



# Navy Littoral Combat Ship (LCS) Program: Background, Issues, and Options for Congress

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## Summary

The Littoral Combat Ship (LCS) is a relatively inexpensive Navy surface combatant equipped with modular “plug-and-fight” mission packages. The basic version of the LCS, without any mission packages, is referred to as the LCS sea frame.

The Navy wants to field a force of 55 LCSs. The first two (LCS-1 and LCS-2) were procured in FY2005 and FY2006 and were commissioned into service on November 8, 2008, and January 16, 2010. Another two (LCS-3 and LCS-4) were procured in FY2009 and are under construction. Two more (LCS-5 and LCS-6) were procured in FY2010.

The Navy’s FY2011-FY2015 shipbuilding plan calls for procuring 17 more LCSs in annual quantities of 2, 3, 4, 4, and 4. The Navy’s proposed FY2011 budget requests \$1,231.0 million in procurement funding for the two LCSs that the Navy wants to procure in FY2011, and \$278.4 million in FY2011 advance procurement funding for the 11 LCSs that the Navy wants to procure in FY2012-FY2014. The Navy’s proposed FY2011 budget also requests procurement funding to procure LCS module weapons and LCS mission packages, and research and development funding for the LCS program.

There are currently two very different LCS designs—one developed and produced by an industry team led by Lockheed, and another developed and produced by an industry team led by General Dynamics. LCS-1 and LCS-3 use the Lockheed design; LCS-2 and LCS-4 use the General Dynamics design.

On September 16, 2009, the Navy announced a proposed new LCS acquisition strategy. Under the strategy, the Navy would hold a competition to pick a single design to which all LCSs procured in FY2010 and subsequent years would be built. (The process of selecting the single design for all future production is called a down select.) The winner of the down select would be awarded a contract to build 10 LCSs over the five-year period FY2010-FY2014, at a rate of two ships per year. The Navy would then hold a second competition—open to all bidders other than the shipyard building the 10 LCSs in FY2010-FY2014—to select a second shipyard to build up to five additional LCSs to the same design in FY2012-FY2014 (one ship in FY2012, and two ships per year in FY2013-FY2014). These two shipyards would then compete for contracts to build LCSs procured in FY2015 and subsequent years.

Section 121(a) and (b) of the FY2010 defense authorization act (H.R. 2647/P.L. 111-84 of October 28, 2009) grant the Navy contracting and other authority needed to implement this new LCS acquisition strategy.

The Navy had earlier planned to make the down select decision and award the contract to build the 10 LCSs sometime this past summer, but the decision was delayed and reportedly will now occur within 90 days of September 15—the date by which the two industry teams were told by the Navy to submit new proposal revisions. On this basis, it would appear that the decision could be announced as late as December 14. On October 12, 2010, it was reported that a Defense Acquisition Board (DAB) review meeting on the LCS program that was scheduled for October 29 has been postponed to a later date that has not been set. The Navy states that it cannot announce its down select decision and award a contract to the winner until after the DAB meeting occurs.

FY2011 issues for Congress include whether to approve, reject, or modify the Navy’s request for FY2011 procurement and advance procurement funding for the LCS program, and whether to provide any additional direction to the Navy regarding LCS acquisition strategy.

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## **Introduction**

The Littoral Combat Ship (LCS) is a relatively inexpensive Navy surface combatant equipped with modular “plug-and-fight” mission packages. The basic version of the LCS, without any mission packages, is referred to as the LCS sea frame.

The Navy wants to field a force of 55 LCSs. The first two (LCS-1 and LCS-2) were procured in FY2005 and FY2006 and were commissioned into service on November 8, 2008, and January 16, 2010. Another two (LCS-3 and LCS-4) were procured in FY2009 and are under construction. Two more (LCS-5 and LCS-6) were procured in FY2010.

The Navy’s FY2011-FY2015 shipbuilding plan calls for procuring 17 more LCSs in annual quantities of 2, 3, 4, 4, and 4. The Navy’s proposed FY2011 budget requests \$1,231.0 million in procurement funding for the two LCSs that the Navy wants to procure in FY2011, and \$278.4 million in FY2011 advance procurement funding for the 11 LCSs that the Navy wants to procure in FY2012-FY2014. The Navy’s proposed FY2011 budget also requests procurement funding to procure LCS module weapons and LCS mission packages, and research and development funding for the LCS program.

There are currently two very different LCS designs—one developed and produced by an industry team led by Lockheed, and another developed and produced by an industry team led by General Dynamics. LCS-1 and LCS-3 use the Lockheed design; LCS-2 and LCS-4 use the General Dynamics design.

On September 16, 2009, the Navy announced a proposed new LCS acquisition strategy. Under the strategy, the Navy would hold a competition to pick a single design to which all LCSs procured in FY2010 and subsequent years would be built. (The process of selecting the single design for all future production is called a down select.) The winner of the down select would be awarded a contract to build 10 LCSs over the five-year period FY2010-FY2014, at a rate of two ships per year. The Navy would then hold a second competition—open to all bidders other than the shipyard building the 10 LCSs in FY2010-FY2014—to select a second shipyard to build up to five additional LCSs to the same design in FY2012-FY2014 (one ship in FY2012, and two ships per year in FY2013-FY2014). These two shipyards would then compete for contracts to build LCSs procured in FY2015 and subsequent years.

Section 121(a) and (b) of the FY2010 defense authorization act (H.R. 2647/P.L. 111-84 of October 28, 2009) grant the Navy contracting and other authority needed to implement this new LCS acquisition strategy.

The Navy had earlier planned to make the down select decision and award the contract to build the 10 LCSs sometime this past summer, but the decision was delayed and reportedly will now occur within 90 days of September 15—the date by which the two industry teams were told by the Navy to submit new proposal revisions. On this basis, it would appear that the decision could be announced as late as December 14.<sup>1</sup> On October 12, 2010, it was reported that a Defense Acquisition Board (DAB) review meeting on the LCS program that was scheduled for October 29

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<sup>1</sup> Cid Standifer and Andrew Burt, “LCS Decision May Extend To December; Senate Cuts One Ship From FY-11,” *Inside the Navy*, September 20, 2010.

has been postponed to a later date that has not been set.<sup>2</sup> The Navy states that it cannot announce its down select decision and award a contract to the winner until after the DAB meeting occurs.<sup>3</sup>

FY2011 issues for Congress include whether to approve, reject, or modify the Navy's request for FY2011 procurement and advance procurement funding for the LCS program, and whether to provide any additional direction to the Navy regarding LCS acquisition strategy. Decisions that Congress makes on this issue could affect future Navy capabilities and funding requirements, and the shipbuilding industrial base.

## Background

### The LCS in General

The LCS program was announced on November 1, 2001.<sup>4</sup> The LCS is a relatively inexpensive Navy surface combatant that is to be equipped with modular “plug-and-fight” mission packages, including unmanned vehicles (UVs). Rather than being a multimission ship like the Navy's larger surface combatants, the LCS is to be a focused-mission ship equipped to perform one primary mission at any one time. The ship's mission orientation can be changed by changing out its mission packages. The basic version of the LCS, without any mission packages, is referred to as the LCS sea frame.

The LCS's primary intended missions are antisubmarine warfare (ASW), mine countermeasures (MCM), and surface warfare (SUW) against small boats (including so-called “swarm boats”), particularly in littoral (i.e., near-shore) waters. The LCS program includes the development and procurement of ASW, MCM, and SUW mission packages for LCS sea frames. Additional missions for the LCS include peacetime engagement and partnership-building operations, intelligence, surveillance, and reconnaissance (ISR) operations, maritime intercept operations, operations to support special operations forces, and homeland defense operations.

The LCS displaces about 3,000 tons, making it about the size of a corvette (i.e., a light frigate) or a Coast Guard cutter. It has a maximum speed of more than 40 knots, compared to something more than 30 knots for the Navy cruisers and destroyers. The LCS has a shallower draft than Navy cruisers and destroyers, permitting it to operate in certain coastal waters and visit certain ports that are not accessible to Navy cruisers and destroyers. The LCS employs automation to achieve a reduced “core” crew of 40 sailors. Up to 35 or so additional sailors are to operate the ship's embarked aircraft and mission packages, making for a total crew of about 75, compared to

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<sup>2</sup> Andrea Shalal-Esa, “Pentagon Postpones Oct. 29 Meeting on Coastal Ship,” *Reuters.com*, October 12, 2010.

<sup>3</sup> Source: CRS telephone consultation with Navy Office of Legislative Affairs, October 14, 2010.

<sup>4</sup> On November 1, 2001, the Navy announced that it was launching a Future Surface Combatant Program aimed at acquiring a family of next-generation surface combatants. This new family of surface combatants, the Navy stated, would include three new classes of ships: a destroyer called the DD(X)—later redesignated the DDG-1000—for the precision long-range strike and naval gunfire mission; a cruiser called the CG(X) for the air defense and ballistic missile mission, and a smaller combatant called the Littoral Combat Ship (LCS) to counter submarines, small surface attack craft, and mines in heavily contested littoral (near-shore) areas. For more on the DDG-1000 program, see CRS Report RL32109, *Navy DDG-51 and DDG-1000 Destroyer Programs: Background and Issues for Congress*, by Ronald O'Rourke. For more on the CG(X) program, see CRS Report RL34179, *Navy CG(X) Cruiser Program: Background for Congress*, by Ronald O'Rourke.

more than 200 for the Navy's frigates and about 300 (or more) for the Navy's current cruisers and destroyers.

## Two Industry Teams, Each with Its Own Design

On May 27, 2004, the Navy awarded contracts to two industry teams—one led by Lockheed Martin, the other by General Dynamics (GD)—to design two versions of the LCS, with options for each team to build up to two LCSs each. The two teams' LCS designs are quite different—Lockheed's design is based on a steel semi-planing monohull, while GD's design is based on an aluminum trimaran hull. The two ships also use different combat systems (i.e., different collections of built-in sensors, computers, software, and tactical displays) that were designed by each industry team. The Navy states that both designs meet the Key Performance Parameters (KPPs) for the LCS program. The Lockheed team built LCS-1 and is building LCS-3 at Marinette Marine of Marinette, WI. The General Dynamics team built LCS-2 and is building LCS-4 at the Austal USA shipyard of Mobile, AL.<sup>5</sup>

## Planned Procurement Quantities

The Navy plans to field a force of 55 LCS sea frames and 64 LCS mission packages (16 ASW, 24 MCM, and 24 SUW). The Navy's planned force of 55 LCSs would account for about 18% of the Navy's planned force of 313 ships of all types.<sup>6</sup>

The Navy's five-year (FY2011-FY2015) shipbuilding plan calls for procuring 17 LCSs in annual quantities of 2, 3, 4, 4, and 4. The Navy's 30-year (FY2011-FY2040) shipbuilding plan shows three LCSs per year for FY2016-FY2019, two per year for FY2020-FY2024, a 1-2-1-2 pattern for FY2025-FY2033, and two per year for FY2034-FY2040. LCSs scheduled for procurement in the final years of the 30-year plan would be replacements for LCSs that will have reached the end of their 25-year expected service lives by that time.

## Unit Procurement Cost Cap

LCS sea frames procured in FY2010 and subsequent years are subject to a unit procurement cost cap. The legislative history of the cost cap is as follows:

- The cost cap was originally established by **Section 124 of the FY2006 defense authorization act** (H.R. 1815/P.L. 109-163 of January 6, 2006). Under this provision, the fifth and sixth ships in the class were to cost no more than \$220 million each, plus adjustments for inflation and other factors.
- The cost cap was amended by **Section 125 of the FY2008 defense authorization act** (H.R. 4986/P.L. 110-181 of January 28, 2008). This provision

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<sup>5</sup> Austal USA was created in 1999 as a joint venture between Austal Limited of Henderson, Western Australia and Bender Shipbuilding & Repair Company of Mobile, AL. The GD LCS team also includes GD/BIW as prime contractor to provide program management and planning, provide technical management, and to serve as "LCS system production lead."

<sup>6</sup> For more on the Navy's planned 313-ship fleet, see CRS Report RL32665, *Navy Force Structure and Shipbuilding Plans: Background and Issues for Congress*, by Ronald O'Rourke.



- amended the cost cap to \$460 million per ship, with no adjustments for inflation, and applied the cap to all LCSs procured in FY2008 and subsequent years.
- The cost cap was amended again by **Section 122 of the FY2009 defense authorization act** (S. 3001/P.L. 110-417 of October 14, 2008). This provision deferred the implementation of the cost cap by two years, applying it to all LCSs procured in FY2010 and subsequent years.
  - The cost cap was amended again by **Section 121(c) and (d) of the FY2010 defense authorization act** (H.R. 2647/P.L. 111-84 of October 28, 2009). The provision adjusted the cost cap to \$480 million per ship, excluded certain costs from being counted against the \$480 million cap, included provisions for adjusting that figure over time to take inflation and other events into account, and permitted the Secretary of the Navy to waive the cost cap under certain conditions.<sup>7</sup>

## Growth in Sea Frame Procurement Costs

The Navy originally spoke of building LCS sea frames for about \$220 million each in constant FY2005 dollars. Estimated LCS sea frame unit procurement costs have since more than doubled. The FY2011 budget estimates the procurement costs of LCS sea frames to be procured in FY2011-FY2015 at roughly \$600 million each in then-year dollars. An August 2010 Government Accountability Office (GAO) report on the LCS program stated:

The Navy entered contract negotiations in 2009 for fiscal year 2010 funded [LCS] seaframes with an incomplete understanding of LCS program costs. These contract negotiations proved unsuccessful, prompting the Navy to revise its acquisition strategy for the program. The contractors' proposals for construction of the next three ships exceeded the approximate \$1.4 billion in funds the Navy had allocated in its fiscal year 2010 budget. In response, the Navy revised its strategy to construct one seaframe design instead of two for fiscal year 2010 ships and beyond in an effort to improve affordability. Navy cost analyses completed prior to the failed negotiations in 2009 lack several characteristics essential to a high-quality cost estimate. These characteristics include the completion of sensitivity and uncertainty analyses and an independent review of the cost estimate. The Navy plans to complete a more comprehensive cost estimate before award of additional ship contracts in 2010.<sup>8</sup>

<sup>7</sup> Section 121(d)(1) states that the Secretary of the Navy may waive the cost cap if:

(A) the Secretary provides supporting data and certifies in writing to the congressional defense committees that—

(i) the total amount obligated or expended for procurement of the vessel-

(I) is in the best interest of the United States; and

(II) is affordable, within the context of the annual naval vessel construction plan required by section 231 of title 10, United States Code; and

(ii) the total amount obligated or expended for procurement of at least one other vessel authorized by subsection (a) has been or is expected to be less than \$480,000,000; and

(B) a period of not less than 30 days has expired following the date on which such certification and data are submitted to the congressional defense committees.

<sup>8</sup> Government Accountability Office, *Defense Acquisitions[:] Navy's Ability to Overcome Challenges Facing the Littoral Combat Ship Will Determine Eventual Capabilities*, GAO-10-523, August 2010, summary page.



For a detailed discussion of cost growth on LCS sea frames from the FY2006 budget cycle through the FY2009 budget cycle, see **Appendix B**.

## **2007 Program Restructuring and Ship Cancellations**

The Navy substantially restructured the LCS program in 2007 in response to significant cost growth and delays in constructing the first LCS sea frames. This restructuring led to the cancellation of four LCSs that were funded in FY2006 and FY2007. A fifth LCS, funded in FY2008, was cancelled in 2008. For details on the 2007 program restructuring and the cancellation of the five LCSs funded in FY2006-FY2008, see **Appendix C**.

## **New Acquisition Strategy Announced in September 2009**

On September 16, 2009, the Navy announced a proposed new LCS acquisition strategy.<sup>9</sup> Under the strategy, the Navy would hold a competition to pick a single design to which all LCSs procured in FY2010 and subsequent years would be built. (The process of selecting the single design for all future production is called a down select.) The winner of the down select would be awarded a contract to build 10 LCSs over the five-year period FY2010-FY2014, at a rate of two ships per year. The Navy would then hold a second competition—open to all bidders other than the shipyard building the 10 LCSs in FY2010-FY2014—to select a second shipyard to build up to five additional LCSs to the same design in FY2012-FY2014 (one ship in FY2012, and two ships per year in FY2013-FY2014). These two shipyards would then compete for contracts to build LCSs procured in FY2015 and subsequent years.

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The Navy had earlier planned to make the down select decision and award the contract to build the 10 LCSs sometime this past summer, but the decision was delayed and reportedly will now occur within 90 days of September 15—the date by which the two industry teams were told by the Navy to submit new proposal revisions. On this basis, it would appear that the decision could

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<sup>9</sup> Prior to the Navy's announcement of September 16, 2009, the Navy had announced an acquisition strategy for LCSs to be procured in FY2009 and FY2010. Under this acquisition strategy, the Navy bundled together the two LCSs funded in FY2009 (LCSs 3 and 4) with the three LCSs to be requested for FY2010 into a single, five-ship solicitation. The Navy announced that each LCS industry team would be awarded a contract for one of the FY2009 ships, and that the prices that the two teams bid for both the FY2009 ships and the FY2010 ships would determine the allocation of the three FY2010 ships, with the winning team getting two of the FY2010 ships and the other team getting one FY2010 ship. This strategy was intended to use the carrot of the third FY2010 ship to generate bidding pressure on the two industry teams for both the FY2009 ships and the FY2010 ships.

