost estimate, the greater the probability that actual costs will not exceed the estimate. Navy guidance indicates that the confidence level of a program's cost estimate should be above 85 percent to merit a "green" or low-risk designation and that a confidence level of less than 60 percent merits a "red" or high-risk designation.¹⁷ The Weapon Systems Acquisition Reform Act of 2009

¹⁷ Naval PoPS Criteria Handbook, *A Program Health Assessment Methodology for Navy and Marine Corps Acquisition Programs* (September 2008), issued by the Assistant Secretary of the Navy for Research Development and Acquisition.

requires that the confidence level—usually developed based on an analysis of the likelihood that costs will be greater than estimated—for cost estimates be disclosed and, if less than 80 percent, justified.¹⁸ Navy cost estimating officials told us that they have not yet decided what confidence level they will use for the operating and support cost estimate prepared for the next milestone decision point. Since the Navy has not performed this risk analysis, neither the Navy nor DOD decision makers have a full picture of the range of possible operating and support costs and the likelihood of costs increasing beyond the estimates discussed above.

Second, according to DOD and GAO best practices, a credible cost estimate should include an assessment of how the cost estimate may change in response to changes in key program assumptions. This is known as a sensitivity analysis of cost drivers. Such an analysis helps decision makers identify areas that could significantly affect a program's cost, choose between program alternatives, and mitigate risks. Cost drivers could include operational plans and assumptions such as crew size, maintenance plans, or the system's expected useful life. The Navy has identified several cost drivers for the LCS program, including fuel, manning, maintenance, and infrastructure. However, to date the Navy has only completed analysis of one of these cost drivers—fuel—and, officials said, is conducting analyses of other areas such as manning and maintenance. Without a more complete identification and analysis of key cost drivers, the Navy may not have a complete picture of how changes in program operations or assumptions could affect operating and support costs.

Third, according to DOD and GAO best practices, a credible cost estimate should be developed and compared to an independently developed cost estimate. DOD and Navy guidance require that an independent life-cycle cost estimate, including an estimate of operating and support costs, be completed for a shipbuilding program at the program's Milestone B decision point, when lead and initial follow-on ships are normally

¹⁸ Pub. L. No. 111-23, §101(2009), codified at 10 U.S.C. §2334 (d). Specifically, the law requires the Director of Cost Assessment and Program Evaluation, as well as the Secretary of the military department concerned to each disclose the confidence level used in establishing a cost estimate for a major defense acquisition program, the rationale for selecting such confidence level, and, if such confidence level is less than 80 percent, the justification for selecting a confidence level of less than 80 percent in certain documentation specified in the statute.

approved, and at the Navy's internal review, referred to as Gate 4,¹⁹ which occurs just before Milestone B. As the LCS program has not gone through Milestone B, no independent life-cycle cost estimate has been performed for the LCS program. Specifically, neither the Naval Center for Cost Analysis nor the Office of the Secretary of Defense's Office of the Director of Cost Assessment and Program Evaluation (CAPE) has developed an independent estimate of LCS operating and support costs according to Navy and CAPE officials. Independent cost estimates are one of the best and most reliable methods of validating a cost estimate. Past experience has shown that an independent estimate, prepared by an entity separate from those connected to the program, tends to be higher and more accurate than estimates developed by a system's program office. In a previous review of DOD acquisition programs, we found that 19 of 20 independent estimates developed by CAPE were higher than the service estimate. Even so, some of the CAPE's estimates understated actual program costs.²⁰

In addition, two other important elements of a cost estimate were omitted from the documentation the Navy provided to us on the mission package operating and support costs prepared in July 2009. First, Navy officials told us that they had not updated and therefore did not include the estimate for the antisubmarine package because the contents are under development.²¹ However, the Navy plans to buy 16 of these packages. According to DOD and GAO best practices, cost estimates should be complete and account for all possible costs. Further, the Navy did not show total lifetime operating and support costs or costs expected in each year of the program—instead, the Navy only showed average annual mission package operating and support costs. Showing cost estimates for each year of the program, known as time phasing, is also a best practice and necessary for use in the formulation of and comparison with actual program budgets.

¹⁹ The internal Navy review that occurs just prior to the second DOD milestone decision point is known as the Gate 4 review. Secretary of the Navy Instruction 5000.2D, *Implementation and Operation of the Defense Acquisition System and the Joint Capabilities Integration and Development System*, paragraph 2.5.5.5 and Annex 20A (Oct 16, 2008).

²⁰ GAO, *Defense Acquisitions: A Knowledge-Based Funding Approach Could Improve Major Weapon System Program Outcomes*, [GAO-08-619](#) (Washington, D.C.: July 2, 2008).

²¹ Our analysis of the mission package operating and support costs used the Navy's 2008 estimate of the annual operating and support costs for the antisubmarine package.

Operating and Support Cost Estimates Are Likely to Change Due to Program Uncertainties

The Navy has not yet decided which one of the two LCS seaframes it will buy for the remainder of the program, leading to uncertainty about the effects of this program decision on the operating and support cost estimates developed to date. Also, the Navy has not yet decided what it will do over the long term with the two ships of the design that is not chosen. The Navy currently plans to deploy these two ships as they become available, according to Navy officials. Since the two designs will require separate training facilities and core crew, and since each design has unique equipment and therefore different maintenance requirements, continuing to support both designs may carry a cost premium. Likewise, deciding which one of the two LCS seaframes to buy is likely to, in turn, affect decisions on issues such as infrastructure and training requirements, with accompanying cost implications.

The Navy's force structure analyses supporting the planned purchase quantities of mission packages are incomplete, adding to uncertainty about costs in future budget years. Our prior work has shown that a knowledge-based decision-making process can help provide a comprehensive analytic basis for an acquisition program, including determining the optimum quantities of LCS seaframes and mission packages.²² This information in turn can help decision makers evaluate the affordability of the LCS program and establish funding priorities. Navy officials from two divisions within the Office of the Chief of Naval Operations—the Surface Warfare Division and the Assessments Division—said they were unaware of any analysis supporting the total planned quantities for either the surface warfare package or its maritime security module. Also, Navy officials said that the Navy has not performed a force structure analysis on the antisubmarine package because the contents are under development. The Navy has not performed a complete analysis of LCS seaframe and mission package quantities because certain information needed for the analyses was not yet available, including decisions on potential changes to program operating assumptions and requirements. Further, an analysis of LCS seaframe and mission package quantities is not included in the Assessments Division's fiscal year 2010 agenda.

²² GAO, *Missile Defense: DOD Needs to More Fully Assess Requirements and Establish Operational Units before Fielding New Capabilities*, [GAO-09-856](#) (Washington, D.C.: Sept 16, 2009). GAO, *Defense Acquisitions: A Knowledge-Based Funding Approach Could Improve Major Weapon System Program Outcomes*, [GAO-08-619](#) (Washington, D.C.: July 2, 2008), and GAO, *Defense Acquisitions: Assessments of Selected Weapon Programs*, [GAO-08-467SP](#) (Washington, D.C.: Mar. 31, 2008).

