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Navy Littoral Combat Ship (LCS)/Frigate Program: Background and Issues for Congress

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Summary

The Navy's Littoral Combat Ship (LCS)/Frigate program is a program to procure a large number of LCSs and modified LCSs. The modified LCSs are to be referred to as frigates. The LCS program has been controversial over the years due to past cost growth, design and construction issues with the lead ships built to each design, concerns over the ships' survivability (i.e., ability to withstand battle damage), concerns over whether the ships are sufficiently armed and would be able to perform their stated missions effectively, and concerns over the development and testing of the ships' modular mission packages. The Navy's execution of the program has been a matter of congressional oversight attention for several years.

Prior to December 14, 2015, Navy plans called for procuring a total of 32 LCSs and 20 frigates, for a total of 52 ships. A December 14, 2015, memorandum from Secretary of Defense Ashton Carter to Secretary of the Navy Ray Mabus directed the Navy to reduce the LCS/Frigate program to a total of 40 ships. The memorandum also directed the Navy to reduce planned annual procurement quantities of LCSs during the Navy's FY2017-FY2021 five-year shipbuilding plan, and to neck down to a single design variant of the ships starting with the ships to be procured in FY2019. (Two different variants of the LCS are currently built by two shipyards.)

The first LCS was funded in FY2005, and a total of 26 have been funded through FY2016. The Navy's proposed FY2017 budget requests \$1,125.6 million for the procurement of the 27th and 28th LCSs, or an average of \$562.8 million for each ship. The Navy's proposed FY2017 budget also requests \$86 million in so-called "cost-to-complete" procurement funding to cover cost growth on LCSs procured in previous fiscal years, and \$139.4 million for procurement of LCS mission module equipment.

Two very different baseline LCS designs are currently being built. One was developed by an industry team led by Lockheed; the other was developed by an industry team that was led by General Dynamics. The Lockheed design is built at the Marinette Marine shipyard at Marinette, WI; the General Dynamics design is built at the Austal USA shipyard at Mobile, AL. Ships 5 through 26 in the program are being procured under a pair of block buy contracts that were awarded to the two LCS builders in December 2010. The 24th LCS—the first of the three LCSs requested for procurement in FY2016—was to be the final ship to be procured under these block buy contracts, but contracts were extended to include the 25th and 26th ships (i.e., the second and third ships requested for FY2016) as well.

The LCS program poses several issues for Congress, including whether to approve, reject, or modify the Navy's FY2017 funding requests for the program, and whether to approve, reject, or modify the Secretary of Defense's December 2015 direction to the Navy to reduce the program from 52 ships to 40, and to neck down to a single design variant starting with the ships to be procured in FY2019.

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Introduction

This report provides background information and issues for Congress on the Navy's Littoral Combat Ship (LCS)/Frigate program, a program to procure a large number of LCSs and modified LCSs. The modified LCSs are to be referred to as frigates. The Navy's execution of the program has been a matter of congressional oversight attention for several years. The program presents several oversight issues for Congress. Congress's decisions on the LCS/Frigate program will affect Navy capabilities and funding requirements, and the shipbuilding industrial base.

Background

Strategic and Budgetary Context

For an overview of the strategic and budgetary context in which the LCS/Frigate program and other Navy shipbuilding programs may be considered, see CRS Report RL32665, *Navy Force Structure and Shipbuilding Plans: Background and Issues for Congress*, by Ronald O'Rourke.

Program in General

Ships

A Program for Procuring LCSs and Frigates

The Navy's Littoral Combat Ship (LCS)/Frigate program is a program to procure a large number of LCSs and modified LCSs. The modified LCSs are to be referred to as frigates. Prior to December 14, 2015, Navy plans called for procuring a total of 32 LCSs and 20 frigates, for a total of 52 ships. The planned total of 52 ships would have accounted for 17%, or about one-sixth, of the Navy's planned fleet of about 308 ships of all types. A December 14, 2015, memorandum from Secretary of Defense Ashton Carter to Secretary of the Navy Ray Mabus directed the Navy to reduce the LCS/Frigate program to a total of 40 ships.

The establishment of the program was announced on November 1, 2001.¹ From 2001 to 2014, the program was known simply as the Littoral Combat Ship (LCS) program, and all 52 then-planned ships were referred to as LCSs. In 2014, at the direction of Secretary of Defense Chuck Hagel, the program was restructured. As a result of the restructuring, the final 20 ships in the program (ships 33 through 52), which were to be procured in FY2019 and subsequent fiscal years, were to be built to a revised version of the baseline LCS design, and were to be referred to as frigates rather than LCSs.

¹ On November 1, 2001, the Navy announced that it was launching a Future Surface Combatant Program aimed at acquiring a family of next-generation surface combatants. This new family of surface combatants, the Navy stated, would include three new classes of ships: a destroyer called the DD(X)—later redesignated the DDG-1000—for the precision long-range strike and naval gunfire mission; a cruiser called the CG(X) for the air defense and ballistic missile mission, and a smaller combatant called the Littoral Combat Ship (LCS) to counter submarines, small surface attack craft, and mines in heavily contested littoral (near-shore) areas. The DDG-1000 was truncated to a total of three ships in 2009, and the CG(X) program was terminated in 2010. For more on the DDG-1000 program, see CRS Report RL32109, *Navy DDG-51 and DDG-1000 Destroyer Programs: Background and Issues for Congress*, by Ronald O'Rourke. For more on the CG(X) program, see CRS Report RL34179, *Navy CG(X) Cruiser Program: Background for Congress*, by Ronald O'Rourke.

Baseline LCS Design for First 24 Ships in the Program

The baseline LCS design, to be used for the first 24 ships in the program, is known as the Flight 0+ design.² The baseline LCS is a relatively inexpensive Navy surface combatant that is to be equipped with modular “plug-and-fight” mission packages, including unmanned vehicles (UVs). Rather than being a multimission ship like the Navy’s larger surface combatants, the baseline LCS is to be a focused-mission ship, meaning a ship equipped to perform one primary mission at any given time. The ship’s mission orientation can be changed by changing out its mission packages. The baseline LCS design, without any mission packages, is referred to as the LCS sea frame.

The baseline LCS’s primary missions are antisubmarine warfare (ASW), mine countermeasures (MCM), and surface warfare (SUW) against small boats (including so-called “swarm boats”), particularly in littoral (i.e., near-shore) waters. The LCS/Frigate program includes the development and procurement of ASW, MCM, and SUW mission packages for use by LCS sea frames. These three primary missions appear oriented toward countering, among other things, some of the littoral anti-access/area-denial (A2/AD) capabilities that have been fielded in recent years by Iran,³ although they could also be used to counter similar A2/AD capabilities that might be fielded by other countries.

Additional potential missions for baseline LCSs include peacetime engagement and partnership-building operations; intelligence, surveillance, and reconnaissance (ISR) operations; maritime security and intercept operations (including anti-piracy operations); support of Marines or special operations forces; and homeland defense operations. An LCS might perform these missions at any time, regardless of its installed mission module, although an installed mission module might enhance an LCS’s ability to perform some of these missions.

The LCS displaces about 3,000 tons, making it about the size of a corvette (i.e., a light frigate) or a Coast Guard cutter. It has a maximum speed of more than 40 knots, compared to something more than 30 knots for the Navy cruisers and destroyers. The LCS has a shallower draft than Navy cruisers and destroyers, permitting it to operate in certain coastal waters and visit certain shallow-draft ports that are not accessible to Navy cruisers and destroyers.

Modified LCS Design (aka Frigate)

The modified LCS design (aka frigate) includes additional or improved built-in equipment for SUW, ASW, and anti-air warfare (AAW), as well as changes to make the ship harder for adversaries to detect and changes to improve the ship’s ability to withstand battle damage. These ships are to be a little heavier than the baseline LCS design, and consequently are to have a slightly lower maximum sustained speed. They would have less capacity than the baseline LCS design for accepting LCS mission packages. The Navy does not intend to use the frigates as MCM platforms; their primary missions are to be SUW and ASW. The frigates could also perform the additional potential missions listed above for the baseline LCS design.

² The first two ships in the program were built to an earlier and slightly different design known as the Flight 0 design.

³ For a discussion of Iran’s littoral A2/AD capabilities, including submarines, mines, and small boats, see CRS Report R42335, *Iran’s Threat to the Strait of Hormuz*, coordinated by Kenneth Katzman.

Procurement Quantities

Table 1 shows past (FY2005-FY2016) and projected (FY2017-FY2021) annual procurement quantities for LCSs/frigates under the Navy’s FY2017 budget submission.

Table 1. Past (FY2005-FY2016) and Projected (FY2017-FY2021) Annual LCS Sea Frame Procurement Quantities

FY05	FY06	FY07	FY08	FY09	FY10	FY11	FY12	FY13
1	1	0	0	2	2	2	4	4
FY14	FY15	FY16	FY17	FY18	FY19	FY20	FY21	
4	3	3	2	1	1	1	2	

Source: Prepared by CRS based on FY2017 Navy budget submission.

Notes: (1) The two ships shown in FY2005 and FY2006 were funded through Navy’s research and development account rather than the Navy’s shipbuilding account. (2) The figures for FY2006-FY2008 do not include five LCSs (two in FY2006, two in FY2007, and one in FY2008) that were funded in those years but later canceled by the Navy.

Two Baseline LCS Designs Built by Two LCS Shipyards

On May 27, 2004, the Navy awarded contracts to two industry teams—one led by Lockheed Martin, the other by General Dynamics (GD)—to design two baseline versions of the LCS, with options for each team to build up to two LCSs each. The baseline LCS designs developed by the two teams are quite different—the Lockheed team’s design is based on a steel semi-planing monohull (with an aluminum superstructure), while the GD team’s design is based on an all-aluminum trimaran hull (see **Figure 1**). The two ships also use different built-in combat systems (i.e., different collections of built-in sensors, computers, software, and tactical displays) that were designed by each industry team. The Navy states that both baseline LCS designs meet the Key Performance Parameters (KPPs) for the first 24 ships in the program.

The Lockheed baseline LCS design is built at the Marinette Marine shipyard at Marinette, WI.⁴ The GD baseline LCS design is built at the Austal USA shipyard at Mobile, AL.⁵ Odd-numbered LCSs (i.e., LCS-1, LCS-3, LCS-5, and so on) use the Lockheed design; even-numbered LCSs (i.e., LCS-2, LCS-4, LCS-6, and so on) use the GD design.

⁴ Marinette Marine is a division of the Fincantieri Marine Group, an Italian shipbuilding firm. In 2009, Fincantieri purchased Manitowoc Marine Group, the owner of Marinette Marine and two other shipyards. Lockheed is a minority investor in Marinette Marine.

⁵ 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, with Austal Limited as the majority owner.

Figure I. Lockheed Baseline LCS Design (Top) and General Dynamics Baseline LCS Design (Bottom)



Source: U.S. Navy file photo accessed by CRS at http://www.navy.mil/list_all.asp?id=57917 on January 6, 2010.

Two Block Buy Contracts for Procuring Ships 5-26

Ships 1 through 4 in the program were procured with single-ship contracts. The next 22 ships in the program (ships 5 through 26) have been procured under two 10-ship block buy contracts that the Navy awarded to the two LCS builders in December 2010, and which were later extended in

each case to include an 11th ship. The Navy sought and received legislative authority from Congress to award these block buy contracts.⁶

LCSs in Service

As of March 14, 2016, the first six LCSs had entered service—LCS-1 on November 8, 2008; LCS-2 on January 16, 2010; LCS-3 on August 6, 2012; LCS-4 on January 27, 2014; LCS-5 on October 16, 2015 (in a status called “Special—in service”); and LCS-6 on August 11, 2015 (also as “Special—in service”).

Mission Packages

Planned Procurement Quantities

Prior to the program’s 2014 restructuring, the Navy had planned to procure 64 LCS mission packages (16 ASW, 24 MCM, and 24 SUW) for the 52 LCSs. The Navy did not announce how, if at all, the program’s 2014 restructuring changed planned numbers of mission packages. Whether the planned number of mission packages has been further changed by the December 14, 2015, memorandum directing the Navy to reduce the program from 52 ships to 40 is similarly not clear.

Deliveries and Initial Operational Capability (IOC) Dates

Initial increments (i.e., versions) of LCS mission packages are undergoing testing. At a February 25, 2015, hearing on Department of the Navy acquisition programs before the Seapower and Projection Forces subcommittee of the House Armed Services Committee, Department of the Navy officials testified that

The LCS Mission Modules program continues to field capability incrementally as individual mission systems become available in order to fill these critical warfighting gaps. The SUW Mission Packages are being introduced in three phases, providing capability to address Fast Attack Craft and Fast Inshore Attack Craft in the littorals, and maritime security and escort roles previously assigned to Oliver Hazard Perry class Frigates and Cyclone class patrol ships. MCM Mission Packages are being fielded in four phases delivering capability to address maritime mines and to replace legacy Avenger class Mine Countermeasures ships and MH-53E Sea Dragon helicopters that are nearing the end of service life. The ASW Mission Package will be delivered in a single phase and provides counter-submarine capability in littoral and deep water environments, High Value Unit (HVU) ASW escort and barrier patrol capability.

Increment 1 of the SUW Mission Package has completed Initial Operational Test & Evaluation (IOT&E) and is successfully deployed on the USS Fort Worth today. The initial phase of IOT&E for the Increment 2 SUW MP, aboard an Independence-variant ship, was completed in September 2015. A subsequent phase of IOT&E will be conducted in the Summer of FY 2016, following upgrades to the ship’s Integrated Combat Management System and SeaRAM weapon system. USS Fort Worth (LCS 3), with an embarked SUW MP, is currently on an extended operational deployment based out of Singapore. This SUW MP includes the first time deployment of a combined MQ-8B Fire Scout Vertical Take-off Unmanned Aerial Vehicle and a MH-60R helicopter

⁶ Congress granted the authority for the block buy contracts in Section 150 of H.R. 3082/P.L. 111-322 of December 22, 2010, an act that, among other things, funded federal government operations through March 4, 2011. For more on block buy contracts, see CRS Report R41909, *Multiyear Procurement (MYP) and Block Buy Contracting in Defense Acquisition: Background and Issues for Congress*, by Ronald O’Rourke and Moshe Schwartz.

aviation detachment. Finally, the Navy completed the second in a series of Guided Test Vehicle launches of the Army's Hellfire Longbow missile in December 2015 to evaluate performance of the Surface-to-Surface Missile Module launcher and missile system in a littoral environment. The demonstration showed that the vertically-launched missiles could effectively acquire, discriminate and engage the representative targets.

Technical Evaluation (TECHEVAL) of the Increment 1 MCM MP was completed in August 2015, aboard USS Independence (LCS 2). The Mission Package met the majority of its sustained area coverage rate test requirements, but significant reliability issues were noted with the Remote Multi-Mission Vehicle (RMMV) and associated subsystems. Based on TECHEVAL results, CNO and ASN (RDA) chartered an Independent Review Team to assess the Remote Minehunting System (RMS). The review team recommended halting the procurement of the RMMV Low Rate Initial Production (LRIP) 2 and recommended pursuing acceleration of other promising near term technologies to accomplish the MCM mission. The Navy will coordinate with all stakeholders, particularly the Fleet, in developing the way ahead for this important capability.

The ASW Mission Package, which comprises a continuously active variable depth sonar, multi-function towed array, and a torpedo defense capability, is conducting Developmental Testing (DT). The ASW MP is on track to complete DT in FY 2017 with IOT&E in late FY 2018.⁷

Manning and Deployment

Reduced-Size Crew

The baseline LCS employs automation to achieve a reduced-sized core crew (i.e., sea frame crew). The aim was to achieve a core crew of 40 sailors; the Navy has now decided to increase that number to about 50. Another 38 or so additional sailors are to operate the ship's embarked aircraft (about 23 sailors) and its embarked mission package (about 15 sailors in the case of the MCM package), which would make for a total crew of about 88 sailors (for a baseline LCS equipped with an MCM mission package), compared to more than 200 for the Navy's frigates and about 300 (or more) for the Navy's current cruisers and destroyers.⁸ The crew size for the frigate may differ from that of the baseline LCS design.

"3-2-1" Plan

The Navy plans to maintain three crews for each two baseline LCSs, and to keep one of those two baseline LCSs continuously underway—a plan Navy officials refer to as "3-2-1." Under the 3-2-1 plan, baseline LCSs are to be deployed for 16 months at a time, and crews are to rotate on and off deployed ships at 4-month intervals.⁹ The 3-2-1 plan will permit the Navy to maintain a greater

⁷ Statement of the Honorable Sean J. Stackley, Assistant Secretary of the Navy (Research, Development and Acquisition) and Vice Admiral Joseph P. Mulloy, Deputy Chief of Naval Operations for Integration of Capabilities and Resources and Lieutenant General Robert S. Walsh, Deputy Commandant, Combat Development and Integration & Commanding General, Marine Corps Combat Development Command, Before the Subcommittee on Seapower and Projection Forces of the House Armed Services Committee on department of the Navy Seapower and Projection Forces Capabilities, February 25, 2016, pp. 16-17.

