

CRS Report for Congress

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Navy DD(X), CG(X), and LCS Ship Acquisition Programs: Oversight Issues and Options for Congress

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Summary

The Navy wants to procure three new classes of surface combatants — the DD(X) destroyer, the CG(X) cruiser, and a smaller surface combatant called the Littoral Combat Ship (LCS). The Navy reportedly wants to procure a total of 7 DD(X)s, 19 CG(X)s, and 55 LCSs.

Congress in FY2005 funded the procurement of the first LCS and provided advance procurement funding for the first and second DD(X)s, which the Navy wants to procure in FY2007 and FY2008. The FY2006 budget requested \$716 million in advance procurement funding for the DD(X) program — \$666 million for the first DD(X) and \$50 million for the second DD(X) — and \$1,115 million for DD(X)/CG(X) research and development. The FY2006 budget requested \$613.3 million for the LCS program, including \$576.5 million in research and development funding — \$240.5 million to build the second LCS, and \$336.0 million in additional research and development funding — and \$36.8 million in procurement funding for LCS mission modules.

On April 20, 2005, Department of Defense (DOD) deferred as “premature” a Navy proposal to hold a one-time, winner-take-all competition between Northrop Grumman’s Ship System Division (NGSS) and General Dynamics’ Bath Iron Works (GD/BIW) for the right to build all DD(X)s. The Emergency Supplemental Appropriations Act for 2005 (H.R. 1268/P.L. 109-13) contains a provision (Sec. 1019) that effectively prohibits such a competition. The provision does not prohibit the Navy from shifting to a DD(X) acquisition strategy that limits the second shipyard’s involvement to building only one ship in the DD(X) program.

The DD(X), CG(X), and LCS programs raise several oversight issues for Congress, including the affordability of the DD(X) and CG(X) and the rapid acquisition strategy being used for the LCS. Options for Congress for the DD(X) program include approving the program as proposed by the Navy and supplementing the industrial base, if needed, with additional work; deferring procurement of the lead DD(X) to FY2008; procuring two or more DD(X)s per year; building DD(X)s at a single yard, or building each DD(X) jointly at two yards; terminating the DD(X) program now (or after procuring one or two ships as technology demonstrators), and supplementing the industrial base with additional work until the start of CG(X) procurement; and starting design work now on a smaller, less expensive alternative to the DD(X) and procuring this new design, rather than DD(X)s or CG(X)s, starting around FY2011.

Options for Congress on the LCS program include shifting procurement funding for LCS mission modules to the Navy’s ship-procurement account; procuring a few LCSs and then evaluating them before deciding whether to put the LCS into larger-scale series production; procuring LCSs at a rate of up to 10 per year; procuring LCSs at a rate of less than 5 per year; and terminating the LCS program and instead procuring a new-design frigate or investing more in other littoral-warfare improvements. This report will be updated as events warrant.

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Navy DD(X), CG(X), and LCS Ship Acquisition Programs: Oversight Issues and Options for Congress

Introduction

Issue for Congress

The Navy wants to procure three new classes of surface combatants — the DD(X) destroyer, the CG(X) cruiser, and a smaller surface combatant called the Littoral Combat Ship (LCS). The Navy reportedly wants to procure a total of 7 DD(X)s, 19 CG(X)s, and 55 LCSs.

Congress in FY2005 funded the procurement of the first LCS and provided advance procurement funding for the first and second DD(X)s, which the Navy wants to procure in FY2007 and FY2008. The FY2006 budget requested \$716 million in advance procurement funding for the DD(X) program — \$666 million for the first DD(X) and \$50 million for the second DD(X) — and \$1,115 million for DD(X)/CG(X) research and development. The FY2006 budget requested \$613.3 million for the LCS program, including \$576.5 million in research and development funding — \$240.5 million to build the second LCS, and \$336.0 million in additional research and development funding — and \$36.8 million in procurement funding for LCS mission modules.

The issue for Congress is whether to approve, modify, or reject the Navy's proposals for the DD(X), CG(X), and LCS programs. Surface combatants are a major component of the Navy, and construction of surface combatants represents a significant share of the Navy's shipbuilding program. Decisions that Congress makes on procurement of surface combatants will thus significantly affect future Navy capabilities, Navy funding requirements, and the U.S. defense industrial base.

Summary of FY2006 Legislative Activity

DD(X) and CG(X) Programs. On April 20, 2005, Department of Defense (DOD) issued a decision deferring as “premature” a Navy proposal to shift the DD(X) acquisition strategy to one in which the Navy would hold a one-time, winner-take-all competition between Northrop Grumman's Ship System Division (NGSS) and General Dynamics' Bath Iron Works (GD/BIW) for the right to build all DD(X)s. Several Members of Congress expressed opposition to this idea. The **Emergency Supplemental Appropriations Act for 2005 (H.R. 1268/P.L. 109-13 of May 11, 2005)** contains a provision (Section 1019) that prohibits a winter-take-all competition. The provision does not prohibit the Navy from shifting to a DD(X)

acquisition strategy that limits the second shipyard's involvement to building only one ship in the DD(X) program.

On May 25, 2005, the Navy announced that, in light of Section 1019, it wants to shift to a DD(X) acquisition strategy under which two DD(X)s would be procured in FY2007, with one to be designed and built by NGSS and the other by GD/BIW. Each ship would be split-funded (i.e., incrementally funded) in FY2007 and FY2008. The two yards might then compete for the right to build all subsequent DD(X)s, in which case this strategy could be viewed as a deferred winner-take-all approach.

The **FY2006 defense authorization bill (H.R. 1815) as reported by the House Armed Services Committee (H.Rept. 109-89 of May 20, 2005)** includes a provision (Section 123) that limits the procurement cost of the "future major surface combatant, destroyer type," to \$1.7 billion per ship. The provision also directs the Navy to develop an acquisition plan for a future major surface combatant, destroyer type, that uses technologies from the DD(X) and CG(X) programs, is at least as capable as the Navy's current Arleigh Burke (DDG-51) class Aegis destroyer, and would be ready for lead-ship procurement in FY2011. Since the current DD(X) design likely could not be built for \$1.7 billion, Section 123 would effectively restructure the DD(X) program into an effort aimed at developing a new surface combatant design that could meet the \$1.7-billion cost limit. Such a ship would likely be smaller and less capable in some respects than the DD(X). With a capability at least equal to that of the DDG-51 design, however, it would still have a substantial capability. The bill as reported recommends no FY2006 advance procurement funding for the DD(X) program and reduces the program's FY2006 research and development request to \$700 million. The bill would also authorize \$2.5 billion for procurement of two additional DDG-51s, to help support the surface combatant industrial base.