The planned force structure of 55 LCS seaframes is based on a 2005 analysis of requirements for responding to possible overseas conflicts and meeting overseas presence requirements, which officials said they revalidated in 2007 and 2008. However, this analysis is based, in part, on certain assumptions that are not yet verified. For example, one assumption is that rotational crewing plans will work as expected, allowing a greater presence per ship than the traditional one crew per ship. However, rotational crewing has never been routinely conducted by the Navy for an entire class of surface combatants. If the Navy switches to a different crewing model, a different number of ships could be required to sustain the same presence, or alternatively, a different number of crews could be required. The expected purchase of 55 seaframes is also based on an assumption that some ships would be homeported overseas, according to Navy officials. If the assumed number homeported overseas changes, then the number of LCS needed to maintain the same presence requirements could also change. If these assumptions change due to program decisions or operating experience, the total number of LCS seaframes needed to meet requirements may change. It may be important for Navy and DOD decision makers to have updated and complete force structure analyses for the LCS program since any changes to the planned purchase quantities as a result of updated force structure analyses would affect the program's total operating and support costs. Without such analyses, decision-makers may not be able to effectively evaluate the affordability of the program.

Finally, the LCS cost estimates could change as actual operating data become available and operational concepts are refined. Since little actual LCS operating and support data are available to date, the estimates are currently based on data from other systems, and the estimates could change as actual cost data become available. The cost estimates are also based on new operational concepts for personnel, training, and maintenance. These new concepts are not fully developed, tested, and implemented, and, if these concepts change, the estimates could change. For example, the Navy has not yet fully developed or implemented a comprehensive training plan, and it is possible that the plan could cost more or less than the training costs accounted for in the current estimates.

Upcoming Program Decisions Would Benefit from Further Analysis of Long-Term Operating and Support Costs

Decision makers could benefit from further analysis of the program's long-term operating and support costs before making key program and investment decisions. Since operating and support costs constitute a major portion of system life-cycle costs—over 70 percent—they are critical to the evaluation of acquisition alternatives. Navy officials told us that they are developing criteria for selecting one seaframe for the remainder of the

program; however, at this time it is not clear that the criteria will include a comparison of the operating and support costs of each seaframe or whether the estimates will be developed according to all three steps for ensuring credibility and the results presented to decision makers in the Navy and DOD.

According to DOD and GAO best practices for cost estimating, decision makers should consider affordability at major decision points, and a comparative analysis should be done to identify costs and benefits of competing alternatives, including an operating and support estimate of each alternative.²³ The lack of cost estimates that fully meet best practices, such as including an analysis to assess the likelihood that costs will be greater than estimated, raises questions about the credibility of the estimates that have been produced to date and limits the ability of decision makers to make fully informed program and investment decisions, such as:

- accurately assessing the affordability of LCS within the broader portfolio of Navy and DOD programs,
- identifying the resources needed over the long term to support the planned investment in the LCS force structure,
- assessing the long-term cost implications of alternative acquisition strategies such as which seaframe the Navy will buy for the remainder of the 55-ship class, and
- analyzing the costs of options for what to do with the two seaframes of the design that is not selected.

According to DOD acquisition guidance, at the Milestone B decision point lead and initial follow-on ships are normally approved and an independent life-cycle cost estimate for the program, including operating and support costs, is required.²⁴ The Milestone B decision point for the LCS program has been delayed several times. Originally scheduled for January 2007, Navy officials now say they plan to hold the milestone in May or June 2010.

²³ Office of the Secretary of Defense, Cost Analysis Improvement Group, *Operating and Support Cost Estimating Guide*, (Arlington, Va., October 2007), and GAO, *GAO Cost Estimating and Assessment Guide*, [GAO-09-3SP](#) (Washington, D.C.: March 2009).

²⁴ Department of Defense Instruction 5000.02, *Operation of the Defense Acquisition System* (Dec. 8, 2008).

According to Naval Sea Systems Command officials, the Navy plans to develop a life-cycle cost estimate including operating and support costs and have an independent cost estimate prepared by CAPE to support the program's Milestone B decision in May or June 2010. Navy officials told us they plan to complete the other two steps for a credible estimate—analyzing the likelihood that costs will increase over time, and fully assessing the effects of changing key program assumptions—at Milestone B. However, Navy officials said that this information may not be presented to top decision makers in the Navy and DOD, and therefore may not inform key program decisions such as the decision of which seaframe to buy for the remainder of the program. Further, congressional decision makers may not be fully aware of the LCS program's operating and support costs since, to date, the LCS Selected Acquisition Reports submitted to Congress have not included operating and support cost estimates.²⁵ Operating and support costs are required to be included in such reports for programs that have passed Milestone B²⁶ and, as previously noted, the LCS program has not yet passed that point. Without the benefit of current, credible estimates of the long-term operating and support costs, congressional decision makers may not be fully aware of the resources that will be needed over time to support the ships for which DOD requests funds to buy each year.

²⁵ Section 2432 of Title 10 of the U.S. Code requires the Secretary of Defense to submit selected acquisition reports to Congress on current major defense acquisition programs.

²⁶ Section 2436 of Title 10 of the U.S. Code requires that selected acquisition reports for the first quarter of a fiscal year, called comprehensive selected acquisition reports, include a full life-cycle cost analysis for each major defense acquisition program. A full life-cycle cost analysis is required in the second, third, and fourth quarters of a fiscal year if a major defense acquisition program was not included in the most recent comprehensive selected acquisition report.

The Navy Has Made Progress but Faces Risks in Implementing Its Plans to Operate and Support LCS

The Navy Faces Risks in Implementing Its Personnel Plans over the Long Term

Although the Navy is conducting studies to determine personnel requirements for LCS, it has not fully identified the number of ship and shore support personnel required to support LCS over the long term and faces risks in its ability to identify and assign personnel over the long term. Additionally, the Navy has not routinely rotationally crewed an entire class of surface combatants; therefore, the concept being planned for the LCS class is unproven. Although the Navy rotationally crews some small ships, such as the mine countermeasure ships, the Navy has only experimented with rotationally crewing surface combatants such as destroyers and only did so for a short time.²⁷

The current Navy plan for a 40-person core crew has not yet been validated by an analysis of the crew's expected workload. Early Navy estimates indicated that the core crew might need to be more than 40 to mitigate a concern that a crew this small could experience fatigue. For example, one study raised the issue that crew fatigue could affect missions which could be mitigated by temporarily augmenting the crew or modifying how missions are conducted. The 40-person core crew size was based upon the results of a 2005 conference to explore options for reducing the size of the core crew, which was not the typical workload analysis. The Navy's Manpower Analysis Center typically conducts analyses of a ship's workload to determine the number and type of personnel required to complete all operational and maintenance tasks. However, this analysis for the LCS core crew and the three mission packages is not scheduled to be complete until after the first full deployment, around fiscal year 2014.²⁸

²⁷ GAO, *Force Structure: Ship Rotational Crewing Initiatives Would Benefit from Top-Level Leadership, Navy-wide Guidance, Comprehensive Analysis, and Improved Lessons-Learned Sharing*, [GAO-08-418](#) (Washington, D.C.: Mar. 29, 2008).

²⁸ Navy officials stated that they had not yet been directed to include an analysis of the maritime security module of the surface warfare package.

The Navy’s initial analysis to identify shore personnel requirements is due by the end of 2009; however, the full requirements for shore personnel may not be known for several years. Due to the limited crew size, many administrative and maintenance duties will have to be performed ashore rather than on board as on other surface ships and will be managed by LCS squadrons.²⁹ Navy officials estimated that the number of people needed in a squadron organization to manage and support 12 to 15 LCSs might be about 170. The LCS squadrons are likely to be larger than squadrons for other surface ships since their responsibilities for the level of shore-based support required for the small core crew will be greater. However, Navy officials said that they will not know how large the LCS squadrons should be until they have experience with supporting deployed ships. In addition, the shore support personnel required will be affected by outstanding decisions, such as where to homeport the ships and the long-term maintenance strategy. Since the Navy has not yet completed its studies to identify the LCS personnel requirement, we compiled Navy estimates of the personnel that may be required to support LCS over the long term. Specifically, we added Navy estimates of the personnel that may be required for the ship crews, mission package crews, and the LCS squadrons to derive a total number of personnel that may be required for the program. Table 2 below shows that the total personnel required for the LCS program over the long term might be approximately 4,600 people.

