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Navy Littoral Combat Ship (LCS) Program: Oversight Issues and Options for Congress

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Summary

The Littoral Combat Ship (LCS) is a small, fast ship that uses modular "plug-and-fight" mission packages, including unmanned vehicles (UVs). The basic version of the LCS, without any mission packages, is referred to as the LCS sea frame. The first LCS was procured in FY2005, another three were procured in FY2006, and two more were procured in FY2007. The Navy's proposed FY2008 budget, submitted to Congress in February 2007, requested $910.5 million in procurement funding for three more LCSs. Navy plans call for procuring a total of 55 LCSs.

In response to significant cost growth in the building of the first LCSs that was first reported in January 2007, the Navy in March 2007 announced a proposed plan for restructuring the LCS program. The plan would:

- cancel the two LCSs funded in FY2007 (LCSs 5 and 6) and use the funding to pay for cost overruns on LCSs 1 through 4;
- lift the Navy's stop-work order on LCS-3 — provided that the Navy reached an agreement by about April 12 with the industry team building LCS-3 (a team led by Lockheed) to restructure the contract that the Lockheed team has for building LCSs 1 and 3 from a cost-plus type contract into a fixed price incentive (FPI)-type contract;
- alternatively, terminate construction of LCS-3 — if an agreement on a restructured contract for LCS-1 and LCS-3 cannot be reached with the Lockheed team by April 12;
- seek to restructure the contract for building LCSs 2 and 4 (which are being built by a second industry team led by General Dynamics) into an FPI-type contract — if LCSs 2 and 4 experience cost growth comparable to that experienced on LCSs 1 and 3;
- reduce the number of LCSs requested for FY2008 from 3 to 2, and the number to be requested for FY2009 from 6 to 3; and
- perform a downselect — that is, select a favored design for the LCS — to be procured in FY2010 and subsequent years; and
- conduct a full and open competition among bidders for the right to build that design.

On April 12, 2007, the Navy announced that the Navy and Lockheed could not reach an agreement on a restructured contract for LCS-1 and LCS-3 and that the Navy consequently was terminating construction of LCS-3. On May 10, 2007, it was reported that the Navy would ask Congress to increase the procurement cost cap for the fifth and sixth LCSs to $460 million each in FY2008 dollars.

A primary issue for Congress at this point is whether to approve, reject, or modify the Navy's proposed restructuring plan, and what additional actions, if any, should be taken in response to the Navy's decision to terminate construction of LCS-3. Congress has several potential options regarding the LCS program. This report will be updated as events warrant.

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Introduction

The Navy is procuring a new type of surface combatant called the Littoral Combat Ship (LCS). The LCS is a small, fast ship that uses modular "plug-and-fight" mission packages, including unmanned vehicles (UVs). The basic version of the LCS, without any mission packages, is referred to as the LCS sea frame.

The first LCS was procured in FY2005, another three were procured in FY2006, and two more were procured in FY2007. The Navy's proposed FY2008 budget, submitted to Congress in February 2007, requested $910.5 million in procurement funding for three more LCSs. Navy plans call for procuring a total of 55 LCSs.

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Background

Littoral Combat Ship (LCS) Program

On November 1, 2001, the Navy announced a Future Surface Combatant Program aimed at developing and acquiring a family of three new classes of surface combatants:

- **a destroyer called DDG-1000 (formerly DD(X))** for the precision long-range strike and naval gunfire mission,

- **a cruiser called CG(X)** for the missile and air defense mission,[1] and

- **a smaller combatant called the Littoral Combat Ship (LCS)** to counter submarines, small surface attack craft (also called "swarm boats"), and mines in heavily contested littoral (near-shore) areas.

The LCS is a small, fast surface combatant that uses modular "plug-and-fight" mission packages, including unmanned vehicles (UVs). Rather than being a multimission ship like the Navy's current large surface combatants, the LCS is a focused-mission ship that will be equipped to perform one or two missions 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 missions are shallow-water antisubmarine warfare, mine countermeasures, countering small boats, and intelligence, surveillance, and reconnaissance (ISR). Secondary missions include homeland defense, maritime interception, and support of special operations forces.

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[1] For additional information on the DDG-1000 and CG(X) programs, see CRS Report RL32109, *Navy DDG-1000 (DD(X)) and CG(X) Ship Acquisition Programs: Oversight Issues and Options for Congress*, by Ronald O'Rourke, and CRS Report RS22559, *Navy CG(X) Cruiser Design Options: Background and Oversight Issues For Congress*, by Ronald O'Rourke.

The LCS would displace about 3,000 tons — about the size of a corvette or Coast Guard cutter. It would have a maximum speed of about 45 knots, compared to something more than 30 knots for the Navy's current surface combatants. The LCS would have a shallower draft than the Navy's current surface combatants, permitting it to operate in certain coastal waters and visit certain ports that are not accessible to the Navy's current large surface combatants. The LCS would employ automation to achieve a reduced "core" crew of 40 sailors. Up to 35 or so additional sailors would operate the ship's embarked aircraft and mission packages, making for a total crew of about 75.

In FY2005, Congress approved the Navy's plan to fund the construction of the first two LCSs using research and development funds rather than shipbuilding funds, funded the first LCS's construction cost, required the second LCS to be built 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 Navy's shipbuilding account rather than its research and development account.

In FY2006, Congress funded the procurement of the second, third, and fourth LCSs. (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 $220-million unit procurement cost limit on the fifth and sixth LCSs (the two ships to be procured in FY2007), plus adjustments for inflation and other factors, 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.

For FY2007, Congress funded the procurement of the fifth and sixth LCSs. As mentioned above, Section 124 of the conference report on the FY2006 defense authorization bill (H.R. 1815/P.L. 109-163), limits the cost of these two ships to $220 million per ship, plus adjustments for inflation and other factors.

On May 27, 2004, the Navy awarded contracts to teams led by Lockheed Martin and General Dynamics (GD) for final system design of two versions of the LCS, with options for detailed design and construction of up to two LCSs each. The Lockheed team was assigned LCS-1 and LCS-3, while the GD team was assigned LCS-2 and LCS-4. Lockheed wants to build its LCSs at Marinette Marine of Marinette, WI, and Bollinger Shipyards of Lockport, LA, with LCS-1 being built by Marinette and LCS-3 scheduled to be built by Bollinger. GD is building its LCSs at the Austal USA shipyard of Mobile, AL.[2]

The Navy procured the first and second LCSs through the Navy's research and development account; subsequent LCSs are being procured through the Navy's ship-

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[2] 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 Lockheed 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."

procurement account, called the Shipbuilding and Conversion, Navy (SCN) account. The Navy is procuring LCS mission packages through the Other Procurement, Navy (OPN) account.

Table 1 shows LCS funding through FY2011 as reflected in the FY2007 budget submitted to Congress in February 2006. CRS in February 2007 requested updated (FY2008) budget information from the Navy, but the Navy Office of Legislative Affairs informed CRS by telephone on March 28, 2007, that in light of the Navy's proposed plan for restructuring the LCS program, updated FY2008 funding figures are not available.

Table 1. LCS Program Funding In FY2007 Budget

(Funding as shown in FY2007 budget submitted to Congress in February 2006; millions of then-year dollars; totals may not add due to rounding)

	03	04	05	06	07	08	09	10	11	Total thru FY11
Research, Development, Test & Evaluation, Navy (RDT&EN) account										
Ship 1 construction *(qty)*	0	0	206.7 (1)	59.2	8.5	0	0	0	0	274..5
Ship 2 construction *(qty)*	0	0	16.0	207.1 (1)	55.0	0	0	0	0	278.1
Ships 1and 2 outfit-ting/post delivery	0	0	0	8.7	36.7	36.8	7.1	0	0	89.3
LCS ship development	35.3	160.1	228.0	86.0	57.0	60.3	43.2	43.9	22.4	736.2
LCS mission package project *(qty)*	0	0	0	213.0 (3)	162.3 (1)	90.4	82.5	100.1	40.8	689.2 (4)
Subtotal RDT&EN	35.3	160.1	450.8	574.0	319.6	187.6	132.8	144.1	63.2	2067.3
Shipbuilding and Conversion, Navy (SCN) account										
Ships 3-27 construction *(qty)*	0	0	0	440.0 (2)	520.7 *(2)*	947.6 *(3)*	1764.3 *(6)*	1774.2 *(6)*	1825.4 *(6)*	7272.3 *(25)*
Outfitting & post delivery	0	0	0	0	13	37	70	95	122	337
Subtotal SCN	0	0	0	440.0	533.7	984.6	1834.3	1869.2	1947.4	7609.3
Other Procurement, Navy (OPN) account (for LCS mission packages)										
Subtotal OPN *(qty)*	0	0	0	40.1 *(0)*	79.1 *(1)*	207.6 *(3)*	652.3 *(13)*	656.2 *(12)*	720.2 *(15)*	2355.5 *(44)*
Weapons Procurement, Navy (WPN) account										
Subtotal WPN	0	0	0	0	0	12.5	39.1	91.0	134.2	276.8
TOTAL	35.3	160.1	450.8	1054.1	919.3	1355.3	2588.5	2665.6	2743.0	12308.9

Source: Navy Office of Legislative Affairs (NOLA), March 6 and April 17, 2006, based on figures from FY2007 budget submitted to Congress in February 2006. CRS in February 2007 requested updated (FY2008) budget information from the Navy, but NOLA informed CRS by telephone on March 28, 2007, that in light of the Navy's proposed plan for restructuring the LCS program, updated FY2008 funding figures are not available.

Using recent information about cost growth in the LCS program (including a reported figure of $460 million in FY2008 dollars for the fifth and sixth ships in the program), a 55-ship LCS program, including costs for LCS mission packages, might

have a total acquisition (development plus procurement) cost of roughly $33 billion, or roughly $600 million per ship.

Table 2 shows projected procurement of LCSs as shown in a Navy 30-year shipbuilding plan submitted to Congress in February 2007. This plan does not take into account the Navy's announced proposal, discussed in the next section, to cancel the two LCSs funded in FY2007 and to reduce planned procurement of LCSs to two ships in FY2008 and three ships in FY2009.