The **FY2006 defense authorization bill (S. 1042) as reported by the Senate Armed Services Committee (S.Rept. 109-69 of May 17, 2005)** contains a provision (Section 121) that prohibits a winner-take-all acquisition strategy for the DD(X). The report recommends increasing the DD(X) program's FY2006 advance procurement funding request by \$50 million, with the additional \$50 million to be used for the second DD(X), and recommends increasing the program's FY2006 research and development funding request by \$10 million.

The **House Appropriations Committee, in its report (H.Rept. 109-119 of June 10, 2005) on the FY2006 defense appropriations bill (H.R. 2863)**, recommends deleting the \$716 million FY2006 advance procurement funding request for the DD(X) program and rescinding the program's \$304 million in FY2005 advance procurement funding, "consistent with the recommendations of the House in H.R. 1815" (page 146). It recommends reducing DD(X) FY2006 research and development to \$670 million, and adding \$50 million in FY2006 research and development funding for the CG(X) program (page 251). The report states that the DD(X) program "has encountered serious problems" in terms of technology development and increasing unit procurement cost, and that "Considering the uncertainty in this program and the lack of authorization, the Committee believes this program is likely to be restructured, and a new cost and acquisition strategy developed, before proceeding to advance procurement" (page 147). The report also

states that “Given the age of the current CG — 47 Ticonderoga class [Aegis cruisers] and the potential use of CG(X) to fulfill ballistic missile defense and other missions, the Committee believes it is imperative to accelerate” concept studies, concept design, and other development work for the CG(X) (page 251).

The **Senate Appropriations Committee, in its report (S.Rept. 109-141 of September 29, 2005) on H.R. 2863**, recommended increasing the DD(X) program’s \$716 million advance procurement funding request by \$50 million (page 124), and the program’s \$1,115 million research and development funding request by \$13 million (pages 194 and 201). Of the additional \$13 million, \$11 million is for permanent magnet motor development work, and \$2 million is for “naval smartships that anticipate and manage.”

LCS Program. H.R. 1815 as reported by the **House Armed Services Committee** contains a provision (Section 124) that limits the procurement cost of each LCS, including its mission modules, to \$400 million. The report also recommends increasing the research and development funding request for the LCS program by \$12 million to fund work on high-strength composite material.

The **Senate Armed Services Committee**, in S.Rept. 109-69 on **S. 1042**, recommends increasing the LCS program’s FY2006 procurement funding request by \$8.6 million for a spare marine gas turbine engine. The report also expresses concern for the Navy’s plan to limit competition for future Flight 1 LCSs to the two LCS designs currently being developed, and directs the Navy to report on its acquisition strategy for Flight 1 LCSs.

The **House Appropriations Committee**, in H.Rept. 109-119 on **H.R. 2863**, recommends approving the LCS program’s research and development funding request (page 251), which includes funds for building the second LCS, and adding \$440 million in the SCN account for the procurement of two additional LCSs, for a total FY2006 procurement of three LCSs. The report states that the committee “remains very supportive of the LCS program,” and directs the Navy to submit a report on the development and procurement plan for LCS mission modules (page 146).

The **Senate Appropriations Committee**, in S.Rept. 109-141 on **H.R. 2863**, recommended increasing the LCS program’s \$576 million research and development funding request by \$5 million for remote operation of active sonar technology.” (Pages 192 and 200) The committee expressed continued support for the LCS program, but also concern for “lingering instability of program requirements and thus costs.” The committee also stated that it “understands that both hull and mission module performance specifications and thus projected costs for the LCS program are dramatically increasing.” (Page 87)

Short CRS Reports on These Programs

Two short CRS reports — CRS Report RS21059, *Navy DD(X) and CG(X) Programs: Background and Issues for Congress*, and CRS Report RS21305, *Navy Littoral Combat Ship (LCS): Background and Issues for Congress* — provide

introductory overviews of the DD(X), CG(X), and LCS programs, respectively, for readers seeking short discussions of these programs.¹ This long CRS report discusses these programs in more depth, particularly with regard to oversight issues and options for Congress.

Organization of This Report

The next section of the report provides background information on Navy surface combatants. The following section discusses potential oversight issues for Congress relating to surface combatant force-structure planning, the DD(X) program, the CG(X) program, and the LCS program. The subsequent section presents options for Congress on the DD(X), CG(X), and LCS programs. A final section presents recent legislative activity on the two programs. This report will be updated as events warrant.

Background

Surface Combatants in the Navy²

A Major Component of the Navy. Surface combatants are one of four major types of Navy combat ships, along with aircraft carriers, submarines, and amphibious ships.³ Historically, surface combatants have accounted for 30% to 40% of the Navy's battle force ships.⁴ At the end of FY2005, they accounted for about 35% (99 of 282 battle force ships).⁵

¹ CRS Report RS21059, *Navy DD(X) and CG(X) Programs: Background and Issues for Congress*; and CRS Report RS21305, *Navy Littoral Combat Ship (LCS): Background and Issues for Congress*, both by Ronald O'Rourke.

² For additional background information on surface combatants, see U.S. Congressional Budget Office, *Transforming the Navy's Surface Combatant Force*, Mar. 2003, pp. 4-17; and CRS Report 94-343, *Navy DDG-51 Destroyer Procurement Rate: Issues and Options for Congress*, by Ronald O'Rourke. (Out of print; available from author at 7-7610.)

³ The Navy's fleet also includes mine warfare and support ships. Aircraft carriers, though sometimes referred to as surface combatants, are usually put into a category of their own because their main armament — an embarked air wing consisting of dozens of high-performance aircraft — is quite different from the typical main armament of other surface warships and leads to fundamental differences in ship design and operation.

⁴ For a graph showing surface combatants as a percentage of the total number of Navy battle force ships for the years 1948-1993, see CRS Report 94-343, *Navy DDG-51 Destroyer Procurement Rate: Issues and Options for Congress*, by Ronald O'Rourke. (Out of print; available from author at 7-7610.)