Table 2: Estimate of the Total Navy Personnel Required for a Fleet of 55 LCS Ships

	Estimate of Navy personnel required ^a
Ship crews	2,880
Mission package crews ^b	888 ^c
LCS squadrons (ashore)	680 to 850
Total personnel required	4,448 to 4,618

Source: GAO compilation of Navy data.

^aThe personnel estimate is for Navy personnel only and does not include contractor personnel who are currently performing most maintenance.

²⁹ The LCS Class Squadron coordinates all shore support and is responsible for the overarching management of seaframes, mission packages, and personnel. The Navy plans to establish several numbered squadrons to manage the day-to-day details of administrative, personnel, operational, maintenance, distance support, logistics, and training functions for a specific number of LCSs.

^bThe total number of personnel for mission package crews includes personnel for three types of mission packages—mine countermeasures, antisubmarine warfare, and surface warfare. Currently, additional personnel are required to support maritime security operations. The Navy is reviewing options for providing personnel using existing personnel. However if additional personnel are required for each maritime security module, the additional personnel could total up to 432.

^cNavy officials stated that there is a proposal to reduce the number of mission package crews for antisubmarine warfare, mine countermeasures, and surface warfare. If approved, the total number of personnel for mission package crews could decrease to 465. Also, if the Navy decides to use personnel from the other warfare packages, the total number of personnel for mission packages could also decrease.

The above estimate of the total personnel required does not include aviation crews, which could total an additional 1,656 people. We did not include aviation crew personnel in the table because these crews are not totally dedicated to LCS and may be tasked to support other ship types, according to Navy officials. The Navy has the core and mission package crews in its personnel plans, but to date has not funded all the aviation crews. According to Navy officials, if the aviation crews are not funded in the Navy's fiscal year 2012 budget, then the Navy may begin to experience shortfalls in aviation crews beginning in fiscal year 2014.

The Navy also faces risks in its ability to identify and assign personnel to LCS over the long term due to the requirement for relatively senior, highly trained personnel. Specifically:

- LCS sailors must be experienced sailors and positions must be filled by a person of the exact pay grade required, which could limit the pool of personnel available. Sailors must also commit to serving on an LCS crew for 36 months after completing their LCS training. Considering the concept for rotational crewing, a sailor might serve two or three 4-month deployments during their 36-month LCS tour for a total of 8 to 12 months of LCS deployment time.
- The number of requirements that potential sailors must meet in order to qualify for an LCS assignment is rigorous. For example, potential LCS sailors must meet current physical fitness standards as well as have passed the previous 18 months of physical fitness assessments. In contrast, sailors are considered qualified for assignment on other surface ships if they passed the most recent physical fitness test. Also, sailors will not be considered for assignment to LCS if they are color blind or have a pending application for the officer commissioning program.
- Due to the longer training time required to prepare LCS sailors, the Navy's Personnel Command must identify personnel 18 to 24 months prior to when they need them to report to the LCS crew. For other surface ships, the Personnel Command needs to identify personnel only 5 to 9 months ahead of time. Personnel Command officials stated that they must manually identify the personnel for LCS since the computer system

normally used to identify personnel can only identify personnel up to 12 months in advance. Due to the increased workload resulting from the manual process, the Navy Personnel Command has set up a separate office specifically to handle LCS personnel assignments and added eight positions. Officials stated that they will likely need more personnel as more ships and mission packages enter service. Since the average annual turnover rate is about one-third, according to Navy officials, the Personnel Command will have to manually identify a significant number of replacement sailors each year to support the LCS program.

The Navy Faces Risks in Achieving the Extensive LCS Training Requirements

The Navy has made progress in identifying LCS-unique training requirements, but faces risks in implementing its training concept. According to the Navy's concept for LCS,³⁰ sailors must be ready to perform their duties when they arrive on board without additional supervised, on-the-job training that is typical of other surface ships. The Navy calls this the "train to qualify" standard. In contrast, it is typical on other ships for a sailor to complete his or her training on board via supervised, on-the-job training. According to Navy officials, it may take about 6 months of onboard on-the-job training for a sailor on other surface ships to reach the same level of proficiency as that described in the concept for LCS sailors. The Navy's approach to LCS training is different than for other surface ships since the small LCS crew size means that there is little capacity on board for supervised training and no training group on board the ship as is typical of other surface ships. LCS sailors will also be required to be trained in several skill areas outside their primary specialty. For example, an LCS Damage Control Assistant will also have to train in an engineering skill area and an Electronics Technician will also have to train in a Fire Controlman skill area. In addition, LCS sailors will be expected to perform various collateral duties, such as serving as the crew's barber and running the ship's store.

The Navy expects to complete a study of LCS training by the end of 2009 but may not fully implement the results for several years. The Navy began this study to fully identify LCS training requirements and to recommend alternatives for providing training over the life of the LCS program. This is a complex process since training requirements for the core crew are unique for each position on the two seaframes. Although the Navy has identified LCS-specific training requirements for both seaframes and the

³⁰ U.S. Fleet Forces Command, *Littoral Combat Ship Platform Wholeness Concept of Operations* (Revision C) (Sept. 24, 2009).

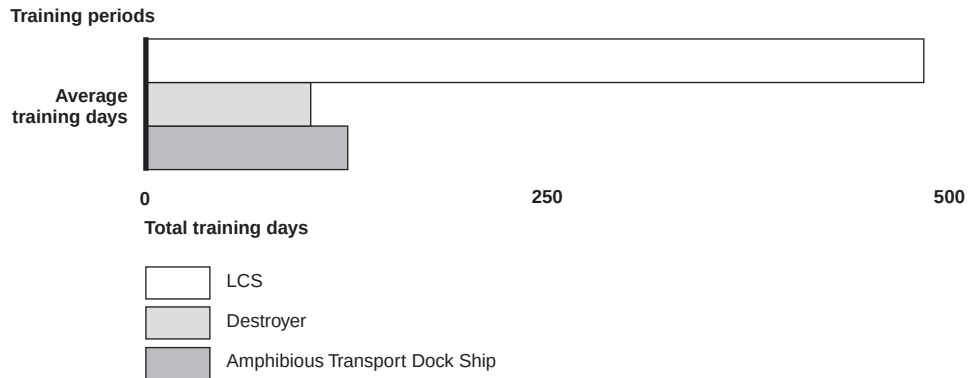
three mission packages, the Navy has not yet completed plans for how to provide this training over the long term. Further, the training plan resulting from the Navy's LCS training study may not be fully implemented until about 2013 or after, largely due to the need to develop and buy simulators and virtual training facilities. Depending on homeporting decisions, the Navy may need to build comparable simulators on the east coast as well as the west coast. Although the Navy has built one shore-based trainer for each seaframe, the trainers will need to be upgraded in accordance with the training study results and to meet the train-to-qualify standard. Until the results of the training analysis are implemented, the Navy has developed an interim solution, called the LCS Academy, to provide LCS-specific training and fill training gaps.