The Navy stated that the contracts for the two FY2009 ships would be awarded by the end of January 2009. The first contract (for Lockheed Martin, to build LCS-3) was awarded March 23, 2009; the second contract (for General Dynamics, to build LCS-4) was awarded May 1, 2009. The delay in the awarding of the contracts past the end-of-January target date may have been due in part to the challenge the Navy faced in coming to agreement with the industry teams on prices for the two FY2009 ships that would permit the three FY2010 ships to be built within the \$460 million LCS unit procurement cost cap. See also Statement of RADM Victor Guillory, U.S. Navy Director of Surface Warfare, and RADM William E. Landay, III, Program Executive Officer Ships, and Ms. E. Anne Sandel, Program Executive Officer Littoral and Mine Warfare, before the Subcommittee on Seapower and Expeditionary Forces of the House Armed Services Committee [hearing] on the Current Status of the Littoral Combat Ship Program, March 10, 2009, pp. 7-8.

be announced as late as December 14.<sup>10</sup> On October 12, 2010, it was reported that a Defense Acquisition Board (DAB) review meeting on the LCS program that was scheduled for October 29 has been postponed to a later date that has not been set.<sup>11</sup> The Navy states that it cannot announce its down select decision and award a contract to the winner until after the DAB meeting occurs.<sup>12</sup>

For additional background information on the Navy's new acquisition strategy, see **Appendix D**.

## **FY2011 Funding Request**

The Navy's proposed FY2011 budget requests \$1,231.0 million in procurement funding for the two LCSs that the Navy wants to procure in FY2011, and \$278.4 million in FY2011 advance procurement funding for the 11 LCSs that the Navy wants to procure in FY2012-FY2014. The Navy's proposed FY2011 budget estimates the procurement costs of LCS sea frames to be procured in FY2011-FY2015 at roughly \$600 million each in then-year dollars. The Navy's proposed FY2011 budget also requests \$9.8 million in procurement funding to procure LCS module weapons, \$83.0 million in procurement funding for procurement of LCS mission packages, and \$226.3 million in research and development funding for the LCS program.

## **Issues for Congress**

### **New Acquisition Strategy Announced in September 2009**

The new LCS acquisition strategy announced by the Navy on September 16, 2009, poses several potential oversight questions for Congress, including the following:

- Did the timing of the Navy's September 2009 announcement of the new strategy—very late in the congressional process for reviewing, marking up, and finalizing action on the FY2010 defense budget—provide Congress with sufficient time to adequately review the proposal prior to finalizing its action on the FY2010 defense budget?
- Does the Navy's proposed strategy allow the Navy enough time to adequately evaluate the operational characteristics of the two LCS designs before selecting one of those designs for all future production?
- Does the Navy's proposed method for conducting the LCS down select—the Request for Proposals (RFP)—appropriately balance procurement cost against other criteria, such as life-cycle operation and support (O&S) cost and ship capability?
- What risks would the Navy face if the shipyard that wins the competition to build the 10 LCSs in FY2010-FY2014 cannot build them within the contracted cost?

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<sup>10</sup> Cid Standifer and Andrew Burt, "LCS Decision May Extend To December; Senate Cuts One Ship From FY-11, *Inside the Navy*, September 20, 2010.

<sup>11</sup> Andrea Shalal-Esa, "Pentagon Postpones Oct. 29 Meeting on Coastal Ship," *Reuters.com*, October 12, 2010.

<sup>12</sup> Source: CRS telephone consultation with Navy Office of Legislative Affairs, October 14, 2010.

- How does the Navy plan to evolve the combat system on the winning LCS design to a configuration that has greater commonality with one or more existing Navy surface ship combat systems?
- What are the Navy's longer-term plans regarding the two "orphan" LCSs that are built to the design that is not chosen in the down select?
- What potential alternatives are there to the Navy's new acquisition strategy?

Each of these questions is discussed briefly below.

### **Enough Time for Adequate Congressional Review of Navy Proposal?**

One potential issue for Congress concerning the Navy's proposed acquisition strategy is whether the timing of the Navy's September 2009 announcement of the new LCS acquisition strategy—very late in the congressional process for reviewing, marking up, and finalizing action on the FY2010 defense budget—provided Congress with sufficient time to adequately review the proposal prior to finalizing its action on the FY2010 defense budget. The announcement of the Navy's proposed acquisition strategy on September 16, 2009, came

- after the defense committees of Congress had held their hearings to review the FY2010 budget submission;
- after the FY2010 defense authorization bill (H.R. 2647/S. 1390) and the Department of Defense (DOD) appropriations bill (H.R. 3326) had been reported in the House and Senate;
- after both the House and Senate had amended and passed their versions of the FY2010 defense authorization bill, setting the stage for the conference on that bill; and
- after the House had passed its version of the FY2010 DOD appropriations bill.

The timing of the Navy's announcement was a byproduct of the fact that the Navy was not able to see and evaluate the industry bids for the three LCSs that the navy had originally requested for FY2010 until August 2009. The September 16, 2009, announcement date may have been the earliest possible announcement date, given the time the Navy needed to consider the situation created by the bids, evaluate potential courses of action, and select the newly proposed acquisition strategy.

Although the Navy might not have been able to present the proposed strategy to Congress any sooner than September 16, the timing of the Navy's announcement nevertheless put Congress in the position of being asked to approve a major proposal for the LCS program—a proposal that would determine the basic shape of the acquisition strategy for the program for many years into the future—with little or no opportunity for formal congressional review and consideration through hearings and committee markup activities.

A shortage of time for formal congressional review and consideration would be a potential oversight issue for Congress for any large weapon acquisition program, but this might be especially the case for the LCS program, because it would not be the first time that the Navy has put Congress in the position of having to make a significant decision about the LCS program with little or no opportunity for formal congressional review and consideration. As discussed in previous CRS reporting on the LCS program, a roughly similar situation occurred in the summer

of 2002, after Congress had completed its budget-review hearings on the proposed FY2003 budget, when the Navy submitted a late request for the research and development funding that effectively started the LCS program.<sup>13</sup>

Supporters of the idea of approving the Navy's proposed acquisition strategy as part of Congress's work to finalize action on the FY2010 defense budget could argue one or more of the following:

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<sup>13</sup> The issue of whether Congress was given sufficient time to review and consider the merits of the LCS program in its early stages was discussed through multiple editions of past CRS reports covering the LCS program. The discussion in those reports raised the question of whether "Navy officials adopted a rapid acquisition strategy for the LCS program in part to limit the amount of time available to Congress to assess the merits of the LCS program and thereby effectively rush Congress into approving the start of LCS procurement before Congress fully understands the details of the program." The discussion continued:

With regard to the possibility of rushing Congress into a quick decision on LCS procurement, it can be noted that announcing the LCS program in November 2001 and subsequently proposing to start procurement in FY2005 resulted in a situation of Congress having only three annual budget-review seasons to learn about the new LCS program, assess its merits against other competing DOD priorities, and make a decision on whether to approve the start of procurement. These three annual budget-review seasons would occur in 2002, 2003, and 2004, when Congress would review the Navy's proposed FY2003, FY2004, and FY2005 budgets, respectively. Congress' opportunity to conduct a thorough review of the LCS program in the first two of these three years, moreover, may have been hampered:

- **2002 budget-review season (for FY2003 budget).** The Navy's original FY2003 budget request, submitted to Congress in February 2002, contained no apparent funding for development of the LCS. In addition, the Navy in early 2002 had not yet announced that it intended to employ a rapid acquisition strategy for the LCS program. As a result, in the early months of 2002, there may have been little reason within Congress to view the LCS program as a significant FY2003 budget-review issue. In the middle of 2002, the Navy submitted an amended request asking for \$33 million in FY2003 development funding for the LCS program. Navy officials explained that they did not decide until the middle of 2002 that they wanted to pursue a rapid acquisition strategy for the LCS program, and consequently did not realize until then that there was a need to request \$33 million in FY2003 funding for the program. By the middle of 2002, however, the House and Senate Armed Services committees had already held their spring FY2003 budget-review hearings and marked up their respective versions of the FY2003 defense authorization bill. These two committees thus did not have an opportunity to use the spring 2002 budget-review season to review in detail the Navy's accelerated acquisition plan for the LCS program or the supporting request for \$33 million in funding.
- **2003 budget-review season (for FY2004 budget).** To support a more informed review of the LCS program during the spring 2003 budget-review season, the conferees on the FY2003 defense authorization bill included a provision (Section 218) requiring the Navy to submit a detailed report on several aspects of the LCS program, including its acquisition strategy. In response to this legislation, the Navy in February 2003 submitted a report of eight pages in length, including a title page and a first page devoted mostly to a restatement of Section 218's requirement for the report. The House and Senate Armed Services committees, in their reports on the FY2004 defense authorization bill, have expressed dissatisfaction with the thoroughness of the report as a response to the requirements of Section 218. (For details, see the "Legislative Activity" section of this report.) It is thus not clear whether the defense authorization committees were able to conduct their spring 2003 budget-review hearings on the FY2004 budget with as much information about the LCS program as they might have preferred.

(See, for example, CRS Report RL 32109, *Navy DD(X), CG(X), and LCS Ship Acquisition Programs: Oversight Issues and Options for Congress*, by Ronald O'Rourke, updated July 29, 2005, pp. CRS-59 to CRS-60. This discussion was carried through multiple updates of CRS reports covering the LCS program.)

- The timing of the Navy’s proposal, though not convenient for Congress, nevertheless represented a good-faith effort by the Navy to present the proposal to Congress at the earliest possible date. The Navy conducted multiple briefings with congressional offices starting in September 2009 to explain the proposed strategy.
- The LCS program needed to be put on a more stable long-term path as soon as possible, and if Congress did not approve the proposal as part of its work in finalizing action on the FY2010 defense budget, another year would pass before the LCS program could be put on a stable path approved by Congress.
- Although cost growth and construction problems with the LCS program can be viewed as a consequence of past attempts to move ahead too quickly on the LCS program, the Navy’s new acquisition strategy does not risk repeating this experience, because it does not represent another attempt to move ahead on the program at an imprudent speed. To the contrary, the strategy seeks to reduce execution risks by limiting LCS procurement to a maximum of four ships per year and providing a stable planning environment for LCS shipyards and suppliers.
- If the proposed strategy were not approved by Congress as part of its action on the FY2010 budget, the LCSs procured in FY2010 would be more expensive to procure, since they would not benefit from economies of scale that would come from awarding the FY2010 ships as part of a contract that also includes LCSs to be procured in FY2011-FY2014.

Supporters of the idea of deferring a decision on the Navy’s proposed acquisition strategy until the FY2011 budget cycle could argue one or more of the following:

- Navy briefings to Congress on the proposed strategy starting in September 2009, though helpful, were not sufficient for Congress to fully understand the features and potential implications of the Navy’s proposed acquisition strategy—much less the relative merits of potential alternatives to that strategy.
- The risks of making a quick decision on the Navy’s proposed acquisition strategy, with little time for formal congressional review and consideration, are underscored by the history of the LCS program, which includes substantial cost growth and construction problems that can be viewed as the consequence of past attempts to move ahead quickly on the program, without more-extensive congressional review and consideration.
- The desire to avoid paying a relatively high cost for LCSs procured in FY2010, though real, should not have been a controlling factor in this situation (i.e., should not have been “the tail that wags the dog”). Paying a higher cost for LCSs procured in FY2010, though not optimal, would be an investment to buy time for Congress to more fully review and consider the merits of both the Navy’s proposal and potential alternatives to it. Problems avoided through a full congressional review and consideration of the Navy’s proposal and potential alternatives during the FY2011 budget cycle could eventually save the Navy a lot more money than the Navy hopes to save on the LCSs procured in FY2010 by procuring them as part of a contract that also includes LCSs to be procured in FY2011-FY2014.



- Approving the Navy's proposed acquisition strategy at a late juncture in the annual congressional process for reviewing and marking up the defense budget would set an undesirable precedent from Congress's standpoint regarding late submissions to Congress of significant proposals for large defense acquisition programs, and encourage DOD to do the same with other large weapon acquisition programs in the future in the hopes of stampeding Congress into making quick decisions on major proposals for those programs.

### **Enough Time to Evaluate the Two Designs' Operational Characteristics?**

Another potential issue for Congress concerning the Navy's proposed acquisition strategy is whether the strategy allows the Navy enough time to adequately evaluate the operational characteristics of the two LCS designs before selecting one of those designs for all future production. Potential oversight questions for Congress include the following:

- Since LCS-1 as of September 2009 had been in commissioned service for less than a year, and LCS-2 as of that date had not yet been delivered to the Navy, how firm was the basis for the Navy's determination that both LCS designs meet the Navy's operational requirements for LCS?
- By the summer of 2010—when the Navy plans to award a contract to the winner of the down select—the Navy will have had only a limited time to evaluate the operational characteristics of LCS-1 and LCS-2 through fleet exercises and use in actual Navy deployments. Will the Navy at that point have a sufficient understanding of the two designs' operational characteristics to appropriately treat the operational characteristics of the two designs in the down select?

The Navy and its supporters could argue that the Navy has chosen a preferred design for other new Navy ships (such as the DDG-1000 destroyer) on the basis of paper designs only, and consequently that the Navy would have a firmer basis for performing the LCS down select than it has had on other shipbuilding programs. They can argue that the Navy has a good understanding of the basic differences between the ships—that the Lockheed design, for example, may have better features for supporting small boat operations (which are used for certain LCS missions), while the General Dynamics design may have better features for supporting helicopter and unmanned aerial vehicle (UAV) operations (which are used for certain LCS missions).

Skeptics could argue that the Navy in the past has talked about performing an extensive operational review of each design prior to settling on an acquisition strategy for follow-on ships in the program, and that the innovative nature of the LCS—a modular ship with plug-and-fight mission packages and a small crew—increases the risks associated with selecting a single LCS design before performing such an extensive operational review. Skeptics could argue that the Navy is depriving itself of the opportunity to better understand, through exercises and real-world deployments, the implications for overall fleet operations of building all LCSs to one design or the other before performing the down select.

### **Weight Given to Procurement Cost vs. Other Factors in Request for Proposals (RFP)**

Another potential issue for Congress concerning the Navy's proposed acquisition strategy concerns the criteria that the Navy will use for selecting a winning design in the down select.

Some observers, particularly supporters of the General Dynamics LCS design, argue that the Navy's proposed method for evaluating the two LCS designs in the LCS down select—set forth in the Request for Proposals (RFP) for the down select—focuses too much on procurement cost and not enough on other factors, particularly life-cycle fuel cost, other components of life-cycle operating and support (O&S) cost, and ship capability. Other observers, particularly supporters of the Lockheed LCS design, argue (as does the Navy) that the Navy's proposed method for conducting the LCS down select adequately takes into account factors other than procurement cost. The issue is viewed as having the potential for leading to a protest of the Navy's down select decision by the firm that is not selected.<sup>14</sup>

Regarding the role of life-cycle operation and support (O&S) cost in the Navy's down select decision, a February 2010 GAO report stated:

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.<sup>15</sup>

A February 8, 2010, press report stated that “the Navy will draw up total life-cycle cost estimates for both the Lockheed Martin and General Dynamics versions of the Littoral Combat Ship before the program goes before the Defense Acquisition Board this year for its Milestone B. review. The service included the announcement in a response to a Government Accountability Office report that criticized LCS life-cycle estimates.”<sup>16</sup>

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<sup>14</sup> For examples of articles discussing this issue, see Sean Reilly, “Loser To Fight In LCS Deal?” *Mobile (AL) Press-Register*, March 28, 2010: 1; Cid Standifer, “Austal USA, GD Officials Criticize Navy's RFP Criteria For LCS Award,” *Inside the Navy*, March 29, 2010; Zachary M. Peterson, “Navy LCS Proposal Request Seeks ‘Qualitative’ Total Ownership Cost Figures,” *Inside the Navy*, March 22, 2010; Emelie Rutherford, “Navy Stands By LCS Due Date As Hill Backers Of Each Bidder Swap Barbs,” *Defense Daily*, March 18, 2010: 2-3; Geoff Fein, “General Dynamics’ LCS Burns Less Fuel At Higher Speeds, Navy Documents Show,” *Defense Daily*, March 2, 2010: 1-2; Geoff Fein, “Sessions Presses Navy Over Fairness of LCS RFP Evaluation,” *Defense Daily*, March 1, 2010: 6-7; Geoff Fein, “USS Independence [LCS-2] Is The More Fuel Efficient of Two LCS Variants, Austal Official Says,” *Defense Daily*, February 24, 2010: 2-3; Geoff Fein, “LCS RFP: Greater Emphasis Placed On Ship Price, Less On Life-Cycle Cost,” *Defense Daily*, January 29, 2010: 5-7; Christopher P. Cavas, “RFP for LCS: Cost Main Factor in Winning Bid,” *NavyTimes.com*, January 28, 2010.

<sup>15</sup> Government Accountability Office, *Littoral Combat Ship[:] Actions Needed to Improve Operating Cost Estimates and Mitigate Risks in Implementing New Concepts*, GAO-10-257, February 2010, summary page.

<sup>16</sup> Cid Standifer, “Navy Will Project Operation Costs Of Both LCS Models for DAB Review,” *Inside the Navy*, February 8, 2010.



At the request of Senator Jeff Sessions, the Congressional Budget Office (CBO) analyzed the impact of O&S cost and other types of costs on the total life-cycle costs of the LCS and (for purposes of comparison) four other types of Navy ships. The results of CBO's analysis were released in the form of an April 28, 2010, letter to Senator Sessions. The letter states:

CBO projected the life-cycle cost of the LCS-1 under three different assumptions about the average annual amount of fuel the ship will use over its 25-year life: low, moderate, and high. In all three scenarios, procurement costs dominate the life-cycle cost of the LCS-1, ranging from 58 percent to 66 percent of the total.... Personnel costs make up 14 percent to 16 percent of the LCS-1's total life-cycle cost in the various scenarios, and fuel costs account for 8 percent to 18 percent.

The low-fuel case assumes that the LCS-1 generally operates at relatively low speeds—10 knots or less 90 percent of the time it is under way and 30 knots or more only about 3 percent of the time. That speed profile is based in part on how the Navy operated the LCS-1 between March 2009 and March 2010. In that scenario, operation and support costs total 33 percent of the ship's life-cycle cost: 16 percent for personnel costs, 8 percent for fuel costs (assuming that the ship consumes 25,000 barrels of fuel per year), and 9 percent for other O&S costs....