⁸ See *Report to Congress, Littoral Combat Ship Manning Concepts*, Prepared by OPNAV—Surface Warfare, July 2013 (with cover letters dated August 1, 2013), posted at USNI News on September 24, 2013, at <http://news.usni.org/2013/09/24/document-littoral-combat-ship-manning-concepts>.

⁹ See, for example, Grace Jean, "Buying Two Littoral Combat Ship Designs Saves the Navy \$600 Million, Official Says," *NationalDefenseMagazine.org*, January 12, 2011.

percentage of the baseline LCS force in deployed status at any given time than would be possible under the traditional approach of maintaining one crew for each baseline LCS and deploying baseline LCSs for six to eight months at a time. The Navy plans to forward-station up to four LCSs in the Western Pacific at Singapore, and up to eight LCSs in the Persian Gulf at Bahrain. The Navy might also apply the 3-2-1 plan to frigates).

Procurement Cost

Unit Procurement Cost Cap

Certain LCS sea frames procured in prior years were subject to an LCS program unit procurement cost cap that could be adjusted to take inflation into account.¹⁰ The Navy states that after taking inflation into account, the most recent version of the unit procurement cost cap, which was to apply to up to 10 LCSs to be procured in FY2011 and subsequent years, was \$538 million per ship as of December 2010. In awarding the two LCS block buy contracts in December 2010, the Navy stated that LCSs to be acquired under the two contracts were to have an average unit cost of about \$440 million, a figure well below this \$538 million figure.¹¹

Program Procurement Costs

Sea Frames

The Navy's proposed FY2017 budget requests \$1,125.6 million for the procurement of the 27th and 28th LCSs, or an average of \$562.8 million for each ship. The three LCSs procured in FY2016 were funded at an average cost of \$482.0 million. The increase in average cost from \$482.0 million in FY2016 to \$562.8 million is likely due in large part to the reduction in procurement quantity from three ships in FY2016 to two ships in FY2017.

¹⁰ The legislative history of the cost cap is as follows:

The cost cap was originally established by Section 124 of the FY2006 National Defense Authorization Act (H.R. 1815/P.L. 109-163 of January 6, 2006). Under this provision, the fifth and sixth ships in the class were to cost no more than \$220 million each, plus adjustments for inflation and other factors.

The cost cap was amended by Section 125 of the FY2008 National Defense Authorization Act (H.R. 4986/P.L. 110-181 of January 28, 2008). This provision amended the cost cap to \$460 million per ship, with no adjustments for inflation, and applied the cap to all LCSs procured in FY2008 and subsequent years.

The cost cap was amended again by Section 122 of the FY2009 Duncan Hunter National Defense Authorization Act (S. 3001/P.L. 110-417 of October 14, 2008). This provision deferred the implementation of the cost cap by two years, applying it to all LCSs procured in FY2010 and subsequent years.

The cost cap was amended again by Section 121(c) and (d) of the FY2010 National Defense Authorization Act (H.R. 2647/P.L. 111-84 of October 28, 2009). The provision repealed the three previous cost cap provisions and established a new cost cap of \$480 million to be applied to up to 10 LCSs to be procured starting in FY2011, excluding certain costs, and with provisions for adjusting the \$480 million figure over time to take inflation and other events into account, and permitted the Secretary of the Navy to waive the cost cap under certain conditions. The Navy stated that after taking inflation into account, the \$480 million figure equates, as of December 2010, to \$538 million.

¹¹ Source: Contract-award information provided to CRS by Navy office of Legislative Affairs, December 29, 2010. The 20 ships to be acquired under the two contracts have a target cost and a higher ceiling cost. Any cost growth above the target cost and up to the ceiling cost would be shared between the contractor and the Navy according to an agreed apportionment (i.e., a "share line"). Any cost growth above the ceiling cost would be borne entirely by the contractor. The Navy states that, as a worst case, if the costs of the 20 ships under the two FPI contracts grew to the ceiling figure and all change orders were expended, the average cost of the ships would increase by about \$20 million, to about \$460 million, a figure still well below the adjusted cost cap figure of \$538 million.

Mission Packages

A March 2014 Government Accountability Office (GAO) report states that for a January 2014 Milestone B acquisition event, the LCS program office estimated the total acquisition cost of the LCS program's mission packages at \$7.24 billion.¹² This figure does not account for any changes in planned LCS mission package procurement that might result from the program's 2014 restructuring or the December 14, 2015, memorandum from the Secretary of Defense.

In August 2013, the Navy had stated that

The estimated Average Production Unit Cost (APUC) for all 59 OPN-funded mission packages [the other five mission packages were funded through the Navy's research, development, test and evaluation (RDT&E) account] is \$69.8M in Constant Year (CY) Fiscal Year 2010 dollars. This is the most accurate answer for "How much does it cost to buy a mission package?" These mission packages are production-representative assets for Operational Test and deployment. The LCS Mission Modules program will use OPN to procure 23 MCM mission packages, 21 SUW mission packages, 15 ASW mission packages, and 59 sets of common mission package equipment.

The APUC can be broken down into the estimated average initial procurement cost of the three types of mission packages and common mission package equipment. None of the figures in this paper represent budget values.

- Mine Countermeasures (MCM) Mission Packages (23): \$97.7M
- Surface Warfare (SUW) Mission Packages (21): \$32.6M
- Anti-Submarine Warfare (ASW) Mission Packages (15): \$20.9M
- Sets of Common Mission Package Equipment (59): \$14.8M...

These estimates do not include the RDT&E expenditures that are associated with mission package development, integration, and test. These RDT&E expenditures include the five RDT&E-funded mission packages intended for use as development, training, and testing assets. Those five mission packages are not production-representative items. Including all prior RDT&E expenditures results in an average Program Acquisition Unit Cost of \$99.7M for all 64 mission packages. This not an accurate answer for "How much does it cost to buy a mission package?" as past RDT&E expenditures are not relevant to the purchase price of a mission package today.¹³

¹² Government Accountability Office, *Defense Acquisitions[:] Assessments of Selected Weapon Programs*, GAO-14-340SP, March 2013, p. 96. See also Jason Sherman, "Navy Sets \$7.2B Price Tag For Littoral Combat Ship Mission Modules," *Inside the Navy*, March 31, 2014.

The December 31, 2012, SAR for the sea frame portion of the LCS program does not contain estimated acquisition costs for the planned total of 64 LCS mission packages. The December 31, 2010, SAR for the LCS program stated:

On February 18, 2011, USD(AT&L) [the Under Secretary of Defense (Acquisition, Technology, and Logistics)—DOD's acquisition executive] conducted a Milestone B (MS B) Defense Acquisition Board (DAB) for the seaframe portion of the LCS program. The decision of the DAB was to separate the program into two separate and distinct programs with separate reporting requirements. The Seaframe portion of the program is reported in this SAR as approved at MS B. The Mission Module portion of the program will begin reporting when it receives its Milestone B decision.

(Department of Defense, *Selected Acquisition Report (SAR), LCS*, as of December 31, 2010, p. 4.)

¹³ Navy information paper on LCS program dated August 26, 2013, and provided to CRS and CBO on August 29, 2013.

Controversy and Proposals to Truncate Program

The LCS program has been controversial over the years due to past cost growth, design and construction issues with the lead ships built to each design, concerns over the ships' survivability (i.e., ability to withstand battle damage), concerns over whether the ships are sufficiently armed and would be able to perform their stated missions effectively, and concerns over the development and testing of the ships' modular mission packages.

Prior to the program's restructuring in 2014, some observers, citing one or more of these issues, had proposed truncating the LCS program to either 24 ships (i.e., stopping procurement after procuring all the ships originally covered under the two block buy contracts) or to some other number well short of 52.¹⁴ In response to criticisms of the LCS program, the Navy prior to the program's 2014 restructuring acknowledged certain problems and stated that it was taking action to correct them, and disputed other arguments made against the program. The LCS is by no means the only Navy shipbuilding program to have encountered controversy over the years; several others have experienced controversy for one reason or another.

Major Program Developments

Major Program Developments Prior to Program's 2014 Restructuring

For a summary of some major developments in the LCS program prior to its 2014 restructuring, see **Appendix A**.

Program's 2014 Restructuring

In 2014, at the direction of Secretary of Defense Chuck Hagel, the program was restructured. As a result of the restructuring, the final 20 ships in the program (ships 33 through 52), which were to be procured in FY2019 and subsequent fiscal years, were to be built to a revised version of the baseline LCS design, and were to be referred to as frigates rather than LCSs.

Under this plan, the LCS/Frigate program was to include 24 baseline-design LCSs procured in FY2005-FY2016, 20 frigates to be procured in FY2019 and subsequent fiscal years, and 8 transitional LCSs (which might incorporate some but not all of the design modifications intended for the final 20 ships) to be procured in FY2016-FY2018, for a total of 52 ships.

For more on the program's 2014 restructuring, see **Appendix B**.

Program's Additional Restructuring in December 2015

A December 14, 2015, memorandum from Secretary of Defense Ashton Carter to Secretary of the Navy Ray Mabus directed the Navy to reduce the LCS/Frigate program to a total of 40 ships. The

¹⁴ For example, a May 2012 report by the Center for a New American Security (CNAS) recommended stopping the LCS program in FY2017 after procuring a total of 27 ships (David W. Barno, et al., *Sustainable Pre-eminence[.] Reforming the U.S. Military at a Time of Strategic Change*, Center for a New American Security, May 2012, pp. 35, 67), and an April 2011 report by the Heritage Foundation recommended a future Navy fleet with a total of 28 small surface combatants—a category that appears to include both Oliver Hazard Perry (FFG-7) frigates (which are being phased out of service) and LCSs (*A Strong National Defense[.] The Armed Forces America Needs and What They Will Cost*, Heritage Foundation, April 5, 2011, pp. 25-26). CNAS made a similar recommendation in a report it published in October 2011 (David W. Barno, et al., *Hard Choices[.] Responsible Defense in an Age of Austerity*, Center for a New American Security, October 2011, pp. 13, 14, 15, 16, 18, 20, 21, 34, 35). The report recommends procuring a total of 27 LCSs under three DOD budget scenarios, or a total of 12 LCSs under a fourth DOD budget scenario).

memorandum also directed the Navy to reduce planned annual procurement quantities of LCSs during the Navy's FY2017-FY2021 five-year shipbuilding plan, and to neck down to a single design variant of the ships starting with the ships to be procured in FY2019. The memorandum is reprinted below.¹⁵

¹⁵ Source for the memorandum: The memorandum was posted at USNI News on December 14, 2015.



SECRETARY OF DEFENSE
1000 DEFENSE PENTAGON
WASHINGTON, DC 20301-1000

DEC 14 2015

MEMORANDUM FOR SECRETARY OF THE NAVY

SUBJECT: Navy Program Balance

The Navy is critical to our nation's defense. Recognizing the importance of the fleet, the Department has and will continue to increase the size and capability of the battle force – as the Navy has noted, compared to the 278 ships in 2008, today we have 282 ships in the fleet, and more than 30 are currently under construction. We are well on our way to reaching the 308-ship goal that will meet the Department's warfighting posture requirement. This requirement should be met, but not irresponsibly exceeded.

For the last several years, the Department of the Navy has overemphasized resources used to incrementally increase total ship numbers at the expense of critically-needed investments in areas where our adversaries are not standing still, such as strike, ship survivability, electronic warfare, and other capabilities. This has resulted in unacceptable reductions to the weapons, aircraft, and other advanced capabilities that are necessary to defeat and deter advanced adversaries. Earlier this year the Department of Defense gave guidance to correct and reverse this trend of prioritizing quantity over lethality; however, counter to that guidance, the Department of the Navy's latest program submission fails to do so. It is accordingly unbalanced, creates too much warfighting and technical risk, and would exceed the numerical requirement of 308 ships.

I have made clear in our discussions, in my budgetary guidance, and in public remarks that our military is first and foremost a warfighting force, and while we seek to deter wars, we must also be prepared to fight and win them. This means that overall, the Navy's strategic future requires focusing more on posture, not only on presence, and more on new capabilities, not only ship numbers.

The Department's priorities are 1) to build advanced capabilities, 2) to close growing gaps in naval aviation, and 3) to ensure sufficient ship capacity. To meet these priorities, the Department will build to a total of 40 Littoral Combat Ships (LCS) and frigates (FF), the number that the Navy's own warfighting analysis says is sufficient to need. This plan reduces, somewhat, the number of LCS available for presence operations, but that need will be met by higher-end ships, and it will ensure that the warfighting forces in our submarine, surface, and aviation fleets have the necessary capabilities and posture to defeat even our most advanced potential adversaries. Under this rebalanced plan, we will still achieve the Navy's 308-ship goal, we will still exceed 300 ships in each year from FY19 to FY30, and we will be better positioned as a force to be overwhelming in posture rather than overextended in presence.

Specifically, the Department of the Navy will:

- **Reduce the planned LCS/FF procurement from 52 ships to 40 ships** (creating a 1/1/1/2 profile, for eight fewer ships within the FYDP) by down-selecting LCS/FF

production to one variant in FY2019. Forty LCS/FF will exceed recent historical presence levels and will provide a far more modern and capable ship than the patrol coastals, minesweepers, and frigates that they will replace. CAPE will provide specific implementation direction and the decision will be documented in the Resource Management Decision (RMD).

- **Procure 10 Flight III destroyers (DDGs) within the FYDP.** Recognizing the significant capabilities that Flight III destroyers provide, the Department will continue to procure 10 DDGs across the FYDP. In addition, we will upgrade additional Flight IIA DDGs, procure additional advanced electronic warfare capabilities, and invest in munitions that will enable the fleet to hold adversary surface ships at risk. The rebalance will allow us to upgrade a large portion of the current DDG fleet, while still protecting procurement of new DDGs.
- **Maintain or increase production of key munitions.** The Department must maintain an aggressive munitions procurement program to ensure that our surface, submarine, and aviation platforms can engage our adversaries effectively. Contrary to the Navy's amended submission, which reduced procurement to minimum sustaining rate across the board, the Department will maximize production of SM-6 missiles and maintain procurement of other advanced munitions. In addition, we will begin development of follow-on torpedoes so that the fleet can prosecute current and future advanced submarines and other targets.
- **Maximize our undersea advantage.** The Navy's amended budget cuts two submarine combat system upgrades, reduces towed array procurement, and misses a key opportunity to add Virginia Payload Modules (VPM) to our fast attack submarines. VPM is the most cost-effective way to increase the capability and capacity of our submarines; therefore the Navy will invest in an additional Virginia Payload Module in FY20. Waiting until FY20 to procure an additional VPM will provide substantial time to allow the Navy to plan for and execute this increased workload even as production of the Ohio Replacement Program begins. The Department will also restore the two combat system upgrades cut in the Navy's submission and procure an additional 10 SSN upgrades. These upgrades will ensure we continue to have the most lethal submarine force in the world.
- **Procure 31 additional F-35C, additional F/A-18E/F, and continue upgrades to 4th generation fighters.** To meet the expanding adversary fighter threat, we will procure 31 additional F-35C relative to the Navy POM submission (and 10 more than the PB-16 plan) to provide a substantial increase in 5th generation capacity. Procuring additional F/A-18E/F in 2018 will provide an early boost to naval aviation capacity, a particularly important investment given recent demands on aircraft for Operation Inherent Resolve. In contrast to the Navy's most recent submission, the Department will also continue investments in 4th generation upgrades to ensure that these aircraft remain relevant in the high-end fight.

These decisions will modernize surface, subsurface, and aviation platforms and address many of the capability shortfalls that the Navy identified at the beginning of the budget process,

even after accounting for the budget reductions in FY17. These decisions will also ensure that the Navy does not need to execute many of the reductions to advanced capabilities that were proposed in the Navy's amended submission, but which created unreasonable technical and warfighting risk. Specifically, the decisions outlined above will avoid:

- Cutting VPM and F/A-18E/F aircraft, two key additions that the Navy was previously directed to procure.
- The dramatic cuts proposed to procurement of our most modern munitions, including 420 AIM-120D missiles and 60 SM-6 missiles.
- The proposed reductions to surface ship electronic warfare capabilities and submarine combat systems, key upgrades that ensure our fleet remains relevant as threats advance.
- Disrupting our efforts to field infrared search and track capability, counter electronic attack radar upgrades, and Next Generation Jammer on Navy fighters, improving their lethality and survivability.
- Further cuts to aviation, such as the three E-2Ds and one MQ-4C Triton reductions that the Navy proposed.
- The 8 percent tax that was applied to a broad swath of programs in FY17, whose negative impacts may not be fully appreciated until the year of execution.