Another reason the training required prior to the sailor coming on board the LCS is longer and more extensive than for other surface ships is that the training requirements include courses outside of the sailor's primary specialty. To assess the training requirements for LCS versus other surface ships, we compared the training days required before a sailor reports to an LCS crew to the training days required before a sailor reports to other types of surface ships.³¹ Our analysis of a sample of LCS positions showed that the number of training days required before an LCS sailor reports to the crew is significantly longer than for sailors in comparable positions on other ships—an average of 484 days versus 126 days for an amphibious transport docking ship and 103 days for a destroyer.³² The lowest number of training days required for an LCS position in our sample was 264 and the highest was 832. Figure 3 below shows the average number of training days for the positions in our sample on a typical destroyer, amphibious transport docking ship, and the LCS.

³¹ To do the analysis, we identified a non-probability sample of 15 enlisted positions from the 40-person LCS core crews of both seaframes. The sample was based on identifying LCS positions that were critical or required cross-training. Next, we compared the training days required before reporting on board for comparable positions on other surface ships. See appendix I for a complete description of the analysis methodology including a discussion of the sample selection criteria.

³² Navy officials noted that some positions on an Aegis ship also have lengthy training requirements, such as training for sailors who work on the Aegis radar. Since this type of equipment is not on LCS, the related positions were not part of our sample.

Figure 3: Comparison of Average Training Days Required before Reporting on Board for LCS with Two Other Surface Ships for a Sample of Positions



Source: GAO analysis of Navy data.

As noted above, a sailor on ships other than LCS may spend an additional 6 months completing training on board via supervised, on-the-job training. Therefore, even accounting for this time, the LCS training time required is significantly higher. Implementing the LCS concept of train-to-qualify has two important effects. First, the costs to train sailors before they report to an LCS crew are likely to be significantly higher than for other surface ships due to the longer training time required before the sailors report to a crew and due to the costs to build and sustain the shore-based training facilities. Second, the longer training time before reporting to a crew is the major reason that the Personnel Command has to identify people 18 to 24 months before they report to an LCS crew, which Navy documents have indicated may be unsustainable using the current personnel distribution system.

The Navy Faces Risks in Implementing Its Maintenance Concept

The Navy also faces risks in implementing the maintenance concept being developed to allow for a small assigned crew. Performing preventive maintenance is an important factor in maintaining the material condition of the ship. According to the Navy's Board of Inspection and Survey, deferred maintenance was a key factor in some surface ships having significant material problems identified during recent inspections.³³ The risks for LCS are in preventive maintenance—periodic tasks to keep equipment in good condition—and distance support—moving work from

³³ Navy Board of Inspection and Survey, *2008 INSURV Annual Report* (undated).

the ship to the shore. Regarding preventive maintenance, the Navy is still assessing how much preventive maintenance the core crew can accomplish. Due to the small core crew size, a significant amount of maintenance has to be moved off ship. The initial analysis was that 20 to 30 man-years of preventive maintenance would have to be moved off of the ship. According to the Navy's LCS concept, the core crew is expected to do little or no corrective maintenance and minimal preventive and facilities maintenance.³⁴ The rest would be done during in-port periods—by the crew or contractors—or by teams that fly out to the ship to perform maintenance during crew turnover periods. As of October 2009, Navy officials stated that well over 50 percent of the preventive maintenance had been transferred from the ship to the shore and is being accomplished by contractors under the interim support plan agreement. In contrast, on other surface ships, the crew performs all preventive maintenance and much corrective maintenance that involves diagnosing problems and completing somewhat complex repairs. During fiscal year 2009, the Navy spent \$6.0 million on the interim support plan for seaframe preventive and facilities maintenance. The Navy is also still working to resolve issues in the system developed for LCS to schedule and track accomplishment of preventive maintenance.

The Navy also faces risks in implementing its plans for distance support. Distance support is a key enabler for supporting LCS and requires the capability to move information to and from the ship. Although other ships in the Navy rely to some extent on distance support, Navy officials stated that distance support is critical to enabling LCS to operate as envisioned in the operational concept due to the small crew size. According to the concept, many administrative functions are also planned to be moved ashore such as postal, administrative records, logistic support, and maintenance and fuel records. Commander, Naval Surface Forces established LCS distance support requirements in April 2009, which included developing the capability to move the workload for 120 processes from the ship to the shore. Navy officials stated that they are still evaluating what work to move ashore and how to do so. The processes identified to date include identifying corrective maintenance, monitoring crew qualifications, fuel reporting, and remote monitoring of the condition of some ship systems. However, the Navy has not yet provided funding for

³⁴ Preventive maintenance refers to periodic tasks to keep equipment in good condition such as inspections, lubrication, or calibration. Facilities maintenance includes deep cleaning and preservation.

the development, implementation, and long-term sustainment of these distance support capabilities. If these capabilities are not fully developed and maintained, then the crew's workload could increase or the crew size might need to be increased.

In addition, the Navy does not yet have a long-term maintenance strategy for the LCS seaframes and mission packages. Currently, the Navy has interim support plans for both the seaframes and mission packages that include contractor-provided maintenance. The Navy intends to develop and implement a long-term maintenance strategy by about 2015 for the mission packages and by the end of 2011 for the seaframes. The long-term strategy may continue to employ mostly contractor-provided maintenance or could consist of a combination of contractor- and service-provided maintenance in a Navy shipyard. According to Navy officials, the Navy has not yet analyzed core logistics capabilities for the LCS program but plans to do so as part of its analysis to identify a long-term maintenance strategy. Under section 2464 of Title 10 U.S. Code, DOD is required to maintain a "core logistics capability" that is government owned, government operated, and that uses government personnel, equipment, and facilities. However, we reported in May 2009 that DOD has neither identified nor established core capabilities in a timely manner for certain new systems that were included in the May 2009 report.³⁵ Consequently, among other things, we recommended that DOD require an initial core assessment early in the acquisition process, preferably before Milestone B, and that acquisition strategies for new or modified systems include either a plan for establishing core capability within 4 years of initial operational capability, or a statement that no core capability requirements were identified.

A Risk Assessment Could Inform Key Procurement Decisions

Despite risks in implementing its new LCS operational concepts, the Navy has not specified the potential operational effects or identified alternative approaches if its concepts cannot be implemented as envisioned. The 2008 *National Defense Strategy* describes the need to assess and mitigate risk in the execution of defense programs critical to national security, including risks relating to the department's capacity to execute future

³⁵ GAO, *Depot Maintenance: Actions Needed to Identify and Establish Core Capability at Military Depots*, [GAO-09-83](#) (Washington, D.C.: May 14, 2009).

missions and manage personnel, training, and maintenance.³⁶ Our prior work also showed that a risk assessment is a best practice that informs an organization's decision making and includes identifying potential risks and identifying countermeasures to reduce the risks.³⁷