The moderate-fuel case—which CBO considers the most likely of the three scenarios—assumes that the LCS-1 operates at 30 or more knots for about 5 percent of the time, at 14 knots to 16 knots 42 percent of the time (a range that might be typical when the ship was traveling from its home port to a deployment location), and at less than 12 knots for the rest of its time under way. In that scenario, O&S costs total 34 percent of the ship's life-cycle cost: 15 percent for personnel, 11 percent for fuel, and 8 percent for other O&S costs. The moderate speed profile would result in fuel usage of about 35,000 barrels per year, slightly less than the 37,600 barrels that the Navy assumed in formulating its 2011 budget request. By comparison, the [Navy's] FFG-7 class frigates consumed about 31,000 barrels of fuel per ship in 2009.

The high-fuel case assumes that the LCS-1 operates at 30 or more knots for about 20 percent of its time under way, an assumption based partly on a speed profile developed by the Naval Sea Systems Command for the LCS program. In that scenario, O&S costs represent about 40 percent of the ship's life-cycle cost—more than in the other scenarios for the LCS-1 but less than for any of the other types of ships considered in this analysis. Personnel costs make up 14 percent of the life-cycle total; fuel costs, 18 percent; and other O&S costs, 8 percent. Projected fuel usage in this scenario is about 67,000 barrels per year. That estimate is unlikely to be exceeded in actual practice: It is twice the historical average for frigates and about 80 percent of the amount used by the Navy's destroyers (which do not have the capability to speed at 40 knots, as the littoral combat ship does, but are three times larger than the LCS-1).<sup>17</sup>

At a May 6, 2010, hearing on Navy shipbuilding programs before the Seapower Subcommittee of the Senate Armed Services Committee, Senator Sessions questioned Sean Stackley, the Navy's acquisition executive (i.e., the Assistant Secretary of the Navy [Research, Development and Acquisition]), regarding the role of fuel costs in the Navy's evaluation of the two LCS designs. For the text of this exchange, see **Appendix E**.

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<sup>17</sup> Letter dated April 28, 2010, from Douglas W. Elmendorf, Director, CBO, to the Honorable Jeff Sessions, pp. 3-5. The letter is available online at <http://www.cbo.gov/ftpdocs/114xx/doc11431/04-28-SessionsLetter.pdf>.

## **Potential Risks If First Shipyard Cannot Build Ships Within Cost**

Another potential issue for Congress concerning the Navy's proposed acquisition strategy concerns the potential risks the Navy would face if the shipyard that wins the competition to build the 10 LCSs in FY2010-FY2014 cannot build them within the contracted cost. The competition between the two existing LCS industry teams to be the winner of the down select could be intense enough to encourage the teams to bid unrealistically low prices for the contract to build the 10 ships.

The Navy and its supporters could argue that the Navy's plan to award a fixed-price contract to the winner of the down select would shift the cost risk on the 10 ships from the government to the shipyard. They could also argue that the Navy plans to carefully evaluate the bid prices submitted by the two industry teams for the down select to ensure that they are realistic, and that the existence of the second LCS shipyard would provide the Navy with an ability to continue building LCSs if production at the first yard were disrupted due to financial issues.

Skeptics could argue that even with a fixed-price contract, the Navy's proposed strategy poses cost risks for the government, because a shipyard could submit an unrealistically low bid so as to win the down select, and then recover its losses on those 10 ships by rolling the losses into prices for downstream ships in the program. Alternatively, the shipyard could present the Navy with the prospect of going out of business and disrupting the LCS production effort unless the Navy were to provide a financial bailout to cover the yard's losses on the 10 ships. Skeptics could argue that Navy decisions dating back to the 1970s to award multi-ship construction contracts to shipyards that had not yet built many ships of the kind in question sometimes led to less-than-satisfactory program outcomes, including substantial financial bailouts.

## **Increasing LCS Combat System Commonality with Other Combat Systems**

Another potential issue for Congress regarding the Navy's proposed acquisition strategy concerns the Navy's plan to evolve the combat system on the winning LCS design to a configuration that has greater commonality with one or more existing Navy surface ship combat systems. The Navy in its September 16, 2009, announcement did not provide many details on this part of its proposed acquisition strategy, making it difficult to evaluate the potential costs and risks of this part of the strategy against potential alternatives, including an alternative (which Navy officials have discussed in the past) of designing a new LCS combat system that would, from the outset, be highly common with one or more existing Navy surface ship combat systems.

## **Navy's Longer-Term Plans Regarding Two "Orphan" Ships**

Another potential issue for Congress concerning the Navy's proposed acquisition strategy concerns the Navy's longer-term plans regarding the two "orphan" LCSs built to the design that was not selected in the down select. The Navy states that it plans to keep these two ships in the fleet because they will be capable ships and the Navy has an urgent need for LCSs. These two LCSs, however, will have unique logistic support needs, potentially making them relatively expensive to operate and support. At some point, as larger numbers of LCSs enter service, the costs of operating and supporting these two ships may begin to outweigh the increasingly marginal addition they make to total LCS fleet capabilities. Potential alternatives to keeping the ships in the active-duty fleet as deployable assets include selling them to foreign buyers, converting them into research and development platforms, shifting them to the Naval Reserve

Force (where they would be operated by crews consisting partially of reservists), or decommissioning them and placing them into preservation (i.e., “mothball”) status as potential mobilization assets. Potential questions for Congress include the following:

- Does the Navy intend to keep the two orphan LCSs in the active-duty fleet as deployable assets for a full 25-year service life?
- If so, how would be the life-cycle operation and support (O&S) costs of these two ships compare to those of the other LCSs? In light of these O&S costs, would it be cost effective to keep these two ships in the active-duty fleet as deployable assets for a full 25-year service life, particularly as large numbers of LCSs enter service?
- If the Navy does not intend to keep the two orphan LCSs in the active-duty fleet as deployable assets for a full 25-year service life, when does the Navy anticipate removing them from such service, and what does the Navy anticipate doing with them afterward?

### **Potential Alternatives to Navy’s New Strategy**

Another potential issue for Congress concerning the Navy’s proposed acquisition strategy concerns potential alternatives to the Navy’s new acquisition strategy for acquiring LCSs procured in FY2010 and subsequent years. A variety of alternatives can be generated by changing one or more elements of the Navy’s proposed strategy. One alternative would be a strategy that would keep both LCS designs in production, at least for the time being. Such a strategy might involve the following:

- the use of block-buy contracts with augmented EOQ authority, as under the Navy’s proposed acquisition strategy, to continue producing both LCS designs, so as to provide stability to shipyards and suppliers involved in producing both LCS designs;
- the use of Profit Related to Offer (PRO) bidding between the builders of the two LCS designs, so as to generate competitive pressure between them and thereby restrain LCS production costs;<sup>18</sup> and
- designing a new LCS combat system that would have a high degree of commonality with one or more existing Navy surface ship combat systems and be provided as government-furnished equipment (GFE) for use on both LCS designs—an idea that was considered by the Navy at an earlier point in the program.

Supporters of an alternative like the one outlined above could argue that it would

- provide stability to LCS shipyards and suppliers;
- use competition to restrain LCS production costs;

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<sup>18</sup> Under PRO bidding, the two shipyards would compete not for LCS quantities (because each shipyard would know that it was going to build a certain number of LCSs over the term of their block-buy contracts), but rather for profit, with the lowest bidder receiving the higher profit margin. PRO bidding has been used in other defense acquisition programs where bidders do not compete for quantity. The Navy, for example, began using PRO bidding in the DDG-51 destroyer program in the 1990s.

- permit the Navy to receive a full return on the investment the Navy made in creating both LCS designs;
- reduce the life-cycle operation and support costs associated with building two LCS designs by equipping all LCSs with a common combat system;
- allow the Navy to design an LCS combat system that is, from the outset, highly common with one or more of the Navy's existing surface ship combat systems;
- achieve a maximum LCS procurement rate of four ships per year starting in FY2011 (two years earlier than under the Navy's proposal), thus permitting more LCSs to enter service with the Navy sooner;
- build both LCS designs in substantial numbers, thereby avoiding a situation of having a small number of orphan LCS ships that could have potentially high operation and support costs;
- preserve a potential to neck down to a single LCS design at some point in the future, while permitting the Navy in the meantime to more fully evaluate the operational characteristics of the two designs in real-world deployments; and
- increase the potential for achieving foreign sales of LCSs (which can reduce production costs for LCSs made for the U.S. Navy) by offering potential foreign buyers two LCS designs with active production lines.

Supporters of the Navy's proposed acquisition strategy could argue that an alternative like the one outlined above would, compared to the Navy's proposed strategy

- achieve lower economies of scale in LCS production costs by splitting production of LCS components between two designs;
- achieve, at the outset of series production of LCSs, less bidding pressure on shipyards, and thus higher LCS production costs, than would be achieved under the Navy's proposed strategy of using a price-based competition to select a single design for all future LCS production;
- miss out on the opportunity to restrain LCS costs by using the level of efficiency achieved in building an LCS design at one shipyard as a directly applicable benchmark for gauging the level of efficiency achieved by the other shipyard in building the same LCS design;
- increase Navy LCS program-management costs and the burden on Navy program-management capabilities by requiring the Navy to continue managing the construction of two very different LCS designs;
- achieve lower economies of scale in LCS operation and support costs because the two LCS designs would still differ in their basic hull, mechanical, and electrical (HM&E) systems, requiring the Navy to maintain two separate HM&E logistics support systems;
- receive only a limited return on the investment the Navy made in developing the two current LCS combat systems (since LCSs in the long run would not use either one), and require the Navy to incur the costs and the technical risks associated with designing a completely new LCS combat system;

- require the Navy to build some number of LCSs with their current combat systems—which are different from one another and from other Navy surface ship combat systems—while awaiting the development of the new LCS combat system, and then incur the costs associated with backfitting these earlier LCSs with the new system when it becomes available;
- send to industry a signal that is undesirable from the government’s perspective that if the Navy or other parts of DOD begin producing two designs for a new kind of weapon system, the Navy or DOD would be reluctant to neck production down to a single design at some point, even if government believes that doing so would reduce program costs while still meeting operational objectives; and
- miss out on the opportunity that would be present under the Navy’s proposed acquisition strategy to increase the potential for achieving foreign sales of LCSs by offering potential foreign buyers an LCS design that, through U.S. production, enjoys significant economies of scale for both production and operation and support.

## **Unit Procurement Cost Cap**

Another potential oversight matter for Congress for the LCS program is where the estimated procurement costs of LCSs stand in relation to the unit procurement cost cap for the LCS program as amended by Section 121(c) and (d) of the FY2010 defense authorization act (H.R. 2647/P.L. 111-84 of October 28, 2009). As mentioned earlier, the Navy’s proposed FY2011 budget estimates the procurement costs of LCS sea frames to be procured in FY2011-FY2015 at roughly \$600 million each in then-year dollars. At first glance, this appears to be well above the \$480 million unit procurement cost cap. As also mentioned earlier, however, the cost cap excludes certain costs from being counted against the \$480 million cap, includes provisions for adjusting that figure over time to take inflation and other events into account, and permits the Secretary of the Navy to waive the cost cap under certain conditions.

## **Cost Growth on LCS Sea Frames**

Another potential oversight issue for Congress for the LCS program concerns cost growth on LCS sea frames. Potential questions for Congress on this issue include the following:

- Has the Navy taken sufficient action to prevent further cost growth on LCS sea frames?
- Has the Navy financed cost growth on LCS sea frames by reducing funding for the procurement of LCS mission packages? For example, is cost growth on LCS sea frames linked in some way to the reduction in the planned number of LCS mission packages from an earlier figure of 90 to 110 to the current figure of 64? If the Navy has financed cost growth on LCS sea frames by reducing funding for the procurement of LCS mission packages, how might this have affected the capabilities of the planned 55-ship LCS fleet?
- In light of the cost growth, is the LCS program still cost-effective? What is the LCS sea frame unit procurement cost above which the Navy would no longer consider the LCS program cost-effective?



- If Congress had known in 2004, when it was acting on the FY2005 budget that contained funding to procure LCS-1, that LCS sea frame unit procurement costs would increase to the degree that they have, how might that have affected Congress's views on the question of approving the start of LCS procurement?

An August 2010 GAO report stated:

The Navy faces technical, design, and construction challenges to completing the first four [LCS] seaframes within current cost and schedule estimates. The Navy and its shipbuilders have learned lessons from construction of the first two seaframes that have positioned them to more effectively construct future vessels. However, technical issues with the first two seaframes have yet to be fully resolved. Addressing these technical issues has required the Navy to implement design changes at the same time LCS 3 and LCS 4 are being built. Incorporating changes during this phase will likely require additional labor hours beyond current forecasts. Together, these challenges may hinder the ability of shipbuilders to apply lessons learned to follow-on ships and could undermine anticipated benefits from recent capital investments in the LCS shipyards.<sup>19</sup>

On September 3, 2010, the Navy provided the press with a point paper responding to certain points made in the August 2010 GAO report.<sup>20</sup> The point paper stated in part:

LCS 3 and LCS 4 are in production under fixed-priced contracts. Delaying production until testing is complete on LCS 1 and LCS 2 would result in a significant increase in the ships' costs, as it would cause a lengthy disruption in the shipbuilding workforce and vendor base required for ship construction. Navy's approach to building LCS 3 and 4 is not different from that used in other Navy shipbuilding programs.<sup>21</sup>

## **Total Program Acquisition Cost**

Another potential oversight issue for Congress for the LCS program concerns the program's potential total acquisition (i.e., research and development plus procurement) cost. DOD has not reported a total estimated acquisition cost for the entire LCS program, including both 55 LCS sea frames and 64 LCS mission packages. Supporters of the LCS program could argue that substantial data is available in the FY2011 budget submission on annual LCS research and development and procurement costs for the period FY2011-FY2015. Skeptics could argue that a major acquisition program like the LCS program should not proceed to higher annual rates of production until the program's potential total acquisition costs is reported and assessed against other defense spending priorities.

## **Operation and Support (O&S) Cost**

Another potential oversight issue for Congress for the LCS program concerns the ship's operation and support (O&S) cost. At the request of Senator Jeff Sessions, the Congressional Budget Office (CBO) analyzed the impact of O&S cost and other types of costs on the total life-cycle costs of

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<sup>19</sup> Government Accountability Office, *Defense Acquisitions[:] Navy's Ability to Overcome Challenges Facing the Littoral Combat Ship Will Determine Eventual Capabilities*, GAO-10-523, August 2010, summary page.

<sup>20</sup> See Cid Standifer, "Navy Pushes Back Against GAO Criticism Of Littoral Combat Ship," *Inside the Navy*, September 6, 2010.

<sup>21</sup> Undated Navy point paper provided to CRS by Navy Office of Legislative Affairs on September 8, 2010.

the LCS and (for purposes of comparison) four other types of Navy ships. The results of CBO's analysis were released in the form of an April 28, 2010, letter to Senator Sessions.<sup>22</sup> CBO estimates in the letter that LCS-1 (the Lockheed Martin LCS design) would have an O&S cost, in constant FY2010 dollars, of \$41 million to \$47 million per year, depending on how often the ship travels at higher speeds and consequently how much fuel the ship uses each year.<sup>23</sup> For an excerpt from CBO's letter, see the earlier section entitled "Weight Given to Procurement Cost vs. Other Factors in Request for Proposals (RFP)."

A February 2010 Government Accountability Office (GAO) report stated:

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.<sup>24</sup>

A February 8, 2010, press report stated:

The Navy will draw up total life-cycle cost estimates for both the Lockheed Martin and General Dynamics versions of the Littoral Combat Ship before the program goes before the Defense Acquisition Board this year for its Milestone B. review.

The service included the announcement in a response to a Government Accountability Office report that criticized LCS life-cycle estimates.<sup>25</sup>

## Operational Concepts

Another potential oversight issue for Congress for the LCS program concerns operational concepts for using LCSs once they enter service. The February 2010 GAO report cited above also stated:

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<sup>22</sup> Letter dated April 28, 2010, from Douglas W. Elmendorf, Director, CBO, to the Honorable Jeff Sessions, 8 pp. The full text of the letter is available online at <http://www.cbo.gov/ftpdocs/114xx/doc11431/04-28-SessionsLetter.pdf>.

<sup>23</sup> Letter dated April 28, 2010, from Douglas W. Elmendorf, Director, CBO, to the Honorable Jeff Sessions, Table 1 on page 7.

<sup>24</sup> Government Accountability Office, *Littoral Combat Ship[:] Actions Needed to Improve Operating Cost Estimates and Mitigate Risks in Implementing New Concepts*, GAO-10-257, February 2010, summary page.

<sup>25</sup> Cid Standifer, "Navy Will Project Operation Costs Of Both LCS Models for DAB Review," Inside the Navy, February 8, 2010.



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.<sup>26</sup>

## Combat Survivability

Another potential oversight issue for Congress for the LCS program concerns the combat survivability of the LCS. A December 2009 report from DOD's Director of Operational Test and Evaluation stated:

LCS was designated by the Navy as a Level I survivability combatant ship, but neither design is expected to achieve the degree of shock hardening as required by the CDD [Capabilities Development Document]. Shock hardening (ability to sustain a level of operations following an underwater explosive attack) is required for all mission critical systems, as required by a Level 1 survivability requirement. Only a few selected subsystems will be shock hardened, supporting only mobility to evacuate a threat area following a design-level shock event. Accordingly, the full, traditional rigor of Navy-mandated ship shock trials is not achievable, due to the damage that would be sustained by the ship and its many non-shock-hardened subsystems.

The LCS LFT&E [Live Fire Test and Evaluation] program has been hampered by the Navy's lack of credible modeling and simulation tools for assessing the vulnerabilities of ships constructed to primarily commercial standards (American Bureau of Shipping Naval Vessel Rules and High Speed Naval Craft Code), particularly aluminum and non-traditional hull forms. Legacy LFT&E models were not developed for these non-traditional factors, nor have they been accredited for such use. These knowledge gaps undermine the credibility of the modeling and simulation, and increase the amount of surrogate testing required for an adequate LFT&E program.