In order to further increase the capabilities of the fleet, in the upcoming RMD the Department will increase Navy resources by \$1.7B over the FYDP to provide for many of the investments described above, including:

- 10 additional Submarine Combat Systems upgrades (SWFTS)
- Development of a new or upgraded lightweight torpedo
- Modernization of two additional Flight IIA DDGs
- 23 additional electronic warfare upgrades for the surface fleet
- Acceleration of the next generation torpedo countermeasure
- Enhanced modernization of TACTOM cruise missiles
- Additional upgrades to P-8A aircraft

These choices will create a Navy that is far better postured to deter and defeat advanced adversaries, while still continuing to grow the size of the fleet. As both you and I have noted, ship count alone is a poor measure of the effectiveness of the force. With the rebalance laid out

this memo, our fleet will not only be larger and more effective than it is today; it will also be equipped with the weapons and capabilities it needs to win any potential war.

The Department of Defense is relying on the Department of the Navy to support and carry out these critical strategic decisions.

A handwritten signature in black ink that reads "Ash Carter". The signature is written in a cursive, flowing style.

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FY2017 Funding Request

The Navy's proposed FY2017 budget requests \$1,125.6 million for the procurement of the 27th and 28th LCSs, or an average of \$562.8 million for each ship. The Navy's proposed FY2017 budget also requests \$86 million in so-called "cost-to-complete" procurement funding to cover

cost growth on LCSs procured in previous fiscal years, and \$139.4 million for procurement of LCS mission module equipment.

Issues for Congress

FY2017 Funding Request

One issue for Congress is whether to approve, reject, or modify the Navy's FY2017 procurement funding requests for the LCS/Frigate program, including the request for procuring two LCSs in FY2017 rather than the three LCSs that were projected for FY2017 under the FY2016 budget submission. In assessing this issue, Congress may consider various factors, including whether the Navy has accurately priced the FY2017 work to be done, the industrial base implications of procuring two rather than three LCSs in FY2017, and the status of the Navy's effort's to develop and test LCS mission modules.

December 2015 Restructuring of Program

Another issue for Congress is whether to approve, reject, or modify the Secretary of Defense's December 2015 restructuring of the LCS/Frigate Program, including the reduction of the program from 52 ships to 40, and the direction to the Navy to neck down to a single LCS design variant starting in FY2019. In assessing this issue, Congress may again consider various factors, including the analytical foundation for the restructuring, the restructuring's implications for Navy funding requirements and capabilities, and the potential impact on the shipbuilding industrial base.

Analytical Foundation

Regarding the analytical foundation for the December 2015 restructuring, potential oversight questions for Congress include the following:

- What is the Office of the Secretary of Defense's (OSD's) analytical basis for directing the Navy to reduce the LCS/Frigate program from 52 ships to 40, and to redirect the savings from this action to the other Navy program priorities shown in the December 14, 2015, memorandum? What is the analytical basis for directing the Navy to reduce the LCS/Frigate program to 40 ships, as opposed to some other number smaller than 52? What studies were done within OSD to form the analytical foundation for the directions in the memorandum?
- What are the potential operational advantages and disadvantages of reducing the LCS/Frigate program from 52 ships to 40 ships and redirecting funding to the other Navy program priorities?
- How would unit procurement costs for LCSs/Frigates be affected by reducing the program's procurement rate to two ships in FY2017, one ship per year in FY2018-FY2020 and two ships in FY2021?
- How dependent is OSD's direction to the Navy to reduce the LCS/Frigate program from 52 ships to 40 ships and redirect funding to the other Navy program priorities dependent on an assumption that limits on defense spending under the Budget Control Act of 2011 (S. 365/P.L. 112-25 of August 2, 2011), as amended, will remain in place? How might the merits of this direction be affected, if at all, by a decision to further amend or repeal these limits?

- Between the program's 2014 restructuring and the direction in the December 14, 2015, memorandum, the program has now been changed by OSD substantially twice in a period of two years. Although these changes are intended by OSD to improve program effectiveness and better optimize Navy spending, what impact might changing the program substantially twice in a period of two years have on program's stability and the ability of the Navy and industry to implement the program efficiently?

At a February 25, 2016, hearing before the Seapower and Projection Forces subcommittee of the House Armed Services Committee, the Navy testified that

The 2014 FSA update [i.e., the Navy's most recently completed Force Structure Assessment for determining the Navy's force-level goals for ships] outlines the requirement for 52 Small Surface Combatants (SSCs) and determined a need for 26 deployed SSCs to meet the Navy's global peacetime and wartime requirement. The Navy's 2016 Long Range Shipbuilding Plan and the FY2016 Future Years Defense Plan (FYDP) included procurement of 14 LCS/Fast Frigate (FF) ships in FY2017-2021. In order to balance current and future capability needs within the FY 2017 top line constraints, the procurement plan for LCS/FF was reduced to seven ships within the FYDP and the overall inventory objective was reduced from 52 to 40 ships. The Navy will evaluate the risk associated with this budget decision, in the broader context of total large and small surface combatant ship inventory, in the course of the 2016 FSA update to inform future shipbuilding plans.¹⁶

A February 26, 2016, press report states:

During hearings on the budget held Thursday on Capitol Hill, top Defense Department officials revealed a stark difference of opinion over the direction of the Littoral Combat Ship (LCS) program, which was slashed from 52 to 40 ships in the fiscal year 2017 budget request.

Defense Secretary Ashton Carter told House appropriators Thursday afternoon that the decision to move to 40 ships—which was dictated to the service through a December memo written by Carter—was driven by longterm national security considerations.

But in a House Armed Services Committee seapower and projection force subcommittee hearing that afternoon, the Navy's top acquisition official Sean Stackley painted a very different picture.

"This budget cycle, the decision was made [to cut the program]," he said. "It comes down to reductions in the budget. Reductions in the budget drove trades in terms of capability in the near term, and long term. The decision was made not based on a force structure assessment."

The latest force structure assessment, which lays out the size and shape of the Navy, was published in 2014 and stated a 52-vessel small surface combatant requirement, which would be made up of 40 LCS and 12 of the "fast frigate" variant of the ship. That requirement has not changed, Stackley said.

¹⁶ Statement of the Honorable Sean J. Stackley, Assistant Secretary of the Navy (Research, Development and Acquisition) and Vice Admiral Joseph P. Mulloy, Deputy Chief of Naval Operations for Integration of Capabilities and Resources and Lieutenant General Robert S. Walsh, Deputy Commandant, Combat Development and Integration & Commanding General, Marine Corps Combat Development Command, Before the Subcommittee on Seapower and Projection Forces of the House Armed Services Committee on department of the Navy Seapower and Projection Forces Capabilities, February 25, 2016, p. 15.

“The Navy’s analysis is captured by the force structure analysis, which still requires 52 small surface combatants,” he said. “The decision to go from 52 to 40 becomes a budget-driven decision and accepts risk.”...

In the House Appropriations defense subcommittee hearing, Carter characterized the reduced buy differently.

“The Littoral Combat Ship is a successful program. It is an excellent ship,” he said. “The Navy’s warfighting analysis concluded 40 of them were enough. And, yes we did want to apply resources elsewhere to the lethality of our ships. That’s critically important, that we not only have enough ships...but that they’re the very best.”¹⁷

A March 6, 2016, press report states:

A controversial request to cap the Littoral Combat Ship (LCS) and follow-on frigate programme at 40 hulls, instead of 52, was made because Pentagon officials felt the lower number was still sufficient for a 'presence' role and funding was prioritised elsewhere.

"A fleet of 40 of those is going to be fully capable of providing more presence than the fleet it replaces," Jamie Morin, director of the Department of Defense's (DoD's) Cost Assessment and Program Evaluation office, said during a 7 March briefing at the Center for Strategic and International Studies....

Morin said the navy had a 52-ship total for LCSs because that accounted for replacing 'warfighting' requirements as well as 'presence' requirements, but the Pentagon believes it can do both with fewer ships and thereby free resources to buy more advanced munitions, bolster USN aviation, and protect investments for readiness and for future capabilities.¹⁸

Industrial Base Impact

Regarding the potential impact of the December 2015 restructuring on the shipbuilding industrial base, potential oversight issues for Congress include the following:

- How does the Navy intend to determine which shipyard or shipyards will build the frigates to be procured in FY2019 and subsequent fiscal years?
- What impact would necking down to a single shipyard have on the Navy’s ability to use competition to help minimize procurement costs, achieve schedule adherence, and ensure production quality in the construction of modified LCSs?
- What would be industrial-base impact, at both the shipyard level and among material and component manufacturers, of necking down to a single shipyard starting in FY2019?

At the February 25, 2016, hearing, the Navy testified that

The FY 2017 President’s budget requests funding for the Navy to competitively award one LCS to each shipbuilder and solicit block buy LCS proposals from each shipbuilder, to be submitted with their 2017 ship proposals. Additionally, it includes a request for RDT&E,N funding to proceed with completion of respective Frigate designs. A competitive down-select to a single shipbuilder is planned for FY2019, but potentially as early as FY2018 based on the proposed Frigate design and the modified block buy cost. This acquisition strategy sustains the two shipbuilders competing for the single ship

¹⁷ Valerie Insinna, “On Capitol Hill, OSD and Navy Officials at Odds Over LCS,” *Defense Daily*, February 26, 2016: 1-2.

¹⁸ Daniel Wasserbly, “US Official: 40 LCSs Sufficient for Navy’s ‘Presence’ Role,” *IHS Jane’s Defence Weekly*, March 6, 2015.

awards in FY 2017 while enabling competitors to align long term options with their vendor base in support of the subsequent down-select, and accelerates delivery of the desired more lethal and survivable Frigate capability to the Fleet. Additionally, the plan preserves the viability of the industrial base in support of a pending decision regarding Foreign Military Sales opportunities, all the while preserving future decision space regarding the Frigate procurement should further future changes to operational requirements, budget, or national security risk dictate the need.

It is recognized that this down-select decision places one of our shipbuilders and part of the support industrial base at risk of closure. The Navy will use this current period of stable production – prior to the down-select decision – to thoroughly assess the impact of such potential closure on our strategic shipbuilding industrial base, the cost of our shipbuilding program, and our ability to support in-service ships, in order to identify appropriate actions to mitigate these impacts to the extent practical.¹⁹

Navy’s Plan for Transitioning from Baseline LCS to Frigate

Another issue for Congress is whether to approve, reject, or modify the Navy’s plans for transitioning from baseline LCS design to the frigate version. Section 123 of the FY2016 National Defense Authorization Act (S. 1356/P.L. 114-92 of November 25, 2015) states (emphasis added):

SEC. 123. Extension and modification of limitation on availability of funds for Littoral Combat Ship.

Section 124(a) of the National Defense Authorization Act for Fiscal Year 2014 (Public Law 113–66; 127 Stat. 693), as amended by section 123 of the Carl Levin and Howard P. “Buck” McKeon National Defense Authorization Act for Fiscal Year 2015 (Public Law 113–291; 128 Stat. 3314), is further amended—

(1) by striking “this Act, the Carl Levin and Howard P. ‘Buck’ McKeon National Defense Authorization Act for Fiscal Year 2015, or otherwise made available for fiscal years 2014 or 2015” and inserting “this Act, the National Defense Authorization Act for Fiscal Year 2016, or otherwise made available for fiscal years 2014, 2015, or 2016”; and

(2) by adding at the end the following new paragraphs:

“(6) A Littoral Combat Ship seaframe acquisition strategy for the Littoral Combat Ships designated as LCS 25 through LCS 32, including upgrades to be installed on these ships that were identified for the upgraded Littoral Combat Ship, which is proposed to commence with LCS 33.

“(7) A Littoral Combat Ship mission module acquisition strategy to reach the total acquisition quantity of each mission module.

“(8) A cost and schedule plan to outfit Flight 0 and Flight 0+ Littoral Combat Ships with capabilities identified for the upgraded Littoral Combat Ship.

“(9) A current Test and Evaluation Master Plan for the Littoral Combat Ship Mission Modules, approved by the Director of Operational Test and Evaluation, which includes the performance levels expected to be demonstrated during developmental testing for

¹⁹ Statement of the Honorable Sean J. Stackley, Assistant Secretary of the Navy (Research, Development and Acquisition) and Vice Admiral Joseph P. Mulloy, Deputy Chief of Naval Operations for Integration of Capabilities and Resources and Lieutenant General Robert S. Walsh, Deputy Commandant, Combat Development and Integration & Commanding General, Marine Corps Combat Development Command, Before the Subcommittee on Seapower and Projection Forces of the House Armed Services Committee on department of the Navy Seapower and Projection Forces Capabilities, February 25, 2016, p. 15.

each component and mission module prior to commencing the associated operational test phase.”²⁰

Analytical Foundation for Frigate Design

Overview

Another oversight issue for Congress concerns the analytical foundation for the Navy’s proposed design for the frigate. Programs with weak analytical foundations can, other things held equal, be at increased risk for experiencing program-execution challenges in later years. The original LCS program arguably had a weakness in its analytical foundation due to a formal, rigorous analysis that was not conducted prior to the announcement of the program’s establishment on November 1, 2001. This weakness may have led to some of the controversy that the program experienced in subsequent years, which in turn formed the backdrop for Secretary of Defense Hagel’s February 24, 2014, announcement of the program’s restructuring. The Navy’s restructured plan for the frigate design may similarly have a weakness in its analytical foundation due to two formal, rigorous analyses that do not appear to have been conducted prior to the announcement of the program’s restructuring.

²⁰ Section 124(a) of P.L. 113-66—the provision that would be further amended by Section 123 of P.L. 114-92—stated:

SEC. 124. LIMITATION ON AVAILABILITY OF FUNDS FOR LITTORAL COMBAT SHIP.

(a) Limitation.—None of the funds authorized to be appropriated by this Act or otherwise made available for fiscal year 2014 for construction or advanced procurement of materials for the Littoral Combat Ships designated as LCS 25 or LCS 26 may be obligated or expended until the Secretary of the Navy submits to the congressional defense committees each of the following:

(1) The report required by subsection (b)(1).

(2) A coordinated determination by the Director of Operational Test and Evaluation and the Under Secretary of Defense for Acquisition, Technology, and Logistics that successful completion of the test evaluation master plan for both seaframes and each mission module will demonstrate operational effectiveness and operational suitability.

(3) A certification that the Joint Requirements Oversight Council—

(A) has reviewed the capabilities of the legacy systems that the Littoral Combat Ship is planned to replace and has compared such capabilities to the capabilities to be provided by the Littoral Combat Ship;

(B) has assessed the adequacy of the current capabilities development document for the Littoral Combat Ship to meet the requirements of the combatant commands and to address future threats as reflected in the latest assessment by the defense intelligence community; and

(C) has either validated the current capabilities development document or directed the Secretary to update the current capabilities development document based on the performance of the Littoral Combat Ship and mission modules to date.

(4) A report on the expected performance of each seaframe variant and mission module against the current or updated capabilities development document.

(5) Certification that a capability production document will be completed for each mission module before operational testing.

Section 123 of P.L. 113-291—the provision that amended Section 124 of P.L. 113-66—stated:

SEC. 123. EXTENSION OF LIMITATION ON AVAILABILITY OF FUNDS FOR LITTORAL COMBAT SHIP.

Section 124(a) of the National Defense Authorization Act for Fiscal Year 2014 (P.L. 113-66; 127 Stat. 693) is amended by striking “this Act or otherwise made available for fiscal year 2014” and inserting “this Act, the Carl Levin and Howard P. ‘Buck’ McKeon National Defense Authorization Act for Fiscal Year 2015, or otherwise made available for fiscal years 2014 or 2015”.