⁵ In public policy discussions about the Navy, the commonly cited number of ships in the Navy is the total number of battle force ships. Battle force ships are ships that can readily deploy overseas to participate in or directly support U.S. Navy combat operations, such as aircraft carriers, major surface combatants, submarines, amphibious ships, higher-readiness mine warfare ships, and Navy auxiliaries that resupply Navy combat ships at sea. Ships that
(continued...)

Surface combatants typically are equipped with sensors (e.g., radars and sonars) and weapons (e.g., missiles, guns, and torpedoes) for detecting and attacking enemy submarines, surface ships, aircraft, anti-ship cruise missiles, and land targets. Many surface combatants also carry one or two helicopters to assist in these operations.

In descending order of size, surface combatants include battleships, cruisers, destroyers, frigates, corvettes (also called light frigates), and patrol craft.⁶ The Navy no longer operates battleships.⁷ The Navy's surface combatant force in recent decades has consisted largely of cruisers, destroyers, and frigates.⁸

Roles, Missions, and Capabilities. From World War II until the 1980s, surface combatants were viewed largely as defensive escorts for protecting other Navy surface ships (i.e., aircraft carriers, amphibious ships, and auxiliary ships)⁹ and commercial cargo ships. During this period, the primary missions of surface combatants were anti-air warfare (AAW) and anti-submarine warfare (ASW), and designs for Navy surface combatant classes were determined in large part by decisions as to whether a given class should emphasize AAW, ASW, or both. Additional but more secondary surface combatant missions during this period included anti-surface warfare (ASuW) and attacking coastal land targets with guns.

The largely escort-oriented role of Navy surface combatants changed in the 1980s with the advent of three major new systems — the Tomahawk cruise missile, the vertical launch system (VLS), and the Aegis ship combat system. The Tomahawk gave surface combatants an ability to attack enemy targets at ranges comparable to targets that could be attacked by carrier-based aircraft. The VLS, which is a battery

⁵ (...continued)

do not qualify as battle force ships, such as patrol craft and military sealift ships that transport equipment and supplies from one land mass to another, are categorized as local defense and miscellaneous support forces. As of the end of FY2005, the Navy counted 282 battle force ships and 130 local defense and miscellaneous support forces ships.

⁶ Battleships, cruisers, destroyers, and frigates are referred to as major surface combatants; patrol craft are sometimes referred to as minor surface combatants; and corvette-sized ships can be included in either group.

⁷ As part of the Reagan-era buildup toward a planned 600-ship fleet, the Navy in the 1980s reactivated and modernized its four Iowa (BB-61) class battleships, which were originally built during World War II and were the last battleships built by the U.S. Navy. The four reactivated and modernized battleships, with Tomahawk cruise missiles and other new equipment, reentered service in 1982-1988. Two of the ships were used in the 1991 Persian Gulf war. The ships were removed from service in 1990-1992 as part of the post-Cold War reduction in the size of the Navy.

⁸ In recent decades, the Navy's cruisers have become smaller while its destroyers have become larger, with the result that the Navy's current cruisers and destroyers are similar in size and (in some respects) capability. The Navy's frigates are considerably smaller and less capable than its cruisers and destroyers. At various times in the past, the Navy has also operated small numbers of patrol craft.

⁹ The fixed-wing aircraft embarked on aircraft carriers in turn provided long-range air protection for both the carrier and the other surface ships (i.e., surface combatants and auxiliary ships) in the carrier battle group.

of vertically oriented missile-launch tubes that is countersunk into the ship's deck, permitted surface combatants to carry and launch an increased number of Tomahawks (and other missiles). The Aegis system — an integrated ship combat system that includes the sophisticated SPY-1 multifunction phased-array radar¹⁰ — significantly enhanced the AAW capability of surface combatants, giving them more potential for conducting operations independent of aircraft carriers.¹¹ In the eyes of many observers, the Tomahawk missile and the Aegis system transformed surface combatants back into significant offensive combatants for the first time since the period before World War II.

The capabilities of Navy surface combatants are currently being enhanced by new networking systems such as the Cooperative Engagement Capability (CEC) for air-defense operations. Networking systems like these enable surface combatants, other ships, and aircraft to share large amounts of targeting-quality data on a rapid and continuous basis, permitting them to engage in what is called network-centric warfare (NCW).¹²

In coming years, surface combatants are scheduled to take on a growing role as platforms for conducting ballistic missile defense operations.¹³ The capabilities of surface combatants will also be enhanced in coming years by increased application of networking technology and by the addition of unmanned air, surface, and underwater vehicles,¹⁴ electromagnetic rail guns, directed-energy weapons such as lasers, and improved equipment for detecting and countering mines. Some of these developments are to be enabled by the application to surface combatants of advanced integrated electric drive propulsion technology.¹⁵ As these developments unfold, surface combatants will likely continue to play a significant role in defending both themselves and other friendly surface ships against enemy submarines, surface ships, aircraft, and anti-ship cruise missiles.

¹⁰ The Aegis system also integrates, among other things, the SPS-49 air search radar (on CG-47 class cruisers), the Mk 99 target illumination radar, the SLQ-32 electronic warfare system, the Standard surface-to-air missile, the Mk 41 VLS system for launching the Standard missile and other missiles, the Phalanx close-in weapon system (CIWS), and the ship's tactical computers and computer displays.

¹¹ For an introductory discussion of the Aegis system, see CRS Report 84-180, *The Aegis System: Its Principal Components, Its Installation on the CG-47 and DDG-51 Class Ships, and Its Effectiveness*, by Ronald O'Rourke. (Out of print; available from author at 7-7610.)

¹² For more on naval NCW, see CRS Report RS20557, *Navy Network-Centric Warfare Concept: Key Programs and Issues for Congress*, by Ronald O'Rourke.

¹³ For a discussion of the emerging role of Navy surface combatants in missile-defense operations, see CRS Report RL31111, *Missile Defense: The Current Debate*, coordinated by Steven A. Hildreth and Amy F. Woolf.

¹⁴ For more information on naval unmanned vehicles, see CRS Report RS21294, *Unmanned Vehicles for U.S. Naval Forces: Background and Issues for Congress*, by Ronald O'Rourke.

¹⁵ For a discussion of electric-drive technology and its application to Navy ships, see CRS Report RL30622, *Electric-Drive Propulsion for U.S. Navy Ships: Background and Issues for Congress*, by Ronald O'Rourke.