Navy's Proposed LCS Program Restructuring Plan

As mentioned earlier, the Navy in March 2007 announced a proposed plan for restructuring the LCS program. The Navy's proposal was made in response to significant cost growth in the building of the first LCSs that was first reported in January 2007. (For a discussion of this cost growth, see the next section on oversight issues for Congress.) The Navy's proposed restructuring plan would:

- cancel the two LCSs funded in FY2007 (LCSs 5 and 6) and use the funding to pay for cost overruns on LCSs 1 through 4;
- lift the Navy's stop-work order on LCS-3 — provided that the Navy reached an agreement by about April 12 with the industry team building LCS-3 (a team led by Lockheed) to restructure the contract that the Lockheed team has for building LCSs 1 and 3 from a cost-plus type contract into a fixed price incentive (FPI)-type contract;
- alternatively, terminate construction of LCS-3 — if an agreement on a restructured contract for LCS-1 and LCS-3 cannot be reached with the Lockheed team by April 12;
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- reduce the number of LCSs requested for FY2008 from 3 to 2, and the number to be requested for FY2009 from 6 to 3; and
- perform a downselect — that is, select a favored design for the LCS — to be procured in FY2010 and subsequent years; and
- conduct a full and open competition among bidders for the right to build that design.[3]

[3] Source: Navy briefing to CRS and Congressional Budget Office (CBO) on Navy's proposed LCS program restructuring plan, March 21, 2007.

Table 2. Projected Procurement Of LCSs

FY	LCS[a]
08	3
09	6
10	6
11	6
12	6
13	5
14	6
15	6
16	5
17	
18	
19	
20	
21	
22	
23	
24	
25	
26	
27	
28	
29	
30	1
31	2
32	3
33	4
34	6
35	6
36	6
37	6

Source: U.S. Department of the Navy, *Report to Congress on Annual Long-Range Plan for Construction of Naval Vessels for FY 2008*, February 2007. Table 3 on page 6.
a. Plus one LCS procured in FY2005, three more in FY2006, and two more in FY2007.

Termination of LCS-3

On April 12, 2007, the Navy announced that the Navy and Lockheed could not reach an agreement on a restructured contract for LCS-1 and LCS-3 and that the Navy

consequently was terminating construction of LCS-3. The Navy's announcement of the decision stated:

> Secretary of the Navy Donald C. Winter announced today that the Department of the Navy is terminating construction of the third Littoral Combat Ship (LCS 3) for convenience under the Termination clause of the contract because the Navy and Lockheed Martin could not reach agreement on the terms of a modified contract.
>
> The Navy issued a stop-work order on construction on LCS 3 in January following a series of cost overruns on LCS 1 and projection of cost increases on LCS 3, which are being built by Lockheed Martin under a cost-plus contract. The Navy announced in March that it would consider lifting the stop-work order on LCS 3 if the Navy and Lockheed Martin could agree on the terms for a fixed price incentive agreement by mid-April. The Navy worked closely with Lockheed Martin to try to restructure the agreement for LCS-3 to more equitably balance cost and risk, but could not come to terms and conditions that were acceptable to both parties.
>
> The Navy remains committed to completing construction on LCS 1 under the current contract with Lockheed Martin.LCS 2 and 4 are under contract with General Dynamics, and the Navy will monitor their cost performance closely. The Navy intends to continue with the plan to assess costs and capabilities of LCS 1 and LCS 2 and transition to a single seaframe configuration in fiscal year 10 after an operational assessment and considering all relevant factors. General Dynamics' ships will continue on a cost-plus basis as long as its costs remain defined and manageable. If the cost performance becomes unacceptable, then General Dynamics will be subject to similar restructuring requirements.
>
> "LCS continues to be a critical warfighting requirement for our Navy to maintain dominance in the littorals and strategic choke points around the world," said Winter. "While this is a difficult decision, we recognize that active oversight and strict cost controls in the early years are necessary to ensuring we can deliver these ships to the fleet over the long term."[4]

Potential Oversight Issues for Congress

Termination of LCS-3

The Navy's decision of April 12, 2007, to terminate construction of LCS-3 raises a number of potential oversight questions for Congress, included but not limited to the following:

- What were the remaining differences between the Lockheed and Navy positions that prevented an agreement on a restructured contract? Were the negotiating positions of one or both sides unreasonable? Would the two sides have been more likely to come

[4] Department of Defense News Release No. 422-07, April 12, 2007, "Navy Terminates Littoral Combat Ship 3."

to an agreement if the Navy had provided more than 30 days of negotiating time?

- What are the termination costs associated with terminating construction of LCS-3? How do these costs compare with the potential cost of building LCS-3 under cost plus-type or FPI-type contracting terms?

- How much unexpended LCS-3 funding is available for potentially covering cover cost overruns on LCSs 1, 2, and 4? Would using unexpended LCS-3 funding for this purpose permit the Navy to keep (rather than cancel) one of the two LCSs funded in FY2007?

- How will the decision to terminate LCS-3 affect Bollinger, the shipyard firm that was to build the ship?

- Where will be the next Lockheed-designed LCS be built — at Marinette or Bollinger?

- What implications, if any, does the termination of LCS-3 have for the Navy's planned LCS downselect decision in FY2010?

- Does the Navy's decision to terminate LCS-3 send a signal to Congress or industry about Navy or Department of Defense (DOD) contracting approaches or other acquisition issues, and if so, what signal? Was the Navy's decision to terminate LCS-3 intended in part to send a signal?

Cost Increase on LCS Sea Frames

Cost growth in building the first LCS sea frames is the primary issue underpinning the Navy's proposed plan for restructuring the LCS program and the Navy's decision to terminate construction of LCS-3. The cost growth issue was the focus of an oversight hearing held before the Seapower and Expeditionary Forces subcommittee of the House Armed Services Committee on February 8, 2007.

Estimated LCS sea frame unit procurement costs increased substantially in early 2006. They increased further in the early months of 2007. The discussion below summarizes both increases.

Increase Reported in Early 2006. Estimated LCS sea frame unit procurement costs as shown in the FY2007 budget submitted to Congress in early 2006 were substantially higher than costs shown in the FY2006 budget submitted a year earlier. The estimate for the first LCS increased from $212.5 million in the FY2006 budget to $274.5 million in the FY2007 budget, an increase of about 29%. The estimate for the second LCS increased from $256.5 million to $278.1 million, an increase of about 8%. As shown in **Table 3**, the estimate for follow-on ships to be procured in FY2009-FY2011, when the LCS program is to reach its maximum annual procurement rate of 6 ships per year, increased from $223.3 million to $298 million, an increase of about 33%.

Table 3. LCS Sea Frame Unit Procurement Costs

(costs in millions of then-year dollars)

	FY07	FY08	FY09	FY10	FY11	FY09-11
FY2006 budget submission						
Procurement cost	542.4	779.7	1,127.2	1,112.3	1,110.3	3,349.8
Number of ships	2	3	5	5	5	15
Unit procurement cost	**271.2**	**259.9**	**225.4**	**222.5**	**222.1**	**223.3**
FY2007 budget submission						
Procurement cost	520.7	947.6	1,764.3	1,774.2	1,825.4	5,363.9
Number of ships	2	3	6	6	6	18
Unit procurement cost	**260.4**	**315.9**	**294.1**	**295.7**	**304.2**	**298.0**
% change in unit procurement cost, FY07 compared to FY06	**(4%)**	**21%**	**30%**	**33%**	**37%**	**33%**

Source: Prepared by CRS using Navy data from FY2006 and FY2007 Navy budget submissions.

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 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 potential oversight issues for Congress, including 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?

- Does the Navy believe there is no substantial risk of penalty for submitting to Congress a budget presentation for a shipbuilding program that, for whatever reason, significantly underestimates 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?

Further Increase Reported in Early Months of 2007. On January 11, 2007, the Navy reported that the first LCS sea frame (LCS-1), being built by Lockheed, was experiencing "considerable cost overruns." On January 12, 2007, the Navy announced that it was issuing a 90-day stop-work order on LCS-3, the second ship being built by Lockheed.

The Navy has stated that the estimated shipyard construction cost of LCS-1 is now $350 million to $375 million. This suggests that the total budgeted procurement cost of LCS-1 — which would also include costs for things such as Navy program-management costs and an allowance for changes — could be in excess of $400 million. The Navy has not publicly provided precise cost overrun figures for LCSs 2 and 4, but the Navy has stated that the cost overrun on LCSs 1 and 2 is somewhere between 50% and 75%, depending on the baseline that is used to measure the overrun. The Navy's proposed plan to cancel LCSs 5 and 6 and use the $520.7 million that Congress appropriated in FY2007 for these two ships to cover cost overruns on LCSs 1, 2, and 4 suggests that the Navy estimates the total cost growth on LCSs 1, 2, and 4 to be at least $260 million, and perhaps something closer to $520 million.[5] A cost overrun of $260 million to $520 million would equate to an overrun of about 34% to about 67% above the $772.6 million total funded cost of LCSs 1, 2, and 4 shown in **Table 1**.

As discussed in the section below on the LCS procurement cost cap, it was reported on May 10, 2007, that the Navy would ask Congress to increase the procurement cost cap for the fifth and sixth LCSs to $460 million each in FY2008 dollars. This figure, if accurate, suggests that follow-on LCSs will cost roughly $460 million each in FY2008 dollars. This figure is roughly 53% higher than the approximate figure of roughly $300 million for follow-on LCSs in the FY2007 budget, as shown in **Table 3**.

Lockheed Perspective And Actions.[6] Lockheed says that cost growth on LCS-1 is due primarily to three factors:

- manufacturing issues that are typically discovered in the construction of a lead ship of a class;
- problems with vendors supplying components and materials for the ship; and
- changes in ship-construction standards directed by the Navy.

A major vendor issue, Lockheed says, were the ship's reduction gears, which link the ship's gas-turbine engines to its waterjets (i.e., its propellers). Due to a faulty tool at the manufacturer (General Electric), the gears were manufactured incorrectly,

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[5] If the Navy had estimated the total cost overrun on LCSs 1 through 4 to be $260 million or less, it presumably would have proposed canceling only one of the LCSs funded in FY2007, rather than both.

[6] This section is based on a Lockheed briefing on the status of the LCS program presented to CRS on February 1, 2007.

causing a 27-week delay in delivery that forced a major resequencing of construction work on LCS-1.

A second vendor issue concerned HSLA-80, a kind of steel used to build the bottom half of the ship's hull.[7] The same kind of steel is in demand for up-armoring U.S. Army and Marine Corps Humvees used in Iraq, leading to delays in obtaining it for the LCS program.

The issue of ship-construction standards involves building the LCS to a standard called Naval Vessel Rules (NVR). Lockheed says it submitted its LCS bid in January 2004, using a combination of the high-speed naval craft (HSNC) rules issued by the American Bureau of Shipping (ABS) and a draft version of the NVR that the Navy had issued. The LCS design in the January 2004 bid, Lockheed says, was the design accepted by the Navy. The final version of the NVR, Lockheed says, was issued by the Navy in May 2004. The final version, Lockheed says, was much more extensive than the draft version. The final version, Lockheed says, impacted 75% of the completed design products for LCS-1, resulted in about 25% additional drawings, and required the ship to include more rugged construction and more capable components in various places.

Lockheed believes that the lead-ship manufacturing issues and the faulty manufacturing of the reduction gears will not recur on follow-on Lockheed-built LCSs, but that the NVR issue will increase the cost of follow-on Lockheed-built LCSs.