The LCS is not expected to be survivable in a hostile combat environment as evidenced by the limited shock hardened design and results of full scale testing of representative hull structures completed in December 2006.<sup>27</sup>

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<sup>26</sup> Government Accountability Office, *Littoral Combat Ship[:] Actions Needed to Improve Operating Cost Estimates and Mitigate Risks in Implementing New Concepts*, GAO-10-257, February 2010, summary page.

<sup>27</sup> Department of Defense, Director, Operation Test and Evaluation, *FY 2009 Annual Report*, December 2009, p. 147.

## **Technical Risk**

Another potential oversight issue for Congress for the LCS program concerns the amount of technical risk in the program. The discussion below addresses this issue first with respect to the LCS seaframe, and then with respect to LCS mission packages.

### **Seaframe**

Regarding technical risk in developing the LCS seaframe, GAO reported the following in March 2010:

#### **Technology Maturity**

Seventeen of 19 critical technologies for both LCS designs are mature. For LCS 2, the trimaran hull and aluminum structure are nearing maturity. The Navy identified watercraft launch and recovery—essential to complete the LCS antisubmarine warfare and mine countermeasures missions—as a major risk to both seaframe designs. Watercraft launch and recovery systems have not been fully demonstrated for either seaframe. On the LCS 1, the Navy is conducting dynamic load testing, but integration with the Remote Multi-Mission Vehicle—a physically stressing system to launch and recover—is not scheduled to occur until after the ship’s shakedown cruise. For LCS 2, factory testing of the twin boom extensible crane revealed performance and reliability concerns that were not fully addressed prior to installation. In addition, program officials report the LCS 2 main propulsion diesel engines have not completed a required endurance test, in part due to corrosion in each engine’s intake valves. As an interim solution, the Navy has installed new intake valves, which enabled the ship to complete acceptance trials. LCS 2 has also experienced pitting and corrosion in its waterjet tunnels. The Navy has temporarily fixed the issue and plans to make weld repairs to pitted areas during a future dry dock availability.

#### **Design and Production Maturity**

The Navy could not provide data on completion of basic and functional drawings—a metric of design stability—at the start of LCS 1 and LCS 2 construction. The Navy used a concurrent design-build strategy for the two seaframes, which proved unsuccessful. Implementation of new design guidelines, delays in major equipment deliveries, and strong focus on achieving schedule and performance goals resulted in increased construction costs. LCS 1 and LCS 2 still require design changes as a result of maturing key systems. At the same time, shipbuilders are constructing modules for the next two ships, LCS 3 and LCS 4. At fabrication start for each ship, approximately 69 percent (LCS 3) and 57 percent (LCS 4) of basic and functional drawings were complete. Starting construction before drawings are complete could result in costly out-of- sequence work and rework to incorporate new design attributes. Incomplete designs at construction also led to weight increases for LCS 1 and LCS 2. According to the Navy, this weight growth contributed to a higher than desired center of gravity on LCS 1 that degraded the stability of that seaframe. Acceptance trials showed LCS 1 may not meet Navy stability requirements in a damaged condition. In response, the Navy added internal and external buoyancy tanks. For LCS 3, the contractor has incorporated a design change to extend the transom by four meters to improve stability.

#### **Other Program Issues**

In an effort to improve affordability in the LCS program, the Navy modified its acquisition strategy for future seaframes. The new strategy calls for selecting one seaframe design and awarding one prime contractor and shipyard a fixed-price incentive contract for construction

of up to 10 ships between fiscal year 2010 and fiscal year 2014. Navy officials report that the earned value management systems (EVMS) in each of the LCS shipyards do not yet meet Defense Contract Management Agency requirements. Under the terms of the LCS 3 and LCS 4 contracts, the shipyards must achieve EVMS certification within 28 months from the date of the award. Until those requirements are met, cost and schedule data reported by the prime contractors cannot be considered fully reliable.

### **Program Office Comments**

According to the Navy, the LCS program continues to deliver vital capability with the recent commissioning of LCS 2. The Navy stated that LCS 1 now meets the damage stability requirement with the addition of external tanks on the rear of the ship. The shipbuilder incorporated additional stability improvements to the design for LCS 3. In the continuing effort to ensure the delivery of affordable LCS capability, the Navy said it revised the acquisition strategy in 2009 to down select to a single design in fiscal year 2010 and procure up to 10 ships in a block buy. The winner of this competition will also be responsible for developing a technical data package to support competition for a second shipbuilder to build up to 5 ships in fiscal year 2012-2014. Construction continues on LCS 3 and LCS 4. To address corrosion of the waterjet tunnels, the Navy stated that electrical isolation of propulsion shafts from the waterjets is being incorporated and a plan is in place to renew the corroded metal in the waterjet intake tunnels.<sup>28</sup>

## **Mission Packages**

Regarding technical risk in developing the modular mission packages for the LCS, an April 26, 2010, news report stated:

The Littoral Combat Ship program lacks a ‘timely’ test program plan for the mission packages slated to deploy aboard the vessels, putting the effort at a ‘medium’ risk for cost increases ... according to a new study by the Pentagon’s acquisition directorate....

‘The program has major integration challenges between seaframes and MPs’ [mission packages], the study states. ‘To address this issue, the program established an Integrated Product Team ... the team has identified numerous deficiencies and verified corrections within each seaframe.’<sup>29</sup>

An August 2010 GAO report stated:

Challenges developing mission packages have delayed the timely fielding of promised capabilities, limiting the ships’ utility to the fleet during initial deployments. Until these challenges are resolved, it will be difficult for the Navy to align seaframe purchases with mission package procurements and execute planned tests. Key mine countermeasures and surface warfare systems encountered problems in operational and other testing that delayed their fielding. For example, four of six Non-Line-of-Sight Launch System missiles did not hit their intended targets in recent testing, and the Department of Defense has since canceled the program. Further, Navy analysis of anti-submarine warfare systems has shown the planned systems do not contribute significantly to the anti-submarine warfare mission. These

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<sup>28</sup> Government Accountability Office, *Defense Acquisitions[:] Assessments of Selected Weapon Programs*, GAO-10-388SP, March 2010, p. 96.

<sup>29</sup> Zachary M. Peterson, “DOD Report: LCS Program Faces ‘Medium Risk,’ Integration Challenges, *Inside the Navy*, April 26, 2010. Material in brackets as in original.

combined challenges have led to procurement delays for all three mission packages. Mission package delays have also disrupted program test schedules—a situation exacerbated by early deployments of initial ships—limiting their availability for operational testing. In addition, these delays could disrupt program plans for simultaneously acquiring seaframes and mission packages. Until mission packages are proven, the Navy risks investing in a fleet of ships that does not deliver promised capability.<sup>30</sup>

On September 3, 2010, the Navy provided the press with a point paper responding to certain points made in the August 2010 GAO report.<sup>31</sup> The point paper stated in part:

The original LCS Anti-Submarine Warfare (ASW) mission package was cancelled by Navy two years ago (POM-10)<sup>32</sup> when analysis indicated that it did not provide a significant contribution to counter the ASW threat. [The] Navy immediately began exploring a new ASW approach for LCS. The next generation LCS ASW mission package is currently under development.

Central to the next ASW mission package will be a ship-deployed variable depth sonar (VDS) to complement the VDS carried by the [Navy's ship-based] MH-60R helicopter. [The] Navy is purchasing an advanced design model of a variable depth sonar system for testing and evaluation in 2012, to develop this future ASW package.<sup>33</sup>

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<sup>30</sup> Government Accountability Office, *Defense Acquisitions[:] Navy's Ability to Overcome Challenges Facing the Littoral Combat Ship Will Determine Eventual Capabilities*, GAO-10-523, August 2010, summary page.

<sup>31</sup> See Cid Standifer, "Navy Pushes Back Against GAO Criticism Of Littoral Combat Ship," *Inside the Navy*, September 6, 2010.

<sup>32</sup> This is a reference to the Program Objective Memorandum (POM) for the FY2010 budget submission. The POM is an internal DOD planning document that guides the preparation of a DOD budget submission. POM-10 was developed during 2008, to support the submission to Congress in May 2009 of the proposed FY2010 defense budget.

<sup>33</sup> Undated Navy point paper provided to CRS by Navy Office of Legislative Affairs on September 8, 2010. In response to a part of the GAO report that discussed the initial deployment of LCS-1, the point paper stated:

Following the successful completion of Acceptance Trials, the Chief of Naval Operations directed the OPNAV staff, United States Fleet Forces Command, and Naval Sea Systems Command to evaluate the feasibility of deploying USS Freedom (LCS 1) earlier than originally scheduled. The intent was to employ the unique capabilities of this new class of warship as soon as practical in the Fleet, to gain real operational experience and to assess LCS' minimal manning strategy. Early deployment retained but modified LCS 1's testing plan.

During her maiden deployment, two years earlier than originally planned, USS Freedom was outfitted with a tailored Surface Warfare Mission Package. She deployed with a Helicopter Sea Combat Squadron 22 detachment and a U.S. Coast Guard Law Enforcement Detachment. Freedom successfully conducted four drug seizures, netting more than five tons of cocaine, detained nine suspected drug smugglers, and disabled two "go-fast" drug vessels.

During deployment, USS Freedom also performed integrated at-sea operations with the USS Carl Vinson (CVN 70) Carrier Strike Group, performed at-sea maneuvers with the former-USS McInerney (FFG 7), and conducted several theater security cooperation port visits in Latin America.

Operations continued over the summer, when USS Freedom participated in the Rim of the Pacific exercise, returning to homeport on Aug. 10, 2010.

Impact on Testing:

There are no changes to the overall scope of LCS 1 testing as a result of early deployment. Given the deployment lasted six months, completion of the LCS 1 test program was extended by approximately six months. Any delays to the overall post delivery testing plan were offset by the extensive depth and breadth of knowledge gained during deployment. To accommodate early deployment, LCS developmental testing was re-sequenced. Some testing was accelerated to before deployment, some testing was accomplished on deployment, and some testing was deferred until

(continued...)

A March 2010 GAO report stated:

### **Technology Maturity**

Operation of the MCM, SUW, and ASW packages on the LCS requires a total of 22 critical technologies, including 11 sensors, 6 vehicles, and 5 weapons. Of these technologies, 16 are mature and have been demonstrated in a realistic environment. In the past year, the Navy removed three critical technologies from LCS mission modules due to changes in future ASW packages.

The Navy has accepted delivery of two partially capable MCM mission packages; however, the program has delayed the procurement of the fiscal year 2009-funded package due to technical issues and the resulting operational test delays. Four MCM systems—the Unmanned Surface Vehicle (USV), Unmanned Sweep System (USS), Organic Airborne and Surface Influence Sweep (OASIS), and Rapid Airborne Mine Clearance System (RAMICS)—have not yet been demonstrated in a realistic environment, and two others—the Airborne Laser Mine Detection System (ALMDS) and Remote Minehunting System (RMS)—cannot meet system requirements. ALMDS has been unable to meet its mine detection requirements at its maximum depth or its mine detection and classification requirements at surface depths. RMS demonstrated poor system reliability, availability, and maintainability in a September 2008 operational assessment, and program officials report the system is currently undergoing a series of tests to try to improve its reliability. Program officials also reported that the cable used to tow certain airborne MCM systems had to be redesigned following test failures with two systems.

The Navy accepted delivery of one partially capable SUW mission package in July 2008. This package included two engineering development models for the 30 mm gun, but did not include the Non-Line-of-Sight Launch System (NLOS-LS) launcher or missiles. Integration of the gun with LCS 1 was completed in January 2009. The gun module design appears stable with 100 percent of its drawings released to manufacturing. According to program officials, NLOS-LS was tested in August 2009, but was unable to fire due to a malfunctioning sensor and battery connector. The program expects delivery of the second SUW mission package in March 2010. It will include the 30 mm gun module and the NLOS-LS launcher, but no missiles.

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(...continued)

after deployment.

In evaluating options for deploying Freedom earlier than originally scheduled, the Navy looked at several key factors: ship materiel condition, test plan acceleration, ship sustainment, integrated support plan, and crew training and certification.

The decision to deploy Freedom early was based on a thorough review of the required changes to the test plan, overseas sustainment plan, and crew certification requirements.

Early deployment brought LCS operational issues to the forefront much sooner than under the original schedule, some of which would not have been learned until two years on.

Through this process, Navy “learned by doing.” Every aspect of this ship and program is new, from the operational concepts, through crew training and certification processes, to the support and sustainment strategies. Early deployment provided a vital opportunity to collect data in real-world operational scenarios. This data will be invaluable in the ongoing effort to accomplish the larger LCS fleet integration strategy....

LCS is a key component of the 21<sup>st</sup> century Navy. Early deployment of LCS 1 was a tremendous opportunity to test the ship in a real-world environment and begin integrating this essential ship into our fleet.



The Navy accepted delivery of one partially capable ASW mission package in September 2008, but plans to reconfigure the content of future packages before procuring additional quantities. According to Navy officials, recent warfighting analyses showed that the baseline ASW package did not provide sufficient capability to meet the range of threats. The current package will undergo developmental testing and the results will inform future configuration decisions. The first package underwent end-to-end testing in April 2009 and will undergo developmental testing in fiscal year 2010. During the 2009 end-to-end test, the Navy found that the USV and its associated sensors will require reliability and interface improvements to support sustained undersea warfare.

### **Other Program Issues**

Recent changes to the LCS seaframe acquisition strategy may necessitate changes to the LCS mission module acquisition strategy and testing plans. For example, the new seaframe strategy calls for the program to select a single design in fiscal year 2010. According to program officials, the first mission modules will still be tested on both seaframe designs, but future mission modules could be tested on one or both seaframe designs.

### **Program Office Comments**

The Navy stated that early packages will be delivered with partial capability, with systems added to the packages as they reach the level of maturity necessary for fielding. According to the Navy, the USV, USS, OASIS, and RAMICS have not entered production or been demonstrated in an operational environment. However, ALMDS and RMS have to date achieved a majority of their key performance requirements. The Navy stated these systems will be available in time to support planned retirement of legacy MCM forces. According to the Navy, it has initiated a program to address RMS reliability. The Navy noted that the program recently declared a critical Nunn-McCurdy cost breach and is under review by the Under Secretary of Defense (Acquisition, Technology & Logistics). Further, the Navy stated it has resolved technical issues related to the helicopter tow cable and the associated systems are ready to resume testing, while mission package acquisition and testing strategies have been updated to reflect seaframe acquisition strategy changes.<sup>34</sup>

## **Impact of Cancellation of NLOS-LS Missile System**

Another potential oversight issue for Congress for the LCS program concerns the impact on LCS capabilities of the cancellation of an Army missile program known as the Non-Line of Sight Launch System (NLOS-LS), which the Navy had planned to use as part of the LCS surface warfare (SUW) mission package. In May 2010, DOD approved an Army recommendation to cancel NLOS-LS.<sup>35</sup> Prior to the cancellation of NLOS-LS, the Navy planned for LCSs equipped with SUW mission packages to be nominally armed with three NLOS missile launchers, each with 15 missiles, for a total of 45 missiles per ship. The missiles could be used to counter swarm boats or other surface threats.

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<sup>34</sup> Government Accountability Office, *Defense Acquisitions[:] Assessments of Selected Weapon Programs*, GAO-10-388SP, March 2010, p. 98.

<sup>35</sup> “Out of Sight,” *Defense Daily*, May 17, 2010: 3. See also Kate Brannen, “U.S. Army Asks to Cancel NLOS-LS,” *DefenseNews.com*, April 23, 2010; Jason Sherman, “Army Cancels NLOS-NS, Frees Up Billions For Other Procurement Needs,” *Inside the Navy*, April 26, 2010; Sebastian Sprenger, “NLOS-LS Seen As Effective—But To Pricey—In Key Army Analysis,” *Inside the Navy*, May 3, 2010.

At a May 6, 2010, hearing on Navy shipbuilding programs before the Seapower Subcommittee of the Senate Armed Services Committee, Senator Jack Reed questioned Sean Stackley, the Navy’s acquisition executive (i.e., the Assistant Secretary of the Navy [Research, Development and Acquisition]), and Lieutenant General George Flynn, Deputy Commandant, Combat Development and Integration, and Commanding General, Marine Corps Combat Development Command, regarding the impact the cancellation of the NLOS-LS program. For the text of this exchange, see **Appendix F**. The Navy reportedly is assessing potential alternative systems for fulfilling the NLOS role in the SUW mission package.<sup>36</sup>

## Legislative Activity for FY2011

### Summary of Congressional Action on FY2011 Funding Request

**Table 1** summarizes congressional action on the Navy’s FY2011 funding request for the LCS program.

**Table 1. Congressional Action on FY2011 LCS Funding Request**  
Millions of dollars, rounded to nearest tenth; figures may not add due to rounding

	Request	Authorization			Appropriation		
		HASC	SASC	Conf.	HAC	SAC	Conf.
<i>Shipbuilding and Conversion, Navy (SCN) account, lines 12 and 13</i>							
LCS sea frames	1,231.0	1,231.0	1,231.0		615.5		
(quantity)	(2)	(2)	(2)		(1)		
LCS sea frames (AP)	278.4	278.4	278.4		278.4		
<i>Weapon Procurement, Navy (WPN account), line 30</i>							
LCS module weapons	9.8	0.9	9.8		0		
<i>Other Procurement, Navy (OPN) account, line 29</i>							
LCS modules	83.0	83.0	83.0		50.0		
<i>Research, Development, Test &amp; Evaluation, Navy (RDT&amp;EN) account, line 48</i>							
LCS	226.3	305.5	226.3		199.4		

**Sources:** Navy’s FY2011 budget submission, committee and conference reports, and the text of S. 3454, the FY2011 defense authorization bill, as reported in the Senate.