Three Analyses That Can Strengthen an Analytical Foundation

The analytical foundation for an acquisition program can be strengthened by performing three formal, rigorous analyses prior to the start of the program:

- an analysis to identify capability gaps and mission needs;²¹
- an analysis to compare potential general approaches for filling those capability gaps or mission needs, so as to identify the best or most promising approach,²² and
- an analysis to refine the approach selected as the best or most promising.²³

Original LCS Program Lacked One of These Analyses Prior to Announcement of Program

As discussed in CRS reports covering the LCS program going back a decade, the Navy, prior to announcing the establishment of the LCS program on November 2001, performed the first and third studies listed above, but it did not perform the second. In other words, the Navy, prior to announcing the establishment of the LCS program on November 1, 2001, did not perform a formal, rigorous analysis to show that a small, fast modular ship was not simply one way, but rather the best or most promising way, to fill the three littoral warfare capability gaps (for countering mines, small boats, and diesel-electric submarines) that the Navy had identified. Instead of performing such an analysis, which at the time might have been called an analysis of multiple concepts, the Navy selected the concept of a small, fast, modular ship based on the judgment of senior Navy leaders.²⁴ In testimony to the House Armed Services Committee in April

²¹ Such a study might be referred to under the defense acquisition system as a Capabilities-Based Assessment (CBA), as referenced, for example, on page A-1 of Chairman of the Joint Chiefs of Staff Instruction (CJCSI) 3170.01H of January 10, 2012, entitled “Joint Capabilities Integration and Development System.” Such analysis might lead to a “validated capability requirements document” or “equivalent requirements document” as referenced on page 5 of DOD Instruction (DODI) 5000.02 of January 7, 2015, entitled “Operation of the Defense Acquisition System.” An example of such a requirements document is an Initial Capabilities Document (ICD), which is also mentioned on page 5, although that might not be the correct term to use in this instance, which concerns an effort to acquire ships in the latter portion of an existing shipbuilding program. For additional background discussion on the defense acquisition system, see CRS Report RL34026, *Defense Acquisitions: How DOD Acquires Weapon Systems and Recent Efforts to Reform the Process*, by Moshe Schwartz.

²² Such a study, like the third study listed above, might be referred to under the defense acquisition system as an Analysis of Alternatives (AoA). (In earlier years, a study like the second of the three studies listed above might have been referred to as an Analysis of Multiple Concepts, or AMC.) In discussing the AOA for a new acquisition program, it can be helpful to understand whether the AoA was more like the second or third of the studies listed here.

²³ Such a study, like the second study listed above, might be referred to under the defense acquisition system as an Analysis of Alternatives (AoA). In discussing the AOA for a new acquisition program, it can be helpful to understand whether the AoA was more like the second or third of the studies listed here.

²⁴ For example, the October 28, 2004, version of a CRS report covering the DD(X) (aka, DDG-100) and LCS programs stated:

In contrast to the DD(X), which reflects the outcome of a formal analysis intended to identify the best or most promising way to perform certain surface combatant missions (the SC-21 COEA of 1995-1997), the Navy prior to announcing the start of the LCS program in November 2001 did not conduct a formal analysis—which would now be called an analysis of multiple concepts (AMC)—to demonstrate that a ship like the LCS would be more cost-effective than potential alternative approaches for performing the LCS’s stated missions. Potential alternative approaches for performing the LCS’s stated missions include (1) manned aircraft, (2) submarines equipped with UVs, (3) a larger (perhaps frigate-sized) surface combatant equipped with UVs and operating further offshore, (4) a noncombat littoral support craft (LSC) equipped with UVs, or (5) some
(continued...)

2003, the Navy acknowledged that, on the question of what would be the best approach to perform the LCS's stated missions, "The more rigorous analysis occurred after the decision to move to LCS."²⁵ This issue may have led to some of the controversy that the program experienced in subsequent years,²⁶ which in turn formed the backdrop for Secretary of Defense Chuck Hagel's February 24, 2014, announcement of the program's restructuring.

Navy's Restructured Plan for Frigate Ships Appears to Have Been Announced Without Two of These Analyses

The Navy's restructured plan for the frigate design may have a weakness in its analytical foundation due to two formal, rigorous analyses that do not appear to have been conducted prior to Secretary of Defense Chuck Hagel's announcement on February 24, 2014, of the effort to restructure the program. Specifically, neither the Office of the Secretary of Defense nor the Navy has presented

- a formal, rigorous analysis to identify capability gaps and/or mission needs that was done prior to the Secretary of Defense Hagel's February 24, 2014, announcement, or
- a formal, rigorous analysis that identified "a capable and lethal small surface combatant, generally consistent with the capabilities of a frigate" as not simply one way, but rather the best or most promising way, to fill those capability gaps or mission needs that was done prior to the February 24, 2014, announcement.

(...continued)

combination. An AMC is often performed before a service starts a major acquisition program.

The absence of an AMC raises a question regarding the analytical basis for the Navy's assertion that the LCS is the most cost-effective approach for performing the LCS's stated missions, particularly given the Navy's pre-November 2001 resistance to the idea of a smaller combatant. As a result, the issue of whether a ship like the LCS represents the best or most promising approach has become a subject of some debate.

(CRS Report RL32109, *Navy DDG-51 and DDG-1000 Destroyer Programs: Background and Issues for Congress*, by Ronald O'Rourke.

²⁵ Spoken testimony of Vice Admiral John Nathman, Deputy Chief of Naval Operations (Warfare Requirements and Programs), at an April 3, 2003, hearing on Navy programs before the Projection Forces subcommittee of the House Armed Services Committee. At this hearing, the chairman of the subcommittee, Representative Roscoe Bartlett, asked the Navy witnesses about the Navy's analytical basis for the LCS program. The witnesses defended the analytical basis of the LCS program but acknowledged that "The more rigorous analysis occurred after the decision to move to LCS." See U.S. Congress, House Committee on Armed Services, Subcommittee on Projection Forces, Hearing on National Defense Authorization Act for Fiscal Year 2004—H.R. 1588, and Oversight of Previously Authorized Programs. 108th Cong., 1st sess., Mar. 27, and Apr. 3, 2003, (Washington: GPO, 2003), p. 126. For an article discussing the exchange, see Jason Ma, "Admiral: Most LCS Requirement Analysis Done After Decision To Build," *Inside the Navy*, April 14, 2003.

²⁶ A January 2015 journal article on the lessons of the LCS program stated:

As Ronald O'Rourke of the Congressional Research Service described it early on [at a presentation at the Surface Navy Association annual symposium in January 2003], the LCS had come about through an "analytical virgin birth... that is going to be a problem for this program down the road." This can be argued to be the root cause of the subsequent LCS woes. One hopes that the new surface combatant [i.e., the Navy's design for the frigate] won't suffer the same problem.

(Gregory V. Cox, "Lessons Learned from the LCS," *U.S. Naval Institute Proceedings*, January 2015: 37-38 (ellipse as in original), citing (for the quoted remark) Hunter Keeter, "O'Rourke: Lack Of Pedigree May Haunt LCS Program," *Defense Daily*, January 16, 2003.)

Given a July 31, 2014, deadline for the Navy to complete its work, the Navy's Small Surface Combatant Task Force (SSCTF) charged with analyzing options for "a capable and lethal small surface combatant, generally consistent with the capabilities of a frigate" apparently did not have enough time to conduct either of the two above analyses. Instead, the task force surveyed Navy fleet commanders to collect their judgments on capability gaps and mission needs, and to get their judgments on what capabilities would be the best to have in "a capable and lethal small surface combatant, generally consistent with the capabilities of a frigate."²⁷

In addition to permitting the task force to complete its work by July 31, 2014, surveying fleet commanders offered the advantage of collecting the "wisdom of the crowd" on the issues of capability gaps/mission needs and what features "a capable and lethal small surface combatant, generally consistent with the capabilities of a frigate" should have. One potential disadvantage of this approach is that it deprived the Navy of a chance to uncover the kind of counter-intuitive results that a formal analysis can uncover. (Indeed, this is a key reason why formal, rigorous analyses are done.) Another potential disadvantage is that fleet commanders can be focused on what they see the Navy needing today, based on current Navy operations, which might not be the same in all respects as what the Navy will need in the future, given the evolving international security environment, potential changes in technology, and resulting potential changes in the nature of warfare and operational concepts. The risk, in other words, is of fielding years from now the best possible improved LCS for the world of 2014.

Using the results it had gathered from surveying fleet commanders, the SSCTF then performed the third of the three above-listed studies—a formal, rigorous analysis to refine the concept for "a capable and lethal small surface combatant, generally consistent with the capabilities of a frigate."

A question for Congress is whether the analytical foundation for the frigate design will provide sufficient stability for acquiring those ships in coming years. Navy officials have stated that, having refined the design concept for the modified LCS design, the Navy will now define and seek approval for the operational requirements for the ship.²⁸ Skeptics might argue that definition

²⁷ A January 8, 2014, press report, for example, states that "The task force canvassed fleet commanders for ways to improve" the baseline LCS design. (Tony Capaccio, "Navy Fixes Won't Much Help Littoral Ship, Tester Says," *Bloomberg News*, January 8, 2015. A January 16, 2015, press report similarly states:

Fleet commanders told Navy officials over the past year that they see anti-submarine warfare, surface warfare and ship self-defense as the most important capabilities for a new small surface combatant, Surface Warfare Director Rear Adm. Peter Fanta said Jan. 13 during the Surface Navy Association's annual symposium. This feedback led the Navy to its decision to move to a modified LCS that will have enhanced weapons, sensors and armor—along with increased weight and a slower top speed.

"What we did first was we went and asked all the warfighters ... what do you want most?" [said] Fanta, who served as one of the co-chairs of the small surface combatant task force that was stood up last year to provide the defense secretary with alternatives for a more lethal and survivable LCS. "They said 'well, we'd like a small surface combatant that does a lot of ASW work, covers our mine mission and still does a lot of surface engagements depending on different parts of the world.'"

(Lara Seligman, "Upgunned LCS Will Trade Speed, Weight For Offensive Capabilities," *Inside the Navy*, January 16, 2015 [with additional reporting by Lee Hudson] Ellipse as in original.)

²⁸ A January 11, 2014, press report, for example, quotes Sean Stackley, the Assistant Secretary of the Navy for Research, Development, and Acquisition (i.e., the Navy's acquisition executive) as stating "We've gone from 'here's the concept,' now we have to go through the formal requirements review board... to define requirements in terms of updating the capabilities document." (As quoted in Christopher Cavas, "Small Combatant Effort Cranks Up," *Defense News*, January 11, 2015. [Ellipse as in original.]) A January 16, 2015, press report similarly states: "The Navy needs to take all the task force's concepts for capabilities and translate them into specific, formal requirements, Stackley explained. Those requirements then need approval by a Resources and Requirements Review Board (R3B)." (Sydney J. (continued...))

and approval of operational requirements should come first, and conceptual design should follow, not the other way around. One possible alternative to the Navy's approach would be to put the announced design concept for the modified LCS design on hold, and perform both a formal, rigorous analysis of capability gaps/mission needs and a formal, rigorous analysis of general approaches for meeting those identified capability gaps/mission needs, and be prepared to follow the results of those analyses, whether they lead back to the announced design concept for the modified LCS design, or to some other solution (which might still be a design of some kind for a modified LCS).

At a March 18, 2015, hearing on Navy shipbuilding programs before the Seapower subcommittee of the Senate Armed Services Committee, the following exchange occurred:

SENATOR MAZIE K. HIRONO, RANKING MEMBER (continuing):

For Secretary Stackley, the Navy—responding to direction from former Secretary Hagel analyzed numerous upgrades to the current LCS designs. And I know you mentioned that this program is undergoing a number of—a number of challenges including large cost overruns in the beginning and design changes that led to instability.

So, you know, Secretary Hagel identified some upgrades to the ship that the Navy hopes to include in the 33rd ship and later. And we need to understand the reasons behind this change.

So either for Secretary Stackley or Admiral Mulloy, perhaps Admiral Mulloy, do you have an approved requirement for the modified LCS vessel, JROC [Joint Requirements Oversight Council] approved?

SEAN J. STACKLEY, ASSISTANT SECRETARY OF THE NAVY FOR RESEARCH, DEVELOPMENT, AND ACQUISITION:

Let me start. JROC approved for the modified vessel, no, ma'am. What we are doing right now is we're going through what's referred to, inside of the service, our equivalent of the JROC inside of the service, our requirements definition process.

That's ongoing today. We've got a target to get down to JROC in the June timeframe, recognizing that this is a[n] [FY]2019 ship that we're proposing to modify. What we want to do though is get—moving on the design activities to support that time—that timeline.

The Secretary of Defense, he gave us the tasking in discussions with him. A lot of the tasking was not dealing with a new threat, taking a look at 306 ship Navy, 52 LCSs, about one in six having what's referred to as a focused- mission capability. In other words it could be doing ASW or it could be doing anti-surface [warfare], or it could be doing mine countermeasures. But it's not doing all of them at one time and his concern that the concept of employment of operations for the LCS either involve Phase zero [i.e., pre-conflict] or early phase [in a conflict] activities or were in the context of a battle group providing a degree of protection for the LCS.

He believed that one in six of our fleet was too large of a number with that concept of employment. And so, that's how he arrived at—capped that [i.e., procurement of baseline LCSs] at 32 [ships]. He wants to see something that had what he referred to as greater lethality and survivability to enable more independent operations, more operations in

(...continued)

Freedberg Jr., "What's In A name? Making The LCS 'Frigate' Reality," *Breaking Defense*, January 16, 2015.) A January 26, 2015, press report similarly states that "the Navy needs to firm up the concept for the new ship's capabilities and translate them into formal requirements, Stackley explained. Those requirements then need to each be approved by a Resources and Requirements Review Board, which is set to occur in the spring." (Lara Seligman, "Navy Working To Iron Out Details Of Plan For Backfitting LCS Upgrade," *Inside the Navy*, January 26, 2015.)

support of battle groups and support of—defending the high value units and give it the ability to provide presence without—outside of the balance of—

HIRONO:

So, Mr. Secretary, I am running out of time, so, just to get a better understanding of what's going on with that LCS program though.

I realize that Secretary Hagel wanted to focus on survivability. And is this survivability requirements for the 33rd ship forward basically very much different from that, that was in the basic LCS.

STACKLEY:

We did not change the requirements associated with the survivability for the modified LCS.

HIRONO:

So, Mr. Chairman, where did he [i.e., the Chairman] go? I guess I can carry on then.

My understanding is that before you really get into the specifics of the design of the ship that you should get the approved requirements. That when you don't have the JROC approval or certification or whatever the technical term is, that, you know, you should put the—you shouldn't put the cart before the horse.

So that is why I asked the question as to whether or not there is an approved requirement for the modified LCS vessel before going forward with any further design aspects.

STACKLEY:

We do not have a—as I described we do not have a JROC requirements documents in advance of today, however, we will have that in advance of doing the design for the modification of the LCS.

HIRONO:

So, when would that timeframe be?

STACKLEY:

We're targeting?

HIRONO:

With getting the JROC?

STACKLEY:

We're targeting the June timeframe for the JROC. And eventually today inside of the Department of the Navy we'll work in the requirements document to support that timeframe.²⁹

An April 13, 2015, press report states:

The Program Executive Office for Littoral Combat Ships (PEO LCS) is working with both its shipbuilders to determine how to bring the current LCS designs into a more lethal and survivable frigate design, while it works with other Navy offices to finalize the frigate requirements....

²⁹ Transcript of hearing.

The program office is also working with the Navy's Surface Warfare Directorate, Naval Surface Warfare Center Dahlgren, Program Executive Office for Integrated Warfare Systems and more to refine the frigate requirements and clearly document them....

[PEO LCS Rear Admiral Brian] Antonio said the requirements will be finalized "this year, as soon as we can."

Surface warfare director Rear Adm. Peter Fanta will lead a series of requirements resource review boards for the frigate, the first of which will look at the combat management system and upgraded over-the-horizon radar, Antonio said.

"We'll get into what the requirements are for those, and then that will sort of free us up [for] getting into the design work," he said, adding that would happen "in a matter of weeks as opposed to months."³⁰

An April 15, 2015, press report states:

The Navy's new frigate will go through the requirements-generation and testing processes as a flight upgrade rather than a new-start program, helping save time and money and allowing the program office to focus on what will be different from the Littoral Combat Ship (LCS) to the frigate upgrade, frigate program manager Capt. Dan Brintzinghoffer said on Wednesday [April 15].

The frigate is working its way through the Joint Requirements Oversight Council (JROC) process now to support the first two ships being bought in Fiscal Year 2019, Brintzinghoffer said at the Navy League's Sea-Air-Space 2015 Exposition. A request for proposals with a detailed technical package would go out in FY 2017 to allow time for industry to ask questions and prepare their bids, which means the Navy has about 18 months to finalize its designs—which will include common combat systems, over-the-horizon radars and over-the-horizon missiles.

Brintzinghoffer noted that he didn't need to decide now which of each system he would use, but rather develop a roadmap for how to ensure a common system could be chosen and engineered into the ship designs. Currently, the Lockheed Martin Freedom variant and the Austal USA Independence variant have different combat systems. Brintzinghoffer said that for the sake of lifecycle costs and fleet flexibility, the frigates would have at the very least common combat system software, if not common consoles.³¹

FY2016 National Defense Authorization Act

Section 130 of the FY2017 National Defense Authorization Act (S. 1356/P.L. 114-92 of November 25, 2015) states:

SEC. 130. Limitation on availability of funds for Littoral Combat Ship.