Lockheed says it has taken several actions in response to the situation concerning LCS-1, including:

- co-locating Lockheed management and the LCS's naval architects (from the naval architectural firm of Gibbs & Cox) at the shipyard;
- increasing the number of Lockheed personnel at the shipyard through the addition of production managers with Navy shipbuilding experience;
- instituting process improvements at the shipyard;
- establishing new metrics for measuring performance on work packages at the shipyard;
- integrating the American Bureau of Shipping and the on-scene Navy supervisor of shipbuilding (SUPSHIP) into daily production meetings;
- strengthening the earned-value management system (EMVS) and financial-management processes for the program; and
- replacing senior management at the shipyard.

Lockheed reportedly warned the Navy about increasing costs on LCS-1 on multiple occasions since March 2006 — a month after the FY2007 budget was submitted to Congress.

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[7] HSLA means high-strength, low-alloy, and 80 is a measurement of the strength of the steel.

Navy Perspective And Initial Actions.[8] The Navy believes that inadequate shipyard manufacturing performance is the principal cause of cost growth on LCS-1 in recent months, and that this issue goes well beyond typical lead-ship manufacturing issues.

The Navy agrees that the reduction gears and NVR were early causes of cost growth on LCS-1, but argues that Lockheed was given an opportunity in October 2005 to incorporate both factors into a revised cost and schedule baseline for LCS-1. As a consequence, the Navy argues, the cost impact of both factors was already reflected in the budgeted cost of the ship as shown in the FY2007 budget submission submitted to Congress in February 2006. The Navy acknowledges, however, that the cost impact of NVR might be larger than what was recognized in October 2005.

A Navy statement on the January 12, 2007, 90-day stop-work order stated:

> The stop work order was issued because of significant cost increases currently being experienced with the construction of LCS-1 and LCS-3, under construction by Lockheed Martin.
>
> "I determined that at this point in time it was critical to stop work on LCS-3 to assess the LCS program and ensure we understand the program's cost and management processes before we move forward. It is essential that we complete LCS 1 and get it to sea so we can evaluate this new ship design," said Secretary of the Navy Donald Winter.
>
> The Navy is working closely with the contractor to identify the root cause of the costs growth. The Navy is reviewing the overall acquisition strategy for the LCS program and is working closely with the contractors to keep this program on track.
>
> The contract for LCS-3 was awarded June 26, 2006, for $197.6 million, and the ship is being constructed at Bollinger Shipyard, Lockport, La.
>
> "The Littoral Combat Ship program remains of critical importance to our Navy. With its great speed and interchangeable warfighting modules, the ship will provide unprecedented flexibility, allowing us to combat almost any specific threat — from enemy mines to submarines to even pirates. It will help us defend our nation not just in the deep blue, but up close in the coastal regions of the world where our enemies like to hide and where so many of our friends and partners strive to prosper," said Chief of Naval Operations Adm. Mike Mullen.
>
> The Navy is committed to the LCS class ship as it remains the cornerstone of the future fleet by providing critical capability.[9]

On January 23, 2007, it was reported that:

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[8] This section is based in part on a Navy briefing on the status of the LCS program presented to CRS on February 5, 2007.

[9] Navy statement on LCS stop-work order, as posted on *InsideDefense.com*.

> The Navy has launched two separate investigations and Lockheed Martin [LMT] has begun an internal examination into the reasons behind the skyrocketing cost of the company's Littoral Combat Ship (LCS).
>
> Top Navy officials Monday afternoon were briefed on the way ahead for the LCS program, a source said....
>
> According to sources, the Navy is conducting two investigations, one by the LCS program manager and Program Executive Office (PEO) Ships and another by the Program Managers Assistance Group (PMAG), which includes aspects of the Navy's Inspector General's office.
>
> Lockheed Martin is performing a "Root Cause Analysis" on LCS, said company spokesman Craig Quigley. "It's pretty much what it sounds like. [We are] shooting to have that done by late January-early February."
>
> The PMAG is a group of acquisition professionals that will review LCS, a source said. The group was called together to specifically review the program. The PMAG was initiated by Delores Etter, the Navy's top acquisition official, in a letter to Naval Sea Systems Command....
>
> In a briefing attended by top Navy brass and Etter on Jan. 10, Chief of Naval Operations (CNO) Adm. Mike Mullen was first briefed on the magnitude of the problem, according to sources. Navy Secretary Donald Winter was also first briefed the week of Jan. 10.
>
> However, Defense Daily has learned that Etter knew about the cost increases on LCS-1 as early as the beginning of November.
>
> Lockheed Martin has maintained that it has been giving the Navy monthly updates on LCS costs, Quigley said.
>
> "We have been providing PEO Ships [the Program Executive Officer for Shipbuilding — a Navy admiral] monthly cost updates since construction started in early 2005; 12 updates between March and December 2006," he said.[10]

On January 26, 2007, it was reported that:

> The Littoral Combat Ship (LCS) Program Management Assist Group (PMAG) is expected to turn over its initial assessment of the causes of the lead ship's cost overruns and provide preliminary recommendations to Delores Etter, the service's acquisition chief, no later than Feb. 2....
>
> Not only will the PMAG examine why LCS-1 costs increased, but they will also review the projected costs for the first four ships....
>
> The LCS PMAG is made up of representatives from the Office of the Chief of Naval Operations (OPNAV) N86 (surface warfare), Deputy Assistant Secretary

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[10] Geoff Fein, "Navy, Lockheed Martin Begin Exploring LCS Cost Overruns," *Defense Daily*, January 23, 2007. Bracketed material as in the original, except for the final instance, which was added by CRS.

of the Navy (DASN) Ships, Supervisor of Shipbuilding, Conversion, and Repair (SUPSHIP), Naval Sea Systems Command (NAVSEA) 017 (part of the Comptroller Directorate), NAVSEA 02 (part of the Contracting Directorate), and the Office of the General Counsel.

Etter had asked for a Plan Of Action and Milestones (POA&M) to be completed by Jan. 19, and to address:
— What were the initial cost estimates for the first four LCS;
— What were Lockheed Martin's and General Dynamics' bid prices for the ships and how were those assessed during the source selection;
— How did the contractors' and the Navy's cost estimates change;
— What factors led to cost growth;
— How were budgets changed to reflect the updated estimates;
— What Navy oversight was provided; and
— To whom and when were notifications of cost growth provided?

Following the Navy's announcement that there were considerable cost overruns on LCS-1, the service issued a 90-day stop work order on LCS-3. A few days following the stop work order, the Navy initiated two separate investigations and Lockheed Martin began its own internal examination of the cost overruns.

Following the PMAG investigation, Etter asked the panel to provide recommendations that include:
— Policy changes for cost risk management including budgeting for ships;
— Directives for independent cost analysis;
— The need for changes to program management offices, NAVSEA cost estimating, and SUPSHIP offices; and
— The need for changes to contracting and acquisition policy to improve cost visibility and performance expectations.[11]

On January 29, the Navy relieved the LCS program manager from duty and replaced him with another person.[12]

A January 30 news article stated:

U.S. Navy Secretary Donald Winter said he hopes a review of a troubled Lockheed Martin Corp. (LMT) ship program can wrap up in 45 days instead of the three months allowed by a recent stop-work order.

Winter said the Navy wants to minimize collateral damage from its review of the Littoral Combat Ship program by conducting its assessment quickly. Lockheed Martin's design has struggled with big cost overruns on its lead ship, leading the Navy to halt work on a second ship until the problems are diagnosed. But the company has estimated the delay will add $14 million in extra costs.

General Dynamics Corp. (GD), which is building a second LCS design, also will be reviewed, Winter said. The Navy has not yet decided whether it wants to keep both designs or pick one version for mass production.

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[11] Geoff Fein, "Initial Findings And Recommendations of Navy's LCS Investigation Due Next Week," *Defense Daily*, January 26, 2007.

[12] Geoff Fein, "LCS Program Manager Relieved of Duty," *Defense Daily*, January 30, 2007.

> "We need to take a good hard look at that," Winter said in a Wednesday [January 31] interview. "I would say at this point in time all options are on the table."[13]

In March 2007, the Navy followed these reported actions by announcing the proposed plan for restructuring the LCS program that is discussed elsewhere in this report. This was followed by the Navy's announcement on April 12, 2007, also discussed elsewhere in this report, to terminate construction of LCS-3.

February 8, 2007 Oversight Hearing. The February 8, 2007, oversight hearing before the Seapower and Expeditionary Forces subcommittee of the House Armed Services Committee included testimony from Navy and industry witnesses. The Navy testified that it estimates cost growth on LCS-1 at about $100 million, and that the shipyard construction cost of the ship may now cost roughly $350 million to $375 million to build. (The Navy clarified in a subsequent hearing that the figure of $350 million to $375 million was the estimated shipyard construction cost of the ship, and not the total budgeted procurement cost of the ship.)

Among other things, Navy and industry witnesses generally agreed at the hearing that concurrency in design and construction of LCS-1 was a significant contributor to cost growth on the ship, and that this concurrency was due in large part to the ship's compressed construction schedule. The Navy testified that the compressed construction schedule reflected a sense of urgency among senior Navy leaders at the time about getting the first LCS into operation as soon as possible. The concurrency issue concerns the previously discussed matter of NVR.

The witnesses also discussed the reduction gear issue. Among other things, the Navy testified that the 27-week delay in the ship's construction schedule resulting from this issue was revealed by the Lockheed team to the Navy through a series of six disclosures over a period of seven months, and that the first disclosure was for a delay of about two and one-half months.

For additional details, see the **Appendix** for reprinted portions of the Navy and industry prepared statements for the hearing.

Potential Oversight Issues. Potential oversight issues raised by the reported further increase in LCS sea frame unit procurement costs include the following:

- When did various Navy leaders first learn of the cost increase on LCS-1? Why did the Navy wait until January 2007 to publicly reveal the cost increase? Lockheed testified at the February 8, 2007, hearing that it sends monthly reports with LCS cost information to the Navy. In which of these monthly reports did Lockheed first attempt to alert the Navy regarding the potential for significant cost growth on LCS-1?

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[13] Rebecca Christie, "US Navy Secy Sees Quick Review Of Halted Lockheed Ship," *Dow Jones Newswires*, February 1, 2007.

- When will the Navy announce its estimates of cost overruns on LCSs 2 and 4?

- How much of the cost increase on LCSs 1, 2 and 4 attributable to contractor performance? To performance by supplier firms? To Navy actions in managing the program?

- Concurrency in design and construction has long been known as a source of risk in shipbuilding and other weapon-acquisition programs. Eliminating concurrency forms part of DOD's effort to move toward best practices in acquisition. In retrospect, did the Navy make a good decision in letting its sense of urgency about the LCS override the known risks of concurrency in design and construction?