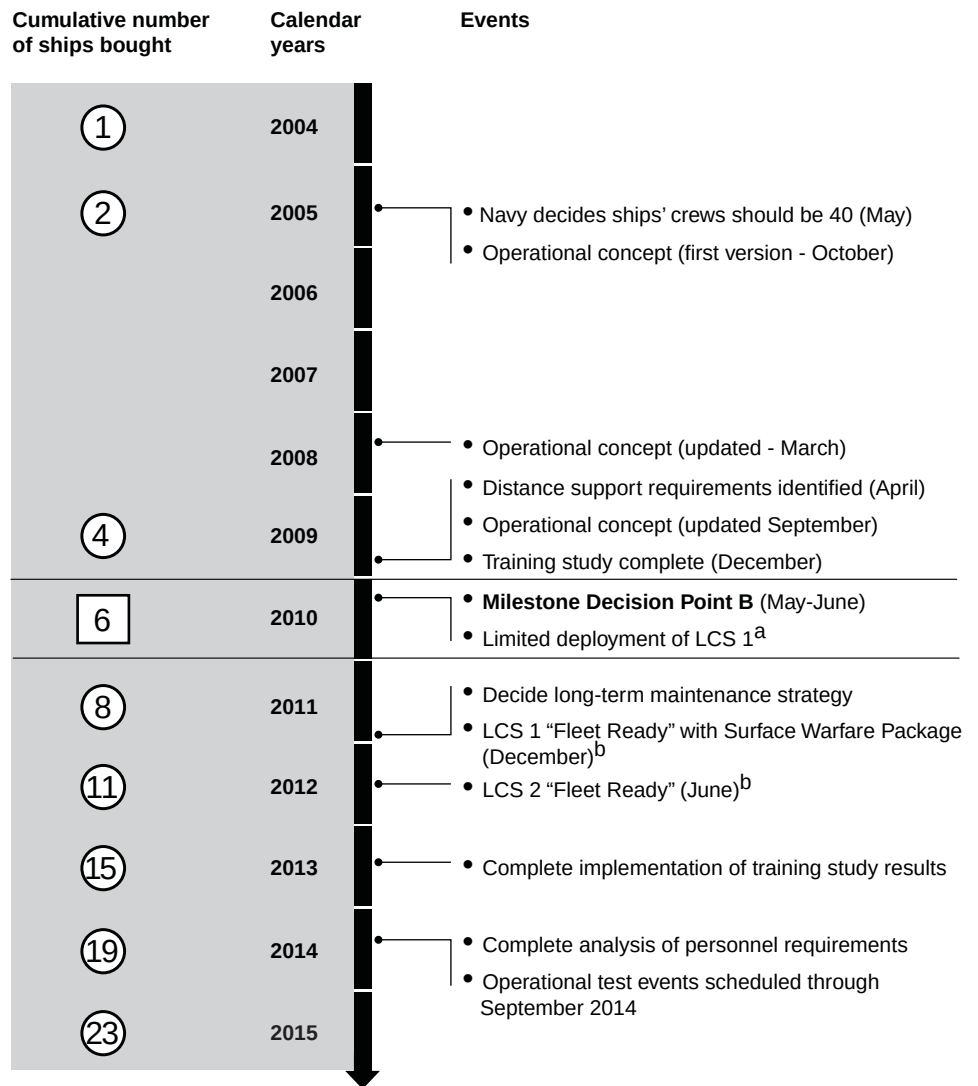
The Navy acknowledges that there are risks in implementing its new LCS operational concepts for personnel, training, and maintenance, and has established some groups to manage the details of how to implement the concepts, such as the cross-functional teams and the Oversight Board. These groups identify and review issues and barriers to implementing the LCS concepts and work together to jointly develop solutions. In addition, the LCS program office has established a Risk Management Board, which monitors issues primarily related to development and production of the seaframe and mission packages and focuses on technical, schedule, and cost risks. In general, this board does not focus on personnel, training, and maintenance risks. Although the work these groups perform is important, their scope does not include a thorough risk assessment as described in DOD's Strategy and GAO best practices. These groups are focused on how to make the operational concepts work and, as yet, have not fully identified operational risks and assessed alternatives to mitigate the risks if these new concepts for personnel, training, and maintenance cannot be implemented as intended. In the case of LCS, a thorough risk assessment could be used, for example, to: identify the operational limitations if a 40-person core crew experiences undue fatigue and assess alternatives to the 40-person core crew or to identify the operational limitations if the distance support does not work as intended and assess alternatives for supporting a small crew. Without such a risk assessment to inform decision makers, the Navy faces unspecified operational and program risks at the same time that it plans to buy a total of 23 ships by the end of fiscal year 2015. Although the LCS operational testing is expected to provide some insights into the effectiveness of the new operational concepts, according to Navy officials, the tests are not scheduled to be

³⁶ Department of Defense, *National Defense Strategy* (June 2008). The *National Defense Strategy* defined risk in terms of the potential for damage to national security combined with the probability of occurrence and the measurement of the consequences should the risk remain unaddressed.

³⁷ GAO, *Homeland Defense: Actions Needed to Improve Management of Air Sovereignty Alert Operations to Protect U.S. Airspace*, [GAO-09-184](#) (Washington, D.C.: Jan. 27, 2009). GAO, *Force Structure: Joint Seabasing Would Benefit from a Comprehensive Management Approach and Rigorous Experimentation Before Services Spend Billions on New Capabilities*, [GAO-07-211](#) (Washington, D.C.: Jan. 26, 2007).

completed until about fiscal year 2014. As shown in figure 4 below, the Navy plans to make a significant investment in LCS force structure before it has information indicating whether the operational concepts are likely to be successful.

Figure 4: Timeline Comparing the Navy's LCS Procurement Plans with Key Events Affecting Implementation of the Operational Concepts



Source: GAO analysis of Navy data.

^aAlthough Navy officials expect to gather useful information about how to operate and support LCS during this limited deployment, the deployment will not fully reflect how the Navy intends to deploy LCS as described in the *Wholeness Concept of Operations*, according to Navy officials. For example, the ship will not be deployed for 18 months, may not rotate crews, and will have more than 78 people on board such as contractors to provide additional support and assistance.

^b"Fleet Ready" means that a specific LCS and mission package combination has completed some testing and certification and is ready for a deployment tasking, according to a Navy official.

If the operational concepts for personnel, training, and maintenance cannot be implemented as desired, then, according to Navy officials, the Navy may face operational limitations, may have to reengineer its operational concept, or may have to make significant design changes to the ship after committing to building 23 ships which represents a significant portion (42 percent) of the class. Further, without an assessment identifying the operational effects and without exploring alternatives, if the Navy's approach to personnel, training, and maintaining LCS ships does not work as planned the Navy risks continuing to buy ships without the assurance that its plans for personnel, training, and maintenance can be implemented as envisioned. In contrast, having a thorough risk assessment of the new operational approaches to personnel, training, and maintenance would provide decision makers with information to link the effectiveness of these new operational concepts with decisions on program investment, specifically the pace of procurement.

Conclusions

Given the Navy's major investment in the LCS program, it is critical that DOD and congressional decision makers have a complete cost estimate that fully reflects best practices—including analyses of how costs may increase with time and vary with changing program assumptions, as well as comparison with an independently developed estimate. Such estimates are needed to enable decision makers to assess the program's affordability, including the long-term, recurring operating and support costs, and assess the long-term operating and support costs of all the acquisition alternatives before a decision is made. Specifically, having complete estimates of the long-term operating and support costs that are periodically updated and based on results of complete and current force structure analyses could be an important factor for decision makers to consider when weighing program investment alternatives such as which seaframe to buy or options for what to do with the two seaframes of the design that is not selected. Although the Navy's operating and support cost estimates showed some qualities of a sound estimating process, the Navy did not follow best practices, such as requesting an independent estimate and comparing it to the program estimate, analyzing the likelihood that costs will increase, and analyzing the effects on the estimate of key cost drivers. Further, the Navy's force structure analyses of the quantities of required seaframes and mission packages are incomplete and based on assumptions, such as how many ships may be homeported overseas, which, if changed, could change the quantities required. Changes in the quantities of required seaframes and mission packages could affect estimates of the program's total operating and support costs. Cost estimates that fully reflect best practices and are based on complete and

current force structure analyses of required quantities could enhance the ability of decision makers to identify the resources needed over the long term to support the seaframes and mission packages and assess the affordability of the LCS program. Further, decision makers in both DOD and Congress lack a complete picture of the likely long-term operating and support costs that will be incurred when buying an increasing number of LCS ships, hampering their ability to make sound program and investment decisions.