**Notes:** **HASC** is House Armed Services Committee; **SASC** is Senate Armed Services Committee; **HAC** is House Appropriations Committee; **SAC** is Senate Appropriations Committee; **Conf.** is conference report; **AP** is advance procurement for ships to be procured in future years.

<sup>36</sup> Zachary M. Peterson, “Navy ‘Assessing Options’ In Lieu Of Army’s Cancellation Of NLOS Missile,” *Inside the Navy*, May 3, 2010; Cid Standifer, “Industry Team Leveraging Canceled Programs To Work On Five-Inch Round,” *Inside the Navy*, May 31, 2010; Cid Standifer, “Navy Looks To Replace NLOS In LCS Surface Warfare Mission Module,” *Inside the Navy*, June 21, 2010.



## **FY2011 Defense Authorization Bill (H.R. 5136/S. 3454)**

### **House**

The House Armed Services Committee, in its report (H.Rept. 111-491 of May 21, 2010) on the FY2011 defense authorization bill (H.R. 5136), recommends approval of the Navy's FY2011 procurement and advance procurement funding requests for LCS sea frames (page 73) and LCS modules (page 81, line 029). The report recommends reducing by \$8.9 million the Navy's FY2011 procurement funding request for LCS module weapons due to termination of the NLOS-LS program (page 68, line 030). The report recommends increasing the Navy's FY2011 request for LCS research and development funding by \$75.0 million for Navy NLOS-NS development, and by \$4.25 million for axial-flow high-power-density waterjets (page 148).

The report states:

#### Littoral Combat Ship

The Littoral Combat Ship program has failed its initial intent to build inexpensive ships with modular capability and field them to the fleet at a high rate. None of those goals have been met. The ships are expensive; the modular capability has not been tested or verified; and in some cases is still undergoing development; and only two of the ships have been delivered to the Navy.

Last year, the committee supported the request of the Secretary of the Navy and the Chief of Naval Operations to revamp the acquisition strategy for these vessels and to down-select to one variant of the ship with the award of the fiscal year 2010 two-ship authorization. The new acquisition strategy is aimed at reducing overall costs by procuring 10 ships in the Future Years Defense Plan using a fixed price incentive contract in fiscal year 2010 with priced options for 8 additional ships, 2 per year, in fiscal years 2011–15. In addition, the government would gain all rights to the technical data package required to compete the winning design to a second source shipyard which would build 5 additional ships, for a total of 15 ships, between fiscal years 2012 and 2015. The committee supported this plan as the best alternative to provide needed capability to the fleet in the shortest time possible, at the least cost. The plan was also proposed to the committee as the best way to divorce the prime contractors from the program and to transition the ship's installed combat systems to government furnished equipment that complimented equipment currently in use in the fleet.

As of this report, the Navy has received the proposals from the two authorized competitors and is in the process of source selection leading to contract award. The committee is cautiously optimistic that, with a down-select to one variant and stability in the construction schedule, this troubled program can begin to fulfill its original purpose of providing capable ships, in quantity, at an affordable cost. (Pages 76-77)

The report also states:

#### Littoral Combat Ship Module weapons

The budget request contained \$9.8 million for Littoral Combat Ship (LCS) Module Weapons, of which \$8.9 million was requested for procurement of 45 non-line-of-sight launch system (NLOS-LS) missiles.

The committee notes that the Army has terminated the NLOS-LS program, and even if it is continued by the Navy, an additional year of development work will be required. As a result,

the committee does not agree with Navy procurement funding for NLOS-LS in fiscal year 2011. In title II of this report, the committee recommends an increase in Navy research and development funding to support continued development work for the NLOS-LS program if the Navy determines that is in the best interest of the LCS program.

The committee recommends \$0.9 million, a decrease of \$8.9 million, for LCS Module weapons. (Page 69)

The report also states:

Navy non-line-of-sight launch system development

The budget request contained \$226.3 million in PE 63581N<sup>37</sup> for Littoral Combat Ship mission module research and development but contained no funds for the non-line-of-sight launch system (NLOS-LS).

The committee notes that the Army's termination of the NLOS-LS could leave the Navy's Littoral Combat Ship (LCS) without sufficient capability to defeat small boat threats and unable to provide precision fire support to Marine Corps forces. The committee is informed that the NLOS-LS will likely require only one more year of research and development work to achieve threshold requirements. Therefore, in order to take advantage of the \$1.5 billion in development funds spent to date, the committee encourages the Navy to complete development of the NLOS-LS system for use on the LCS. The committee also directs the Assistant Secretary of the Navy for Research, Development, and Acquisition to provide a report to the congressional defense committees by December 15, 2010, on the feasibility and utility of the Navy completing development of the NLOS-LS. The report should include an analysis of possible unit cost reduction options.

The committee recommends \$301.3 million, an increase of \$75.0 million, in PE 63581N for research and development of the NLOS-LS for use on the LCS. (Pages 159-160)

## Senate

The FY2011 defense authorization bill (S. 3454), as reported by the Senate Armed Services Committee (S.Rept. 111-201 of June 4, 2010), recommends approval of the Navy's requests for FY2011 procurement and advance procurement funding for LCS sea frames (see page 677, lines 12 and 13, of the printed bill), LCS module weapons (page 675, line 30), LCS modules (page 680, line 29), and LCS research and development (page 732, line 48). The committee's report states:

The Littoral Combat Ship (LCS) program has made progress during the past year and the recent decision to move to a single design should improve affordability. The LCS fleet is expected to comprise 55 vessels of the Navy's 313-ship fleet force structure. Even modest cost growth in this large component of the fleet magnifies the problem of achieving that objective. The committee notes that the Navy's acquisition strategy for the LCS program introduces competition for this class of ships and is therefore cautiously optimistic that this program is making progress. (Page 41)

The committee's report also states:

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<sup>37</sup> Line items in DOD research and development accounts are called program elements (PEs).

### **Littoral combat ship report**

The committee has concluded that the projected ship decommissioning and construction schedule presented in the Navy's program described in its "Report to Congress on Annual Long-Range Plan for Construction of Naval Vessels for FY 2011" could have a negative effect on some of the Nation's Navy bases. This would arise because of a gap that will occur as a result of small surface combatants being retired years before Littoral Combat Ship replacements will arrive.

The Navy's 2010 document "Report on Strategic Plan for Homeporting the Littoral Combat Ship" provided the committee with the Navy's notional strategic plan for stationing the Littoral Combat Ship through fiscal year 2020. In order to fully understand the effects of the Navy's current decommissioning and shipbuilding timeline, the committee directs the Secretary of the Navy to submit a report to the congressional defense committees that would provide the timeline and detailed homeport locations for the Littoral Combat Ships that will be delivered through 2020. The committee directs the Secretary of the Navy to submit the reports at the time the President submits his fiscal year 2012 budget proposal to Congress.

As the Navy finalizes its plans, the committee encourages the Navy to expedite delivery of the Littoral Combat Ship to those Navy bases that need replacement ships to mitigate capability gaps that will result from the retirement of smaller surface combatants. (Page 116)

## **FY2011 DOD Appropriations Bill (S. 3800)**

### **Senate**

The Senate Appropriations Committee, in its report (S.Rept. 111-295 of September 16, 2010) on S. 3800, recommends \$615.5 million in procurement funding for the procurement in FY2011 of one LCS sea frame—a reduction of \$615.5 million and one LCS sea frame from the Navy's request (page 86, line 12). The committee's report states:

*Littoral Combat Ship [LCS].*—The fiscal year 2011 budget request included \$1,230,984,000 for the construction of two LCS ships and \$278,351,000 in advance procurement funding for future ships. The Committee supports the revised acquisition strategy for the LCS program and the decision to down-select to one variant in fiscal year 2010. The Committee, however, is concerned with the very aggressive construction schedule proposed in the budget request. Based on the historical poor cost and schedule performance of the program, including the current delay in the down-select decision, the Committee is concerned that the proposed ramp up to construct four ships in fiscal year 2011 is too aggressive and may be unexecutable. Therefore, the Committee recommends re-phasing the LCS construction schedule by reducing the budget request by \$615,492,000 and one ship in fiscal year 2011. The Committee directs the Navy to add one LCS back into the program during the Future Years Defense Plan. (Page 87)

The committee's report also states:

The Secretary of Defense should be applauded for trying to gain greater control over runaway costs, schedule delays, and requirements creep. However, the Committee remains frustrated by the lack of proper control in the Defense budget process as exemplified by the examples listed below. The Navy should be commended for reshaping its Littoral Combat Ship program to down select to one contractor with the goal of reducing costs. However, the ensuing delay in this program has led to a schedule in which the winning contractor will not be able to begin constructing the second of two LCS ships requested in fiscal year 2011.

Nonetheless, neither the Navy nor the Defense Department has suggested reducing the budget request even though more than \$600,000,000 will not be required this fiscal year. (Page 7)

The committee's report recommends approving the Navy's request for \$278.4 million in advance procurement funding for LCSs to be procured in future years (page 86, line 13).

The committee's report recommends denying the Navy's request for \$9.8 million in procurement funding for the procurement of LCS weapon modules due to the termination of the NLOS-LS program (page 82, line 30).

The committee's report recommends reducing by \$32.9 million the Navy's request for procurement funding for the procurement of LCS modules due to unjustified growth in production engineering (\$6 million reduction), mission package computer environment units requested ahead of need (\$2.3 million reduction), unjustified growth in consulting services (\$2 million reduction), and AN/AQS-20A minehunting sonar equipment requested ahead of need (\$22.7 million reduction) (page 95, line 29).

The committee's report recommends reducing the Navy's request for research and development funding for the LCS program by a net total of \$26.9 million, including a reduction of \$15.4 million due to the termination of the NLOS-LS program, a reduction of \$15.0 million due to savings from "accelerated DT" (which might be a reference to accelerated developmental testing), and an increase of \$3.5 million for LCS axial flow high power density waterjets (page 150, line 48).

## **Appendix A. Summary of Congressional Action in FY2005-FY2010**

This appendix presents a summary of congressional action on the LCS program in FY2005-FY2010.

### **FY2005**

In FY2005, Congress approved the Navy's plan to fund the construction of the first two LCS sea frames using research and development funds rather than shipbuilding funds, funded the first construction cost of the first LCS (LCS-1), required the second LCS (LCS-2) to be built (when funded in FY2006) to a different design from the first, prohibited the Navy from requesting funds in FY2006 to build a third LCS, and required all LCSs built after the lead ships of each design to be funded in the SCN account rather than the Navy's research and development account.

### **FY2006**

In FY2006, Congress funded the procurement of LCSs 2, 3, and 4. (The Navy requested one LCS for FY2006, consistent with Congress's FY2005 action. Congress funded that ship and provided funding for two additional ships.) Congress in FY2006 also established a unit procurement cost limit on the fifth and sixth LCS sea frames of \$220 million per ship, plus adjustments for inflation and other factors (Section 124 of the FY2006 defense authorization bill [H.R. 1815/P.L. 109-163] of January 6, 2006), required an annual report on LCS mission packages and made procurement of more than four LCSs contingent on the Navy certifying that there exists a stable design for the LCS.

### **FY2007**

In FY2007, Congress funded the procurement of LCSs 5 and 6. (The Navy canceled these two ships in 2007 before they were placed under contract for construction.)

### **FY2008**

In FY2008, Congress accepted the Navy's cancellation of LCSs 3 through 6; funded the procurement one additional LCS in FY2008 (which the Navy called LCS-5);<sup>38</sup> significantly reduced the Navy's FY2008 funding request for the LCS program; amended the LCS sea frame unit procurement cost cap to \$460 million per ship for LCSs procured in FY2008 and subsequent years (Section 125 of the conference report [H.Rept. 110-477 of December 6, 2007] on H.R. 1585, the FY2008 defense authorization bill, which was enacted as H.R. 4986/P.L. 110-181 of

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<sup>38</sup> The Navy apparently called this ship LCS-5 because the original LCS-5 and LCS-6 were canceled by the Navy before they were replaced under contract, leaving LCS-4 as last LCS under contract to have been canceled. In spite of its designation, LCS-5 would have been the third LCS in the restructured LCS program, and was the seventh to have been funded by Congress.

January 28, 2008); and required the Navy to use fixed-price-type contracts for the construction of LCSs procured in FY2008 and subsequent years.

The Navy in 2007 requested that Congress amend the existing unit procurement cost cap for the fifth and sixth ships to \$460 million, plus adjustments for inflation and other factors. Congress amended the cost cap to \$460 million, but applied it not only to the fifth and sixth LCSs, but to all LCSs procured in FY2008 and subsequent years. The use of fixed-price contracts for future LCSs was something that the Navy had stated an intention to do as part of its plan for restructuring the LCS program.

## **FY2009**

In FY2009, Congress delayed the implementation of the LCS sea frame unit procurement cost cap by two years, to ships procured in FY2010 and subsequent years (Section 122 of the FY2009 defense authorization act [S. 3001/P.L. 110-417 of October 14, 2008]); rescinded \$337 million in FY2008 shipbuilding funds for the LCS program, effectively canceling the funding for the LCS procured in FY2008 (Section 8042 of the FY2009 defense appropriations act [Division C of H.R. 2638/P.L. 110-329 of September 30, 2008]); and funded the procurement of two LCSs at a cost of \$1,020 million.

## **FY2010**

In FY2010 Congress funded the procurement of two LCSs at a cost of \$1,080 million and rescinded \$66 million in FY2009 Other Procurement, Navy (OPN) funding for LCS mission modules. Section 121 of the FY2010 defense authorization act (H.R. 2647/P.L. 111-84 of October 28, 2009) granted the Navy contracting and other authority to implement the LCS acquisition strategy that the Navy announced on September 16, 2009, and amended the LCS unit procurement cost cap. Section 122 of the act requires the LCS program to be treated as a major defense acquisition program (MDAP) for purposes of program management and oversight. Section 123 of the act requires a report on the Navy's plan for homeporting LCSs.



## **Appendix B. Cost Growth on LCS Sea Frames**

This appendix presents details on cost growth on LCS sea frames from the FY2006 budget cycle through the FY2009 budget cycle.

### **2006**

The proposed FY2007 Navy budget, submitted in February 2006, showed that:

- the estimate for the first LCS had increased from \$215.5 million in the FY2005 budget and \$212.5 million in the FY2006 budget to \$274.5 million in the FY2007 budget—an increase of about 27% from the FY2005 figure and about 29% from the FY2006 figure;
- the estimate for the second LCS increased from \$213.7 million in the FY2005 budget and \$256.5 million in the FY2006 budget to \$278.1 million—an increase of about 30% from the FY2005 figure and about 8% from the FY2006 figure; and
- the estimate for follow-on ships scheduled for FY2009-FY2011, when the LCS program was to have reached a planned maximum annual procurement rate of six ships per year, had increased from \$223.3 million in the FY2006 budget to \$298 million—an increase of about 33%.

The Navy stated in early 2006 that the cost increase from the FY2006 budget to the FY2007 budget was due mostly to the fact that LCS procurement costs in the FY2006 budget did not include items that are traditionally included in the so-called end cost—the total budgeted procurement cost—of a Navy shipbuilding program, such as Navy program-management costs, an allowance for changes, and escalation (inflation). The absence of these costs from the FY2006 LCS budget submission raised certain potential oversight issues for Congress.<sup>39</sup>

### **2007**

On January 11, 2007, the Navy reported that LCS-1 was experiencing “considerable cost overruns.” The Navy subsequently stated that the estimated shipyard construction cost of LCS-1 had grown to \$350 million to \$375 million. This suggested that the end cost of LCS-1—which

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<sup>39</sup> These oversight issues included the following:

—Why were these costs excluded? Was this a budget-preparation oversight? If so, how could such an oversight occur, given the many people involved in Navy budget preparation and review, and why did it occur on the LCS program but not other programs? Was anyone held accountable for this oversight, and if so, how? If this was not an oversight, then what was the reason?

—Did the Navy believe there was no substantial risk of penalty for submitting to Congress a budget presentation for a shipbuilding program that, for whatever reason, significantly underestimated procurement costs?

—Do LCS procurement costs in the budget now include all costs that, under traditional budgeting practices, should be included? If not, what other costs are still unacknowledged?

—Have personnel or other resources from other Navy programs been used for the LCS program in any way? If so, have the costs of these personnel or other resources been fully charged to the LCS program and fully reflected in LCS program costs shown in the budget?

also includes costs for things such as Navy program-management costs and an allowance for changes—could be in excess of \$400 million. The Navy did not publicly provide a precise cost overrun figure for LCS 2, but it stated that the cost overrun on LCSs 1 and 2 was somewhere between 50% and 75%, depending on the baseline that is used to measure the overrun.

The Government Accountability Office (GAO) testified in July 2007 that according to its own analysis of Navy data, the combined cost of LCSs 1 and 2 had increased from \$472 million to \$1,075 million—an increase of 128%.<sup>40</sup> CBO testified in July 2007 that:

Several months ago, press reports indicated that the cost could well exceed \$400 million each for the first two LCS sea frames. Recently, the Navy requested that the cost cap for the fifth and sixth sea frames be raised to \$460 million, which suggests that the Navy's estimate of the acquisition cost for the first two LCSs would be around \$600 million apiece....

As of this writing, the Navy has not publicly released an estimate for the LCS program that incorporates the most recent cost growth, other than its request to raise the cost caps for the fifth and sixth ships. CBO estimates that with that growth included, the first two LCSs would cost about \$630 million each, excluding mission modules but including outfitting, postdelivery, and various nonrecurring costs associated with the first ships of the class. As the program advances, with a settled design and higher annual rates of production, the average cost per ship is likely to decline. Excluding mission modules, the 55 LCSs in the Navy's plan would cost an average of \$450 million each, CBO estimates.<sup>41</sup>

## **2008**

The proposed FY2009 budget, submitted in February 2008, showed that the estimated end costs of LCS-1 and LCS-2 had increased to \$531 million and \$507 million, respectively (or to \$631 million and \$636 million, respectively, when OF/DP and FST MSSIT costs are included, or to \$606 million and \$582 million, respectively, when OF/DP costs are included, but FST MSSIT costs are not included).