- Is there any concurrency in design and construction of LCS-2, the first General Dynamics ship? If so, how much of an adjustment in the construction schedule for this ships would be needed to eliminate this concurrency? If these adjustments are made, how would it affect the ability to execute in a timely way any additional LCSs that are authorized for FY2008?

- When will the Navy have a sense of whether corrective actions taken by the Navy and industry in response to the cost growth are succeeding in controlling LCS construction costs?

- Do the estimated costs of LCSs 1, 2, and 4 reflect systems, components, or materials provided by vendors at reduced prices as part of an effort by those vendors to secure a role in the 55-ship LCS program? If so, how much more expensive might these systems, components, or materials become on later LCSs? Is this a source of concern regarding the potential for cost growth on follow-on LCSs?

- What implications, if any, might cost growth on LCSs have for the Navy's ability to meet the procurement cost cap legislated for the fifth and sixth LCSs (see discussion below)?

- In light of cost growth LCSs, where does the LCS program now stand in relation to the Nunn-McCurdy provision (10 U.S.C. §2433), which requires certain actions to be taken if the cost a defense acquisition program rises above certain thresholds?

- How might the increase in LCS unit procurement costs affect the number of LCSs that the Navy can afford to procure each year, and the total number it can afford to procure over the long run?

- Does the Navy plan to finance part or all of any cost increase on future LCS sea frames by reducing funding for the procurement of LCS mission packages? If so, how might this reduce the capabilities of the planned 55-ship LCS fleet?

- In light of the cost growth, is the LCS program still cost-effective? For follow-on LCSs, what is the unit procurement cost, in FY2008 dollars, 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' views on the question of approving the start of LCS procurement?

- How might the increase in LCS unit procurement costs affect the affordability and executability of the Navy's overall shipbuilding program?[14]

- What implications, if any, does the increase in LCS unit procurement costs have for estimated procurement costs of other new Navy ship classes?

Acquisition Strategy

Another potential oversight issue for Congress concerns the LCS program's acquisition strategy. Within this issue, one longstanding question has concerned the Navy's intentions regarding which LCS design or designs it would continue to procure over the long run, and who would build these LCSs. The Navy's proposal, as part of its proposed plan for restructuring the LCS program, to conduct a downselect between the two designs in FY2010, and to conduct a full and open competition among bidders for the right to build the selected design, puts this issue into a new light. Among other things, the Navy's proposed plan raises the possibility that firms that designed the winning LCS design might not be among those selected to build it.

A second potential oversight issue for Congress concerning the LCS program's acquisition strategy has been the degree of coordination between procurement of LCS sea frames and development and procurement of LCS mission packages.[15]

Potential oversight questions for Congress include the following:

- How does the Navy intend to conduct the evaluation leading to the downselect of a winning LCS design in FY2010?

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[14] For further discussion of this issue, see CRS Report RL32665, *Navy Force Structure and Shipbuilding Plans: Background and Issues for Congress*, by Ronald O'Rourke.

[15] For examples of articles discussing this issue, see Jefferson Morris, "LCS Delays Shouldn't Slow Fire Scout, Northrop Grumman Says," *Aerospace Daily & Defense Report*, April 4, 2007; Rebecca Christie, "Littoral Combat Ship Delays Haven't Yet Hit Related Weapons," *Dow Jones Newswires*, April 2, 2007; Chris Johnson, "Advanced Deployable System Faces Weight and Manpower Issues," *Inside the Navy*, August 14, 2006; Chris Johnson, "Program Manager Says LCS Mission Module Testing 'On Track'," *Inside the Navy*, August 14, 2006; and Michael Bruno, "With LCS Launching Soon, Navy Still Works On USVs," *Aerospace Daily & Defense Report*," August 25, 2006.

- Who owns the two LCS designs — the two LCS industry teams, or the Navy? Will the Navy need to pay a royalty or licensing fee to the designer of the LCS design that the Navy chooses in the FY2010 downselect? How should the value of that royalty or licensing fee be determined?

- If firms that designed the winning LCS design are not among those selected to build it, what message might that send to industry regarding stability in Navy shipbuilding plans, and the potential benefits of investing industry funds in the design of Navy ships, and in facilities to produce them?

- How does the Navy's proposed restructuring plan affect the relative schedules for procuring LCSs and developing and procuring LCS mission packages?

Total Program Acquisition Cost

Although this CRS report estimates that a 55-ship LCS program might have a total acquisition cost of more than $33 billion, the potential total acquisition cost of the LCS program is uncertain. Supporters could argue that total program acquisition cost will become clearer as the Navy works through the details of the program. Critics could argue that a major acquisition program like the LCS program should not proceed at full pace until its potential total costs are better understood.

Cost Cap on Fifth and Sixth Ships

Navy officials stated to CRS in 2006 that LCSs 5 and 6 would meet the legislated cost cap for those two ships of $220 million per ship because the hands-on construction costs of the ships, when adjusted for inflation, would fall within the $220-million figure.[16] The Navy's explanation suggested that the Navy was interpreting the LCS cost cap as something that applied to the hands-on construction costs of the ships, rather than to end cost — the larger procurement costs of the ships as they appear in the budget, which include costs for other items, such as Navy program-management costs and allowance for changes. The LCS cost cap (Sec. 124 of H.R. 1815/P.L. 109-163) refers to "the total amount obligated or expended for procurement of the fifth and sixth vessels...." The Navy's explanation on this issue at the time raised certain potential oversight questions for Congress.[17]

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[16] Source: Information paper provided to CRS by Navy Office of Legislative Affairs, April 3, 2006.

[17] These questions included the following: Does the Navy's apparent interpretation of the meaning of the LCS cost cap mean that the Navy will interpret cost caps on other Navy shipbuilding programs the same way, so as to exclude budgeted procurement costs other than the actual hands-on construction costs of the ships? Is the Navy's apparent interpretation of the LCS cost cap consistent with how the Navy interpreted past legislated cost caps on ships such as the Seawolf-class submarines and the aircraft carrier CVN-77?

On May 10, 2007, it was reported that the Navy would ask Congress to increase the procurement cost cap for the fifth and sixth LCSs to $460 million each in FY2008 dollars. This $460-million figure reportedly applies to end cost — the total budgeted procurement cost of the ship. The press report stated in part:

> The Navy yesterday acknowledged that it will request raising the congressional cost cap on the fifth and sixth Littoral Combat Ships (LCS), after the price of the seaframe more than doubled, raising the end cost of the vessels to $460 million each, according to a Navy official.
>
> "Due to program cost growth, the Navy sought a change in the cost cap to appropriately reflect the restructured program and projected ship end cost," Delores Etter, the Navy's acquisition chief, told *Defense Daily*....
>
> "The Navy is requesting a $460 million per ship end cost (in FY '08 dollars). This represents a 55 percent increase in seaframe cost. The $460 million would now include other program costs typically considered in end cost," she added....
>
> End cost is composed of basic construction cost, plans, change orders, electronics/government furnished equipment, and other (program management, technical support, certification and test) costs, Etter said.
>
> "This adjustment would reflect updated cost estimates for ship end cost that include: incorporation of lessons learned from lead ship contract execution; a more refined cost estimate of the required changes to the designs; and a higher allowance for program management costs to provide for the additional government oversight that was recommended as a result of the Navy's root cause analysis of the LCS-1 cost growth," she added.
>
> "The current cost cap limits the fifth and sixth ships of the LCS class to $220 million (in FY '05 dollars) for each seaframe, adjusted for specific factors such as inflation, outfitting post-delivery costs, legal adjustments and the insertion of certain types of new technology, Etter said.
>
> "This target was considered by the Navy as the basic construction cost of the seaframe and did not include other program costs typically considered in end cost," she added.
>
> Typically, the Navy uses end cost when discussing the price of ships, such as DDG-1000, CVN-21 and CG(X), Allison Stiller, deputy assistant secretary of the Navy, ships, told *Defense Daily* in a separate interview.
>
> "They are all end cost, so we want to be consistent," she said.
>
> Stiller said using just the construction cost when discussing LCS made it confusing.
>
> But why didn't the Navy [originally] stick to using the end cost as it does with other ships? Etter said it was because the target cost of the seaframe did not include other program costs.
>
> "At the commencement of the program, the Navy established a cost benchmark of $220 million (in FY '05 dollars) per ship for basic construction cost. The Navy aggressively applied this target to make

> cost-as-independent-variable trade-offs to develop a program that could produce two seaframe variants to meet [affordability] requirements. This target was considered by the Navy as the basic construction cost (BCC) of the seaframe and did not include other program costs typically considered in end cost," Etter said. "The Navy recently updated the total program cost estimates based on an independent cost estimate, available return cost data, and a more detailed assessment of program costs."[18]

The report that the Navy would ask Congress to increase the procurement cost cap for the fifth and sixth LCSs to $460 million each in FY2008 dollars, if accurate, would raise potential questions for Congress, including the following:

- Given the Navy's termination of LCS-3 and its proposal to cancel the two LCSs funded in FY2007, which LCSs should now be considered the fifth and sixth ships?
- Should the cost cap be amended so that it applies not to (or not *only* to) the fifth and sixth LCSs, but to one or more other ships in the program?
- Is $460 million per ship in FY2008 dollars a reasonable figure to use for the cost cap?

Mission Packages Funded in OPN Account

As mentioned in the Background section, the Navy plans to procure LCS mission packages through the Other Procurement, Navy (OPN) appropriation account rather than the Navy's ship-procurement account. The OPN account, as its name suggests, is a large, "grab-bag" appropriation account for procuring a wide variety of items, many of them miscellaneous in nature.

Supporters of the Navy's plan can argue that it is consistent with the traditional practice of procuring ship weapons (e.g., missiles and gun shells) through the Weapon Procurement, Navy (WPN) appropriation account or the Procurement of Ammunition, Navy and Marine Corps (PANMC) appropriation account rather than the ship-procurement account. LCS mission packages, they could argue, are the payload of the LCS, just as missiles and gun shells are the payload of other types of surface combatants, and should therefore be funded outside the ship-procurement account.

Those skeptical of the Navy's plan to fund LCS mission packages through the OPN account could argue that the LCS mission packages are not comparable to missiles and gun shells. Missiles and gun shells, they could argue, are expendable items that are procured for use by various classes of ships while the LCS mission packages will incorporate sensors as well as weapons, are not intended to be expendable in the way that missiles and gun shells are, and are to be used largely, if not exclusively, by LCSs, making them intrinsic to the LCS program. In light of this,

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[18] Geoff Fein, "Navy Seeks New LCS Cost Cap of $460 Million Each For Ships Five And Six," *Defense Daily*, May 10, 2007.

they could argue, it would be more consistent to fund LCS mission packages in the ship-procurement account rather than the OPN account.