At the beginning of the LCS program, the Navy stated that reducing the number of ship personnel would be a major factor in lowering operating and support costs. As a result, the Navy's decision to operate the LCS with a core crew of only 40 sailors drove the need to develop new operational concepts. Currently, these concepts are broadly stated and the Navy has not fully developed the details to implement its vision for identifying personnel, providing LCS-unique training over the long term, or shifting maintenance from the ship to shore. Although the Navy acknowledges its approach entails risk, the Navy has not specified what the potential operational effects might be if its concept cannot be fully implemented as envisioned. For example, the Navy has not specified potential negative consequences to LCS missions or identified mitigating strategies if there are not enough or insufficiently trained personnel on board or if the distance support concepts cannot be fully implemented. The Navy's LCS plans represent a significant investment to achieve its force structure goals at a time when there are competing demands for limited resources. However, without a thorough risk analysis including an assessment of alternatives, the Navy faces undefined and, potentially significant operational and program risks. If the operational concepts for personnel, training, and maintenance cannot be implemented as desired, the Navy may face operational limitations, may have to reengineer its operational concept, or may have to make significant design changes to the ship after committing to building almost half of the class. For example, a thorough risk assessment could help the Navy identify the operational risks of a 40-person core crew, such as whether the crew can operate continuously for a 30-day mission without undue fatigue. A risk assessment could assess the alternatives such as the pros and cons of conducting shorter missions or increasing the size of the crew. Having such a risk assessment would enable decision makers to identify and assess: the operational effects if these concepts cannot be implemented as envisioned; alternatives to mitigate these risks; and information to link the effectiveness of these new operational concepts with decisions on program investment, specifically how many ships the Navy should buy each year. Moreover, doing so could

help the Navy avoid costly retrofits if ship design changes are needed in order to implement its new concepts.

Recommendations for Executive Action

We recommend that the Secretary of Defense take the following six actions:

In order to assess the long-term affordability of the LCS program and enhance decision making ability for the LCS program, we recommend that the Secretary of Defense direct the Secretary of the Navy to take the following actions:

- before deciding which seaframe to buy, produce a complete estimate of the long-term operating and support costs which fully reflects cost estimating best practices for each seaframe and use these updated estimates in deciding which seaframe to buy for the remainder of the program;
- use an updated estimate as a basis for analyzing the costs and benefits of options regarding the two seaframes built but not selected for long-term production, and use the results of this analysis in making the decision of how to use, or whether to retire, these seaframes;
- annually update the cost estimate for the long-term operating and support costs of the seaframe and each mission package using cost estimating best practices and submit the results to DOD as well as to Congress as part of the LCS Selected Acquisition Report;
- perform complete and updated force structure analyses on the LCS mission packages to help determine the appropriate purchase quantities over the life of the program, and use these updated quantities for the mission package cost estimate; and
- perform an updated seaframe force structure analysis when key underlying assumptions affecting seaframe quantities change, such as crewing policy, overseas homeports, or presence requirements, and use this updated analysis to adjust quantities and to update the seaframe cost estimate.

To improve the Navy's ability to make better informed LCS program and investment decisions, we recommend that the Secretary of Defense direct the Secretary of the Navy to perform a risk assessment and consider the results before committing to buy LCS ships each year in order to link procurement with evidence that the Navy is progressing in its ability to implement its new personnel, training, and maintenance concepts and has taken actions to mitigate the operational effects if these concepts cannot

be implemented as intended. Specifically, this analysis should identify and assess the:

- operational limitations the Navy may face if the Navy's approach to personnel, training, and maintenance cannot be implemented as envisioned;
- possible alternatives, such as changes to the concepts or the ship design, and the related costs of those alternatives if the Navy's approach to LCS personnel, training, and maintenance cannot be implemented as envisioned in its concept of operations; and
- personnel policies and processes to reduce the risks to the LCS program. Such a holistic review could include the processes for identifying and assigning personnel, requirements LCS personnel must meet to qualify for assignment to an LCS crew, and identifying the total ship and shore LCS personnel required steady state to support the program over the long term.

Agency Comments and Our Evaluation

In written comments on a draft of this report, DOD agreed with four recommendations and partially agreed with two of our six recommended actions. The department's comments are reprinted in their entirety in appendix II. DOD also provided technical comments, which we have incorporated as appropriate.

DOD partially agreed with our first recommendation that the Navy produce an estimate of the long-term operating and support costs and use these estimates in deciding which seaframe to buy. DOD stated that the Navy will prepare two cost estimates, one for each seaframe design, that will include estimates of the total operating and support costs for the entire class of LCS ships. However, DOD stated that, since the Navy has not released the solicitation for the fiscal year 2010-2014 buy, it is premature to discuss the down-select criteria included in the solicitation. While we appreciate the sensitivity of discussing criteria for the down-select prior to the release of the solicitation, we noted in the report that operating and support costs are critical to any evaluation of acquisition alternatives since these costs constitute over 70 percent of system life-cycle costs. We continue to believe that decision makers should consider long-term operating and support costs when deciding which of the two seaframes to buy for the remainder of the program. DOD also stated that the LCS seaframe estimate we reviewed for the report was developed solely to support trade study analysis and was not intended as a budget quality estimate. We understand this was the case, but the seaframe estimate we analyzed was the only estimate available even though the Navy has bought four LCS ships. The intent of our recommendation is to

encourage DOD to develop a comprehensive cost estimate to assist decision makers as the program moves forward.

DOD agreed with our recommendation to use updated operating and support cost estimates to analyze the costs and benefits of options regarding the two seaframes built but not selected for long-term production. However, DOD stated that the Navy intends to operate and maintain the two non-selected LCS ships as part of the total LCS force structure but will continue to explore options to keep, sell, or retire the two non-selected ships during annual budget reviews. DOD's response implies that, for the present, the department has decided to keep the two non-selected LCS ships without considering the results of a complete analysis of the costs and benefits of keeping the ships compared to other alternatives. As we point out in the report, it is important that estimates of long-term operating and support costs are available to decision makers to assess alternatives before a decision is made. However, if the department's intent is to do such a cost analysis of alternatives and consider the results as part of the annual budget process, then their actions would meet the intent of our recommendation. DOD also agreed with our recommendations to include an annual update to the operating and support costs for the LCS program in the Selected Acquisition Report, and our recommendations to update both the seaframe and mission package force structure analyses and use these results in updating operating and support cost estimates.

DOD partially agreed with our sixth recommended action that DOD perform a risk assessment and consider the results before committing to buy LCS ships each year in order to link procurement with evidence that the Navy is progressing in its ability to implement its new personnel, training, and maintenance concepts. DOD stated that it agrees such risk assessments are appropriate and should be conducted. However, DOD disagreed that the risk assessment results should be linked to annual procurement decisions since the acquisition strategy is now to buy LCS in blocks—that is multiple ships—in fiscal years 2010, 2012, and 2015. DOD stated that, as an alternative, it will consider reviewing the risk assessments for personnel policies, training, and maintenance planning at the start of each new block buy. At the time of our review, the acquisition strategy involving the block buys was not yet approved by DOD. We believe that DOD's proposed alternative approach would meet the intent of our recommendation. However, we also believe that, given the new acquisition approach, it is even more important that DOD conduct the risk assessment and consider the results before making a procurement decision for each block buy since the department will be committing to

several ships with each block and there will be a gap of several years between each block buy. As we point out in our report, without such a risk assessment to inform each procurement decision, the Navy risks buying ships without the assurance that its plans for personnel, training, and maintenance can be implemented as envisioned.