Service Lives. For planning purposes, the Navy credits its cruisers and destroyers with 35- or 40-year expected service lives (ESLs), its frigates with 30-year ESLs, and its patrol craft with 20-year ESLs. In practice, however, numerous surface combatants in recent years have been decommissioned well before the end of their ESLs for various reasons, including decisions (like the one following the end of the Cold War) to reduce the size of the Navy, shifts in Navy mission requirements that made ships with certain capabilities inappropriate, and high operation and support (O&S) costs that made ships cost-ineffective compared to other approaches for performing their missions. The Navy in recent years has decommissioned numerous cruisers, destroyers, and frigates well before the end of their ESLs.

Current Surface Combatant Force. As of the end of FY2005, the Navy's force of larger surface combatants consisted of 99 ships in three classes:

- 23 Ticonderoga (CG-47) class cruisers;
- 46 Arleigh Burke (DDG-51) class destroyers; and
- 30 Oliver Hazard Perry (FFG-7) class frigates.

The Navy at the end of FY2005 also operated 9 Cyclone (PC-1) class patrol craft.

The CG-47s, which have a full load displacement of about 9,500 tons,¹⁶ are equipped with the Aegis system and are commonly referred to as Aegis cruisers. A total of 27 were procured between FY1978 and FY1988 and entered service between 1983 and 1994. The first five lack VLS and consequently cannot fire Tomahawks; the final 22 are equipped with a 122-tube VLS. The Navy plans to decommission the first five by the end of FY2006. Four of the five were decommissioned by the end of FY2005. The Navy has planned to modernize most or all of the final 22 and keep them in service until they are about 40 years old.

The DDG-51s, which displace about 9,200 tons,¹⁷ are equipped with the Aegis system and are sometimes referred to as Aegis destroyers. They are also equipped with a 90- or 96-tube VLS. The first ship was procured in FY1985, and 62 have been procured through FY2005. By the end of FY2005, 46 had entered service (the first in 1991) and 16 were in various stages of construction. The Navy wants the three ships procured in FY2005 to be the final ships in the program. The Navy plans to give these ships a mid-life modernization that is intended in part to reduce their operating and support costs.

¹⁶ Full load displacement is the weight of the ship including loads such as fuels and water. Another measure of ship size is light (i.e., empty) ship displacement, which excludes such loads. Full load displacement is the more commonly used measure in general discussions of Navy ships, but light displacement is generally more useful in estimating ship construction costs.

¹⁷ This is the figure for the 29th and following ships in the class, which are referred to as the Flight IIA ships. The first 28 ships in the class, which are referred to as the Flight I and II ships, were built to a different design that lacked a helicopter hangar and have a full load displacements of about 8,900 tons. Flight IIA ships have a light ship displacement of about 6,950 tons.

The FFG-7s, which displace about 4,000 tons, were designed as lower-cost, lower-capability surface combatants for use in lower-threat environments. They lack both the Aegis system and VLS. A total of 51 were procured between FY1973 and FY1984 and entered service between 1977 and 1989. Twenty-one were decommissioned by the end of FY2005. The Navy plans to decommission several more over the next decade. Of the 30 FFG-7s in service at the end of FY2005, 9 were operated as Naval Reserve Force (NRF) ships with crews consisting partly of Navy reservists.

All of these ships have landing pads for operating helicopters, and all but the first 28 DDG-51s have hangars for embarking and supporting 2 helicopters.

The PC-1s, which displace about 330 tons, are high-speed craft that were built to support special operations forces. They have also been used by the Navy and Coast Guard for port-security operations. A total of 13 PC-1s were procured between FY1990 and FY1996 for the Navy and entered service with the Navy between 1993 and 2000. The lead ship, PC-1, was donated to the Philippine Navy and commissioned into service with that navy in March 2004. Four other ships in the class have been loaned to the U.S. Coast Guard. PC-1s in service with the U.S. Navy are classified as local defense and miscellaneous support forces and consequently are not included in the total number of battle force ships in the Navy.

Surface Combatant Force-Structure Goal

A December 2005 press report stated that the Navy is planning a 313-ship fleet, including a total of 143 surface combatants — 19 cruisers (CG-47s now, and CG(X)s in the future), 7 DD(X)s, 62 DDG-51s, and 55 LCSs.¹⁸ Under this plan, surface combatants would account for about 46% of the total number of ships in the Navy. The reported 313-ship plan, which replaces earlier Navy force-structure plans,¹⁹ has

¹⁸ Christopher P. Cavas, “U.S. Ship Plan To Cost 20% More,” *Defense News*, December 5, 2005: 1, 8. See also David S. Cloud, “Navy To Expand Fleet With New Enemies in Mind,” *New York Times*, December 5, 2005.

¹⁹ Earlier Navy force structure plans include the following:

310-Ship Fleet From 2001 QDR. In September 2001, as part of its final report on the 2001 QDR, the Department of Defense (DOD) approved a plan for maintaining a Navy of about 310 battle force ships. This plan, which was essentially the same as the Navy force-structure plan approved in the 1997 QDR, included 116 surface combatants (108 active and 8 in the Naval Reserve Force), all of which are cruisers, destroyers, and frigates. In approving the 310-ship plan (and other U.S. military force-structure goals), however, the 2001 QDR report stated that as DOD’s “transformation effort matures — and as it produces significantly higher output of military value from each element of the force — DOD will explore additional opportunities to restructure and reorganize the Armed Forces.” (U.S. Department of Defense, [Report on] *Quadrennial Defense Review*, Sept. 2001, p. 23.)

In February 2003, in submitting its proposed FY2004 defense budget and FY2004-FY2009 Future Years Defense Plan (FYDP) to Congress, DOD announced that it had initiated studies on DOD’s undersea warfare requirements and on forcible entry options
(continued...)

not yet been publicly endorsed by the Office of the Secretary of Defense (OSD) as an official DOD planning goal, but this could happen when the final report on the 2005 Quadrennial Defense Review (QDR) and the FY2007-FY2011 Future Years Defense Plan are submitted to Congress in February 2006.