Potential oversight questions for Congress include the following:

- Are LCS mission packages analogous to missiles and gun shells that are procured through the WPN and PANMC appropriation accounts?
- Does the Navy's plan to fund the LCS mission packages through this account effectively obscure a significant portion of the total LCS program acquisition cost by placing them in a part of the Navy's budget where they might be less visible to Congress? If so, was this the Navy's intention?
- Does funding a significant portion of the LCS program's total procurement cost through the OPN account give the LCS program an unfair advantage in the competition for limited ship-procurement funding by making the LCS program, as it appears in the ship-procurement account, look less expensive? If so, was this the Navy's intention?

Options for Congress

Options Regarding Restructuring and LCS-3 Termination

A primary issue for Congress at this point is whether to approve, reject, or modify the Navy's proposed restructuring plan, and what additional actions, if any, should be taken in response to the Navy's decision to terminate construction of LCS-3. Potential options for Congress include but are not limited to the following:

- cancel LCSs 3 through 6, procure no more LCSs until FY2010, and use LCSs 1 and 2 to support the FY2010 downselect evaluation;
- direct the Navy to restore LCS-3 and perhaps use a fixed-price incentive (FPI)-type contract for LCS-3 but not LCS-1;
- mandate that the contract or contracts for building LCSs 2 and 4 be of the same type or types as the contract or contracts used for building LCSs 1 and 3;
- direct the Navy to use unexpended LCS-3 funds to cover a portion of the cost overruns on LCSs 1, 2, and 4, and direct the Navy to restore either LCS 5 or 6;
- retain LCSs 5 and 6 and fund cost overruns on earlier LCSs through other means;
- procure three LCSs in FY2008, as originally proposed;

- procure two additional LCSs in FY2008 (for a total of four or five), provided that the Navy and industry show clear progress in resolving LCS cost overrun issues; and

- establish terms and conditions for the LCS downselect and competition.

Supporters of the **first option** could argue that only two LCSs — one built to each design — are needed to support a downselect evaluation, and that building a total of nine LCSs before the downselect, as the Navy is now proposing under its restructuring plan (LCSs 1 through 4, plus two more ships in FY2008 and three more in FY2009) will lead to the production of four or five LCSs that are built to the losing design. These four or five ships, supporters of this option could argue, would become "orphans" in the fleet, with their own unique logistics costs — a development that would run counter to the Navy's current strategy of trying to reduce fleet operation and support costs by reducing the number of ship and aircraft types that it operates.

Opponents of the first option could argue that the Navy urgently needs LCSs to enter service with the fleet as soon as possible to perform the missions for which it is intended, and that continuing LCS production between now and FY2010 will permit industry to attain the planned steady production rate of six ships per year more quickly than would be possible if LCS production were halted and then restarted in FY2010. The four or five LCSs built to the losing design, opponents of this option could argue, could either be modified over time to make them more like the Navy's other LCSs in terms of their logistical needs, or sold to foreign buyers.

The **second option** is a potential option for responding specifically to the Navy's decision to terminate construction of LCS-3. Supporters of the this option could argue that it would be inappropriate to use an FPI-type contract to build a lead ship — particularly when, as in the case of LCS-1, the design of that ship has not yet been finalized — because it would shift too much risk to the shipbuilder. An FPI-type contract, they could argue, is potentially appropriate only for building ships whose designs have been finalized. They could argue that, although LCS-1 is mostly complete, much of the risk in a shipbuilding effort comes in the final stages of construction, and that the amount of risk left on LCS-1 is consequently greater than the current completion status of LCS-1 might suggest. If LCS-1 is shifted to an FPI-type arrangement, they could argue, the shipbuilder might seek to cover that risk by demanding a price that could be higher than the one that would result from a continuation of the current cost-plus contracting arrangement. Conversely, supporters of this option could argue that if most of the risk on LCS-1 has been retired, as the Navy argues, then the Navy should be comfortable retaining that risk, and stands to gain little by shifting it to the shipbuilder. Supporters of this option could argue that although LCS-1 and LCS-3 are covered by a single contract, they can be treated differently (with LCS-1 under a cost-plus arrangement, and LCS-3 under an FPI-type arrangement) because the two ships are treated as separate contract line items in the contract. Supporters of this option could argue that since LCS-1 was funded through the Navy's research and development account, using an FPI-type contract for LCS-1 could set a precedent for using fixed-price contracts for future Navy or DOD research and development projects, which might not be a desired precedent, at least from an industry standpoint.

Opponents of the second option (i.e., those who support shifting LCS-1 as well as LCS-3 to an FPI-type contract) could argue that since a single contract covers both LCS-1 and LCS-3, the simplest approach would be to modify the contract to use an FPI-arrangement for both ships. They could argue that since LCS-1 is now mostly complete, the shipbuilder would not face an inordinate amount of risk if the contract terms for that ship, as well as for LCS-3, were shifted to an FPI-type arrangement. The shipbuilder's risk, they could argue, would also not be inordinate because the Navy is proposing to use an FPI-type contract, as opposed to a firm-fixed price contract.

Supporters of the **third option** could argue that the Navy should treat both industry teams equally, particularly in light of the Navy's planned downselect in FY2010. Opponents of the third option could argue that continuing to build LCSs 1 and 3 under the current cost-plus type contract is an invitation to further cost growth on those ships, and that the time and effort needed to convert the contract for building LCSs 2 and 4 into an FPI-type contract is not justified unless LCSs 2 and 4 show cost growth comparable to that experienced on LCSs 1 and 3.

The **fourth** option is an additional potential options for responding specifically to the Navy's decision to terminate construction of LCS-3.

Supporters of the **fifth option** could argue that if the Navy urgently needs LCSs to enter service with the fleet as soon as possible, construction of LCSs 5 and 6 should move forward as soon as possible, and the Navy should be willing to identify offsets to other parts of its budget to fund cost overruns on LCSs 1 through 4. Opponents of the fourth option could argue that delays in completing LCSs 1 through 4 might make it difficult to build LCSs 5 and 6 as FY2007-funded ships, and that funding cost overruns on LCSs 1 through 4 through offsets to other parts of the Navy's budget would disrupt other Navy programs, creating execution problems in those programs in addition to those now being addressed in the LCS program.

Supporters of the **sixth option** could argue that the Navy urgently needs LCSs to enter service with the fleet as soon as possible, and that the Navy's plan to cancel the two FY2007-funded ships and use that funding to cover cost overruns on LCSs 1 through 4 means that, in financial terms, the program is ready to support the procurement of three ships in FY2008, as originally proposed in the Navy's FY2008 budget. Opponents of the fifth option could argue that funding two ships in FY2008 is enough to support industry's ability to increase the production rate to six ships per year by FY2010, and that there are now better potential uses for the funding that would have been used to procure a third ship in FY2008.

Supporters of the **seventh option** could argue that it would provide the Navy and industry with a strong incentive to take effective near-term steps to control cost growth on the LCS program. Opponents of the sixth option could argue that although giving the Navy and industry such an incentive is laudable, the funding that would be needed to procure two additional LCSs in FY2008 could also be used for other

purposes, such as, for example, helping to finance the procurement an additional Lewis and Clark (TAKE-1) cargo ship in FY2008.[19]

Supporters of the **eighth option** could argue that the Navy has not sufficiently defined the terms and conditions of the LCS downselect and the subsequent competition for the right to build the selected design. Opponents of the seventh option could argue that since the downselect and competition would not occur right away, the Navy should be given a chance to provide more details about how it would conduct the downselect and competition.

Potential Additional (and More General) Options

Potential additional (and more general) options for Congress on the LCS program, some of which could be combined, include the following:

- amend the existing cost cap for the fifth and sixth LCSs to reflect updated estimates on their potential procurement costs;
- establish additional cost caps for other ships in the program;
- establish additional or stricter reporting requirements for the program, including, for example, a requirement to report an estimated total program acquisition cost, including costs for LCS mission packages;
- require future LCSs to be built with fixed price-type contracts; and
- terminate the LCS program and invest more in other programs for performing the LCSs stated missions.

FY2008 Legislative Activity

FY2008 Defense Authorization Bill (H.R. 1585/S. 1547)

House. The House Armed Services Committee, in its report (H.Rept. 110-146 of May 11, 2007) on the FY2008 defense authorization bill (H.R. 1585):

- recommends $710.5 million in the Shipbuilding and Conversion, Navy (SCN) account for the procurement of two LCSs — a $200-million reduction from the Navy's FY2008 request of $910.5 million, which was originally requested by the Navy to fund the procurement of three LCSs and later amended by the Navy to fund the procurement of two LCSs;
- directs the Secretary of the Navy to submit a report on several aspects of the LCS program; and

[19] Procuring two additional TAKE-1s in FY2008, at a cost of $600 million each, is the second item on the Navy's FY2008 unfunded programs list.

- recommends $20.3 million in the Other Procurement, Navy (OPN) account for the procurement of LCS mission modules — a $60-million reduction from the Navy's original FY2008 request.

The committee's report states:

The committee notes with concern the significant cost growth experienced within the LCS program, which has recently led to a termination of a contract option to construct the third ship of the class. In testimony before the Subcommittee on Seapower and Expeditionary Forces on February 8, 2007, Navy and industry witnesses agreed that the original ship construction schedule for the lead ship was overly aggressive and that Navy and industry program managers sought to maintain schedule performance, rather than cost performance, to the detriment of cost-effective construction. The witnesses also agreed that additional major cost drivers on the lead ship were caused by the inclusion of the new naval vessel rules into the design of the ship without a pause in the construction schedule. Additionally, a necessary component for the propulsion system arrived late to the construction yard changing the most efficient construction sequence for the vessel.

The committee commends the Secretary of the Navy for taking action to identify the issues discussed above; however the committee remains concerned that recent Navy decisions to terminate the option for the third ship may eliminate the benefit of a competitive environment for this program.

The proposed 55 ship class represents a significant portion of the Chief of Naval Operations plan for a 313 ship Navy. If the Secretary cannot maintain affordability in this vital program, the 313 ship fleet cannot be realized. The committee believes it is imperative that the Navy pursue all reasonable means to control costs in the LCS program. The committee believes that a key component of cost control is competition. The committee strongly encourages the Navy to avoid defaulting to a single design acquisition strategy for fiscal years 2008 and 2009 and expects the Navy to take all reasonable steps necessary to ensure continued competition between the two LCS designs.

The committee is convinced that the capability that this vessel will bring to the Navy is of the utmost urgency for responding to asymmetric threats. The committee understands that in order to cover the cost increases of the first three ships, the Secretary intends to submit to Congress an above threshold reprogramming requesting for the appropriations for the two ships authorized in fiscal year 2007. Further, the Secretary has communicated a request that the committee only authorize two of the three ships submitted in the budget for fiscal year 2008.