Of the funds authorized to be appropriated by this Act or otherwise made available for fiscal year 2016 for research and development, design, construction, procurement, or advanced procurement of materials for the Littoral Combat Ships designated as LCS 33 or subsequent, not more than 50 percent may be obligated or expended until Secretary of the Navy submits to the Committees on Armed Services of the Senate and the House of Representatives each of the following:

³⁰ Megan Eckstein, "Navy Frigate Requirements Will Be Finalized Soon, Will Inform Decision on Hull Downselect," *USNI News*, April 13, 2015.

³¹ Megan Eckstein, "Frigate Will Leverage Littoral Combat Ship Testing, Focus on New Combat Systems," *USNI News*, April 15, 2015.

- (1) A capabilities based assessment, or equivalent report, to assess capability gaps and associated capability requirements and risks for the upgraded Littoral Combat Ship, which is proposed to commence with LCS 33. Such assessment shall conform with the Joint Capabilities Integration and Development System, including Chairman of the Joint Chiefs of Staff Instruction 3170.01H.
- (2) A certification that the Joint Requirements Oversight Council has validated an updated Capabilities Development Document for the upgraded Littoral Combat Ship.
- (3) A report describing the upgraded Littoral Combat Ship modernization, which shall, at a minimum, include the following elements:
 - (A) A description of capabilities that the Littoral Combat Ship program delivers, and a description of how these relate to the characteristics of the future joint force identified in the Capstone Concept for Joint Operations, concept of operations, and integrated architecture documents.
 - (B) A summary of analyses and studies conducted on Littoral Combat Ship modernization.
 - (C) A concept of operations for Littoral Combat Ship at the operational level and tactical level describing how they integrate and synchronize with joint and combined forces to achieve the Joint Force Commander's intent.
 - (D) A description of threat systems of potential adversaries that are projected or assessed to reach initial operational capability within 15 years against which the lethality and survivability of the Littoral Combat Ship should be determined.
 - (E) A plan and timeline for Littoral Combat Ship modernization program execution.
 - (F) A description of system capabilities required for Littoral Combat Ship modernization, including key performance parameters and key system attributes.
 - (G) A plan for family of systems or systems of systems synchronization.
 - (H) A plan for information technology and national security systems supportability.
 - (I) A plan for intelligence supportability.
 - (J) A plan for electromagnetic environmental effects and spectrum supportability.
 - (K) A description of assets required to achieve initial operational capability of a Littoral Combat Ship modernization increment.
 - (L) A schedule and initial operational capability and full operational capability definitions.
 - (M) A description of doctrine, organization, training, materiel, leadership, education, personnel, facilities, and policy considerations.
 - (N) A description of other system attributes.
- (4) A plan for future periodic combat systems upgrades, which are necessary to ensure relevant capability throughout the Littoral Combat Ship or Frigate class service lives, using the process described in paragraph (3).

Survivability and Lethality of Baseline LCS Design

Another oversight issue for Congress concerns the survivability and lethality of the baseline LCS design. A December 2015 GAO report on this issue states:

The lethality and survivability of the Littoral Combat Ship (LCS) is still largely unproven, 6 years after delivery of the lead ships. LCS was designed with reduced

requirements as compared to other surface combatants, and the Navy has since lowered several survivability and lethality requirements and removed several design features—making the ship both less survivable in its expected threat environments and less lethal than initially planned. The Navy is compensating for this by redefining how it plans to operate the ships.

In 2014, the Navy conducted its first operational test of an early increment of the surface warfare mission package on a Freedom variant LCS, demonstrating that LCS could meet an interim lethality requirement. The Navy declared LCS operationally effective. However, the Navy’s test report stated that the ship did not meet some key requirements. Further, the Department of Defense’s Director of Operational Test and Evaluation has stated that there is insufficient data to provide statistical confidence that LCS can meet its lethality requirements in future testing or operations, and further testing is needed to demonstrate both variants can meet requirements in varied threat environments.

The Navy also has not yet demonstrated that LCS will achieve its survivability requirements, and does not plan to complete survivability assessments until 2018—after more than 24 ships are either in the fleet or under construction. The Navy has identified unknowns related to the use of aluminum and the hull of the Independence [i.e., LCS-2] variant, and plans to conduct testing in these areas in 2015 and 2016. However, the Navy does not plan to fully determine how the Independence variant will react to an underwater explosion. This variant also sustained some damage in a trial in rough sea conditions, but the Navy is still assessing the cause and severity of the damage and GAO has not been provided with a copy of the test results. Results from air defense and cybersecurity testing also indicate concerns, but specific details are classified.

In February 2014 the former Secretary of Defense directed the Navy to assess options for a small surface combatant with more survivability and combat capability than LCS. The Navy conducted a study and recommended modifying the LCS to add additional survivability and lethality features. After approving the Navy’s recommendation, the former Secretary of Defense directed the Navy to submit a new acquisition strategy for a modified LCS for his approval. He also directed the Navy to assess the cost and feasibility of backfitting lethality and survivability enhancements on current LCS. Nevertheless, the Navy has established a new frigate program office to manage this program, and the Navy has requested \$1.4 billion for three LCS in the fiscal year 2016 President’s budget, even though it is clear that the current ships fall short of identified survivability and lethality needs. GAO has an ongoing review of the Navy’s small surface combatant study and future plans for the LCS program.

This report is a public version of a classified report issued in July 2015. Throughout this report, GAO has indicated where information has been omitted or redacted due to security considerations. All information in this report reflects information current as of July 2015 to be consistent with the timeframe of the classified report.³²

A January 2016 report from DOD’s Director, Operational Test and Evaluation (DOT&E)—DOT&E’s annual report for FY2015—states:

- In the report to Congress required by the National Defense Authorization Act (NDAA) for FY15, DOT&E concluded that the now-planned use of the Littoral Combat Ship (LCS) as a forward-deployed combatant, where it might be involved in intense naval conflict, appears to be inconsistent with its inherent survivability in those same environments....

³² Government Accountability Office, *Littoral Combat Ship[:] Knowledge of Survivability and Lethality Capabilities Needed Prior to Making Major Funding Decisions*, GAO-16-201, December 2015, summary page.

- In comparison to other Navy ships, the LCS seaframes have relatively modest air defense capabilities that cannot be characterized fully until planned tests on LCS 7 and LCS 8 and the Navy's unmanned self-defense test ship provide data for the Navy Probability of Raid Annihilation (PRA) high-fidelity modeling and simulation analyses. The Navy plans to begin those tests in FY17. In FY15, DOT&E learned that the Program Executive Office for Integrated Warfare Systems (PEO IWS) stopped work on the PRA Test Bed for the Freedom variant because a high-fidelity model of the ship's AN/SPS-75 radar was not being developed. Development of an acceptable radar model requires intellectual property rights that the Navy does not hold and is not actively seeking. Although less critical because of the combat system architecture of the Independence variant, the Navy has also been unable to develop a high-fidelity model of that ship's AN/SPS-77 radar for the same reason. In an August 2015 memorandum, DOT&E advised Navy officials that the lack of these radar models threatens the viability of the Navy's strategy for evaluation of LCS air defense capabilities and suggested alternative strategies specific to each seaframe variant. The Navy has not decided what course of action it wants to pursue.
- In August 2015, the Navy conducted the first shipboard live firing of the ship's SeaRAM system. The demonstration was not designed to be an operationally realistic test of the ship's capability. The aerial drone's flight profile and configuration were not threat representative....
- DOT&E does not expect either LCS variant to be survivable in high-intensity combat because the design requirements accept the risk that the crew would have to abandon ship under circumstances that would not require such action on other surface combatants. Although the ships incorporate capabilities to reduce their susceptibility to attack, previous testing of analogous capabilities demonstrates it cannot be assumed LCS will not be hit in high-intensity combat.
- The LCS 3 Total Ship Survivability Trial (TSST) revealed significant deficiencies in the Freedom variant design. Much of the ship's mission capability would have been lost because of damage caused by the initial weapons effects or the ensuing fire. The weapons effects and fire damage happened before the crew could respond, and the ship does not have sufficient redundancy to recover the lost capability.³³

Survivability of Frigate Design

Another oversight issue for Congress concerns the survivability of the Navy's proposed design for the frigate. A January 2016 report from DOD's Director, Operational Test and Evaluation (DOT&E)—DOT&E's annual report for FY2015—states:

- The latest draft SSC [small surface combatant] CDD [Capability Development Document] requires that the modified LCS [i.e., frigate] be multi-mission capable, more lethal, and more survivable....
- The latest draft CDD relegates all mission performance measures, other than the two measures for force protection against surface and air threats, to Key System Attributes rather than KPPs [Key performance Parameters], which permits the combat capabilities desired in these follow-on ships to be traded away as needed to remain within the cost constraints. As a result, the new SSC [i.e. the frigate] could, in the extreme, be delivered with less mission capability than desired and with limited improvements to the survivability of the ship in a combat environment. In fact, the SSC could meet all its KPPs without having any mission capability.

³³ Department of Defense, Director, Operational Test & Evaluation, *FY 2015 Annual Report*, January 2016, pp. 225-226.

- The vulnerability reduction features proposed for the SSC provide no significant improvement in the ship's survivability. Notwithstanding potential reductions to its susceptibility due to improved electronic warfare system and torpedo defense, minor modifications to LCS (e.g., magazine armoring) will not yield a ship that is significantly more survivable than LCS when engaged with threat missiles, torpedoes, and mines expected in major combat operations.
- The current LCS seaframes do not have sufficient separation and redundancy in their vital systems to recover damaged capability. Because the SSC design is not substantially different from the LCS Flight 0+ baseline and will not add much more redundancy or greater separation of critical equipment or additional compartmentation, it will likely be less survivable than the Navy's previous frigate class.³⁴

Technical Risk and Issues Relating to Program Execution

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

Sea Frame

March 2015 GAO Report

A March 2015 GAO report assessing DOD weapon acquisition programs stated:

Technology Maturity

Sixteen of the 18 critical technologies for both LCS designs are mature and have been demonstrated in a realistic environment. However, the Navy indicated that the remaining two are also mature because the overhead launch and retrieval system was demonstrated through last year's deployment of LCS 1, and LCS 2's aluminum structure was demonstrated based on its performance in trials and maritime exercises. Yet the Navy stated that the maturity of these technologies has not been formally validated—and no date has been set to do so. Unknowns also remain regarding LCS 2's hull structure, and test events are scheduled through 2016.

Design and Production Maturity

To date, the Navy has accepted delivery of four seaframes; LCS 5 through LCS 16 are in various stages of construction and LCS 17 through 24 are under contract. The next contract award is planned for 2016. The Navy continues to incorporate changes into follow-on ship designs, including an updated radar starting on LCS 17, and Freedom class gunfire control system improvements. LCS 1 and 2 do not meet certain performance requirements and face capability limitations due to weight growth during construction. As a result, these ships lack the required amount of service life allowance—the margin to accommodate future changes—without removing weight over the ship's lifetime.

The Navy declared initial operational capability for the Freedom variant when LCS 1 deployed to Singapore in March 2013. DOD's test authority reported in December 2013 on the results of this early fielding with the surface warfare mission package. It noted a number of issues with the seaframe and its planned capabilities, including survivability. The Freedom variant began formal operational testing in fiscal year 2014 and completed total ship survivability trials in October 2014, but the results are not yet available.

³⁴ Department of Defense, Director, Operational Test & Evaluation, *FY 2015 Annual Report*, January 2016, p. 294.

DOD and Navy test officials have not yet assessed the survivability or cyber defense capabilities of the Independence variant. The Navy continues to develop and test the LCS 2 combat system, and the software and system integration necessary to achieve baseline capabilities will not be complete until September 2015. LCS 2 completed rough water trials in January 2014, the results of which are pending completion of a final test report. The Navy discovered cracks in the mission bay following this testing and imposed a weight limit on the LCS 2 and LCS 4 launch and recovery systems. In lieu of completing final contract trials on the Independence variant, the Navy's Board of Inspection and Survey conducted a one-day special trial in August 2014, and the Navy does not plan to complete the acceptance trial for LCS 2. According to the Navy, the initial operational capability of LCS 2 has been delayed until September 2015 as a result of funding restrictions for one type of mission package.

Other Program Issues

In February 2014, the Secretary of Defense directed the Navy to contract for no more than 32 ships, citing concerns about the ships' survivability and lethality. The Secretary also directed the Navy to create a task force to evaluate a range of cost and capability options for a future small surface combatant, including an improved LCS. The Navy recommended a modified LCS to satisfy DOD's small surface combatant requirement and plans to buy 20 additional LCS hulls, which will be reclassified as frigates, starting in fiscal year 2019.

Program Office Comments

In commenting on a draft of this assessment, the program office noted that it continues to test the long-term behavior of the LCS 2's aluminum hull. The program office is modifying LCS 1 and 2 designs to ensure they meet service life allowance requirements. The LCS 2 Combat System is functional and is supporting developmental testing onboard LCS 2. Both variants of LCS achieved operational and developmental testing milestones. In 2015, LCS will achieve Initial Operational Capability for the LCS 2 variant. The intent of the LCS 2 Special Trial was to identify deficiencies, test the ship, and deliver a report card to US Fleet Forces Command. The scope included standard underway demonstrations. The program office indicated that, with over four years of robust developmental testing the performance of the ship, and its systems are well understood. The program office also provided technical comments, which were incorporated where deemed appropriate.³⁵

January 2016 DOT&E Report

Regarding technical risk in the LCS sea frame, a January 2016 report from DOD's Director, Operational Test and Evaluation (DOT&E)—DOT&E's annual report for FY2015—states:

- Test activities in FY15 allowed the collection of reliability, maintainability, availability, and logistics supportability data to support evaluation of the operational suitability of the Independence variant seaframe. Although incomplete, the data collected to date show that many of the Independence variant seaframe systems have significant reliability problems. During developmental testing, the LCS 4 crew had difficulty keeping the ship operational as it suffered repeated failures of the ship's diesel generators, water jets, and air conditioning units. LCS 4 spent 45 days over a period of 113 days without all 4 engines and steerable water jets operational. This includes a 19-day period in May when 3 of the 4 engines were degraded or non-functional. During the five-month MCM mission package TECHEVAL period, LCS 2 seaframe failures caused the ship to return to, or

³⁵ Government Accountability Office, *Defense Acquisitions[:] Assessments of Selected Weapon Programs*, GAO-15-342SP, March 2015, p. 108.

remain in, port for repairs on seven occasions. Similar to LCS 4, the ship's core systems, such as the air defense system, SeaRAM, the MK 110 57 mm gun, the electro-optical/infrared sensor (Sea Star Shipboard Airborne Forward-Looking Infra-Red Equipment (SAFIRE)) used to target the gun, and the ship's primary radar, experienced failures, leaving the ship with no air or surface defense capability for more than one-half of the test period. LCS 2 was unable to launch and recover RMMVs on 15 of the 58 days underway because of 4 separate propulsion equipment failures involving diesel engines, water jets, and associated hydraulic systems and piping.³⁶

Mission Packages

March 2015 GAO Report

A March 2015 GAO report assessing DOD weapon acquisition programs stated:

Mine Countermeasures (MCM)

The Navy has accepted five MCM packages without demonstrating that they meet interim—or threshold—requirements and plans to accept one more in fiscal 2015. The package will field in four increments: the first is designed to remove sailors from the minefield and improve mine detection, classification, and neutralization over legacy vessels. Operational testing for the first increment is scheduled to begin in fiscal 2015 on both variants. Future increments, needed to meet threshold requirements, are intended to provide additional capability to detect mines as well as different means of neutralizing them.

Surface Warfare (SUW)

The Navy has accepted five SUW packages and plans to accept two more in fiscal year 2015. Each package currently consists of two 30 millimeter guns, an armed helicopter, and two rigid hull inflatable boats. In August 2014, the Navy found that the current package met its interim performance requirements on the Freedom variant (LCS 1) and declared initial operational capability in November 2014. Operational testing of the current package with the Independence variant (LCS 2) is planned for 2015. To meet threshold requirements for SUW the Navy needs a surface-to-surface missile and plans to use the Army's Longbow Hellfire missile for this capability, as it canceled previous efforts with the Griffin missile. According to program officials, initial demonstrations with Longbow Hellfire have been successful, and the Navy is currently integrating this missile with both variants of the LCS. Operational testing is planned for fiscal 2016, with initial capability planned for fiscal 2017.

Antisubmarine Warfare (ASW)

According to the Navy, the systems that comprise the ASW mission package are mature as they have been fielded by United States and foreign navies. In September 2014, the Navy completed development testing aboard the Freedom variant. Program officials report that currently the mission package is 5 tons too heavy to fit within the parameters reserved for the packages. According to program officials, the Navy is soliciting industry for suggestions to reduce the package's weight by at least 15 percent. The Navy is planning to meet the threshold requirement for ASW in 2016.