Surface Combatant Industrial Base

Construction Yards. All cruisers, destroyers, and frigates procured since FY1985 have been built at two shipyards — General Dynamics' Bath Iron Works (GD/BIW) in Bath, ME, and Northrop Grumman's Ingalls shipyard (Northrop/Ingalls) in Pascagoula, MS.²⁰ Both yards have long histories of building larger surface combatants. Construction of Navy surface combatants in recent years has accounted for virtually all of GD/BIW's ship-construction work and for a significant share of Ingalls' ship-construction work.²¹

¹⁹ (...continued)

for the U.S. military. The studies on undersea warfare could affect, among other things, the required number of SSNs, while the studies on forcible entry options could affect, among other things, requirements for amphibious ships and for naval surface fire support capabilities. In launching these studies, DOD thus created uncertainty about two of the four principal categories of ships that define the 310-ship plan (submarines and amphibious ships), and about requirements for a certain capability (naval surface fire support) to be performed by the Navy's surface combatant force.

Navy 375-Ship Proposal of 2002-2004. From about February 2002 through about February 2004, Navy officials spoke of an alternative plan for a 375-ship Navy. The principal difference between the 310-ship plan and the 375-ship plan was that the 375-ship plan called for a total of 160 surface combatants, including 104 cruisers, destroyers, and frigates, and 56 LCSs. Although Navy leaders routinely referred to the 375-ship proposal from early 2002 through early 2004, Secretary of Defense Donald Rumsfeld, at a February 5, 2003 hearing before the House Armed Services Committee, explicitly declined to endorse it as an official DOD goal, leaving it a Navy proposal only. In April 2004, Navy leaders began to back away from the 375-ship proposal, stating that 375 was an approximate figure, that the ships making up the total of 375 were subject to change, and perhaps most important, that the 375-ship figure reflected traditional concepts for deploying Navy ships, rather than new concepts (such as the Sea Swap concept for long deployments with crew rotation) that could significantly reduce future requirements for Navy ships.)

2005 Navy Testimony on 260- and 325-Ship Fleets. In February and March 2005, the Navy testified that the Navy in future years might require a total of 260 to 325 ships. The 260-ship fleet included 130 surface combatants — 44 Arleigh Burke (DDG-51) class Aegis destroyers, 8 DD(X)s, 15 CG(X)s, and 63 LCSs. The 325-ship fleet included 174 surface combatants — 62 DDG-51s, 12 DD(X)s, 18 CG(X)s, and 82 LCSs. (U.S. Department of the Navy, *An Interim Report to Congress on Annual Long-Range Plan For The Construction Of Naval Vessels For FY 2006*.)

²⁰ The Ingalls yard, along with the Avondale shipyard near New Orleans and a third facility at Gulfport, MS, form Northrop Grumman's Ship Systems (NGSS) division.

²¹ In earlier years, some Navy surface combatants were built at other yards, such as Northrop Grumman's Avondale shipyard near New Orleans, LA (which built most of the Navy's Knox [FF-1052] class frigates between 1967 and 1974), Northrop Grumman's Newport (continued...)

The two industry teams now involved in the LCS program plan to build their LCSs at other yards. The Lockheed-led team plans to build its LCSs at Marinette Marine of Marinette, WI, and Bollinger Shipyards of Louisiana and Texas; the GD-led team plans to build its LCSs at Austal USA of Mobile, AL.

The Navy's PC-1 class patrol boats were built at Bollinger Shipyards at Lockport, LA.

Overhaul and Repair Yards. Navy surface combatants are overhauled, repaired, and modernized at GD/BIW, Northrop/Ingalls, other private-sector U.S. shipyards, and government-operated naval shipyards (NSYs).

System Integrators and Supplier Firms. Lockheed Martin and Raytheon are generally considered the two leading Navy surface ship radar makers and combat system integrators. Boeing is another system integrator and maker of Navy surface ship weapons and equipment. The surface combatant industrial and technological base also includes hundreds of additional firms that supply materials and components. The financial health of the supplier firms has been a matter of concern in recent years, particularly since some of them are the sole sources for what they make for Navy surface combatants.

Other Elements. The surface combatant industrial base also includes naval architects and engineers who work for shipyards, systems integrators, supplier firms, and independent naval architectural engineering firms, as well as research and development organizations and laboratories in the Navy and at shipyards, system integrators, supplier firms, Federally Funded Research and Development Centers (FFRDCs), and universities and colleges.

Surface Combatant Acquisition Programs

This section provides background on six Navy surface combatant acquisition programs:

- the DDG-51 destroyer program,
- the terminated arsenal ship program,
- the terminated DD-21 destroyer program,
- the DD(X) destroyer program,
- the CG(X) cruiser, and
- the LCS program.

²¹ (...continued)

News Shipbuilding of Newport News, VA (which built six nuclear-powered cruisers in the 1970s), Todd Shipyards of Seattle, WA, and San Pedro, CA (which built many of the FFG-7s between 1977 and 1989), and Lockheed Shipbuilding of Seattle, WA (which built some of the FF-1052s between 1968 and 1972). Additional private-sector shipyards and government-operated naval shipyards were involved in building Navy surface combatants in the 1960s and previous years.

Although the arsenal ship and DD-21 programs have been terminated, they are reviewed below because they provide context for understanding the DD(X) destroyer and LCS programs.

DDG-51 Destroyer

The Arleigh Burke (DDG-51) class destroyer has been the sole class of larger surface combatant in procurement for the Navy since FY1989. As mentioned earlier, 62 DDG-51s have been procured through FY2005. The Navy wants the three ships procured in FY2005, which are scheduled to enter service in FY2010 and FY2011, to be the final ships in the program.

In the early 1990s, the Navy ended the use of competition between GD/BIW and Northrop/Ingalls for the awarding of DDG-51 construction contracts and began allocating contracts equally between the two shipyards on a noncompetitive basis. That arrangement remained in place until 2002, when a new agreement was reached between General Dynamics, Northrop Grumman, and the Navy. Under this agreement, construction of San Antonio (LPD-17) class amphibious ships was consolidated at Northrop Grumman's Avondale and Northrop/Ingalls shipyards (rather than being split on a 2-to-1 basis between the Northrop yards and GD/BIW, respectively), and construction of most of the remaining DDG-51s was shifted to GD/BIW (rather than being split on a 1-for-1 basis between GD/BIW and Northrop/Ingalls).