We are sending copies of this report to the Secretary of Defense; the Secretary of the Navy; Naval Sea Systems Command; and Fleet Forces Command. In addition, the report will be available at no charge on the GAO Web site at <http://www.gao.gov>.

If you or your staff have any questions, please call me at (404) 679-1816. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. Staff members who made key contributions to this report are listed in appendix III.



John H. Pendleton
Director
Defense Capabilities and Management

Appendix I: Scope and Methodology

To assess the extent to which the Navy estimated the long-term operating and support costs for the Littoral Combat Ship (LCS) seaframes and mission packages, we reviewed documentation of seaframes and mission package cost estimates prepared by the cost-estimating division of the Naval Sea Systems Command. We met with officials from Naval Sea System Command's cost-estimating division, as well as the program offices responsible for developing both seaframes and mission packages, to discuss and document the methodologies employed in the estimates. We also met with the Office of the Secretary of Defense's office of the Director of Cost Assessment and Program Evaluation (CAPE) to determine the extent to which CAPE had reviewed Navy cost estimates for LCS and produced an independent estimate. We compared the estimates to cost estimating best practices identified by the CAPE¹ and in the *GAO Cost Estimating and Assessment Guide*,² and reviewed Department of Defense (DOD) and Navy acquisition regulations. To assess the extent to which the Navy analyzed the force structure requirements underlying the planned purchase quantities of LCS seaframes and mission packages, we met with officials of the Assessments and Surface Warfare divisions of the Office of the Chief of Naval Operations. We also reviewed documents reflecting the force structure analyses the Navy performed on LCS seaframes and mission packages.

Although the Navy's estimates did not fully reflect best practices, they were based on a cost-estimating process that we deemed sufficient for reporting, with appropriate limitations. To calculate an average annual seaframe operating and support cost estimate, we divided the Navy's estimate of total operating and support costs of LCS seaframes by the planned purchase quantity of seaframes and by their expected service life. We multiplied the average annual estimated mission package operating and support cost for each mission package by the planned purchase quantity of that mission package and the assumed service life. We then added together the seaframe and mission package totals. To obtain an average annual seaframe cost that included the cost of mission packages, we divided this total program operating and support estimate by the

¹ Office of the Secretary of Defense, Cost Analysis Improvement Group, *Operating and Support Cost Estimating Guide* (Arlington, Va., October 2007), Office of the Secretary of Defense, Cost Analysis Improvement Group, *Operating and Support Cost Estimating Guide* (Arlington, Va., May 1, 1992).

² GAO, *GAO Cost Estimating and Assessment Guide*, [GAO-09-3SP](#) (Washington, D.C.: March 2009).

number of seaframe service years (seaframe quantity times assumed service life). We validated the methodology and results of our analysis with relevant officials from the Naval Sea Systems Command. However, our analysis of the Navy estimates is approximate and does not fully reflect cost estimating best practices as described in the report.

To assess the extent to which the Navy has developed and implemented plans to operate and support LCS, particularly in the areas of personnel, training, and maintenance, we reviewed and analyzed DOD and Navy guidance, the *LCS Wholeness Concept of Operations*, and instructions on personnel, training, and maintenance as well as key studies and planning documents. We also reviewed prior GAO products and DOD guidance on risk management to assess the extent that Navy plans included assessments of program risk. In addition, we interviewed officials at Headquarters, Department of the Navy and Navy Sea Systems Command for personnel, training, and maintenance as well as Fleet Forces Command, Commander, Naval Surface Forces, Navy Personnel Command, Bureau of Naval Personnel, and Navy Manpower Analysis Center.

To estimate long-term LCS personnel requirements, we analyzed Navy documentation, including personnel estimate documentation and the concept of operations, and validated the results with Navy officials at the offices listed above. To compare LCS training days to training days for other surface ships, we first identified a non-probability sample of LCS positions from both seaframes which were for critical positions such as the most senior enlisted personnel (E-8 or above), or those that generally met three of the following four criteria:

- a position that required training in several areas outside the sailor's primary specialty;
- a position for a specialty that was on a list of 14 specialties which the Commander, Naval Surface Forces determined to have "unique cross rate training";
- a position for a specialty which, at the time, was filled at less than 100 percent or a position for a specialty which, at the time, was filled at less than 100 percent at the lower levels, which might lead to less availability in the future; and
- a position in the unplanned loss pool.

To identify the training days required prior to reporting to an LCS crew, we obtained the training days required for the positions in our sample based on the Navy's study of training requirements for LCS. We reviewed the process of how the Navy study team developed the course time

requirements by speaking with knowledgeable officials and found the process was reasonable. To identify the training days required before reporting to a destroyer and amphibious transport docking ship, we obtained the training days required for comparable positions in our sample. We validated these data in meetings with Naval Sea Systems Command and Bureau of Naval Personnel officials. Finally, we compared the training days for LCS with the training days for the destroyer and amphibious transport docking ship. We reviewed the results of this comparison with Bureau of Naval Personnel, Fleet Forces Command, Naval Sea Systems Command, and several offices within the Office of the Chief of Naval Operations who generally agreed with the data, methodology, and results. Based on the work described above we concluded that the data were sufficiently reliable for our purposes.

We conducted this performance audit from October 2008 through February 2010 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: Comments from the Department of Defense



OFFICE OF THE UNDER SECRETARY OF DEFENSE
3000 DEFENSE PENTAGON
WASHINGTON, DC 20301-3000

ACQUISITION
TECHNOLOGY
AND LOGISTICS

JAN 21 2010

Mr. John H. Pendleton
Director, Defense Capabilities and Management
U.S. Government Accountability Office
441 G Street, N.W.
Washington, DC 20548

Dear Mr. Pendleton:

This is the Department of Defense response to the GAO draft report, GAO-10-257, "LITTORAL COMBAT SHIP: Actions Needed to Improve Operating Cost Estimates and Mitigate Risks in Implementing New Concepts," dated December 14, 2009 (GAO Code 351278). The Department's comments on the six specific recommendations are enclosed.

The Department concurs with recommendations 2, 3, 4, and 5. The Department partially concurs with recommendations 1 and 6. In response to recommendation 1, the Department agrees that life cycle cost estimates should be completed for both LCS designs, but it is premature to discuss whether life cycle costs will be a factor in down-selecting to a single design because the solicitation for the FY 2010 block buy has not been released. The partial concur on recommendation 6 relates to Department concerns about using the recommended risk assessments as decision criteria at annual buy decisions. The Department proposes instead to consider the risk assessments prior to major procurement decisions in FY 2010, FY 2012, and FY 2015.

The Department appreciates the opportunity to comment on the draft report. Technical comments were provided separately. For further questions concerning this report, please contact Ms. Darlene Costello, Deputy Director, Naval Warfare, 703-697-2205.

Sincerely,

A handwritten signature in cursive script, reading "Darlene Costello for", is written above the typed name of David G. Ahern.