Other Program Issues

The Navy continues to procure LCS seaframes, even though the sub-systems necessary to meet full mission package requirements have not yet been fully developed, demonstrated,

³⁶ Department of Defense, Director, Operational Test & Evaluation, *FY 2015 Annual Report*, January 2016, p. 226.

and integrated with either seaframe class. Integrating these systems on the LCS seaframe is challenging because of limitations on space and weight inherent in the seaframe designs. The Navy will not achieve the capability to meet full requirements for all three of the mission packages until 2020, by which time it plans to take delivery of 24 ships.

Program Office Comments

The Navy states that it is purchasing the quantity of mission systems and packages needed for system integration, crew training, developmental testing, operational testing, and LCS operational deployments. The mission packages have all been demonstrated in a relevant environment prior to mission package integration, and therefore, the LCS program is purchasing the mission systems in accordance with DOD guidance and regulations. Further, the Navy is following its plan to incrementally deliver operationally effective mission package capability to the fleet rather than waiting years to acquire all mission systems needed to meet the threshold requirements. For example, initial SUW capability has been fielded and initial MCM capability will be fielded in fiscal 2015.

GAO Response

The systems that comprise the Navy's mission packages have yet to work successfully together to achieve results. For example, none of the mission packages for any increment have achieved interim requirements on the Independence variant, or meet its threshold requirements for either seaframe. In the absence of a defined increment-based approach to sequentially gain knowledge and meet requirements, the Navy's acquisition approach is not in accordance with best practices.³⁷

January 2016 DOT&E Report

Regarding technical risk in LCS mission packages, the January 2016 DOT&E report states:

- [In a report to Congress required by the National Defense Authorization Act (NDAA) for FY2015, DOT&E] concluded that the ability of LCS to successfully execute significant aspects of its envisioned concept of operations (CONOPS) depends on the effectiveness of the mission packages. To date, the Navy has not yet demonstrated effective capability for either the Mine Countermeasures (MCM) or Anti-Submarine Warfare (ASW) mission packages. The Surface Warfare (SUW) mission package has demonstrated a modest ability to aid the ship in defending itself against small swarms of small boats, and the ability to conduct maritime security operations.
- During FY15, the Navy conducted developmental testing of the Independence variant LCS seaframe and Increment 1 MCM mission package aboard USS Independence (LCS 2). Although the Navy intended to complete that testing by June 2015 and conduct the operational test from July to September, it extended developmental testing through the end of August because of seaframe failures and MCM mission system reliability shortfalls. The Navy subsequently decided in October 2015 to postpone the first phase of IOT&E of the MCM mission package until sometime in 2016, at the earliest.
- The Navy chartered an independent program review of the Remote Minehunting System (RMS), including an evaluation of potential alternative MCM systems, in September 2015.
- DOT&E concluded in a November 2015 memorandum to the USD(AT&L) and the Navy, based on all testing conducted to date, that an LCS employing the current MCM mission package would not be operationally effective or operationally suitable if the

³⁷ Government Accountability Office, *Defense Acquisitions[:] Assessments of Selected Weapon Programs*, GAO-15-342SP, March 2013, p. 110.

Navy called upon it to conduct MCM missions in combat and that a single LCS equipped with the Increment 1 MCM mission package would provide little or no operational capability to complete MCM clearance missions to the levels needed by operational commanders. The following summarize the primary reasons for this conclusion:

- Critical MCM systems are not reliable.
- The ship is not reliable.
- Vulnerabilities of the Remote Multi-Mission Vehicle (RMMV) to mines and its high rate of failures do not support sustained operations in potentially mined waters.
- RMMV operational communications ranges are limited.
- Minehunting capabilities are limited in other-than-benign environmental conditions.
- The fleet is not equipped to maintain the ship or the MCM systems.
- The Airborne Mine Neutralization Systems (AMNS) cannot neutralize most of the mines in the Navy's threat scenarios; an Explosive Ordnance Disposal Team or other means provided by another unit must be used.
- During the MCM mission package Technical Evaluation (TECHEVAL), the Navy demonstrated that an LSC could detect, classify, identify, and neutralize only a fraction of the mines in the Navy's mine clearance scenarios while requiring extraordinary efforts from shore support, maintenance personnel, and contractors.
- The Navy also conducted both developmental and operational testing of the Independence variant LCS seaframe with the Increment 2 SUW mission package aboard LCS 4. Operational testing of the seaframe and Increment 2 SUW mission package is not yet complete because of pending changes to the ship's air defense system, Sea Rolling Airframe Missile (SeaRAM), and other elements of the ship's combat system and networks. A second phase of operational testing of the Increment 2 version of the SUW mission package and Independence variant seaframe is scheduled to occur in 3QFY16.
- While equipped with the Increment 2 SUW mission package, LCS 4 participated in three engagements with small swarms of Fast Inshore Attack Craft (FIAC). Although all of the attacking boats were ultimately defeated, an attacker managed to penetrate the "keep-out" range in two of the three events. In all three events, however, the ship expended a large quantity of ammunition from the seaframe's 57 mm gun and the two mission package 30 mm guns, while contending with repeated network communication faults that disrupted the flow of navigation information to the gun systems as well as azimuth elevation inhibits that disrupted or prevented establishing firing solutions on the targets. LCS 4's inability to defeat this relatively modest threat beyond the "keep-out" range routinely under test conditions raises questions about its ability to deal with more challenging threats that could be present in an operational environment.³⁸

FY2016 National Defense Authorization Act

Section 1090 the FY2016 National Defense Authorization Act (S. 1356/P.L. 114-92 of November 25, 2015) states:

SEC. 1090. Mine countermeasures master plan and report.

(a) Master plan required.—

³⁸ Department of Defense, Director, Operational Test & Evaluation, *FY 2015 Annual Report*, January 2016, pp. 225-226.

(1) **PLAN REQUIRED.**—At the same time the budget is submitted to Congress for each of fiscal years 2018 through 2023, the Secretary of the Navy shall submit to the congressional defense committees a mine countermeasures (in this section referred to as “MCM”) master plan.

(2) **ELEMENTS.**—Each MCM master plan submitted under paragraph (1) shall include each of the following:

(A) An evaluation of the capabilities, capacities, requirements, and readiness levels of the defensive capabilities of the Navy for MCM, including an assessment of—

(i) the dedicated MCM force; and

(ii) the capabilities of ships, aircraft, and submarines that are not yet dedicated to MCM but could be modified to carry MCM capabilities.

(B) An evaluation of the ability of commanders—

(i) to properly command and control air and surface MCM forces from the fleet to the unit level; and

(ii) to provide necessary operational and tactical control and awareness of such forces to facilitate mission accomplishment and defense.

(C) An assessment of—

(i) technologies having promising potential to improve MCM; and

(ii) programs for transitioning such technologies from the testing and evaluation phases to procurement.

(D) A fiscal plan to support the master plan through the Future Years Defense Plan.

(E) A plan for inspection of each asset with MCM responsibilities, requirements, and capabilities, which shall include proposed methods to ensure the material readiness of each asset and the training level of the force, a general summary, and readiness trends.

(3) **FORM OF SUBMISSION.**—Each MCM master plan submitted under paragraph (1) shall be in unclassified form, but may include a classified annex addressing the capability and capacity to meet operational plans and contingency requirements.

(b) Report to Congress.—

(1) **REPORT REQUIRED.**—Not later than one year after the date of the enactment of this Act, the Secretary of the Navy shall submit to the congressional defense committees a report that contains the recommendations of the Secretary—

(A) regarding MCM force structure; and

(B) ensuring the operational effectiveness of the surface MCM force through 2025 based on current capabilities and capacity, replacement schedules, and service life extensions or retirement schedules.

(2) **ELEMENTS.**—The report submitted under paragraph (1) shall include the following:

(A) An assessment of the MCM vessels, including the decommissioned MCM-1 and MCM-2 ships and the potential of such ships for reserve operating status.

(B) An assessment of the Littoral Combat Ship MCM mission package increment one performance against the initial operational test and evaluation criteria.

(C) An assessment of other commercially available MCM systems that could supplement or supplant Littoral Combat Ship MCM mission package systems.

Additional Oversight Issues Raised in GAO Reports

Additional oversight issues raised in recent GAO reports include LCS operation and support (O&S) costs,³⁹ weight management on the LCS sea frames—an issue that can affect the ability of LCSs to accept new systems and equipment over their expected life cycles⁴⁰—and construction quality on the lead ships in the LCS program.⁴¹

Legislative Activity for FY2017

Summary of Congressional Action on FY2017 Funding Request

Table 2 summarizes congressional action on the Navy’s FY2017 procurement funding request for the LCS program.

Table 2. Congressional Action on FY2017 Procurement Funding Request

Figures in millions, rounded to nearest tenth

	Request	Authorization			Appropriation		
		HASC	SASC	Conf.	HAC	SAC	Conf.
Shipbuilding and Conversion, Navy (SCN) appropriation account							
Procurement of two LCSs	1,125.6						
Cost-to-complete funding for prior-year LCSs	86.0						
Other Procurement, Navy (OPN) appropriation account							
Line 36: LCS common mission modules equipment	27.8						
Line 37: LCS MCM mission modules	57.1						
Line 38: LCS ASW mission modules	32.0						
Line 39: LCS SUW mission modules	22.5						
Line 40: Remote Minehunting System (RMS)	0						

Source: Table prepared by CRS based on FY2017 Navy budget submission and committee and conference reports.

Notes: **HASC** is House Armed Services Committee; **SASC** is Senate Armed Services Committee; **HAC** is House Appropriations Committee; **SAC** is Senate Appropriations Committee; **Conf.** is conference agreement.

³⁹ Government Accountability Office, *Littoral Combat Ship[:]* *Deployment of USS Freedom Revealed Risks in Implementing Operational Concepts and Uncertain Costs*, GAO-14-447, July 2014, 57 pp.

⁴⁰ Government Accountability Office, *Littoral Combat Ship[:]* *Additional Testing and Improved Weight Management Needed Prior to Further Investments*, GAO-14-749, July 2014, 54 pp.

⁴¹ Government Accountability Office, *Littoral Combat Ship[:]* *Navy Complied with Regulations in Accepting Two Lead Ships, but Quality Problems Persisted after Delivery*, GAO-14-827, September 2014, 35 pp.

Appendix A. Some Major Program Developments Prior to Program's 2014 Restructuring

This appendix summarizes some major developments in the LCS program prior to its 2014 restructuring. For information on the program's 2014 restructuring, see **Appendix B**.

Growth in Sea Frame Procurement Costs

The Navy originally spoke of building LCS sea frames for about \$220 million each in constant FY2005 dollars. Unit costs for the first few LCSs subsequently more than doubled. Costs for subsequent LCSs then came down under the current block buy contracts, to roughly \$450 million each in current dollars, which equates to roughly \$380 million in constant FY2005 dollars, using DOD's budget authority deflator for procurement excluding pay, fuel, and medical.⁴²

2007 Program Restructuring and Ship Cancellations

The Navy substantially restructured the LCS program in 2007 in response to significant cost growth and delays in constructing the first LCS sea frames. This restructuring led to the cancellation in 2007 of four LCSs that were funded in FY2006 and FY2007. A fifth LCS, funded in FY2008, was cancelled in 2008. The annual procurement quantities shown above in **Table 1** reflect these cancellations (i.e., the five canceled ships no longer are shown in the annual procurement quantities in this table).

2009 Down Select Acquisition Strategy (Not Implemented)

On September 16, 2009, the Navy announced a proposed acquisition strategy under which the Navy would hold a competition to pick a single design to which all LCSs procured in FY2010 and subsequent years would be built (i.e., carry out a design "down select").⁴³ Section 121(a) and

⁴² This deflator is shown in *National Defense Budget Estimates for FY 2014*, May 2013, Table 5-7 (pages 71-72). This DOD budget reference document is also known as the "Green Book."

⁴³ The winner of the down select would be awarded a contract to build 10 LCSs over the five-year period FY2010-FY2014, at a rate of two ships per year. The Navy would then hold a second competition—open to all bidders other than the shipyard building the 10 LCSs in FY2010-FY2014—to select a second shipyard to build up to five additional LCSs to the same design in FY2012-FY2014 (one ship in FY2012, and two ships per year in FY2013-FY2014). These two shipyards would then compete for contracts to build LCSs procured in FY2015 and subsequent years.

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

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

(b) of the FY2010 National Defense Authorization Act (H.R. 2647/P.L. 111-84 of October 28, 2009) provided the Navy authority to implement this down select strategy. The Navy's down select decision was expected to be announced by December 14, 2010, the date when the two LCS bidders' bid prices would expire.⁴⁴ The down select strategy was not implemented; it was superseded in late December 2010 by the current dual-award acquisition strategy (see next section).

2010 Dual-Award Acquisition Strategy (Implemented)

On November 3, 2010, while observers were awaiting the Navy's decision under the down select strategy (see previous section), the Navy notified congressional offices that it was prepared to implement an alternative dual-award acquisition strategy under which the Navy would forego making a down select decision and instead award each LCS bidder a 10-ship block buy contract for the six-year period FY2010-FY2015, in annual quantities of 1-1-2-2-2-2.⁴⁵ The Navy stated that, compared to the down select strategy, the dual-award strategy would reduce LCS procurement costs by hundreds of millions of dollars. The Navy needed additional legislative authority from Congress to implement the dual-award strategy. The Navy stated that if the additional authority were not granted by December 14, the Navy would proceed to announce its down select decision under the acquisition strategy announced on September 16, 2009. On December 13, 2010, it was reported that the two LCS bidders, at the Navy's request, had extended the prices in their bids to December 30, 2010, effectively giving Congress until then to decide whether to grant the Navy the authority needed for the dual-award strategy.

The Navy's November 3, 2010, proposal of a dual-award strategy posed an issue for Congress of whether this strategy would be preferable to the down select strategy, and whether Congress should grant the Navy, by December 30, 2010, the additional legislative authority the Navy would need to implement the dual-award strategy. On December 14, 2010, the Senate Armed Services Committee held a hearing to review the proposed dual-award strategy. Congress granted the Navy authority to implement the dual-award strategy in Section 150 of H.R. 3082/P.L. 111-322 of December 22, 2010, an act that, among other things, funded federal government operations through March 4, 2011.

On December 29, 2010, using the authority granted in H.R. 3082/P.L. 111-322, the Navy implemented the dual-award strategy, awarding a 10-ship, fixed-price incentive (FPI) block-buy contract to Lockheed, and another 10-ship, FPI block-buy contract to Austal USA. As mentioned earlier (see "Unit Procurement Cost Cap"), in awarding the contracts, the Navy stated that LCSs to be acquired under the two contracts are to have an average unit cost of about \$440 million, a figure well below the program's adjusted unit procurement cost cap (as of December 2010) of \$538 million. The 20 ships to be acquired under the two contracts have a target cost and a higher ceiling cost. Any cost growth above the target cost and up to the ceiling cost would be shared between the contractor and the Navy according to an agreed apportionment (i.e., a "share line").

(...continued)

Officer Littoral and Mine Warfare, before the Subcommittee on Seapower and Expeditionary Forces of the House Armed Services Committee [hearing] on the Current Status of the Littoral Combat Ship Program, March 10, 2009, pp. 7-8.

⁴⁴ The Navy had earlier planned to make the down select decision and award the contract to build the 10 LCSs in the summer of 2010, but the decision was delayed to as late as December 14. (The final bids submitted by the two LCS contractors were submitted on about September 15, and were valid for another 90 days, or until December 14.)

⁴⁵ For more on block buy contracts, see CRS Report R41909, *Multiyear Procurement (MYP) and Block Buy Contracting in Defense Acquisition: Background and Issues for Congress*, by Ronald O'Rourke and Moshe Schwartz.