The committee recommends $710.5 million, a decrease of $200.0 million from the budget request, for the construction of two ships in fiscal year 2008.

The committee directs the Secretary of the Navy to submit a report to the congressional defense committees by August 1, 2007, on the analysis of the root causes of the LCS cost overruns; the methods and procedures put in place throughout the various Program Executive Offices ensuring these mistakes are not repeated in other programs; the structure of the Navy's current contractual agreements with both LCS prime contractors along with justification for differences between the two, if any; an explanation of the Navy's plan for testing

of the two different ship variants; and an analysis of alternatives for future procurement and deployment of the LCS. (Pages 78-79)

The House-reported version of H.R. 1585 contains a provision (Section 127) that would require that construction of a first ship in a shipbuilding program not start until the Secretary of the Navy has certified that the detailed design of the ship is completed and approved by the relevant design certification agents, to a level determined by the Secretary to be acceptable for commencement of construction. The provision states:

SEC. 127. LIMITATION ON CONCURRENT DESIGN AND CONSTRUCTION ON FIRST SHIP OF A SHIPBUILDING PROGRAM.

(a) In General- For any shipbuilding program that is a major defense acquisition program under section 2430 of title 10, United States Code, the start of construction of a first ship (as defined in subsection (b)) may not occur until the Secretary of the Navy certifies to the congressional defense committees that the detailed design of the ship is completed and approved by the relevant design certification agents, to a level determined by the Secretary to be acceptable for commencement of construction, via a report described in subsection (d).

(b) First Ship- For purposes of subsection (a), a ship is a first ship if —

(1) the ship is the first ship to be constructed under that shipbuilding program;

(2) the shipyard at which the ship is to be constructed has not previously started construction on a ship under that shipbuilding program; or

(3) the ship is the first ship to be constructed following a major design change, characterized as a change in flight, under that shipbuilding program.

(c) Start of Construction- For purposes of subsection (a), start of construction means the beginning of fabrication of the hull and superstructure of the ship.

(d) Report- The Secretary of the Navy shall provide the certification required by subsection (a) in a report that provides an assessment of each of the following:

(1) The degree of completion of the detailed design drawings and specifications for the ship.

(2) The readiness of the shipyard facilities and workforce to begin construction.

(3) The maturity level of research and development efforts of any new technologies that will be used in the ship's command and control systems, weapons systems, sensor systems, mechanical or electrical systems, or hull.

(4) The ability to meet cost and schedule estimates within the applicable program baseline.

(e) Applicability-

(1) NEW SHIPBUILDING PROGRAMS- This section applies to each shipbuilding program beginning after the date of the enactment of this Act.

(2) MAJOR DESIGN CHANGES FOR EXISTING SHIPBUILDING PROGRAMS- In addition, subsection (b)(3) applies to any major design change occurring after the date of the enactment of this Act to any shipbuilding program in existence as of the date of the enactment of this Act.

The House-reported version of H.R. 1585 also contains a provision (Section 822) requiring federal agencies that award more than $1 billion in contracts per year to develop and implement plans to maximize the use of fixed-price contracts. The section states:

SEC. 822. MAXIMIZING FIXED-PRICE PROCUREMENT CONTRACTS.

(a) Plans Required- Subject to subsection (c), the head of each executive agency covered by title III of the Federal Property and Administrative Services Act of 1949 (41 U.S.C. 251 et seq.) or, in the case of the Department of Defense, the Under Secretary of Defense for Acquisition, Technology, and Logistics, shall develop and implement a plan to maximize, to the fullest extent practicable, the use of fixed-price type contracts for the procurement of goods and services by the agency or department concerned. The plan shall contain measurable goals and shall be completed and submitted to the Committee on Oversight and Government Reform of the House of Representatives, the Committee on Homeland Security and Governmental Affairs of the Senate, and the Committees on Appropriations of the House of Representatives and the Senate and, in the case of the Department of Defense and the Department of Energy, the Committees on Armed Services of the Senate and the House of Representatives, with a copy provided to the Comptroller General, not later than 1 year after the date of the enactment of this Act.

(b) Comptroller General Review- The Comptroller General shall review the plans provided under subsection (a) and submit a report to Congress on the plans not later than 18 months after the date of the enactment of this Act.

(c) Requirement Limited to Certain Agencies- The requirement of subsection (a) shall apply only to those agencies that awarded contracts in a total amount of at least $1,000,000,000 in the fiscal year preceding the fiscal year in which the report is submitted.

Senate. The Senate Armed Services Committee, in its report (S.Rept. 110-77 of June 5, 2007) on the FY2008 defense authorization bill (S. 1547):

- recommends $480 million in the Shipbuilding and Conversion, Navy (SCN) account for the procurement of one LCS — a reduction of $430.5-million and one ship from the Navy's amended FY2008 request of $910.5 million for two LCSs;

- directs the Secretary of Defense to submit a report on the acquisition strategy for the LCS program; and

- recommends $15.3 million in the Other Procurement, Navy (OPN) account for the procurement of LCS mission modules — a $65 million reduction from the Navy's original FY2008 request.

With regard to SCN funding for the program and the report to be done by the Secretary of Defense on the program's acquisition strategy, the committee's report states:

> The first ship (LCS-1) was scheduled to deliver in late 2006. The Navy is now estimating that the first ship will deliver sometime in the middle of 2008. The LCS-1 contractor team had barely started on their second ship (LCS-3) when the program ran into major cost problems earlier this year. The Navy then issued a stop work order on LCS-3 in order to reduce expenditures and limit further cost exposure on the program while it separately re-evaluated program cost estimates.
>
> The Navy entered into negotiations with the LCS-1 team to sign up to a fixed price contract on the two ships or face outright cancellation on the second ship. These negotiations occurred during this past spring. When the stop work order was nearly ready to expire, the Navy announced that it and the LCS-1 contractor team were unable to reach an agreement and that the Navy was terminating the contract for LCS-3 for the convenience of the Government. It is too early to precisely estimate the termination costs, but the Navy has reported that significant funds for LCS-3 are on hold pending completion of the termination negotiations.
>
> The second contractor team has a contract to build two LCS vessels of another design (LCS-2 and LCS-4). The Navy awarded this contract later, so LCS-2 is roughly 1 year behind the LCS-1. Unfortunately, it appears that this team is experiencing similar cost problems. The Navy has not issued the same ultimatum to this contractor team, but has claimed that the Navy will do so if the cost of LCS-2 continues to grow toward the Navy's estimate. Meanwhile, the Navy is proceeding with the start of construction on LCS-4, although it is not clear that the root causes for early cost growth on LCS-2 have been addressed.
>
> The committee is disappointed that the cost of the lead ship has more than doubled and the delivery schedule has slipped several times.
>
> The committee commends the Secretary of the Navy for exercising oversight and for trying to bring cost and schedule discipline to this troubled program. The committee is also interested in supporting the Secretary's efforts to improve the Navy's acquisition process. 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.
>
> The Navy has said that the capability that this vessel will bring to the fleet is of the utmost urgency for responding to asymmetric threats. The committee believes that if the Navy really believed that the threat were that urgent, it might have taken more near-term steps to address it. For example, the Navy might not have cancelled the remote minehunting system (RMS) capability on a number of the DDG-51 class destroyers, ships that will be available to the combatant commanders much sooner than LCS. The Navy might also have taken this modular capability slated for the LCS and packaged those modules to deploy

sooner on ships of opportunity. Rather, the Navy is waiting on a shipbuilding program to deliver that capability (in a useful quantity) at some future date.

The Navy now proposes to use the funds requested in fiscal year 2008 to award contracts for two LCS vessels, rather than the three originally envisioned. Given the uncertainty about what is happening with the earlier ships in the program and uncertainties about the options for an acquisition strategy that will remain available to the Navy next year, the Navy does not intend to award these two contracts until late in fiscal year 2008.

In summary:

(1) a high degree of cost uncertainty will continue to overshadow the LCS program until the two lead ships execute test and trials, starting late in 2007.

(2) the Navy's current estimate is that the approximately $1.6 billion appropriated for the first six ships will be required to complete the three ships currently under contract, with significant additional funding being held for termination of a fourth ship.

(3) if the Navy's estimates are correct, or low, then the Navy will be engaging in fixed price negotiations with the second prime contractor for LCS-2 and LCS-4 late in 2007, with the distinct possibility that LCS-4 would be terminated.

(4) if the Navy's estimates are high, then sufficient funding from within previous appropriations should be available for a newly procured LCS.

(5) the Navy has yet to formulate its acquisition strategy for the LCS program, however, the challenges inherent to fair competition between two dissimilar ship designs have become LCS-3 (or potential termination of LCS-4).

(6) the Navy has announced a delay for conducting a program downselect decision until 2010, at which time it also plans to revise the LCS combat system, which raises concerns regarding the infrastructure and life cycle support costs for the three or four ships of the LCS variant not selected for "full rate production."

(7) program delays have pushed the next notional contract award until late in fiscal year 2008.

(8) termination negotiations for LCS-3 will likely be proceeding at the same time the prime contractor is being solicited for a proposal to build another LCS ship, in which case the material procured for LCS-3 would likely revert back to the contractor for this new procurement. The net effect is that the current LCS-3 obligations that are fenced for termination costs would sufficiently cover the contractor's fiscal year 2008 obligations for a newly procured LCS.

The committee recommends $480.0 million for LCS in fiscal year 2008, a decrease of $430.5 million. We cannot relive the early days of the LCS program and remember "lessons learned," but we have the opportunity to take positive steps now to right the program. Before awarding contracts for additional ships in the LCS program, we need to maintain focus on delivering the most capability possible for the $1.6 billion invested thus far for six ships. This would require that we impose accountability for the quality of program estimates; halt further changes to program requirements; and ensure that the contracts provide effective incentives for cost performance.

The Secretary of the Navy has advised the committee that the Navy's estimates appear to be quite conservative based on contractor performance over the past quarter, as measured against recently revised baselines. Although further risk is acknowledged, the Navy has expressed confidence that the program will be able to improve on the Navy's worst case estimates and avoid further termination action. If the Navy and industry are successful in managing costs

going forward, this should allow four ships to be delivered within previously appropriated funds.

The committee notes that the LCS-1 contractor was awarded a lead ship contract that targeted a significantly lower price and a significantly more aggressive schedule for starting construction. The risks inherent in this aggressive schedule were exacerbated by changes to Navy requirements. These factors may have contributed to the decision to terminate LCS-3 — an outcome referred to as "winner-loses." The resultant imbalance between the two competing shipbuilders jeopardizes the Navy's ultimate goal for a competitive downselect in 2010, followed by full and open competition for the winning LCS variant.