Arsenal Ship (Terminated)²²

The Navy initiated the arsenal ship program in early 1996. The program was aimed at developing and acquiring a class of six large surface combatants that were each equipped with 512 VLS tubes for firing Tomahawk cruise missiles and other land-attack weapons. The arsenal ships were to be relatively simple and (for their size) relatively low cost ships manned by crews of not more than 50 sailors. The stated purpose of the program was to provide U.S. regional military commanders with substantial additional in-theater or early-arriving firepower for use in the early phases of regional crises and conflicts.

The Navy pursued the arsenal ship program under a streamlined acquisition strategy using what is known as Other Transaction Agreement (OTA) or Section 845/804 contracting authority. This statutory authority exempted the arsenal ship program from many of the regulatory requirements that DOD acquisition programs at the time were normally required to meet.²³ In line with this streamlined acquisition strategy, the Navy prior to starting the arsenal ship program did not issue a traditional DOD document known as a Mission Need Statement (MNS) establishing a formal DOD requirement for substantial additional in-theater or early-arriving firepower.

²² For detailed background information on the arsenal ship program, see CRS Report 97-455 F, *Navy/DARPA Arsenal Ship Program: Issues and Options for Congress*, by Ronald O'Rourke. (Out of print; available from author at 7-7610.)

²³ For more on the Section 845/804 authority, see CRS Report 97-455, op. cit., pp. 34-37.

Also consistent with the streamlined acquisition strategy, the Navy did not conduct a rigorous analysis — then known as a cost and operational effectiveness analysis (COEA) and now known as an analysis of multiple concepts (AMC) or analysis of alternatives (AOA) — demonstrating that developing and acquiring a force of six arsenal ships was not simply one way, but rather the best or most promising way, of providing this capability.

The arsenal ship program was widely understood to be a personal initiative of Admiral Jeremy M. Boorda, who was the Chief of Naval Operations (CNO) from April 1994 until May 1996. The arsenal ship program did not appear to be as high a personal priority for Boorda's successor as CNO, Admiral Jay L. Johnson, and support for the arsenal ship program appeared to decline under Johnson's tenure. In April 1997, the program was incorporated into the Navy's SC-21 family of surface combatants for the 21st Century (see discussion below on the DD-21 program). The Navy at about this time also deemphasized the goal of procuring six arsenal ships and focused instead on the idea of procuring a single arsenal ship for use as a technology test-bed. The reduction of the program from a firm six-ship effort to one involving perhaps no more than a single ship appeared to reduce industry interest in the program. Congress raised questions about the need for and cost-effectiveness of the arsenal ship and substantially reduced the Navy's FY1998 funding request for the program. The Navy responded to this reduction by announcing in October 1997 that it had decided to terminate the arsenal ship program for lack of sufficient funding.²⁴

DD-21 Destroyer (Terminated)²⁵

The Navy initiated the DD-21 program in 1994-1995.²⁶ The DD-21 program was aimed at developing and acquiring a next-generation destroyer called the DD-21, meaning the destroyer for the 21st century. The ship was also called the land attack destroyer.²⁷ The Navy envisaged procuring a total of 32 DD-21s; the first was to be procured in FY2005 and enter service in 2010. The Navy hoped to procure DD-21s at an eventual rate of three ships per year, so as to replace retiring DD-963s and FFG-7s on a timely basis.

²⁴ For a discussion of the termination the program, see CRS Report 97-1044, *Navy/DARPA Maritime Fire Support Demonstrator (Arsenal Ship) Program: Issues Arising From Its Termination*, by Ronald O'Rourke. (Archived, available from author.)

²⁵ For more on the DD-21 program, see CRS Report RS20698, *Navy Zumwalt (DD-21) Class Destroyer Program: Background and Issues for Congress*, by Ronald O'Rourke. (Archived, available from author.)

²⁶ The Department of Defense (DOD) Joint Requirements Oversight Council (JROC) approved a Mission Need Statement (MNS) for the SC-21 program in Sept. 1994. DOD's Defense Acquisition Board (DAB) granted Milestone 0 approval for the SC-21 program in Jan. 1995. USD(A&T) granted Milestone I approval for the program (which permitted the Navy to enter Phase I, the demonstration and validation phase) in Jan. 1998. The Navy issued a Request for Proposals (RFP) for the program in Mar. 1998.

²⁷ The DD-21 was subsequently also called the Zumwalt-class destroyer because the Navy in July 2000 announced that the lead ship in the class would be named in honor of the late Admiral Elmo R. Zumwalt, Jr., a surface combatant officer who was the Chief of Naval Operations in 1970-1974.

The DD-21 was to be the first member of the SC-21 family of surface combatants for the 21st century. Following completion of DD-21 procurement, perhaps around FY2015, the Navy planned to begin procuring the CG-21 — a cruiser variant of the basic DD-21 design — to replace aging CG-47s. A third intended member of the SC-21 family of ships was the arsenal ship, which, as mentioned above, was incorporated into the SC-21 family of ships in April 1997.

As envisioned by the Navy, the DD-21 was to have been a multimission ship with an emphasis on two mission areas — maritime dominance (which included ASW, ASuW, and countermine warfare) and land attack. The emphasis on maritime dominance reflected the DD-21's role as a replacement for the FFG-7s and DD-963s, which were designed with an emphasis on ASW. The emphasis on land attack reflected a requirement to replace the large-caliber naval gunfire support capability that the Navy lost in 1990-1992 when it removed its four reactivated Iowa-class battleships from service.²⁸

The DD-21 was to have a crew of 95 to 150 sailors, which would have been significantly smaller than the crew of a CG-47 (about 400 persons), a DDG-51 or DD-963 (about 350), or a FFG-7 (about 235). The goal for a significantly smaller crew reflected a Navy emphasis on reducing ship operating and support (O&S) costs, which are driven in large part by crew-related costs.

The DD-21 was to have featured a new wave-piercing, tumblehome hull design²⁹ with significantly reduced radar, infrared, and acoustic signatures; a VLS with 64 to 256 tubes (128 may have been the final number), two copies of a new 155-mm (i.e., 6.1-inch) gun called the Advanced Gun System (AGS), each with a magazine containing 600 to 750 shells; sonars and other equipment for ASW and countermine warfare; a moderately capable air-defense system (like those on FFG-7s and DD-963s) rather than a highly capable air-defense system (like the Aegis system on CG-47s and DDG-51s); and a hangar for a helicopter and a few unmanned air vehicles (UAVs). In January 2000, the Navy announced that the DD-21 would be equipped with an integrated electric-drive system.