## **2009**

The proposed FY2010 budget, submitted in May 2009, showed that the estimated end costs of LCS-1 and LCS-2 had increased to \$537 million and \$575 million, respectively (or to \$637 million and \$704 million, respectively, when OF/DP and FST MSSIT costs are included, or to \$612 million and \$650 million, respectively, when OF/DP costs are included, but FST MSSIT costs are not included). CBO reported on June 9, 2008, that:

Historical experience indicates that cost growth in the LCS program is likely. In particular, using the lead ship of the FFG-7 Oliver Hazard Perry class frigate as an analogy, historical cost-to-weight relationships indicate that the Navy's original cost target for the LCS of \$260

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<sup>40</sup> Defense Acquisitions[:] Realistic Business Cases Needed to Execute Navy Shipbuilding Programs, Statement of Paul L. Francis, Director, Acquisition and Sourcing Management Team, Testimony Before the Subcommittee on Seapower and Expeditionary Forces, Committee on Armed Services, House of Representatives, July 24, 2007 (GAO-07-943T), pp. 4 and 22.

<sup>41</sup> Statement of J. Michael Gilmore, Assistant Director for National Security, and Eric J. Labs, Senior Analyst, [on] The Navy's 2008 Shipbuilding Plan and Key Ship Programs, before the Subcommittee on Seapower and Expeditionary Forces Committee on Armed Services U.S. House of Representatives, July 24, 2007, p. 18.

million in 2009 dollars (or \$220 million in 2005 dollars) was optimistic. The first FFG-7 cost about \$670 million in 2009 dollars to build, or about \$250 million per thousand tons, including combat systems. Applying that metric to the LCS program suggests that the lead ships would cost about \$600 million apiece, including the cost of one mission module. Thus, in this case, the use of a historical cost-to-weight relationship produces an estimate that is less than the actual costs of the first LCSs to date but substantially more than the Navy's original estimate.

Based on actual costs the Navy has incurred for the LCS program, CBO estimates that the first two LCSs could cost about \$700 million each, including outfitting and postdelivery and various nonrecurring costs associated with first ships of a class but excluding mission modules. However, as of May 1, 2008, LCS-1 was 83 percent complete and LCS-2 was 68 percent complete. Thus, additional cost growth is possible, and CBO's estimate reflects that cost risk.

Overall, CBO estimates that the LCSs in the Navy's plan would cost about \$550 million each, on average, excluding mission modules. That estimate assumes that the Navy would select one of the two existing designs and make no changes. As the program advanced with a settled design and higher annual rates of production, average ship costs would probably decline. If the Navy decided to make changes to that design, however, the costs of building future ships could be higher than CBO now estimates.<sup>42</sup>

## Reasons for Cost Growth

Various reasons have been cited for cost growth in the LCS program, including the following:

- **Unrealistically low original estimate.** Some observers believe that the original cost estimate of \$220 million for the LCS sea frame was unrealistically low. If so, a potential follow-on question would be whether the LCS represents a case of “low-balling”—using an unrealistically low cost estimate in the early stages of a proposed weapon program to help the program win approval and become an established procurement effort.
- **Impact of Naval Vessel Rules (NVR).** Navy and industry officials have attributed some of the cost growth to the impact of applying new Naval Vessel Rules (NVR)—essentially, new rules specifying the construction standards for the ship—to the LCS program. The NVR issued for the LCS program incorporated, among other things, an increase in the survivability standard (the ability to withstand damage) to which LCSs were to be built.<sup>43</sup> Building the ship to a higher survivability standard represented a change in requirements for the ship that led to many design changes, including changes that made ship more rugged and more complex in terms of its damage-control systems. In addition, Navy and industry officials have testified, the timing of the issuing of NVR

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<sup>42</sup> Congressional Budget Office, *Resource Implications of the Navy's Fiscal Year 2009 Shipbuilding Plan*, June 8, 2008, pp. 26-27.

<sup>43</sup> The LCS was earlier conceived as a ship that would be built to a survivability standard that would be sufficient, in the event of significant battle damage, to save the ship's crew, but not necessarily the ship. The survivability standard for the LCS was increased as part of the issuing of NVR to one that would be sufficient to save not only the ship's crew, but the ship as well. (Other U.S. Navy combat ships are built to a still-higher survivability standard that is sufficient not only to save the crew and the ship, but to permit the ship to keep fighting even though it has sustained damage.)

created a situation of concurrency between design and construction in the LCS program, meaning that the ship was being designed at the same time that the shipyard was attempting to build it—a situation long known to be a potential cause of cost growth. This concurrency, Navy officials testified, was a consequence of the compressed construction schedule for the LCS program, which in turn reflected an urgency about getting LCSs into the fleet to meet critical mission demands.

- **Improperly manufactured reduction gear.** Navy and industry officials testified that cost growth on LCS-1 was partly due to a main reduction gear<sup>44</sup> that was incorrectly manufactured and had to be replaced, forcing a reordering of the construction sequence for the various major sections of the ship.
- **Increased costs for materials.** Some observers have attributed part of the cost growth in the program to higher-than-estimated costs for steel and other materials that are used in building the ships.
- **Emphasis on meeting schedule combined with cost-plus contract.** Some portion of cost growth on LCS-1 has been attributed to a combination of a Navy emphasis on meeting the ship's aggressive construction schedule and the Navy's use of a cost-plus contract to build the ship.<sup>45</sup>
- **Shipyard Performance.** Shipyard performance and supervision of the LCS shipyards by the LCS team leaders and the Navy has been cited as another cause of cost growth.<sup>46</sup>

## July 2007 GAO Testimony

GAO testified in July 2007 that:

We have frequently reported on the wisdom of using a solid, executable business case before committing resources to a new product development effort....

<sup>44</sup> A ship's reduction gear is a large, heavy gear that reduces the high-speed revolutions of the ship's turbine engines to the lower-speed revolutions of its propellers.

<sup>45</sup> The Senate Armed Services Committee, as part of its discussion of the LCS program in its report (S.Rept. 110-77 of June 5, 2007) on the FY2008 defense authorization bill (S. 1547), stated:

Reviewing this LCS situation will undoubtedly result in a new set of "lessons learned" that the acquisition community will dutifully try to implement. However, the committee has previously expressed concerns about the LCS concept and the LCS acquisition strategy. The LCS situation may be more a case of "lessons lost." Long ago, we knew that we should not rush to sign a construction contract before we have solidified requirements. We also knew that the contractors will respond to incentives, and that if the incentives are focused on maintaining schedules and not on controlling cost, cost growth on a cost-plus contract should surprise no one. After the fact, everyone appears ready to agree that the original ship construction schedule for the lead ship was overly aggressive. (Page 98)

<sup>46</sup> See Katherine McIntire Peters, "Navy's Top Officer Sees Lessons In Shipbuilding Program Failures," *GovernmentExecutive.com*, September 24, 2008; Christopher J. Castelli, "Audit Exposes Failed Management of Troubled Littoral Warship," *Inside the Navy*, February 4, 2008; Christopher J. Castelli, "Audit Reveals Both LCS and Industry Teams Violated Management Rules," *Inside the Pentagon*, July 10, 2008 (reprinted in essentially identical form, with the same headline, in the July 14, 2008, issue of sister publication *Inside the Navy*).

A sound business case would establish and resource a knowledge-based approach at the outset of a program. We would define such a business case as firm requirements, mature technologies, and an acquisition strategy that provides sufficient time and money for design activities before construction start. The business case is the essential first step in any acquisition program that sets the stage for the remaining stages of a program, namely the business or contracting arrangements and actual execution or performance. If the business case is not sound, the contract will not correct the problem and execution will be subpar. This does not mean that all potential problems can be eliminated and perfection achieved, but rather that sound business cases can get the Navy better shipbuilding outcomes and better return on investment. If any one element of the business case is weak, problems can be expected in construction. The need to meet schedule is one of the main reasons why programs cannot execute their business cases. This pattern was clearly evident in both the LPD 17 [amphibious ship] and LCS programs. In both cases, the program pushed ahead with production even when design problems arose or key equipment was not available when needed. Short cuts, such as doing technology development concurrently with design and construction, are taken to meet schedule. In the end, problems occur that cannot be resolved within compressed, optimistic schedules. Ultimately, when a schedule is set that cannot accommodate program scope, delivering an initial capability is delayed and higher costs are incurred....

What happens when the elements of a solid business case are not present? Unfortunately, the results have been all too visible in the LPD 17 and the LCS. Ship construction in these programs has been hampered throughout by design instability and program management challenges that can be traced back to flawed business cases. The Navy moved forward with ambitious schedules for constructing LPD 17 and LCS despite significant challenges in stabilizing the designs for these ships. As a result, construction work has been performed out of sequence and significant rework has been required, disrupting the optimal construction sequence and application of lessons learned for follow-on vessels in these programs....

In the LCS program, design instability resulted from a flawed business case as well as changes to Navy requirements. From the outset, the Navy sought to concurrently design and construct two lead ships in the LCS program in an effort to rapidly meet pressing needs in the mine countermeasures, antisubmarine warfare, and surface warfare mission areas. The Navy believed it could manage this approach, even with little margin for error, because it considered each LCS to be an adaptation of an existing high-speed ferry design. It has since been realized that transforming a high-speed ferry into a capable, networked, survivable warship was quite a complex venture. Implementation of new Naval Vessel Rules (design guidelines) further complicated the Navy's concurrent design-build strategy for LCS. These rules required program officials to redesign major elements of each LCS design to meet enhanced survivability requirements, even after construction had begun on the first ship. While these requirements changes improved the robustness of LCS designs, they contributed to out of sequence work and rework on the lead ships. The Navy failed to fully account for these changes when establishing its \$220 million cost target and 2-year construction cycle for the lead ships.

Complicating LCS construction was a compressed and aggressive schedule. When design standards were clarified with the issuance of Naval Vessel Rules and major equipment deliveries were delayed (e.g., main reduction gears), adjustments to the schedule were not made. Instead, with the first LCS, the Navy and shipbuilder continued to focus on achieving the planned schedule, accepting the higher costs associated with out of sequence work and rework. This approach enabled the Navy to achieve its planned launch date for the first Littoral Combat Ship, but required it to sacrifice its desired level of outfitting. Program officials report that schedule pressures also drove low outfitting levels on the second Littoral Combat Ship design as well, although rework requirements have been less intensive to date. However, because remaining work on the first two ships will now have to be completed out-

of-sequence, the initial schedule gains most likely will be offset by increased labor hours to finish these ships.

The difficulties and costs discussed above relate to the LCS seaframe only. This program is unique in that the ship's mission equipment is being developed and funded separately from the seaframe. The Navy faces additional challenges integrating mission packages with the ships, which could further increase costs and delay delivery of new antisubmarine warfare, mine countermeasures, and surface warfare capabilities to the fleet. These mission packages are required to meet a weight requirement of 180 metric tons or less and require 35 personnel or less to operate them. However, the Navy estimates that the mine countermeasures mission package may require an additional 13 metric tons of weight and seven more operator personnel in order to deploy the full level of promised capability. Because neither of the competing ship designs can accommodate these increases, the Navy may be forced to reevaluate its planned capabilities for LCS.<sup>47</sup>

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<sup>47</sup> Defense Acquisitions[:] Realistic Business Cases Needed to Execute Navy Shipbuilding Programs, Statement of Paul L. Francis, Director, Acquisition and Sourcing Management Team, Testimony Before the Subcommittee on Seapower and Expeditionary Forces, Committee on Armed Services, House of Representatives, July 24, 2007 (GAO-07-943T), pp. 8-11.



## **Appendix C. 2007 Program Restructuring and Ship Cancellations**

The Navy substantially restructured the LCS program in 2007 in response to significant cost growth and delays in constructing the first LCS sea frames. This restructuring led to the cancellation of four LCSs that were funded in FY2006 and FY2007. A fifth LCS, funded in FY2008, was cancelled in 2008. This appendix presents the details of the program restructuring and ship cancellations.

### **2007 Program Restructuring**

#### **March 2007 Navy Restructuring Plan**

In response to significant cost growth and schedule delays in the building of the first LCSs that first came to light in January 2007 (see next section), the Navy in March 2007 announced a plan for restructuring the LCS program that:

- canceled the two LCSs funded in FY2007 and redirected the funding for those two ships to pay for cost overruns on earlier LCSs;
- announced an intention to lift a 90-day stop-work order that the Navy had placed on LCS-3 in January 2007—provided that the Navy reached an agreement with the Lockheed-led industry team by April 12, 2007, to restructure the contract for building LCSs 1 and 3 from a cost-plus type contract into a fixed price incentive (FPI)-type contract—or terminate construction of LCS-3 if an agreement on a restructured contract could not be reached with the Lockheed team by April 12, 2007;
- announced an intention to seek to restructure the contract with the General Dynamics-led industry team for building LCSs 2 and 4 into an FPI-type contract—if LCSs 2 and 4 experienced cost growth comparable to that of LCSs 1 and 3—and, if such a restructuring were sought, terminate construction of LCS-4 if an agreement on a restructured contract for LCS-2 and LCS-4 could not be reached;
- reduced the number of LCSs requested for FY2008 from three to two (for the same requested FY2008 procurement funding of \$910.5 million), and the number to be requested for FY2009 from six to three; and
- announced an intention to conduct an operational evaluation to select a favored design for the LCS that would be procured in FY2010 and subsequent years, and to conduct a full and open follow-on competition among bidders for the right to build that design.<sup>48</sup>

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<sup>48</sup> Source: Navy briefing to CRS and Congressional Budget Office (CBO) on Navy's proposed LCS program restructuring plan, March 21, 2007.

### April 2007 Termination of LCS-3

On April 12, 2007, the Navy announced that it had not reached an agreement with Lockheed on a restructured FPI-type contract for LCS-1 and LCS-3, and consequently was terminating construction of LCS-3.<sup>49</sup> (The Navy subsequently began referring to the ship as having been partially terminated—a reference to the fact that Lockheed was allowed to continue procuring certain components for LCS-3, so that a complete set of these components would be on hand to be incorporated into the next LCS built to the Lockheed design.) (The designation LCS-3 is now being reused to refer to one of the two LCSs procured in FY2009.)

### November 2007 Termination of LCS-4

In late September 2007, it was reported that the Navy on September 19 had sent a letter to General Dynamics to initiate negotiations on restructuring the contract for building LCSs 2 and 4 into an FPI-type contract. The negotiations reportedly were to be completed by October 19, 2007—30 days from September 19.<sup>50</sup> On November 1, 2007, the Navy announced that it had not reached an agreement with General Dynamics on a restructured FPI-type contract for LCS-2 and LCS-4, and consequently was terminating construction of LCS-4.<sup>51</sup> (The designation LCS-4 is now being reused to refer to one of the two LCSs procured in FY2009.)

### Cancellation of Prior-Year Ships

**Table C-1** below summarizes the status of the nine LCSs funded by Congress from FY2005 through FY2009. As shown in the table, of the nine ships, five were later canceled, leaving four ships in place through FY2009—LCSs 1 and 2, and the two LCSs funded in FY2009. Ship designations LCS-3 and LCS-4 are being reused as the designations for the two ships funded in FY2009.

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<sup>49</sup> Department of Defense News Release No. 422-07, April 12, 2007, “Navy Terminates Littoral Combat Ship 3.”

<sup>50</sup> Geoff Fein, “Navy Seeking To Negotiate FPI Contract With General Dynamics,” *Defense Daily*, September 24, 2007; Geoff Fein, “Navy, General Dynamics Meet To Discuss New LCS Fixed Price Structure,” *Defense Daily*, September 27, 2007; Tony Capaccio, “General Dynamics Urged To Take Fixed Price On Warship Contract,” *Bloomberg News*, September 28, 2007; Jason Sherman, “Navy, General Dynamics Discuss Fixed-Price Contract For LCS,” *Inside the Navy*, October 1, 2007.

<sup>51</sup> Department of Defense News Release No. 1269-07, November 1, 2007, “Navy Terminates Littoral Combat Ship (LCS 4) Contract.”

**Table C-1. Status of LCSs Funded in FY2005-FY2009**

<b>Ships funded</b>	<b>FY funded</b>	<b>Navy hull designation</b>	<b>Status</b>
1 <sup>st</sup>	2005	LCS-1	<b>Commissioned into service</b> on November 8, 2008.
2 <sup>nd</sup>	2006	LCS-2	<b>Commissioned into service</b> on January 16, 2010.
3 <sup>rd</sup>		LCS-3 (not the same ship as LCS-3 below)	<b>Canceled by Navy</b> in April 2007 after being placed under contract due to inability to come to agreement with contractor on revised (fixed-price) contract terms for LCSs 1 and 3.
4 <sup>th</sup>		LCS-4 (not the same ship as LCS-4 below)	<b>Canceled by Navy</b> in November 2007 after being placed under contract due to inability to come to agreement with contractor on revised (fixed-price) contract terms for LCSs 2 and 4.
5 <sup>th</sup>	2007	none (ship canceled before being placed under contract)	<b>Canceled by Navy</b> in March 2007 before being placed under contract as part of Navy's LCS program restructuring; funds reapplied to cover other program costs.
6 <sup>th</sup>		none (ship canceled before being placed under contract)	<b>Canceled by Navy</b> in March 2007 before being placed under contract as part of Navy's LCS program restructuring; funds reapplied to cover other program costs.
7 <sup>th</sup>	2008	LCS-5 (for a while, at least, although the ship was canceled before being placed under contract)	<b>Canceled by Navy following Congress's decision</b> in September 2008, as part of its action on the FY2009 defense appropriations bill, to rescind the funding for the ship.
8 <sup>th</sup>	2009	LCS-3 (not the same ship as LCS-3 above; the ship designation is being reused)	<b>Funded in FY2009 and Under Construction.</b> Contract to build the ship awarded to Lockheed Martin on March 23, 2009. Ship is currently under construction.
9 <sup>th</sup>		LCS-4 (not the same ship as LCS-4 above; the ship designation is being reused)	<b>Funded in FY2009 and Under Construction.</b> Contract to build the ship awarded to General Dynamics on May 1, 2009. Ship is currently under construction.