Any cost growth above the ceiling cost would be borne entirely by the contractor. The Navy stated that, as a worst case, if the costs of the 20 ships under the two FPI contracts grew to the ceiling figure and all change orders were expended, the average cost of the ships would increase by about \$20 million, to about \$460 million, a figure still well below the adjusted cost cap figure of \$538 million.⁴⁶

The Navy on December 29, 2010, technically awarded only two LCSs (one to each contractor). These ships (LCS-5 and LCS-6) are the two LCSs funded in FY2010. Awards of additional ships under the two contracts are subject to congressional authorization and appropriations. The Navy states that if authorization or sufficient funding for any ship covered under the contracts is not provided, or if the Navy is not satisfied with the performance of a contractor, the Navy is not obliged to award additional ships covered under contracts. The Navy states that it can do this without paying a penalty to the contractor, because the two block-buy contracts, unlike a typical multiyear procurement (MYP) contract, do not include a provision requiring the government to pay the contractor a contract cancellation penalty.⁴⁷

Changes in Mission Package Equipment

The Navy since January 2011 has announced changes to the composition of all three LCS mission packages. The concept for the ASW package, and consequently the equipment making up the package, was changed substantially. The equipment making up the MIW package has changed somewhat, partly as a result of the testing of the MIW systems being developed for the package. An Army-developed missile called Non-Line of Sight Launch System (NLOS-LS) that was to be used in the SUW package was canceled by the Army and has been replaced for the next few years in the LCS SUW module by the shorter-ranged Army Longbow Hellfire missile, pending the eventual acquisition for the LCS SUW module of a follow-on missile with longer range.⁴⁸

2012 Establishment of LCS Council

On August 22, 2012, Admiral Jonathan Greenert, the chief of Naval Operations, established an LCS Council headed by four vice admirals to address challenges faced by the LCS program for supporting the planned deployment of an LCS to Singapore beginning in 2013. The challenges were identified in four internal Navy reviews of the LCS program (two of them based on wargames) that were completed between February and August of 2012. The memorandum from the CNO establishing the council states that the council will be “empowered ... to drive action across the acquisition, requirements and Fleet enterprises of the Navy.” The council was given an immediate focus of developing and implementing an LCS plan of action and milestones by

⁴⁶ Source: Contract-award information provided to CRS by navy office of Legislative Affairs, December 29, 2010.

⁴⁷ Source: Navy briefing to CRS and the Congressional Budget Office (CBO) on December 15, 2010. For a press article on this issue, see Cid Standifer, “FY-11 LCS Contracts On Hold Because Of Continuing Resolution,” *Inside the Navy*, March 14, 2011.

⁴⁸ The Navy initially chose the Griffin missile as the near-term replacement for NLOS-LS, but in April 2014 announced that the near-term replacement for NLOS-LS would instead be the Longbow Hellfire missile. See Sam LaGrone, “Navy Axes Griffin Missile In Favor of Longbow Hellfire for LCS,” *USNI News* (<http://news.usni.org>), April 9, 2014; Mike McCarthy, “LCS Program Dumping Griffin Missile In Favor Of Army’s Longbow,” *Defense Daily*, April 10, 2014; Michael Fabey, “Hellfire Front-Runner For U.S. Navy Littoral Combat Ship,” *Aerospace Daily & Defense Report*, April 10, 2014: 4.

January 31, 2013. The memorandum also required the council to develop a charter for its operations within 14 days.⁴⁹

⁴⁹ Memorandum from Chief of Naval Operations to Director, Navy Staff, dated August 22, 2012, on Littoral Combat Ship (LCS) Council, posted at *InsideDefense.com* (subscription required), August 24, 2012. See also Defense Media Activity—Navy, “CNO Establishes LCS Council,” *Navy News Service*, August 22, 2012; Christopher P. Cavas, “U.S. Navy Creates LCS ‘Council’ To Guide Development,” *DefenseNews.com*, August 22, 2012; Megan Eckstein, “CNO Establishes LCS Council To Review Recent Data, Lessons Learned,” *Inside the Navy*, August 27, 2012; Mike McCarthy, “Navy Establishes LCS Council,” *Defense Daily*, August 27, 2012.

Appendix B. Program's 2014 Restructuring

This appendix provides additional background information on the 2014 restructuring of the LCS program.

Overview

In 2014, at the direction of Secretary of Defense Chuck Hagel, the program was restructured. As a result of the restructuring, the final 20 ships in the program (ships 33 through 52), which were to be procured in FY2019 and subsequent fiscal years, were to be built to a revised version of the baseline LCS design, and were to be referred to as frigates rather than LCSs.

Under this plan, the LCS/Frigate program was to include 24 baseline-design LCSs procured in FY2005-FY2016, 20 frigates to be procured in FY2019 and subsequent fiscal years, and eight transitional LCSs (which might incorporate some but not all of the design modifications intended for the final 20 ships) to be procured in FY2016-FY2018, for a total of 52 ships.

February 2014 DOD Announcement of Restructuring Effort

February 24, 2014, Secretary of Defense Address and DOD Background Briefing

On February 24, 2014, in an address previewing certain decisions incorporated into DOD's FY2015 budget submission, Secretary of Defense Chuck Hagel stated:

Regarding the Navy's littoral combat ship [LCS], I am concerned that the Navy is relying too heavily on the LCS to achieve its long-term goals for ship numbers. Therefore, no new contract negotiations beyond 32 ships will go forward. With this decision, the LCS line will continue beyond our five-year budget plan with no interruptions.

The LCS was designed to perform certain missions—such as mine sweeping and anti-submarine warfare—in a relatively permissive environment. But we need to closely examine whether the LCS has the independent protection and firepower to operate and survive against a more advanced military adversary and emerging new technologies, especially in the Asia Pacific. If we were to build out the LCS program to 52 ships, as previously planned, it would represent one-sixth of our future 300-ship Navy. Given continued fiscal restraints, we must direct shipbuilding resources toward platforms that can operate in every region and along the full spectrum of conflict.

Additionally, at my direction, the Navy will submit alternative proposals to procure a capable and lethal small surface combatant, generally consistent with the capabilities of a frigate. I've directed the Navy to consider a completely new design, existing ship designs, and a modified LCS. These proposals are due to me later this year in time to inform next year's budget submission.⁵⁰

Also on February 24, 2014, in a background briefing associated with Hagel's address, a senior defense official stated:

⁵⁰ DOD News Transcript, "Remarks by Secretary Hagel and Gen. Dempsey on the fiscal year 2015 budget preview in the Pentagon Briefing Room," February 24, 2014, accessed February 25, 2014, at <http://www.defense.gov/transcripts/transcript.aspx?transcriptid=5377>. Brackets as in original.

On the LCS, we clearly do need the LCS capabilities of the minesweeps, the ASW [Anti-Submarine Warfare] module for example is looking very promising, and we absolutely need those capabilities. But as we look at our adversary growing capabilities, we also need to make certain that our fleet has enough capabilities, enough survivability and lethality that they can go up against those adversaries, so we want to look at what—what is out there for the future of the small surface combatants beyond LCS? And we—and we want to start that now.⁵¹

February 24, 2014, Secretary of Defense Memorandum to Navy Leadership

A February 24, 2014, memorandum from Secretary of Defense Hagel to Secretary of the Navy Ray Mabus and Chief of Naval Operations Admiral Jonathan Greenert stated:

I have given careful consideration to the Littoral Combat Ship (LCS) program, and I wanted to get back to you on my decision. I have consulted with Naval Surface Commanders, acquisition officials, policy and evaluation experts and reviewed preliminary assessments and evaluations of the LCS.

If we build out the LCS program to 52 ships it would represent one-sixth of our future 300-ship Navy. Given the emerging threat environment of the future, I have considerable reservations as to whether that is what our Navy will require over the next few decades. I recognize the importance of presence, which is tied to the number of ships. But I also believe that capability and power projection is the foundation of our Navy's effectiveness.

Therefore, no new contract negotiations beyond 32 ships will go forward. The Department of the Navy is directed to provide me the following information:

— Provide regular updates on LCS performance based on test results and experience from recent deployments. These assessments should consider survivability, performance, sustainment cost, materiel readiness, lethality and growth potential.

— Submit to me, in time to inform the PB 2016 [President's Budget for FY2016] budget deliberations, alternative proposals to procure a capable and lethal small surface combatant, generally consistent with the capabilities of a frigate. Options considered should include a completely new design, existing ship designs (including the LCS), and a modified LCS. Include target cost, mission requirements, sensors and weapon requirements and required delivery date.

If a modified LCS is an acceptable option for a more capable small surface combatant, negotiations for LCS beyond the 24 ships currently on contract should seek to incorporate the upgraded LCS as soon as possible. Should the aforementioned assessments provide dispositive against the LCS, I retain the right to modify the program.

As we both agree, smart investments in our future ships will be required as we continue to face limited resources over the next few years. We need to focus on what the Navy will require in the years ahead to meet our Nation's security needs and future missions.⁵²

⁵¹ DOD News Transcript, "Background Briefing on Fiscal 2015 Budget Recommendations," February 24, 2014, accessed February 25, 2014, at <http://www.defense.gov/transcripts/transcript.aspx?transcriptid=5376>. Brackets as in original.

⁵² Memorandum dated February 24, 2014, from the Office of the Secretary of Defense to the Secretary of the Navy and Chief of Naval Operations on Littoral Combat Ship (LCS) program, posted at InsideDefense.com (subscription required) February 28, 2014.

Navy Work to Identify Ships to Follow First 32 LCSs

Following Secretary Hagel's February 24, 2014, announcement, the Navy conducted an internal study of options for small surface combatants to be procured following the first 32 LCSs.⁵³ The study was completed on July 31, 2014, as required. The results of the study were then reviewed for several months within the Office of the Secretary of Defense.

December 2014 DOD And Navy Announcement of Restructured Plan

December 10, 2014, Secretary of Defense Memo

A December 10, 2014, memorandum from Secretary of Defense Chuck Hagel to Secretary of the Navy Ray Mabus and Chief of Naval Operations Jonathan Greenert on the subject of "Littoral Combat Ship Program Way Ahead" states:

I want to thank you and your staff for the timely, thorough, and professional work conducted in response to my memorandum from February 24, 2014, which directed you to submit to me alternate proposals for a capable small surface combatant that is more lethal and survivable than the current Flight 0+ Littoral Combat Ship (LCS) now in serial production. After giving careful thought to your briefing on options, I approve your plan to procure a small surface combatant (SSC) based on an upgraded Flight 0+ LCS, and direct the following actions to be taken:

— Develop an Acquisition Strategy to support design and procurement of new SSCs no later than Fiscal Year 2019 (FY 19), and sooner if possible. Provide this Acquisition Strategy to the USD(AT&L) for review and approval no later than May 1, 2015. As this strategy is developed, the Navy should continue to identify further opportunities to increase ship survivability and lethality as it proceeds to the next phase of SSC design. Competition for the SSC should be sustained to the maximum extent possible within available resources.

— Provide the Director, CAPE and USD(AT&L) with a Service Cost Position in support of the FY17 POM submission and provide the USD(AT &L) with your plan for

⁵³ For more on the Navy's internal study, see Statement of The Honorable Sean J. Stackley, Assistant Secretary of the Navy (Research, Development and Acquisition) and Vice Admiral Joseph P. Mulloy, Deputy Chief of Naval Operations for Integration of Capabilities and Resources and Vice Admiral William H. Hilarides, Commander, Naval Sea Systems Command, Before the Subcommittee on Seapower of the Senate Armed Services Committee on Department of the Navy Shipbuilding Programs, April 10, 2014, pp. 11-12; joint letter dated March 13, 2014, from the Chief of Naval Operations and the Assistant Secretary of the Navy (Research, Development, and Acquisition) on Small Surface Combatant Task Force, posted at InsideDefense.com (subscription required) March 18, 2014; Kris Osborn, "Navy Starts Study to Re-Examine LCS Mission," *DoD Buzz* (www.dodbuzz.com), March 7, 2014; Christopher P. Cavas, "CNO: Group Will Study New LCS Designs," *DefenseNews.com*, March 10, 2014; Olga Belogolova, "Top Navy Official: New Design For A Small Surface Combatant Unlikely," *Inside the Navy*, April 14, 2014; Christopher P. Cavas, "Ship Study Should Favor Existing Designs," *DefenseNews.com*, April 19, 2014; Michael Fabey, "LCS Template Colors Small Surface Combatant Development," *Aerospace Daily & Defense Report*, May 2, 2014: 1-2; Philip Ewing, "CNO: Navy Could've Been Clearer About LCS," *Politico Pro Defense*, May 21, 2014; Sandra Erwin, "Navy Chief: We Will Lay Out Clear Plan for Littoral Combat Ship," *National Defense* (www.nationaldefensemagazine.org), May 21, 2014; Mike McCarthy, "Up-gunned LCSs, Coast Guard's Cutter Among Ideas Proposed For Navy's Small Surface Combatant," *Defense Daily*, May 23, 2014: 2-3; Mike McCarthy, "LCS Follow-On Will Have To Be 'Very Close' In Price, Admiral Says," *Defense Daily*, June 2, 2014: 4-5; Michael Fabey, "Robust Air Defense Not Needed In New Frigates, Studies Show," *Aerospace Daily & Defense Report*, January 30, 2015: 4; Mike McCarthy, "Modifying An LCS And Calling It A Frigate—How The Navy Got There," *Defense Daily*, February 2, 2015: 4-7.

controlling overall program cost. Cost control should be a major emphasis of the program. I am particularly interested in ensuring that the Navy addresses operations and support (O&S) cost projections, and takes actions to reduce them.

— Provide to me no later than May 1, 2015, an assessment of the cost and feasibility of back-fitting SSC survivability and lethality enhancements on earlier Flight 0+ LCSs already under contract, as well as those built before production of new SSCs commences. The intent should be to improve the lethality and survivability of Flight 0+ ships as much as practical. Your assessment should be coordinated with Deputy Secretary Work, USD (AT&L), and Director, CAPE.

Your strategy, plans, and assessments should assume a total buy of up to 52 Flight 0+ LCSs and SSCs, with the final number and mix procured dependent on future fleet requirements, final procurement and O&S costs, and overall Department of the Navy resources.

By executing the above guidance, I am confident we will procure the most lethal, survivable and capable small surface combatant given our available resources.

Thank you and the men and women of the world's finest Navy for your daily efforts to defend this Nation.⁵⁴

December 11, 2014, DOD News Release

A December 11, 2014, DOD news release stated:

Statement by Secretary Hagel on the Littoral Combat Ship

Earlier this year, expressing concern that the U.S. Navy was relying too heavily on the littoral combat ship (LCS) to meet long-term targets for the size of its fleet, I announced that the Defense Department would not undertake new contract negotiations beyond 32 littoral combat ships, and directed the Navy to submit alternative proposals to identify and procure a more lethal and survivable small surface combatant, with capabilities generally consistent with those of a frigate. I specifically asked the Navy to consider completely new designs, existing ship designs, and modified LCS designs; and to provide their recommendations to me in time to inform the president's fiscal year 2016 defense budget.

After rigorous review and analysis, today I accepted the Navy's recommendation to build a new small surface combatant (SSC) ship based on upgraded variants of the LCS. The new SSC will offer improvements in ship lethality and survivability, delivering enhanced naval combat performance at an affordable price.

The LCS was designed to be a modular and focused-mission platform individually tailored for mine-sweeping, surface warfare, and anti-submarine warfare. Given today's fiscal climate and an increasingly volatile security environment, I concluded the Navy must direct its future shipbuilding resources toward more multi-mission platforms that can operate in every region and across the full spectrum of conflict.

My decision today follows consultations with DoD's senior leadership and careful review of the Navy's recommendation and underlying analysis, which included detailed evaluation of 192 design concepts as well as consultation with fleet commanders, industry, surface warfare officers, engineers, program managers, and analysts.

⁵⁴ Memorandum dated December 10, 2014, from the Secretary of Defense to the Secretary of the Navy and the Chief of Naval Operations on Littoral Combat Ship Program Way Ahead, accessed December 24, 2014, at <http://www.defense.gov/pubs/SD%20Signed%20Memo%20to%20SECNAV%20&%20CNO%2010DEC2014.pdf>.

The more lethal and survivable SSC will meet a broader set of missions across the range of military operations, and addresses the Navy's top war-fighting priorities. It will feature an improved air defense radar; air defense decoys; a new, more effective electronic warfare system; an over-the-horizon anti-ship missile; multi-function towed array sonar; torpedo defenses; and additional armor protection.

I have directed the Navy to assume a total buy of 52 LCSs and SSCs, with the final number and mix dependent on future fleet requirements, final procurement costs, and overall Navy resources. Production of the new SSC will begin no later than fiscal year 2019, and there will be no gap between production of the last LCS and the first SSC. A significant advantage to this approach is the ability to enhance naval combat performance by back-fitting select SSC improvements to the LCS fleet.

The Navy's new proposal, like the LCS, will continue to have its critics, but considering the context of our broader naval battle force and the current strategic and fiscal environment, I believe it represents our best and most cost effective option. By avoiding a new class of ships and new system design costs, it also represents the most responsible use of our industrial base investment while expanding the commonality of the Navy's fleet.

Going forward, I have issued three directives to the Navy. First, by next May, the Navy will provide the secretary of defense with an acquisition strategy to support design and procurement of the SSC no later than fiscal year 2019, while continuing to identify further opportunities to enhance the new ship's survivability and lethality. Second, also by next May, the Navy will provide a detailed assessment of the cost and feasibility of back-fitting the SSCs enhancements onto LCSs already under contract. Finally, in advance of fiscal year 2017 budget preparations, the Navy will provide the undersecretary of defense for acquisition, technology, and logistics and the director of cost analysis and program evaluation with detailed cost estimates as well as a plan for controlling those costs.