To permit a procurement rate of three ships per year within anticipated funding levels, the Navy wanted the DD-21 to have a unit procurement cost somewhat lower than that of the DDG-51. Specifically, the fifth and following DD-21s were to have a procurement cost of \$750 million in FY1996 dollars — the equivalent of about \$1,057 million in FY2007 dollars. The procurement cost of the first DD-21, which

²⁸ The battleships were each equipped with nine 16-inch guns. All of the Navy's other surface combatants are equipped with 5-inch or 3-inch guns. More generally, the DD-21's emphasis on land attack reflected the Navy's post-Cold War shift in emphasis toward operations in littoral waters that are intended to influence events ashore.

²⁹ "Wave-piercing" means that the front end of the ship, instead of coming to a sharp tip that is well above the water, as in a conventional hull, instead narrows to a tip that slopes down toward the water, so that the front end of the ship looks somewhat like the blade on a farmer's plow that breaks through the ground as it is pushed forward. "Tumblehome" means that the ship's hull will have sides that slope inward from the waterline up, so as to reduce the ship's visibility to radar waves coming at the ship from the side.

included the DD-21 program's non-recurring detailed design and engineering costs, was estimated at \$2.03 billion in then-year dollars. The DD-21 was to have had an O&S cost equivalent of not more than \$6,000 per steaming hour in FY2001 dollars. This figure, which represented a significant reduction from the O&S costs of other Navy surface combatants, was to have been achieved in significant part by designing the ship to be operated by crew of 95 to 150 sailors.

In July 1996, the Under Secretary of Defense for Acquisition and Technology (USD[A&T]) approved Part 1 of the SC-21 Cost and Operational Effectiveness Analysis (COEA), which examined surface combatant capabilities and requirements and developed acquisition alternatives. In April 1997, the Navy completed Part 2 of the COEA, which compared acquisition alternatives.

As with the arsenal ship program, the Navy for Phases I and II of the DD-21 program planned on using a streamlined acquisition strategy using Section 845/804 contracting authority.

Under a plan worked out by the Navy in the first half of 1998 after considerable consultation with industry and Congress, two industry teams were competing for the program — the **“Blue” team**, which included GD/BIW as the shipbuilder, Lockheed Martin as the combat system designer and integrator, and other firms; and the **“Gold” team**, which included Northrop/Ingalls as the shipbuilder, Raytheon as the combat system designer and integrator, and other companies.

GD/BIW and Northrop/Ingalls were to build DD-21s in roughly equal numbers, paralleling the arrangement for building DDG-51s that the Navy put into place in the early 1990s. As a consequence, GD/BIW and Northrop/Ingalls were competing not for the right to build the DD-21, but rather for the right to design the DD-21 and to be the full-service contractor for the DD-21 class (i.e., the entity in charge of planning and conducting life-cycle support for DD-21s over the many years that they would be in service).³⁰

Navy and DOD support for the DD-21 program appeared to decline during 2001. In the spring of that year, the Navy twice delayed its planned announcement of the winner of the DD-21 competition.³¹ In June 2001, two special DOD panels that were established by Secretary of Defense Donald Rumsfeld to review DOD programs indicated that they did not view the DD-21 as particularly transformational. At about the same time, Navy officials, in testifying to Congress on the proposed

³⁰ Designing the DD-21 would involve hundreds of millions of dollars in design and engineering work, while being the FSC would involve a stream of potentially many millions of dollars of work spread out over a period of more than 40 years.

³¹ On Mar. 1, 2001, the Navy announced that it had delayed its planned selection of a winning industry design for the DD-21 program by two months, to May 2001. On May 31, 2001, the Navy announced that it had again delayed selection of a winning design until sometime after the completion of several defense studies, including the 2001 Quadrennial Defense Review, which was submitted to Congress on September 30, 2001.

FY2002 defense budget, suggested that the Navy was uncertain about the merits of the program.³²

The Navy's uncertainty was apparently due in part to the emerging size and cost of the ship: Although initial reporting suggested that the DD-21 might displace about 9,000 tons, like the Navy's current cruisers and destroyers, the reported size of the DD-21 design grew over time to about 16,000 tons. A ship of this size, it appeared, was needed either to accommodate two AGSs (each with a magazine containing 600 to 750 shells) along with a 128-tube VLS and a helicopter/UAV hangar, or to permit the DD-21 hull to serve as the basis for the projected CG-21 cruiser, or both. The projected size of the DD-21 led to concerns among observers, including Navy officials, that the DD-21 would substantially exceed its unit procurement cost goal and thus be difficult for the Navy to afford.³³ Navy and DOD officials were also concerned about the amount of technical risk in the DD-21 development effort, particularly in light of the large number of new technologies that were to be incorporated into the ship.

These developments, plus the Administration's continued delay in announcing a winning design after DOD submitted the 2001 Quadrennial Defense Review (QDR) to Congress on September 30, 2001, gave rise to speculation that the Administration was considering cancelling or restructuring the program. In late October 2001, the House Appropriations Committee, in its markup of the FY2002 defense appropriation bill, recommended substantially reducing the Navy's request for FY2002 research and development funding for the program and posed basic questions about the DD-21's target crew size, unit procurement cost, and whether the DD-21 qualified as a "leap ahead" defense program. The Navy announced the next

³² When asked whether the Navy needed the DD-21, Navy officials on more than one occasion answered that the Navy needed the technologies that were scheduled to be incorporated into the ship, but avoided stating directly that the Navy needed the ship itself. For a press report on this shift in Navy testimony, see Mike McCarthy, "Navy Rhetoric On New Destroyer Subtly Shifts," *Defense Week*, Aug. 6, 2001, p. 6.

³³ One press account, published more than a year later, stated:

In a March 10 [2003] interview with *Inside the Navy*, [Navy acquisition executive John] Young recounted how, in discussions going back a year or more, it became clear that officials were not comfortable with all of DD-21's attributes. Discussions were held with then-Navy Secretary Gordon England, Pentagon acquisition czar Pete Aldridge, Young, Chief of Naval Operations Adm. Vern Clark and Deputy Defense Secretary Paul Wolfowitz....

Before DD-21 became DD(X), the new destroyer was not truly affordable, according to Young.