Source: Prepared by CRS.

## **Appendix D. LCS Acquisition Strategy Announced in September 2009**

This appendix presents additional background information on the LCS acquisition strategy announced by the Navy on September 16, 2009.

A September 16, 2009, Department of Defense (DOD) news release on the proposed new acquisition strategy stated:

The Navy announced today it will down select between the two Littoral Combat Ship (LCS) designs in fiscal 2010. The current LCS seaframe construction solicitation [for the FY2010 LCSs] will be cancelled and a new solicitation will be issued. At down select, a single prime contractor and shipyard will be awarded a fixed price incentive contract for up to 10 ships with two ships in fiscal 2010 and options through fiscal 2014. This decision was reached after careful review of the fiscal 2010 industry bids, consideration of total program costs, and ongoing discussions with Congress.

“This change to increase competition is required so we can build the LCS at an affordable price,” said Ray Mabus, secretary of the Navy. “LCS is vital to our Navy’s future. It must succeed.”

“Both ships meet our operational requirements and we need LCS now to meet the warfighters’ needs,” said Adm. Gary Roughead, chief of naval operations. “Down selecting now will improve affordability and will allow us to build LCS at a realistic cost and not compromise critical warfighting capabilities.”

The Navy cancelled the solicitation to procure up to three LCS Flight 0+ ships in fiscal 2010 due to affordability. Based on proposals received this summer, it was not possible to execute the LCS program under the current acquisition strategy and given the expectation of constrained budgets. The new LCS acquisition strategy improves affordability by competitively awarding a larger number of ships across several years to one source. The Navy will accomplish this goal by issuing a new fixed price incentive solicitation for a down select to one of the two designs beginning in fiscal 2010.

Both industry teams will have the opportunity to submit proposals for the fiscal 2010 ships under the new solicitation. The selected industry team will deliver a quality technical data package, allowing the Navy to open competition for a second source for the selected design beginning in fiscal 2012. The winner of the down select will be awarded a contract for up to 10 ships from fiscal 2010 through fiscal 2014, and also provide combat systems for up to five additional ships provided by a second source. Delivery of LCS 2, along with construction of LCS 3 and LCS 4 will not be affected by the decision. This plan ensures the best value for the Navy, continues to fill critical warfighting gaps, reduces program ownership costs, and meets the spirit and intent of the Weapons System Acquisition Reform Act of 2009....

The Navy remains committed to the LCS program and the requirement for 55 of these ships to provide combatant commanders with the capability to defeat anti-access threats in the littorals, including fast surface craft, quiet submarines and various types of mines. The

Navy's acquisition strategy will be guided by cost and performance of the respective designs as well as options for sustaining competition throughout the life of the program.<sup>52</sup>

A September 16, 2009, e-mail from the Navy to CRS provided additional information on the proposed new strategy, stating:

The Navy remains committed to a 55 ship LCS program and intends to procure these ships through an acquisition strategy that leverages competition, fixed price contracting and stability in order to meet our overarching objectives of performance and affordability.

In the best interest of the Government, the Navy cancelled the solicitation to procure up to three LCS Flight 0+ ships in FY10 due to affordability.

Based on proposals received in August, the Navy had no reasonable basis to find that the LCS Program would be executable going forward under the current acquisition strategy, given the expectation of constrained budgets.

In the near future, and working closely with Congress, the Navy will issue a new FY10 solicitation which downselects between the two existing designs and calls for building two ships in FY10 and provides options for two additional ships per year from FY11 to FY14 for a total of ten ships. The intent is for all of these ships to be built in one shipyard, which will benefit from a stable order quantity, training and production efficiencies to drive costs down. Both industry teams will have the opportunity to submit proposals for the FY10 ships under the new solicitation.

To sustain competition throughout the life of the program and in conjunction with the downselect, the Navy will develop a complete Technical Data Package which will be used to open competition for a second source of the selected design in FY12, awarding one ship with options for up to four additional ships through FY14, to a new shipbuilder.

Our FY10 solicitation will call for the prime to build an additional five combat systems to be delivered as government-furnished equipment for this second source shipyard. Separating the ship and combat systems procurement will enable bringing the LCS combat system into the broader Navy's open architecture plan.

In short, this strategy calls for two shipbuilders in continuous competition for a single LCS seaframe design, and a government-provided combat system.

The revised strategy meets the full spirit and intent of the Weapon Systems Acquisition Reform Act of 2009 by increasing Government oversight, employing fixed price contract types, maximizing competition, leveraging open architecture, using Economic Order Quantity and Block Buy strategies, and ensuring future competition for shipbuilding as enabled by development of a Technical Data Package to solicit ships from a second shipyard.

We also continue to work closely with Congress on the Navy's LCS procurement intentions....

The Navy intends to continue with construction and delivery of LCS 3 and LCS 4, ultimately for use as deployable assets. We will continue to explore all avenues to ensure this is an affordable program.<sup>53</sup>

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<sup>52</sup> Department of Defense, "Littoral Combat Ship Down Select Announced," News Release 722-09, September 16, 2009, available online at <http://www.defenselink.mil/releases/release.aspx?releaseid=12984>.

The Navy briefed CRS and CBO about the proposed new acquisition strategy on September 22, 2009. Points made by the Navy in the briefing included the following:

- The bids from the two industry teams for the three LCSs requested in the FY2010 budget (which were submitted to the Navy in late July or early August 2009<sup>54</sup>) were above the LCS unit procurement cost cap in “all scenarios.”
- Negotiations with the industry teams were deemed by the Navy to be not likely to result in award prices for the FY2010 ships that were acceptable to the Navy.
- The Navy judged that the current LCS teaming arrangements “considerably influenced costs” in the FY2010 bids.
- The Navy judged that it cannot afford more than a two-ship award in FY2010 within the amount of funding (\$1,380 million) requested for LCS sea frame procurement in FY2010.
- In response to the above points, the Navy decided to seek a new acquisition strategy for LCSs procured in FY2010 and subsequent years that would make the LCS program affordable by leveraging competition, providing stability to LCS shipyards and suppliers, producing LCSs at efficient rates, giving industry incentives to make investments that would reduce LCS production costs, and increase commonality in the resulting LCS fleet.
- Under the Navy’s proposed new strategy, the winner of the LCS down select would be awarded a contract to build two ships procured in FY2010, with options to build two more ships per year in FY2011-FY2014. The contract would be a block-buy contract augmented with Economic Order Quantity (EOQ) authority, so as to permit up-front batch purchases of long leadtime components, as would be the case under a multiyear procurement (MYP) contract. Unlike an MYP contract, however, the block buy contract would not include a termination liability.
- The winner of the down select would deliver to the Navy a technical data package that would permit another shipyard to build the winning LCS design.
- The Navy would hold a second competition to select a second LCS bidder. This competition would be open to all firms other than the shipyard that is building the 10 LCSs in FY2010-FY2014. The winner of this second competition would be awarded a contract to build up to five LCSs in FY2012-FY2014 (one ship in FY2012, and two ships per year in FY2013-FY2014).
- The Navy would maintain competition between the two shipyards for LCSs procured in FY2015 and subsequent years.
- The prime contractor on the team that wins the LCS down select (i.e., Lockheed or General Dynamics) would provide the combat systems for all the LCSs to be

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(...continued)

<sup>53</sup> Email from Navy Office of Legislative Affairs to CRS, entitled “LCS Way Ahead,” September 16, 2009.

<sup>54</sup> See, for example, Christopher P. Cavas, “LCS Bids Submitted to U.S. Navy,” *DefenseNews.com*, August 3, 2009, which states: “Lockheed Martin announced its proposal was sent to the Navy on July 31, and rival General Dynamics confirmed its plans were sent in by the Aug. 3 deadline.” See also Bettina H. Chavanne, “Lockheed Submits First LCS Proposal Under Cost Cap Regulations,” *Aerospace Daily & Defense Report*, August 4, 2009: 5.



- procured in FY2010-FY2014—the 10 that would be built by the first shipyard, and the others that would be built by the second shipyard.
- The structure of the industry team that wins the down select would be altered, with the prime contractor on the team being separated from the shipyard (i.e., the shipyard building the 10 LCSs in FY2010-FY2014). The separation, which would occur some time between FY2010 and FY2014, would be intended in part to prevent an organizational conflict of interest on the part of the prime contractor as it provides combat systems to the two shipyards building LCSs.
  - The current combat system used on the selected LCS design will be modified over time to a configuration that increases its commonality with one or more of the Navy's existing surface ship combat systems.
  - The Navy intends to complete the construction and delivery of LCS-3 and LCS-4.
  - The Navy believes that the proposed acquisition strategy does the following: maximize the use of competition in awarding contracts for LCSs procured in FY2010-FY2014; provide an opportunity for achieving EOQ savings with vendors; provide stability and efficient production quantities to the shipyards and vendors; provide an opportunity to move to a common combat system for the LCS fleet; and provide the lowest-possible total ownership cost for the Navy for the resulting LCS fleet, in large part because the fleet would consist primarily of a single LCS design with a single logistics support system. The Navy also believes the proposed strategy is consistent with the spirit and intent of the Weapon Systems Acquisition Reform Act of 2009 (S. 454/P.L. 111-23 of May 22, 2009).

Regarding the Navy's ability to sustain a competition between two LCS builders for LCS construction contracts years from now, when the annual LCS procurement rate is projected to drop to 1.5 ships per year (i.e., a 1-2-1-2 pattern), Undersecretary of the Navy Robert Work reportedly stated:

“We are going to be able to compete those. We will be able to compete three [ships] every two years and one of the yards will win two and one yard will win one. Sometimes, we'll do a five multi-year [procurement contract]. We have all sorts of flexibility in here,” he said.<sup>55</sup>

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<sup>55</sup> Geoff Fein, “Official: Navy OK With Either LCS, New Acquisition Plan Adds Flexibility In Out Years,” *Defense Daily*, February 18, 2010: 3.

## **Appendix E. May 2010 Navy Testimony Regarding Fuel Costs as Evaluation Factor**

At a May 6, 2010, hearing on Navy shipbuilding programs before the Seapower Subcommittee of the Senate Armed Services Committee, Senator Jeff Sessions questioned Sean Stackley, the Navy's acquisition executive (i.e., the Assistant Secretary of the Navy [Research, Development and Acquisition]), regarding the role of fuel costs in the Navy's evaluation of the two LCS designs. The following is text of the exchange:

SENATOR SESSIONS:

Secretary Stackley, yesterday, Defense News reported that Secretary Mabus, the Navy secretary, in his remarks to the Navy League on May 5<sup>th</sup>, stated that "energy efficiency, both in the manufacturing process and in the final product would increasingly be a factor in judging program"—reform—"performance, as well as in the contract awards."

Earlier, he said, in October of last year at an energy forum, "First, we're going to change the way the Navy and the Marine Corps awards contracts, that lifetime energy costs of a building or a system and the fully burdened costs of fuel in powering those will be a mandatory evaluation factor used when awarding contracts.

"We're going to hold industry contractually accountable for meeting energy targets and system efficiency requirements." And he goes on to emphasize that more.

And in September of '09, he said, "One of the drivers for me is the affordability of being able to operate the force. We no longer have the luxury to say it's a good deal on price, or let's buy it, we have to get our arms around the lifecycle costs."

Do you agree that that's the right way to purchase a ship or anything, but—any vehicle, but a ship, particularly, that you want to know not only how much it costs today, but how much fuel it will use and how much it will cost to operate that? Is that a factor that should given weight in the process?

STACKLEY:

Sir, we—the secretary has outlined his goals for energy, and we are putting a lot of effort into not just meeting his goals, but building the path to get there.

When we look at how we procure our ships, we bring total ownership cost into the equation, and we evaluate not just—we look at not just the procurement costs, but we look at, again, the ownership costs throughout the life of the program, which includes—that includes energy, it includes manpower, it includes maintenance and modernization considerations in addition to the upfront procurement cost.

SESSIONS:

Well, I think you said that you agree with the secretary. Is that right?

STACKLEY:

I would—I would always agree with the secretary, sir.

(LAUGHTER)

SESSIONS:

Well, especially when he's correct, as he is in that statement.

But I didn't hear you say precisely that you are at that level now. He said, we're going to—"the first thing we're going to do is fix this energy matter."

So I'm asking you today, when you look at Littoral Combat Ship competition, is that effectively being evaluated in the bid process? It certainly seems that it should be?

STACKLEY:

We took a look at, inside of the—of the larger category of ownership costs, we took a look at—we considered it as an evaluation factor, compared the two designs, and arrived at an evaluation inside the technical portion of the LCS award criteria that would address improvements to total ownership costs, which would include energy as well as maintenance and modernization.

SESSIONS:

Well, the fact that that is a very long and complex answer makes me nervous. Because my analysis of it is that it does not do just what the secretary said.

And I would offer, for the record, Mr. Chairman, a report from the Congressional Budget Office that's analyzed this particular question. The way I read the report, it's pretty clear to me that the Navy has not sufficiently calculated the fuel costs of this ship.

Has the—in calculating the comparative fuel costs of the two ships, and that's what you mean by those words you gave us, doesn't it? You compare the cost of one ship and its normal operating procedure and you compare the cost of the other. Correct? Is that what you mean?

STACKLEY:

We look at total ownership cost, which includes all the factors, including energy, yes, sir.

SESSIONS:

Well, let's focus on the energy part of cost. Do you consider how much it costs to run one ship and you consider the cost of the other one? That's what it means. Does it not?

STACKLEY:

Yes, sir.

SESSIONS:

And have you calculated and reduced to dollar amounts, the estimated fuel cost of operating these ships, each one, through the lifecycle?

STACKLEY:

We've looked at the different ways in which the Navy would operate the ship—because, clearly, fuel costs are dependent upon how you would operate the ship—and ran the respective analyses for the two different designs.

SESSIONS:

Well, I'm well aware of that, but that's—that would be part of how you would calculate it. So have you calculated it to a dollar- and-cent figure, so you can compare actual cost?

STACKLEY:

Yes, sir. In accordance with the different ways in which we would operate the ship, inside of the total...

SESSIONS:

How much do you calculate for the LCS 1 and the LCS 2? What are the figures for each?

STACKLEY:

I would not provide those in an open forum because the respective figures that were used—that we have used are proprietary. However, we have provided that information through other means to the CBO, in forming their report.

SESSIONS:

Well, as I would read the CBO report, it would conclude that Navy inadequately scored that.

But, do I hear you saying you have an actual dollar-and-cent figure that you've used in evaluating the life-cycle cost, that now—that the Navy has and is applying to this ship?

STACKLEY:

To be exact, we took a look at the total ownership cost for the two competing designs. We looked at maintenance, modernization, manpower and fuel consumption. When we look at fuel consumption, we have to consider the different ways in which the Navy would operate the ship.

And then we looked at the total ownership costs, side by side, for the two different designs, considering different categories for the way the Navy would...

(CROSSTALK)

SESSIONS:

Surely you would have to reduce this variable speed to some sort of a factor that you could evaluate in terms of dollars and cents. That's what CBO said.

(CROSSTALK)

SESSIONS:

It's been done before, hasn't it?

STACKLEY:

Yes, sir. So as you read through the CBO report, what they point out is, one, there's a range in terms of the percent of the total ownership cost that's made up by fuel, and also there's a range for how much of an impact the different mission type of operations have on that percent. And within that range, you could have one design being better than the other and vice versa.

So, in fact, the outcome of the analysis for total ownership cost is highly sensitive to the way that the Navy would operate the ships. And depending on which...

(CROSSTALK)

SESSIONS:

I couldn't agree more. But have you calculated that?

STACKLEY:

Yes, sir.

SESSIONS:

And you would agree, would you not, that if you didn't properly calculate that, then it could be unfair to one competitor or another?

STACKLEY:

What I would definitely agree to is that there is a degree of uncertainty around the estimates. And so within—when you say not properly calculating it, I would say that the Navy's estimate is not so much of a point estimate, as it is a number plus or minus a certain percentage of uncertainty.

And so, I would not—I would not suggest that we've been unfair to one or the other based on that calculation.

SESSIONS:

Mr. Stackley, I've not been able to follow those answers. It's awfully complex to me. It would seem to me that you would, if you were buying an automobile, and got better gas mileage than another one, you would calculate over the expected life of that car, how many dollars you spend on fuel on each one.

And are you saying that you have done that in this case, and—this competition—and that you are prepared at some point to make that public?

STACKLEY:

Two things. One, you say, within the competition. The analysis that you are referring to is not a part of the award criteria.

SESSIONS:

Oh. So—well, then are you going to make it a part of the award evaluation or not?

STACKLEY:

No, sir. What we do have as a part of the award criteria is how to improve upon total ownership cost. When we do the analysis of total ownership cost, which includes fuel, and we put side by side comparison between the two designs, then the outcome of that analysis is entirely dependent on the assumptions you make with regards to how the Navy would operate the ship, where the range of operations is entirely within what the LCS will be called to perform.

SESSIONS:

Well, the CBO, faced with those circumstances, came up with a range, did they not?

STACKLEY:

Yes, sir.

SESSIONS:

And the range was something like eight to 18.

STACKLEY:

It was eight percent to 11 percent for a frigate-type of combatant, which would include an LCS.

SESSIONS:

And they estimated the moderate range would be 11. That was their guesstimate of—that was their estimate of what the...

STACKLEY:

Yes, sir.

SESSIONS:

... fuel costs should be. Have you used—do you use that figure or a different one?