Therefore, the committee directs that funds authorized for a fiscal year 2008 LCS ship may only be used when combined with LCS SCN funds appropriated in prior years, to solicit, on a competitive basis, bids for two fixed price LCS ship construction contracts, one for each of the two competing LCS variants. The Secretary of the Navy may waive this requirement only if: he determines that there is only one acceptable LCS variant, based on completion of acceptance trials on the two LCS variants; and he notifies the congressional defense committees 30 days before releasing a solicitation based on that waiver determination.

The committee believes that the history of the LCS acquisition strategy has been one of documenting decisions, rather than guiding and informing decisions. Therefore, the Secretary of Defense is directed to submit a report on the approved acquisition strategy for the LCS program at least 90 days prior to issuing any solicitation or requests for proposal, but no later than December 1, 2008. (Pages 97-100)

With regard to OPN funding for the program, the committee's report states:

As described elsewhere in this report, the LCS program has run into serious problems. The committee sees no particular reason to acquire mission modules at the pace planned by the Navy, since there have been significant delays in the ship program. The committee recommends a decrease of $65.0 million for LCS modules. (Page 100)

Appendix. Testimony From February 8, 2007, Oversight Hearing

Reprinted below are portions of the prepared statements of Navy and industry witnesses at the February 8, 2007, oversight hearing on the LCS program before the Seapower and Expeditionary Forces subcommittee of the House Armed Services Committee.

Excerpts From Navy Prepared Statement[20]

> The LCS acquisition strategy calls for a rapid 24-month build cycle for each seaframe, as opposed to the five or more years that have become the norm in naval shipbuilding. In addition to speeding the delivery of operational capability to the Fleet, the accelerated build timeline is designed to create cost benefits. By defining the build cycle constraint as a foundation of the program, this informed industry design and system selections to reduce risky and time consuming technology development. Only developmental systems that were absolutely required to meet performance requirements have been included in the LCS designs. Beyond system selections, the two-year build cycle also increases technology stability, reducing the risk of technology obsolescence that can occur between final design and procurement and construction. Finally, this shorter construction window should result in a direct reduction in program overhead costs. A certain portion of fixed overhead costs from lower tier vendors up through the industry and government program offices are minimized by simply shortening the construction period.
>
> This shortened cycle, however, presents challenges and can exacerbate performance issues. Unexpected vendor issues or design changes are more difficult to accommodate. The most unpredictable, but often the most significant, source of schedule and cost pressure stems from the unique conditions and events that occur in and around an acquisition program, such as concurrent design and production, start-up construction experience with a first time design, and the impact of unforeseeable external events.
>
> In addition to the aggressive 24-month build cycle, the LM [Lockheed martin] lead ship detail design and construction effort was initiated simultaneously and the lead ship commenced construction only seven months after the start of final design....
>
> [B]ased on execution history and early reviews, several major contributing factors to the cost growth are evident. The Navy wishes to stress that these are preliminary findings only. The path ahead for root cause analysis and resulting courses of actions is discussed later.
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> The Navy identified cost drivers for LCS 1 as concurrent design-and-build while incorporating Naval Vessel Rules (NVR), reduction gear delays created by a manufacturing error, and, insufficient program oversight. More recent drivers

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[20] Statement of the Honorable Dr. Delores M. Etter et al., Before the Subcommittee on Seapower and Expeditionary Forces of the House Armed Services Committee on Acquisition Oversight of the U.S. Navy's Littoral Combat Ship Program, February 8, 2007.

identified by LM include design volatility/concurrency; design complexity; shipyard productivity and process cost. These recent drivers will be more fully assessed by the ongoing program review....

Both [industry] teams have expressed difficulty in incorporating NVR, and LM and Marinette Marine have identified it as a major root cause of the cost overruns. The NVR was first published after Final System Design (FSD) proposals were submitted to the Navy, but both LCS teams were aware of the NVR development process, interacted with ABS [American Bureau of Shipping] to ensure insight into interim criteria, and had that information to influence and cost their respective design proposals to meet the RFP requirements. The Request for Proposal clearly stated that LCS should be designed and built in accordance with ABS Guide for Building and Classing Naval Vessels. It was so important enough to the government, that "Ability to Produce a Classed/Certificable Design" was one of four Technical Evaluation factors for the Final System Design/Detail Design and Construction competition. The NVR guide was published one week prior to FSD contract award to each team. LM had approximately 9 months to incorporate NVR into its FSD before fabrication began in February 2005. GD [General Dynamics] had approximately 18 months to incorporate NVR before fabrication started.

The Navy does not deny that NVR has been a contributor to cost. The impact of NVR was first considered early in 2005. The Navy worked with the LM team to identify those impacts and negotiate adjustments to the LCS 1 contract, which has provisions for the incorporation and classing of LCS to NVR. In order to accommodate these impacts, the program completed an over-target baseline in October 2005 and increased the budget for LCS 1 in the President's FY 2007 Budget in February 2006....

The LCS first-of-class ships have also experienced some delays in delivery of critical components. The most significant of these resulted from a series of errors and failures in the manufacturing of a main reduction gear that delayed its delivery by eighteen weeks and created a total impact of twenty-seven weeks. The total delay of the manufacturing errors was not immediately recognized, with notifications of additional delays occurring over several months. Due to its size and location in the ship, typical build sequences place the reduction gears into the ship early and the remainder of the ship is built around it. As a result of this error, construction was resequenced multiple times in attempts to mitigate schedule impact but the net result was significant to both schedule and cost performance on the contract.

Another contributing factor has been the unprecedented spike in basic prices of critical shipbuilding commodities. For example, over the past three years steel prices have increased in excess of 125%, and copper has increased by more than 300%. These dramatic increases have direct and significant impacts on LCS seaframe end costs. The primary mitigation method within program control is to maximize the stability of the acquisition such that the industry teams can enter long-term agreements with suppliers and minimize variability in their material costs....

As a result of the early cost growth due primarily to the incorporation of NVR and the reduction gear manufacturing error, the Navy and LM conducted a joint assessment of schedule impact and re-plan options, including an assessment of the Estimate-at-Completion (EAC) costs. Schedule was also assessed. In

October 2005, the Navy approved what is termed an "over-target baseline" essentially resetting the baseline against which cost and schedule performance is measured. Delivery of LCS-1 was also shifted from December 2006 to June 2007. Subsequently the Navy prepared a budget issue and increased the LCS-1 budget in Fiscal Year 2007 based on the revised over-target baseline.

Cost growth has continued on the LCS-1 contract since this over-target baseline. LM has identified to the Navy that these cost increases include the impact of design volatility/concurrency; design complexity; shipyard productivity and process cost. These recent drivers will be more fully assessed by the ongoing program review....

During the 90-day stop work period, the Navy will complete an Industry / Government Root Cause analysis; evaluate contractual terms / conditions for proceeding forward on LCS 3; assess LM management team's ability to deliver LCS 1 and LCS 3; revalidate earned value management system at Marinette Marine, Gibbs & Cox, and LM; re-baseline cost and schedule; revalidate contract performance status, and cost control processes in place; conduct an independent Program Management Assist Group (PMAG) and take corrective actions. The Navy will then perform a similar assessment for LCS 2 and LCS 4. Based on the findings and recommendations the Navy will develop a proposed financing plan regarding the cost growth. The Navy expects these initial actions to be complete within the first 30-45 days following the LCS-3 stop work.

The Navy is also determining how much of the lead-ship cost increase will carry over to follow ships, assessing company actions to regain cost control, and evaluating changes to improve Navy program management and oversight. The Navy will also develop an acquisition strategy for LCS 5 and follow which factors in the results of the LCS assessments and chosen course of action. This acquisition strategy assessment is expected to be complete within 90 days.

Excerpts From Industry Prepared Statement[21]

[The Lockheed Martin (LM) team] has experienced cost and schedule growth on LCS 1 due to:

— The initial program's aggressive acquisition plan, which resulted in a moderate risk program plan that provided little flexibility in the areas of cost and schedule from the outset.

— With little schedule flexibility from the outset, the program was significantly impacted by the insertion of new shipbuilding standards and build specifications (shortly after contract award and at the conclusion of Final Design) that introduced extensive changes, above those expected for a lead ship. The Naval Vessel Rules introduced over 14,000 new technical requirements which required review and adjudication to determine applicability to the Lockheed Martin LCS design. This in turn drove many of the over 600 engineering changes on the lead ship.

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[21] Statement of Fred P. Moosally, President, Lockheed Martin MS2, Kevin Moak, Chairman & President, Gibbs & Cox, Richard McCreary, Vice President & General Manager, Marinette Marine Corporation, Mike Ellis, Executive Vice President & Chief Operating Officer, Bollinger Shipyards, Inc., Before The House Armed Services Committee Subcommittee on Seapower and Expeditionary Forces, February 8, 2007. Emphasis as in the original.

— Adverse material shortages (e.g., steel needed for U. S. Army wartime requirements) and a vendor supply issue on a major component (i.e., main reduction gears delivered six months late) that forced out-of-sequence ship module construction in order to minimize the impact to the overriding program management goal — schedule.
— First-of-Class issues associated with the process of transitioning a new ship design into production.

Collectively, these challenges forced significant program inefficiencies through out-of-sequence construction, excessive unplanned concurrency between design and production, and significant rework, all of which are still impacting the LCS 1 cost and schedule.

The Team has conducted lessons learned assessments and implemented corrective actions throughout the LCS 1 design and construction program. We recently conducted a detailed root cause analysis and developed additional corrective actions, all of which are being implemented into the LCS 3 program plan to ensure we do not experience the same challenges on that ship....

Final Design and Detailed Design & Construction was awarded to the LM team on 29 May 2004. A U.S. Navy/LM Team kickoff meeting was held on 3 June 2004. At kickoff the team was informed that the requirements baseline had changed substantially. A new version of the NVR, dated 21 May 2004, was to be invoked as well as an extensive list of modifications to the Specified Performance Document. The new NVR included over 14,000 new technical requirements and 23 previously unreleased major sections which required review and adjudication to determine applicability to the Lockheed Martin LCS design. This in turn drove many of the over 600 engineering changes on the lead ship. This substantial change to the requirements baseline (driven by the new NVR) caused the team to revisit much of the design accomplished during the Preliminary Design Phase and invalidated the progress made possible with team investment during the early start of Final Design. The LM team pre-contract schedule progress funded with corporate investment was negated by these NVR-driven design changes.

On 12 June 2004 the team conducted a second PDR (six months after the original PDR) to reset the requirements baseline. Although PDR was considered successful by the Navy/Industry Team, many of the completed preliminary design and final design products had to be reworked. To maintain schedule the team began Final Design in parallel with this Preliminary Design rework to meet a December 2004 Final Critical Design Review milestone. During this period the team updated the material Purchase Technical Specifications and began to renegotiate our fixed price contracts with suppliers. Development of the Build Specification began in this early phase, to document and reflect the design as it was evolving. The resulting concurrency in design and construction negatively impacted the team's ability to clearly assess, depict or predict the overall schedule impact due to the cumulative impact of all the changes.