I want to thank the Navy for its rigorous analysis, as well as Deputy Secretary of Defense Bob Work; Vice Chairman of the Joint Chiefs of Staff Admiral Sandy Winnefeld; Undersecretary of Defense for Acquisition, Technology, and Logistics Frank Kendall; Director of Cost Assessment and Program Evaluation Jamie Morin; and Director of Operational Test and Evaluation Michael Gilmore for leading a task force to analyze the Navy's recommendations. We look forward to working with Congress to ensure that our nation's fleet remains unrivaled for many decades to come.⁵⁵

December 11, 2014, Navy News Story

A December 11, 2014, Navy News story reprinting a statement from the office of the Secretary of the Navy stated:

Secretary of Defense Chuck Hagel has directed the Navy "to move forward with a multi-mission small surface combatant based on modified Littoral Combat Ship (LCS) hull designs."

Consistent with the Fleet's views on the most valued capabilities delivered by a small surface combatant, the modified LCS ship will be more lethal and survivable. It will provide multi-mission anti-surface warfare (SUW) and anti-submarine warfare capabilities (ASW), as well as continuous and effective air, surface and underwater self-defense. Adding to current LCS Flight 0+ baseline configurations, which include the

⁵⁵ DOD news release, "Statement by Secretary Hagel on the Littoral Combat Ship," December 11, 2014, accessed December 24, 2014, at <http://www.defense.gov/Releases/Release.aspx?ReleaseID=17073>.

57mm gun and SeaRAM missile system, this ship will be equipped with over-the-horizon surface-to-surface missiles, air defense upgrades (sensors and weapons), an advanced electronic warfare system; advanced decoys; a towed array system for submarine detection and torpedo defense, two 25mm guns, an armed helicopter capable of engaging with either Hellfire missiles or MK-54 torpedoes, and an unmanned FireScout helicopter for surveillance, reconnaissance, and targeting.

Modularity design features will also be retained to augment SUW and ASW capabilities as directed by the Fleet Commanders. Available mission modules include Longbow Surface to-Surface Missiles (Hellfire), two MK46 30mm guns, and two 11M RHIBs for Surface Warfare, or a variable depth sonar for submarine warfare which, when added to the ship's organic multi-function towed array and embarked helicopter, make this an extremely effective anti-submarine warfare platform.

In addition to the improved weapon systems capabilities for this ship, which reduce its susceptibility to being hit by a threat weapon, the small surface combatant will also include improved passive measures - measures that will reduce the ship's signature against mine threats, and measures that will harden certain vital spaces and systems against potential damage caused by weapon impact - to further enhance its overall survivability.

From an operational perspective, the sum of these improvements will increase the ship's capability and availability to participate in SUW Surface Action Groups, ASW Search and Attack Units; escort of High Value Units, and support of Carrier Strike Group (CSG) SUW and ASW operations.

With increased lethality and survivability, the modified LCS will provide the flexibility to operate both independently and as a part of an aggregated force. This decision allows the Navy to add organic multi-mission capabilities to the small surface combatant force while leveraging the benefits and affordability of the LCS program. The modified LCS ships will complement the planned 32 LCS ships, resulting in a 52 ship Small Surface Combatant Fleet in keeping with the Navy's Force Structure Analysis. The 32 LCS ships, with their full modular capability, will allow the Navy to deploy assets to meet the Navy's mine warfare, SUW, and ASW demands.⁵⁶

December 11, 2014, Navy Fact Sheet

A December 11 Navy fact sheet on "The Modified Littoral Combat Ship (LCS)" stated:

The modified LCS will be multi-missioned, with increased lethality and enhanced survivability at the most affordable cost.

- The modified LCS is multi-mission focused and expands Surface Warfare (SUW) and Anti-Submarine Warfare (ASW) capabilities.
- The ships will be based upon on existing LCS designs with modifications that will include additional capabilities.
 - Over-the-horizon surface to surface missile and additional weapon systems and combat system upgrades improves lethality.
 - Increased survivability will be achieved by incorporating additional self-defense capabilities and increased hardening vital systems and vital spaces.

⁵⁶ "Navy Moving Forward With LCS," *Navy News*, December 11, 2014, accessed December 24, 2014, at http://www.navy.mil/submit/display.asp?story_id=84849.

- The ship will retain certain aspects of modularity but will maintain a baseline of surface and subsurface warfare capabilities.
- Provides lethality, survivability and multi-mission capabilities in accordance with fleet priorities.
- Requirements are based on estimated theater threat environment for the 2025 timeframe.
- Fulfills the remaining 20 ships of our 52 small surface combatant requirement.
- Both LCS variants remain a valuable addition to the fleet.
 - Our procurement strategy of 32 LCS continues, and we intend to provide incremental upgrades to these ships beginning in FY17.
 - The 32 LCS, with their full modular capability, will allow the Navy to deploy assets to meet the Navy’s Mine Warfare, Surface Warfare, and Anti-Submarine Warfare demands.
- Small surface combatants enable the Navy to execute Defense Strategic Guidance (DSG).
 - The Navy has a validated requirement for 52 small surface combatants
 - Innovative, low-cost, and small footprint approach to achieve security objectives
 - Offers flexibility to Combatant Commanders for Theater Security Cooperation
 - Frees large surface combatants to conduct their primary missions
 - Builds and strengthens maritime partnerships by being able to train and operate with smaller, regional navies and to enter previously inaccessible, shallow-water foreign ports.
- Procurement of this multi-mission ship supports industrial base schedule and is fiscally responsible.
 - The modified LCS helps maintain industrial infrastructure with no breaks in production.
 - The Navy balanced design alternatives with consideration for cost, risk, and other capabilities currently in the fleet.
 - Ship and combat systems design funding is included in our FY16 President’s Budget Request to support procurement starting in FY19.
 - By leveraging the current LCS design, total ownership cost is optimized.
 - This increased capability is achieved at less than 20% more cost than the current LCS.⁵⁷

The fact sheet goes on to say that specific modifications to the existing LCS design include the following:

- an improved three-dimensional air surveillance radar;
- an upgrade of the ship’s air defense capability to include a system called SeaRAM;

⁵⁷ Navy fact sheet entitled “The Modified Littoral Combat Ship,” December 11, 2014, posted at InsideDefense.com (subscription required) December 11, 2014.

- an over-the-horizon (OTH) surface warfare (SUW) missile;
- an improved electronic warfare (EW) capability;
- improved decoy systems;
- improved signature management;
- a multifunction towed-array sonar system;
- torpedo defense and countermeasures equipment;
- increased armor;
- 25mm guns; and
- actions elsewhere to reduce the weight of the ship, so as to help accommodate the above additions.

April 22, 2015, Navy Information Paper

An April 22, 2015, Navy information paper states:

The Small Surface Combatant Task Force (SSCTF) [cost] estimates were based on surrogate systems which are not always representative of the production Frigate systems. SSCTF estimated that the modified LCS/Frigate (FF) will result in no more than a 20% increase to LCS Flight 0+, equating to approximately \$75-100M [million] more for the average follow on ship of a block buy. The Frigate will remain below the LCS congressional cost cap.

Navy is currently working through the process to develop a service cost position in support of the Frigate. The Frigate program office will utilize the surrogate systems from the Small Surface Combatant Task Force until final decisions are made regarding new, different and/or upgraded systems. This work is scheduled to conclude in October 2015 in order to support Program Objective Memorandum (POM) Fiscal Year 17 submission.⁵⁸

Additional Information in Press Reports

Regarding the acquisition strategy for the 20 ships, a December 15, 2014, trade press article stated:

The Navy will continue to build both Lockheed's Freedom and Austal's Independence-class LCS surface variants, Sean Stackley, the service's top acquisition official, stressed during a Dec. 11 roundtable at the Pentagon. The service's plan is to continue to dual-source the new SSC program in order to increase competition and drive down costs, he said. However, as to how the last 20 out of a planned 52 LCS-type ships would be split between those two shipbuilders, Stackley said it is too soon to tell.⁵⁹

Another December 15, 2014, trade press article stated:

Throughout the LCS program, the Navy has asked both firms to compete for the ship contracts, a formula [Navy acquisition chief Sean] Stackley said the Navy plans on keeping for the final 20 ships.

⁵⁸ Navy information paper dated April 22, 2015, provided by Navy Office of Legislative Affairs to CRS on April 22, 2015.

⁵⁹ Lara Seligman, "Stackley: Navy Will Continue Dual-Source Approach For Modified LCS Hull," *Inside the Navy*, December 15, 2014.

“Absolutely there will be competition. This program has been based on the benefits of competition. That’s how we have been able to bring the price down,” Stackley said, adding the Navy will continue to employ the “duel source” approach.

Stackley said the Navy is still looking at how it will structure a competition, and would not say whether the remaining 20 ships will be evenly split between Lockheed Martin and Austal USA. So far that’s been the case with the LCS program, with each company producing 12 of the 24 ships under contract or already delivered.

“The details in terms of ‘are you going to split it 50/50 etcetera?’—[it’s] too early to make those calls,” he said.

Stackley said the Navy does not plan to compete on a “ship to ship” basis, and wants the savings associated with the multi-year block buy awards currently used on LCS....

Going forward, Stackley said, the Navy will sort through which new capabilities should be competed among industry, which can be leveraged from other programs and transferred to the new small surface combatants, or in other cases will work with the prime contractors to determine solutions.

“It’s going to be a case by case basis,” Stackley said. “So the answer might be for a particular system that we know what capability we want. Rather than go out with a fresh competition we are going to use a system that is already common to other Navy ships. In that case what we are going to do is leverage those other contracts and not go out with a fresh contract.”

“In other cases we might determine ... there are some other alternatives out there that are very attractive, and for other right reasons, we are going to run a competition for this program, for those systems, and that would be a separate, standalone competition,” Stackley added.

In additional instances, Stackley said, the Navy will look to the prime contractors to come up with solutions, such as for an improved degaussing system designed to minimize the hull’s magnetic field and thereby reduce radar detectability.⁶⁰

A January 21, 2015, press report stated:

Navy Secretary Ray Mabus thinks one of the reasons the ship is misunderstood is the nontraditional LCS designator. He directed an effort to find a more traditional and appropriate designation for the LCS and several other recent ship types, such as the Joint High Speed Vessel (JHSV), the Mobile Landing Platform (MLP) and the Afloat Forward Staging Base (AFSB).

The first of the types to be redesignated is the LCS.

“If it’s like a frigate, why don’t we call it a frigate?” he said Jan. 14 to a roomful of surface warfare sailors at the Surface Navy Association’s annual symposium just outside Washington.

“We are going to change the hull designation of the LCS class ships to FF,” Mabus said, citing the traditional hull designation for frigates. “It will still be the same ship, the same program of record, just with an appropriate and traditional name.”...

⁶⁰ Mike McCarthy, “Navy Weighs Acquisition, Competition Strategies For New, Upgraded LCS,” *Defense Daily*, December 15, 2014: 3-5. See also Mike McCarthy, “Calling Them Frigates, Navy Aims For Upgraded Version Of LCSs Sooner,” *Defense Daily*, January 16, 2015: 1-2; Sydney J. Freedberg Jr., “What’s In A Name? Making The LCS ‘Frigate’ Reality,” *Breaking Defense*, January 16, 2015.

Redesignating the ships as FF puts the ship squarely back in the surface combatant category, and is appropriate, since the Pentagon direction in developing the modified LCS was to make it more “frigate-like.”

Navy sources said it was intended to designate only the modified LCS as frigates, but many of the upgrades intended for those ships are to be backfitted into earlier LCS hulls, blending the types. Mabus said the designation definitely will apply to the modified ships, and will likely be extended to all LCSs.⁶¹

A January 23, 2015, press report stated:

The Navy is working to iron out the details of a plan to backfit upgrades planned for its future fleet of small surface combatants onto earlier Littoral Combat Ships, according to information from top service officials.

The Navy’s overarching plan is to buy 32 LCSs of the current design, and then 20 modified LCSs starting in fiscal year 2019. But the Navy wants to incorporate some, if not all, of the planned improvements onto LCSs built before FY-19.⁶²

⁶¹ Christopher P. Cavas, “LCS Now Officially Called A Frigate,” *Defense News*, January 21, 2015. See also Sam LaGrone, “SNA: Modified Littoral Combat Ships to be Designated Frigates,” *USNI News*, January 15, 2015; Mike McCarthy, “Calling Them Frigates, Navy Aims For Upgraded Version Of LCSs Sooner,” *Defense Daily*, January 16, 2015: 1-2; Sydney J. Freedberg Jr., “What’s In A Name? Making The LCS ‘Frigate’ Reality,” *Breaking Defense*, January 16, 2015.

⁶² Lara Seligman, “Navy Working To Iron Out Details Of Plan For Backfitting LCS Upgrades,” *Inside the Navy*, January 23, 2015. See also Sydney J. Freedberg Jr., “What’s In A Name? Making The LCS ‘Frigate’ Reality,” *Breaking Defense*, January 16, 2015.

Appendix C. Defense-Acquisition Policy Lessons of LCS Program

Another issue for Congress concerns what defense-acquisition policy lessons, if any, the LCS program may offer to policymakers, particularly in terms of the rapid acquisition strategy that the Navy pursued for the LCS program, which aimed at reducing acquisition cycle time (i.e., the amount of time between starting the program and getting the first ship into service).

One possible perspective is that the LCS program demonstrated that reducing acquisition cycle time can be done. Supporters of this perspective might argue that under a traditional Navy ship acquisition approach, the Navy might have spent five or six years developing a design for a new frigate or corvette, and perhaps another five years building the lead ship, for a total acquisition cycle time of perhaps 10 to 11 years. For a program announced in November 2001, this would have resulted in the first ship entering service in between late 2011 and late 2012. In contrast, supporters of this perspective might argue, LCS-1 entered service on November 8, 2008, about seven years after the program was announced, and LCS-2 entered service on January 16, 2010, a little more than eight years after the program announced. Supporters of this perspective might argue that this reduction in acquisition cycle time was accomplished even though the LCS incorporates major innovations compared to previous larger Navy surface combatants in terms of reduced crew size, “plug-and fight” mission package modularity, high-speed propulsion, and (in the case of LCS-2) hull form and hull materials.

Another possible perspective is that the LCS program demonstrated the risks or consequences of attempting to reduce acquisition cycle time. Supporters of this perspective might argue that the program’s rapid acquisition strategy resulted in design-construction concurrency (i.e., building the lead ships before their designs were fully developed), a practice long known to increase risks in defense acquisition programs. Supporters of this perspective might argue that the cost growth, design issues, and construction-quality issues experienced by the first LCSs were due in substantial part to design-construction concurrency, and that these problems embarrassed the Navy and reduced the Navy’s credibility in defending other acquisition programs. They might argue that the challenges the Navy faces today in terms of developing an LCS concept of operations (CONOPS),⁶³ LCS manning and training policies, and LCS maintenance and logistics plans were increased by the rapid acquisition strategy, because these matters were partly deferred to later years (i.e., to today) while the Navy moved to put LCSs into production. Supporters of this perspective might argue that the costs of the rapid acquisition strategy are not offset by very much in terms of a true reduction in acquisition cycle time, because the first LCS to be equipped with a mission package that has reached IOC (initial operational capability) will not occur until late FY2014—almost 13 years after the LCS program was announced. Supporters of this perspective could argue that the Navy could have avoided many of the program’s early problems and current challenges—and could have had a fully equipped first ship enter service in 2011 or 2012—if it had instead pursued a traditional acquisition approach for a new frigate or corvette. They could argue that the LCS program validated, for defense acquisition, the guideline from the world of business management that if an effort aims at obtaining something fast, cheap, and good, it will succeed in getting no more than two of these things,⁶⁴ or, more simply, that the LCS program validated the general saying that haste makes waste.

⁶³ A CONOPS is a detailed understanding of how to use the ship to accomplish various missions.

⁶⁴ The guideline is sometimes referred to in the business world as “Fast, cheap, good—pick two.”

A third possible perspective is that the LCS program offers few if any defense-acquisition policy lessons because the LCS differs so much from other Navy ships and the Navy (and DOD generally) consequently is unlikely to attempt a program like the LCS in the future. Supporters of this perspective might argue that the risks of design-construction concurrency have long been known, and that the experience of the LCS program did not provide a new lesson in this regard so much as a reminder of an old one. They might argue that the cost growth and construction delays experienced by LCS-1 were caused not simply by the program's rapid acquisition strategy, but by a variety of factors, including an incorrectly made reduction gear⁶⁵ from a supplier firm that forced the shipbuilder to build the lead ship in a significantly revised and sub-optimal construction sequence.

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⁶⁵ A ship's reduction gear is a large, heavy gear that reduces the high-speed revolutions of the ship's turbine engines to the lower-speed revolutions of its propulsors.