David G. Ahern
Director
Portfolio Systems Acquisition

Enclosure:
As stated

**GAO DRAFT REPORT – DATED DECEMBER 14, 2009
GAO CODE 351278/GAO-10-257**

**"LITTORAL COMBAT SHIP: Actions Needed to Improve Operating Cost
Estimates and Mitigate Risks in Implementing New Concepts"**

**DEPARTMENT OF DEFENSE COMMENTS
TO THE RECOMMENDATIONS**

RECOMMENDATION 1: The GAO recommends that the Secretary of Defense direct the Secretary of the Navy to, before deciding which seaframe to buy, produce a complete estimate of the long-term operating and support costs which fully reflects cost estimating best practices for each seaframe and use these updated estimates in deciding which seaframe to buy for the remainder of the program.

DOD RESPONSE: Partially concur. The Navy will prepare two Program Life Cycle Cost Estimates (PLCCEs) in support of the Milestone B Defense Acquisition Board review of the Littoral Combat Ship (LCS) program, one for each of the potential outcomes of the down-select decision. The PLCCEs will be developed using best cost estimating practices (including cost risk, cost driver sensitivity analyses, and an Independent Cost Estimate, in accordance with the Naval Sea Systems Command cost estimating group documented 12-step cost estimating process) and include estimates of the total operating and support costs for the entire class of LCS ships, including costs to operate and support the two ships of the non-selected design expected to remain as operational units in the Navy's LCS force structure. GAO should note that the LCS seaframe estimate reviewed by the GAO for this report was developed solely to support trade study analysis and was not intended as a budget quality estimate.

The Navy has not released the solicitation for the FY2010-FY2014 block buy, therefore, it is premature to discuss the down-select criteria included in the solicitation. For reference purposes this recommendation will be identified as item GAO-10-257-01.

RECOMMENDATION 2: The GAO recommends that the Secretary of Defense direct the Secretary of the Navy to use an updated estimate as a basis for analyzing the costs and benefits of options regarding the two seaframes built but not selected for long-term production, and use the results of this analysis in making the decision of how to use, or whether to retire, these seaframes.

DOD RESPONSE: Concur. The costs for operating and supporting the two non-selected Littoral Combat Ships (LCS) will be included in the life cycle cost estimates

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prepared for the Milestone B Defense Acquisition Board (DAB) review. These estimates will be used to inform the DAB on the cost of keeping the two non-selected seaframes compared to procuring two more seaframes of the selected design and selling-off or retiring the two non-selected seaframes. However, at this point, the Navy intends to operate and maintain the two non-selected LCS seaframes as part of the total LCS force structure. There is currently no plan to procure two additional seaframes of the selected design to make up any reduction in force structure caused by selling-off or retiring the two non-selected LCS seaframes. At this time, the Department accepts the risk of keeping the two non-selected seaframes, but will continue to explore options to keep, sell, or retire the two non-selected seaframes during annual budget reviews. For reference purposes this recommendation will be identified as item GAO-10-257-02.

RECOMMENDATION 3: The GAO recommends that the Secretary of Defense direct the Secretary of the Navy to annually update the cost estimate for the long-term operating and support costs of the seaframe and each mission package using cost estimating best practices and submit the results to the Department of Defense as well as to Congress as part of the Littoral Combat Ship (LCS) Selected Acquisition Report.

DOD RESPONSE: Concur. The Office of the Secretary of Defense will ensure that the Navy's Selected Acquisition Report for the Littoral Combat Ship program will reflect an annual update to the operating and support costs for the seaframe and mission packages using the Program Life Cycle Cost Estimates information prepared for the Milestone B Defense Acquisition Board review as the baseline. For reference purposes this recommendation will be identified as item GAO-10-257-03.

RECOMMENDATION 4: The GAO recommends that the Secretary of Defense direct the Secretary of the Navy to perform complete and updated force structure analyses on the Littoral Combat Ship mission packages to help determine the appropriate purchase quantities over the life of the program, and use these updated quantities for the mission package cost estimate.

DOD RESPONSE: Concur. The Navy will update the force structure analyses used to determine the number and types of mission packages to be procured over the life of the program as Littoral Combat Ship mission requirements evolve.

When adjustments to the mission package procurement objectives are deemed necessary, they will be rolled into the annual updates to the operating and support costs for the program. However, it should be noted that adjustments to the mission package procurement objectives may be deemed necessary on an annual basis.

These adjustments to the mission package procurement objectives will be rolled into the annual updates to the operating and support costs for the program as they evolve.

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However, it should be noted that these mission package adjustments might not occur annually. For reference purposes this recommendation will be identified as item GAO-10-257-04.

RECOMMENDATION 5: The GAO recommends that the Secretary of Defense direct the Secretary of the Navy to perform an updated seaframe force structure analysis when key underlying assumptions affecting seaframe quantities change, such as crewing policy, overseas homeports, or presence requirements, and use this updated analysis to adjust quantities and to update the seaframe cost estimate

DOD RESPONSE: Concur. The Navy will update its seaframe force structure analysis as required to reflect changes in key underlying assumptions that affect the force structure. If the procurement quantities for seaframes changes, then the Navy will update the seaframe cost estimate and report the resulting changes in program operating and support costs in the following Selected Acquisition Report for the Littoral Combat Ship program. For reference purposes this recommendation will be identified as item GAO-10-257-05.

RECOMMENDATION 6: The GAO recommends that the Secretary of Defense direct the Secretary of the Navy to perform a risk assessment and consider the results before committing to buy Littoral Combat Ship (LCS) ships each year in order to link procurement with evidence that the Navy is progressing in its ability to implement its new personnel, training, and maintenance concepts and has taken actions to mitigate the operational effects if these concepts cannot be implemented as intended. Specifically, this analysis should identify and assess the:

- operational limitations the Navy may face if the Navy's approach to personnel, training, and maintenance cannot be implemented as envisioned;
- possible alternatives, such as changes to the concepts or the ship design, and the related costs of those alternatives if the Navy's approach to LCS personnel, training, and maintenance cannot be implemented as envisioned in its concept of operations; and
- personnel policies and processes to reduce the risks to the LCS program. Such a holistic review could include the processes for identifying and assigning personnel, requirements LCS personnel must meet to qualify for assignment to a LCS crew, and identifying the total ship and shore LCS personnel required steady state to support the program over the long term.

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DOD RESPONSE: Partially concur. The Department agrees that risk assessments are appropriate and should be conducted. However, the Department disagrees that the results of these assessments should be linked to annual procurement decisions for Littoral Combat Ship (LCS) seaframes. The Acquisition Strategy for the LCS program lays out a plan for two block buys of LCS seaframes over the period from Fiscal Year (FY) 2010 through FY 2014. These block buys are specifically intended to promote acquisition cost reductions to make the program more affordable over the long term. To assure a stable program, the integrity of the block buys needs to be maintained. As an alternative, the Department will consider reviewing the risk assessments for personnel policies, training, and maintenance planning at the start of each new block buy. Those review points would occur at the Milestone B Defense Acquisition Board (DAB) review in FY 2010 and at the DAB reviews prior to the FY 2012 block buy and the FY 2015 procurement. While these review points do not occur annually, as recommended by the GAO, the Department accepts the risk in considering these performance assessments at procurement decision points spaced at two or three year intervals and will continue to monitor risk assessments for personnel policies, training, and maintenance planning during the intervening years. For reference purposes this recommendation will be identified as item GAO-10-257-06.

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Appendix III: GAO Contact and Staff Acknowledgments

GAO Contact

John H. Pendleton, (404) 679-1816, pendletonj@gao.gov

Acknowledgments

In addition to the contact named above, Patricia W. Lentini, Assistant Director; Brenda M. Waterfield; James R. Bancroft; Simon J. Hirschfeld; Linda S. Keefer; and Grace Coleman made key contributions to this report.

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