Throughout the process of incorporating the Naval Vessel Rules and the build specification updates, the ship's cost, weight and performance were closely monitored. As cost broached the $220M target, the LM Team continuously offered solutions and reductions to the Navy for consideration. The same was true for the increased weight driven by changes that added capability, redundancy and/or survivability improvements, but impacted performance. The Team formed a "weight management" group with the NAVSEA technical staff where all

impacts were assessed and all options to remove weight, implement material changes, and use alternative commercial practices were offered through an ongoing review process. The same structure was established for cost increases as both LM and the U.S. Navy engaged in an iterative process to examine options to remove as much as $60M across a period of 18 months. Some of these recommendations were accepted, but many were deemed unacceptable since they could infringe on the performance factors still considered as top priorities. Throughout the churn of the process, clear offers were presented by the LM Team to balance both cost and weight. While the LM Team established an expedited process for generating and qualifying cost/weight reduction ideas, the Navy's process for considering and approving these options was not similarly streamlined.

In January 2005 the team conducted a successful Production Readiness Review and construction started in February 2005. At this point the team was executing Final Design and Detailed Design & Construction in parallel to maintain schedule. The team experienced two substantial supplier production issues early in construction. The design called for HSLA-80 steel for the shell plate below the waterline for its high strength, light weight and fracture toughness. This steel alloy is unique to military applications and is available from only one domestic supplier. The team was informed by the mill that a higher priority Army program would delay our material for several months. After an exhaustive search for alternate supplies the team decided to redesign the effected hull modules to use alternate steel alloys to maintain the production schedule. In early May 2005 the team was also informed by MAAG Gear AG that a production error that damaged a critical gear forging and would cause a 2-3 month delay in the delivery of a reduction gear. The team responded, and the Navy concurred, with a plan to re-sequence module construction to accommodate the delay. A series of additional manufacturing issues with the reduction gear ultimately caused this delay to grow to 6 months. The team was also forced to renegotiate many of the fixed price material contracts to reflect NVR-related changes. This drove cost increases and schedule delays for HM&E and combat system components such as the machinery control system, switchboards, load centers, and navigation systems.

MAAG Gear AG is the subcontractor for the LCS main reduction gear. MAAG is responsible for approximately 50% of the gear scope, including the overall design, fabrication of the gear casings and supply of auxiliary equipment. MAAG's subcontractor, General Electric (GE), is responsible for the balance of the scope, including the manufacture of the rotating components, final assembly, and test. The LCS gear is a very complex design, incorporating lightweight gear production technology, capable of handling the high power levels of the MT 30 gas turbines and diesel engines in a CODAG arrangement with a sophisticated propulsion control system.

The subcontract delivery dates for the gear had no schedule flexibility, as the opportunity to develop any schedule margin was not available given the design cycle and shipyard material need dates. Delivery of the LCS 1 gear set (two combining gears and two splitter gears) was six months late despite being placed on order with Lockheed Martin investment in September 2004, three months prior to Detailed Design & Construction contract award. Most of the delay is attributable to a number of manufacturing, tooling, assembly, and test issues at the GE gear plant in Lynn, Massachusetts. MAAG Gear AG was under a firm fixed price subcontract from Lockheed Martin and was therefore required to pay for all the re-work on the defective gear. In addition, they were responsible for paying

liquidated damages for the late delivery of the gear set, which flowed through LM's contract to benefit the Government....

Over the course of the design and construction effort, the team has also experienced increasing levels of oversight from activities such as NAVSEA, SUPSHIP, PEO-IWS, NSWC-DD, and NAVAIR which is typical of a traditional acquisition model, but was not expected for the transformational, streamlined LCS acquisition approach. For example, the ABS drawing review and approval cycle time of 4-6 weeks, typical of a commercial approach, became a 12-16 week cycle time and required multiple re-submissions of drawings and approval from a combined ABS, NAVSEA and SUPSHIP approach. This caused uncertainty and indecision within the team on the roles and responsibilities and how the team should respond to direction that was given from multiple sources. This caused an even further delay in the completion of the design, forcing even more inefficient overlap of design and construction....

As we progressed through LCS 1 design and construction, Costs increased for the reasons previously discussed. This cost was disclosed to the Navy Program office (PMS501) in the LM Team's contractually mandated, monthly Cost Performance Report (CPR). In addition, the LM team conducted bi-weekly meetings with the Navy's Program Manager (PMS 501) and provided briefings to PEO Ships in September 2005, April 2006 and November 2006 on LCS 1 cost growth and the root causes and corrective actions....

As noted above, LCS 1 suffered from the failure of a major system (Main Reduction Gears) and the availability of a critical raw material (HSLA 80 Steel). Both events had significant impacts on the program driving a significant amount of out-of-sequence work and inefficiency, which in turn created more design churn. Although the team cannot anticipate every catastrophic supplier issue, Lockheed Martin has put in place relevant mitigation steps to reduce the probability that supplier issues will recur. The LM Team has undertaken a vigorous process to reduce the likelihood of experiencing LCS 1 challenges on LCS 3.

For instance, unlike LCS 1, the team has had the opportunity to create schedule flexibility for the LCS 3 gears. The required subcontract delivery dates for major equipment are 1-3 months in advance of shipyard need. In addition, the Lockheed Martin subcontract management team thoroughly reviewed with MAAG and GE each LCS 1 gear failure along with all other issues that caused delays. Root causes were identified and corrective actions have been implemented to minimize the likelihood of repeated failures. GE has also changed their management structure at the Gear Plant. Lockheed Martin is on site at GE weekly to review progress and status, and the production of the LCS 3 gear set is progressing ahead of schedule. In addition, Lockheed Martin has been assured by GE's CEO that GE will meet its delivery commitments. At this time, the LM Team believes the appropriate corrective actions have been implemented, and the LCS 3 gear is being effectively managed to support the in-yard need dates and thus avoid the issue experienced on LCS 1.

Regarding raw material availability, Bollinger has ordered steel from Mittal, the only U.S. supplier of HSLA-80, for LCS 3 and scheduled delivery with sufficient lead time to support the original planned production start at the end of January 2007. In July 2006, Mittal suffered a major equipment failure at their rolling mill. The main drive motor for their rolling mill failed and the repair time

resulted in a six week outage at the mill. During the period of outage and restart, Mittal had received additional priorities for armor from the Army. Lockheed Martin has submitted a request for a revised program plan delaying production start to March 2007 to accommodate the steel delay. Currently, Mittal has shipped over 50% of the HSLA 80 steel requirements for LCS 3 and over 80% of all types of steel required for LCS 3. Lockheed Martin has also entered into discussions with Algoma Steel (Canada) as a preliminary step to develop a second source to Mittal. Algoma has preliminarily agreed to make investments to develop the HSLA chemistry and perform necessary qualification testing. Lockheed Martin would also recommend that the U.S. Navy seek a DPAS rating for the LCS program that would guarantee priority over commercial business at the mills. This would further mitigate some of the risk associated with the procurement of this crucial material to support the LCS two-year construction schedule.

Lockheed Martin has already implemented a standard set of material management metrics with Bollinger to identify the time phased requirements for material release and actual performance against plan. A Lockheed Martin material program management representative has been embedded with the Bollinger procurement team to not only track the material management performance metrics, but to drive actions to meet the material release plan. As Bollinger transitions from the material ordering phase to the delivery phase, a supplier management process that will include expediting manpower to status supplier material delivery dates, elevate potential supplier delivery risk issues early, and on site supplier progress reviews for major and/or critical systems will be used. Lockheed Martin representatives will participate in on-site supplier reviews with Bollinger. Additionally, all LCS 3 Product Technical Specifications were updated to reflect the final configuration of LCS 1 and to include any LCS 3 improvements to address cost, weight and producibility. This will ensure the vendors can accurately provide Firm Fixed Price Proposals for these systems without the risk of change and possible cost increase. Lockheed Martin is confident these actions will facilitate on-time delivery of the right material to support the production sequence and eliminate cost growth due to changing or ambiguous requirements.

The LM Team has also contracted with Fincantieri to assist the shipyards with developing more cost effective manufacturing approaches based on their experience producing the MDV 3000 Fast Ferry vessels, which share a similar hull form with the LM LCS design.

We have recently completed another detailed root cause analysis and developed additional corrective actions which have been or will be incorporated into the LCS 3 program plan. A few examples are:

LCS 1 Lesson Learned — Early design products sent to Production contained open issues such as missing vendor information and yet-to-be adjudicated requirement changes creating significant design/build concurrency and leading to construction inefficiencies due to out of sequence work. LCS 3 implements a program schedule that allows for completion of all design products, including full review and approval of all design products by the shipyard and ABS prior to the start of production on each module.

LCS 1 Lesson Learned — Material availability adversely impacted efficient production process resulting in out-of-sequence work and re-work. LCS 3 placed orders for critical equipment as early as possible to ensure in yard and production

need dates were met. The effectiveness of this effort is evident in 75% of Tier 1 and 2 subcontractor materials already on order for LCS 3.

LCS 1 Lesson Learned — The U.S. Navy Team roles, responsibilities, authority and accountability within the LCS program were not defined resulting in confusing and conflicting line of authority and accountability. LCS 3 finalized an agreement with the NAVSEA Technical Authority, SUPSHIP and ABS on the drawings they will be reviewing and the schedule for responses and comments. All parties have met their commitments and the drawings have been delivered according to schedule.

LCS 1 Lesson Learned — Despite all our efforts to reduce the schedule risk, key processes such as Configuration Management were overwhelmed by the significant number of changes. For LCS 3 we have implemented an on-line process for vendors to review the data that they delivered for LCS 1 and to certify that it has not changed. The changes for LCS 3 have been assessed and approved through our configuration management process and the volume of changes on LCS 1 will not occur on LCS 3.

LCS 1 Lesson Learned — The team managed performance and drove behavior with metrics that did not comprehensively measure progress and provide the leading indicators required to forecast cost issues with the volume of change and the speed of the program. For LCS 3 we have developed metrics to track the many handoffs of data and products during the design, production, test and acceptance of the LCS Platform. For design products, updated drawings for LCS 3 are jointly reviewed by Gibbs and Cox and Bollinger against clearly defined format and content requirements. To date, all drawings have been completed on schedule.

LCS 1 Lesson Learned — Timing of application of resources to oversee the design and construction of the platform. As the LCS 1 design and construction progressed and the magnitude of design change became clear, Lockheed Martin increased its oversight of the shipyard from 3 to 13 people to assist in engineering, material procurement, business process improvement, and construction management. This approach is being further modified to support construction of LCS 3 at Bollinger Shipyard.