STACKLEY:

We used the baseline figures that we have for the two designs. The other information that the CBO pointed toward was the operating regime of the ships, where they would nominally spend 95 percent of their time at 16 knots or less, 5 percent of their time north of that speed.

So you have a range of variability of 5 percent inside of the CBO's numbers, driven by the way you operate the ships, for a cost factor that's 11 percent of the total ownership cost.

SESSIONS:

Well, I would—thank you, Mr. Chairman.



I would just say that this is a very serious matter. And I would expect—I'm not able to follow your answers, and my concern is that you're not adequately accounting for differences of fuel. And I intend to follow it.

I hope that you conduct this correctly, but if not, I think—I think we would not have had a fair competition.<sup>56</sup>

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<sup>56</sup> Source: Transcript of hearing.

## **Appendix F. May 2010 Navy Testimony Regarding Impact of NLOS-LS Cancellation**

At a May 6, 2010, hearing on Navy shipbuilding programs before the Seapower Subcommittee of the Senate Armed Services Committee, Senator Jack Reed questioned Sean Stackley, the Navy's acquisition executive (i.e., the Assistant Secretary of the Navy [Research, Development and Acquisition]), and Lieutenant General George Flynn, Deputy Commandant, Combat Development and Integration, and Commanding General, Marine Corps Combat Development Command, regarding the impact the cancellation of the NLOS-LS program. The following is text of the exchange:

SENATOR REED:

Let me ask a question, then yield to Senator Wicker. And I might have one more question, but going back to the decision about the DDG- 51 versus the DDG-1000. The DDG-1000 was developed with the principal mission of close fire support for forcible entry, principally the Marine Corps.

Then the Navy made the decision that they could do that by other means, and the more pressing need was missile defense, which the DDG- 51 seems more capable. Part of that decision, I understand, is the thought that essentially the Navy could adopt an Army system, the non- line of sight launch system, NLOS. But now it appears that the Army is getting ready to abandon the development of that system, forcing you to have no system or to adopt the cost of that system, rather than bootstrapping on the Army.

So, I'm just, Admiral Blake, if NLOS is canceled, which it appears close to be, what's your backup plan? But more importantly, I'd like everyone to comment on this general topic. What are we going to do to ensure close fire support for forcible entry of Marines?

BLAKE:

Well, sir, first of all, for the NLOS program, the NLOS was looked at from the Navy perspective to go on the LCS. It was going to be a part of the surface package, the surface modular package [for the LCS]. It was going to go on there.

And it was going to be used—one of the missions it was going to be used for was for the swarming boat issue. What we are doing right now is because of the Army's announcement that they are potentially looking at terminating the program, we have been—we are going back and evaluating for that particular module.

If, in fact that program is terminated and it is decided that the Navy would not go down that path, then what would we have to do in order to meet the key performance parameters for that particular module on the LCS.

REED:

Thank you. That helps to clarify.

Can I assume then, Secretary Stackley, to my comment, that the close fire support would be provided not by a destroyer, but by the LCS? Is that correct, the operational concept, Mr. Secretary?

STACKLEY:

No, sir. There's a naval surface first support capability. That requirement is met by what is called a triad. First, there's organic artillery, there is air, then there's naval surface fires. So that triad is intended to meet the overarching or capstone requirement.

And we look at—you started with the DDG-1000 with the advanced con [sic: gun] system [the DDG-1000's 155 mm Advanced Gun System] to [help meet] the overall requirement, and we look at other surface ships, basically [the] five-inch 54 [caliber gun], basically which is common to the DDG-51 and the [CG-47 class] cruiser. And with the NLOS, we looked at a capability that the LCS could further contribute to that [naval surface fire support] campaign problem.

REED:

General Flynn, since your Marines are going to have to make the forceful entry, you have the last word on the whole topic and NLOS, too.

FLYNN:

Sir, over a year ago we agreed that the solution, and this was at the same time we were examining the DDG-1000, we agreed to look for a joint analysis of alternatives [AOA] to determine the way ahead for naval surface fires. A key part of that had, as Secretary Stackley said, is our belief in the triad, that no single leg of the triad can meet all the demands of it. And we see naval surface fires as providing volume and accuracy as a key part of that triad.

As part of the joint AOA, we looked at 71 alternatives, and we came down to the six most promising. One of them was the NLOS system. If it proved promising, it would have to have an extended range, but that was one of the alternatives. And that was one of the areas that we were also looking to capitalize on the Navy's building of the LCS platform.

If NLOS proves not to be effective, then the only other option that's available right now is the development of the five-inch round, the extended range round for extended use off the DDG-81 and higher class [destroyer] hull forms. And that really needs to be upon 12-ish (ph) [sic: a POM-12 issue],<sup>57</sup> because right now there is no [new] naval surface fire [capability], with the exception of the DDG-1000 in the program of record. The next promising or viable thing seems to be the extended five-inch range [shell]. And that would meet the requirement.<sup>58</sup>

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<sup>57</sup> The Program Objective Memorandum, or POM, is an internal DOD document used to develop DOD's proposed budget. POM-12 is the POM for the proposed FY2012 budget that DOD will submit to Congress in February 2011.

<sup>58</sup> Source: Transcript of hearing.

## Appendix G. Potential for Common Hulls

Some observers, including some Members of Congress, have expressed interest in the idea of using common hulls for Coast Guard cutters and smaller Navy combatants, so as to improve economies of scale in the construction of these ships and thereby reduce their procurement costs. In earlier years, this interest focused on using a common hull for the LCS and the Offshore Patrol Cutter (OPC), a cutter displacing roughly 3,000 tons that is to be procured under the Coast Guard's Deepwater acquisition program.<sup>59</sup> More recently, this interest has focused on using a common hull for the LCS and the National Security Cutter (NSC), a cutter displacing about 4,300 tons that is also being acquired under the Deepwater program. This appendix presents information regarding the idea of using common hulls for Coast Guard cutters and smaller Navy combatants.

### July 2009 CBO Report

A July 2009 CBO report examines options for the Navy and Coast Guard to use common hulls for some of their ships. The report states that:

some members of Congress and independent analysts have questioned whether the Navy and the Coast Guard need to purchase four different types of small combatants and whether—in spite of the services' well-documented reservations about using similar hull designs—the same type of hull could be employed for certain missions. To explore that possibility, the Congressional Budget Office (CBO) examined three alternatives to the Navy's and the Coast Guard's current plans for acquiring littoral combat ships and deepwater cutters.

- Option 1 explores the feasibility of having the Coast Guard buy a variant of the Navy's LCS—specifically, the semiplaning monohull—to use as its offshore patrol cutter.
- Option 2 examines the effects of reducing the number of LCSs the Navy would buy and substituting instead a naval version of the Coast Guard's national security cutter. (The rationale for this option is that, according to some analysts, the NSC's longer mission range and higher endurance might make it better suited than the LCS to act as a "patrol frigate," which would allow the Navy to carry out certain activities—maritime security, engagement, and humanitarian operations—outlined in the sea services' new maritime strategy.)
- Option 3 examines the advantages and disadvantages of having the Coast Guard buy more national security cutters rather than incur the costs of designing and building a new ship to perform the missions of an offshore patrol cutter.

According to CBO's estimates, all three alternatives and the services' plans would have similar costs, regardless of whether they are calculated in terms of acquisition costs or total life-cycle costs (see Table 1).<sup>6</sup> CBO's analysis also indicates that the three alternative plans would not necessarily be more cost-effective or provide more capability than the services' existing plans. Specifically, even if the options addressed individual problems that the Navy and Coast Guard might confront with their small combatants, it would be at the cost of creating new challenges. For instance, Option 1—which calls for using the LCS monohull for the Coast Guard's OPC—would provide less capability for the Coast Guard from that

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<sup>59</sup> For more on the Deepwater program, see CRS Report RL33753, *Coast Guard Deepwater Acquisition Programs: Background, Oversight Issues, and Options for Congress*, by Ronald O'Rourke.

service's perspective and at a potentially higher cost. Option 2 could provide the Navy with capability that, in some respects, would be superior for executing the peacetime elements of its maritime strategy; but that enhanced peacetime capability would sacrifice wartime capability and survivability. Option 3 would allow the Coast Guard to replace its aging cutters more quickly at a slightly higher cost but without the technical risk that is associated with designing and constructing a new class of ships, which the service's existing plan entails. It would, however, provide fewer mission days at sea and require the Coast Guard to find new home ports for its much larger force of national security cutters.<sup>60</sup>

## **Reported Proposal to Build Variant of NSC for Navy**

In January 2008, it was reported that Northrop Grumman, the builder of the NSC, had submitted an unsolicited proposal to the Navy to build a version of the NSC for the Navy as a complement to, rather than a replacement for, the LCS.

### **January 14, 2008, Press Report**

A press report dated January 14, 2008, stated:

The U.S. Navy is stumbling to build the ship it wants—the Littoral Combat Ship (LCS)—so shipbuilder Northrop Grumman is urging the service to turn to a ship it can get sooner and cheaper: a patrol frigate version of the Coast Guard's National Security Cutter (NSC).

“We have listened to what the Navy has said—to be more efficient, be innovative and produce affordable and capable ships,” said Phil Teel, president of Northrop's Ship Systems sector. “The patrol frigate is a response to that, and to the Navy's new National Maritime Strategy.”

Northrop's analysts have studied remarks and themes oft repeated by senior Navy leaders and concluded a de facto requirement exists for a frigate-size ship capable of handling a range of low- and mid-intensity missions. Those missions, said Eric Womble, head of Ship Systems' Advanced Capabilities Group, are detailed in the Navy's new Maritime Strategy and include forward presence, deterrence, sea control, maritime security, humanitarian assistance and disaster response.

“You don't want a high-end Aegis ship to handle those missions,” Womble said, “you want something cheaper and smaller.”

The National Security Cutter (NSC) as configured for the Coast Guard could easily handle those roles, Womble said.

The first NSC, the *Bertholf*, successfully carried out its initial trials in early December and will be commissioned this year by the Coast Guard. Womble said a Navy version would avoid the first-of-class issues that have plagued numerous Navy programs, including both designs being built for the LCS competition.

Northrop in late December began briefing select Navy leaders on its unsolicited proposal. The company is taking pains to avoid presenting the ship as an LCS alternative, instead

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<sup>60</sup> Congressional Budget Office, *Options for Combining the Navy's and the Coast Guard's Small Combatant Programs*, July 2009, p. 2.

calling it an LCS “complement,” which is being built under a competition between Lockheed Martin and General Dynamics.

Key features of Northrop’s concept are:

—The ship is based on a proven design already under construction.

—The NSC’s weapons, sensors and systems already have a high degree of commonality with Navy systems, increasing affordability.

—While the NSC is 15 knots slower than the 45-knot LCS, the cutter can stay at sea up to two months, much longer than the LCS.

The report also stated:

Northrop is claiming it can deliver the first ship at the end of 2012 at an average cost of less than \$400 million per ship, exclusive of government-furnished equipment, in fiscal 2007 dollars. That’s close to the \$403 million contract cost of the third NSC, which incorporates all current design upgrades.

A major element of Northrop’s proposal, Womble said, is that the Navy should make no changes to the current Block 0 design. “That’s the only way we can deliver the ship at this price.”

The design, however, has plenty of room for upgrades, Womble claimed, and Northrop is proposing future upgrades be handled in groups, or blocks, of ships, rather than modifying individual ones. Those upgrades could include non-line-of-sight missiles, SeaRAM missile launchers and more capabilities to handle unmanned systems. The design even has room for an LCS-like reconfigurable mission area under the flight deck, he claimed.

Northrop admits the ships are deficient in one significant Navy requirement: full compatibility with the Naval Vessel Rules (NVR), essentially building codes developed by the Naval Sea Systems Command and the American Bureau of Shipping. The belated application of the NVR to both LCS designs was a major factor in the cost growth on those ships.

Most of the NSC design already is NVR-compatible, Womble said, but upgrading the entire design to NVR standards would involve a fundamental redesign and eliminate the proposal’s cost and construction time attributes.

“We’d need a waiver [from the NVR rules] to make this proposal work,” he said.

The report also stated:

Navy Response: ‘No Requirement’

The official response from the Navy to Northrop’s proposal so far is unenthusiastic.

“There is currently no requirement for such a combatant,” said Lt. Clay Doss, a Navy spokesman at the Pentagon. The Navy’s other surface ship programs, he said, “address specific requirements.”



Doss did note that “the Navy and Coast Guard have considered a common platform for the LCS and the Coast Guard’s National Security Cutter. However, due to the unique mission requirements of each service, a common hull is not a likely course of action.”

Problems with the LCS have caused some observers to predict the program’s demise, but the Navy “is completely committed to the LCS program,” Doss said. “We need 55 Littoral Combat Ships sooner rather than later, and we need them now to fulfill critical, urgent war-fighting gaps.”

Northrop however, is not alone in proposing the NSC as an LCS alternative. Coast Guard Capt. James Howe, writing in the current issue of the U.S. Naval Institute’s Proceedings magazine, is urging Navy leaders to consider the NSC.

“I think the Navy should look at it,” he said Jan. 10. “Northrop is building a naval combatant here. It has standard U.S. Navy weapon systems as part of its packages. Its communications are interoperable. It can handle underway replenishment. If there’s a possibility it could be a cost saver or a good deal for the Navy, it needs to be explored.”

Howe, who said he was unaware of Northrop’s patrol frigate proposal, agreed the NSC is capable of further enhancements. “There’s a lot of space on that ship,” he said.

‘Potential Game-changer’

Northrop likely is facing an uphill battle with its patrol frigate, as the Navy culturally prefers to dictate requirements based on its own analysis.

But the Navy is having trouble defending the affordability of its shipbuilding plan to Congress and bringing programs in on budget. One congressional source noted the service “can’t admit their plan won’t work.” An unsolicited proposal, the source said, “opens the way for someone else to come up with a potential game-changer.”

Northrop’s plan, the source said, may be an unexpected opportunity.

“Northrop is listening to the people who have been criticizing the Navy’s shipbuilding plan,” the source said. “They’ve gotten a sense that maybe the Navy is looking for a solution, and the Navy can’t produce a solution because it might be too embarrassing.”

One more aspect that could be at work in the Northrop proposal: “I think there’s something coy going on here,” the source said. “They may be promoting this as an LCS complement, but their idea might be part of a strategic plan to replace the LCS.”<sup>61</sup>

## **January 17, 2008, Press Report**

A press report dated January 17, 2008, stated:

Northrop Grumman Corp said on Wednesday [January 16, 2008, that] a proposal to turn its 418-foot Coast Guard cutter into a new class of Navy frigates is sparking some interest among U.S. Navy officials and lawmakers.

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<sup>61</sup> Christopher P. Cavas, “Northrop Offers NSC-Based Vessel To Fill LCS Delays,” *Defense News*, January 14, 2008.

Northrop is offering the Navy a fixed price for the new ship of under \$400 million and could deliver the first one as early as 2012 to help out with maritime security, humanitarian aid and disaster response, among other things, said Eric Womble, vice president of Northrop Grumman Ship Systems.

So far, the officials briefed have found Northrop's offer "intriguing," Womble told Reuters in an interview. "They like the fact that we're putting an option on the table. No one has told us, 'Go away, don't come back, we don't want to hear this'," Womble said.

At the same time, the Navy says it remains committed to another class of smaller, more agile ships—the Littoral Combat Ships (LCS) being built by Lockheed Martin Corp (LMT.N: Quote, Profile, Research) and General Dynamics Corp (GD.N: Quote, Profile, Research)—amid huge cost overruns.

"There currently is no requirement for a frigate," Navy spokesman Lt. Clay Doss said. He said the Navy and Coast Guard had discussed a common hull during the initial stage of the LCS competition, but agreed that was "not a likely course of action due to the unique mission capabilities."

For now, he said the Navy was proceeding as quickly as it could with the 55-ship LCS program as well as design work on a new DDG-1000 destroyer, and a planned cruiser, CG-X....

The report also stated:

Virginia-based defense consultant Jim McAleese said the fixed-price offer could be good news for the Navy, which has typically borne the risk of cost-based shipbuilding contracts.

"That is a potential catalyst that could have a huge impact on the way the Navy buys small- and mid-sized surface combatants," McAleese said.

Northrop says its new Coast Guard cutter also experienced some cost growth, but says that was mainly due to requirements added after the Sept. 11, 2001, hijacking attacks. The first of the new ships is due to be delivered to the Coast Guard in March, followed by one ship annually over the next few years.

Northrop said it could offer the Navy a fixed price on the frigate because design work on the ships is already largely completed. Its price excludes government-furnished equipment that would still have to be put on board.

"We're not advocating an LCS replacement," said spokesman Randy Belote. "But after listening to the Navy leadership and studying the new maritime strategy, we think we can get hulls and capabilities into the water at a much faster pace."

Womble said Northrop analysts and an outside consultant studied the Navy's needs and concluded the Navy could use another ship that can operate in shallow water, be forward deployed, has the range and endurance to operate independently, and can work with U.S. allies, if needed.

The press report also stated:

The proposed ship can be deployed for 60 days without new supplies, has a range of 12,000 nautical miles, and can travel at 29 knots, fast enough to keep up with other warships. That compares to 20 days and a range of 3,500 miles for LCS.

Northrop began sharing a PowerPoint presentation about the proposal with Navy officials and lawmakers at the end of December, and has already met with several senior officials, including Chief of Naval Operations Adm. Gary Roughead.

It could deliver the first frigate by 2012, if the Navy was able to add \$75 million for long lead procurement items into the fiscal 2009 budget proposal to be sent to Congress next month, Northrop said.

The frigate is about 75 percent compliant with special requirements that apply only to U.S. Navy ships. Northrop said it believed it could qualify for waivers on the remaining 25 percent because similar waivers were granted in the past.<sup>62</sup>

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<sup>62</sup> Andrea Shalal-Esa, "Northrop Offers US Navy New Ship For Fixed Price," *Reuters*, January 17, 2008.