"On DD-21, people were promising to deliver a DD-21 at something around 17,000 tons for the same cost of a 9,000-ton DDG-51," said Young. "I personally found that hard to believe. In fact, I didn't think it was doable...."

(Christopher J. Castelli, "Young Seeks Smaller DD(X) Ship, Prompting Fire Support Discussions," *Inside the Navy*, Mar. 24, 2003.)

month that it was replacing the DD-21 program with the restructured DD(X) family of ships program (see discussion below).

DD(X)/CG(X)/LCS Family of Future Surface Combatants

On November 1, 2001, the Navy announced that it was replacing the DD-21 program with a new DD(X) Future Surface Combatant Program aimed at developing and acquiring a family of three new classes of surface combatants:

- **a destroyer called DD(X)** for the precision long-range strike and naval gunfire mission,
- **a cruiser called CG(X)** for the missile and air defense mission, and
- **a smaller combatant called the Littoral Combat Ship (LCS)** to counter submarines, small surface attack craft (also called “swarm boats”) and mines in heavily contested littoral (near-shore) areas.³⁴

The Navy stated that it planned to employ multiple competitions among industry teams for each of the three programs. In addition, DOD announced that the DD(X) family of ships effort would employ a relatively new acquisition strategy called evolutionary acquisition with spiral development (EA/SD). EA/SD aims at rapidly developing and fielding useful increments of capability and exploiting user feedback in developing additional increments, but poses potentially important issues for Congress regarding Congress’s ability to conduct oversight of DOD acquisition programs.³⁵

DD(X) Destroyer

The DD(X) destroyer is effectively the successor to the DD-21 destroyer and will resemble the DD-21 in terms of mission orientation and ship design. Specifically, the DD(X) would:

- be a multimission ship with an emphasis on land-attack operations that reflects a desire to replace the large-caliber naval gunfire support capability that the Navy lost in 1990-1992, when it removed its four reactivated Iowa-class battleships from service;
- have a reduced-size crew (compared to the Navy’s current surface combatants) of 125 to 175 sailors so as to permit reduced operating and support (O&S) costs; and

³⁴ Somewhat confusingly, “DD(X)” has been used to refer to both the entire effort for developing three classes of ships and (more frequently) to the destroyer program within the overall effort.

³⁵ For a discussion of EA/SD, see CRS Report RS21195, *Evolutionary Acquisition and Spiral Development in DOD Programs: Policy Issues for Congress*, by Gary J. Pagliano and Ronald O’Rourke.

- feature a wave-piercing, tumblehome hull design with significantly reduced signatures; a VLS; two AGSs; air-defense and ASW systems; a hangar for a helicopter and a few unmanned air vehicles (UAVs); and an integrated electric-drive system.

Due to continuing Navy concerns over ship affordability, the DD(X) is to be somewhat smaller and less expensive than the DD-21. The DD(X)'s VLS would include 80 tubes rather than the 128 tubes on the DD-21, and the DD(X) would carry a combined total of 600 shells for its two AGSs,³⁶ rather than 600 to 750 shells for each AGS, as on the DD-21. As a result, the DD(X) is to displace 14,564 tons rather than the DD-21's figure of almost 16,000 tons.³⁷ (It is possible, though, that if the DD-21 program had been continued, the Navy eventually might have decided to similarly reduce the size, capability, and cost of the DD-21 design.)

Although somewhat smaller than the earlier DD-21 design, the DD(X), at 14,564 tons, would be roughly 50% larger than the Navy's current 9,500-ton cruisers and destroyers, and larger than any Navy destroyer or cruiser since the nuclear-powered cruiser Long Beach (CGN-9), which was procured in FY1957.

The DD(X) is to incorporate a significant number of new technologies, including the wave-piercing, tumblehome hull design, a superstructure made partly of large sections of composite materials rather than steel or aluminum, the integrated electric drive propulsion system and a related ship-wide electrical distribution system, a total-ship computing system for moving information about the ship, automation technologies for the reduced-sized crew, a dual-band radar, a new kind of VLS called the peripheral VLS (PVLS),³⁸ and a new type of gun (the AGS).

The Navy originally envisaged procuring a total of 16 to 24 DD(X)s. Navy officials subsequently testified in February and March 2005 that they had a requirement for 8 to 12. The Navy's reported new 313-ship plan calls for a total of seven.

The FY2005-FY2009 FYDP submitted to Congress in February 2004 called for procuring the first DD(X) in FY2005, another two in FY2007, two more in FY2008, and three more in FY2009, for a total of eight ships through FY2009. The FY2006-FY2011 submitted to Congress in February 2005 reduced planned DD(X) procurement to one per year for FY2007-FY2011, for a total of five ships through

³⁶ The design previously included a total of 920 shells; the capacity was reduced to 600 as part of an effort to reduce the cost of the ship. See Christopher P. Cavas, "U.S. Ship Plan To Cost 20% More," *Defense News*, December 5, 2005: 1, 8.

³⁷ As of Oct. 2003, the ship's estimated full load displacement (including loaded fuels, water, etc.) was 14,064 tons, and the ship's estimated light (i.e., empty) displacement was 12,135 tons. (Navy Office of Legislative Affairs, Oct. 3, 2003.)

³⁸ The system is called the Peripheral VLS because the VLS tubes, instead of being installed into the ship's main deck in a cluster along the ship's centerline, as with the current VLS system, would be installed in the ship's main deck in a line along the outer perimeter (i.e., periphery) of the ship.

FY2009. Under the Navy's reported 313-ship plan, DD(X)s and CG(X)s are to be procured during the period FY2007-FY2015 as shown in **Table 1** below.

Table 1. Planned DD(X) and CG(X) Procurement, FY2007-FY2015

	07	08	09	10	11	12	13	14	15
DD(X)	2*	0*	1	1	1	1	1		
CG(X)					1	0	1	1	2
TOTAL	2*	0*	1	1	2	1	2	1	2

Source: Christopher P. Cavas, "U.S. Ship Plan To Cost 20% More," Defense News, December 5, 2005: 1, 8.

* Each of the two ships to be procured in FY2007 is to be split-funded across FY2007 and FY2008.

The Navy substantially increased its estimates of DD(X) unit procurement costs between 2004 and 2005:

- The Navy in 2004 estimated that the first DD(X) would cost about \$2.8 billion to procure, including about \$1 billion in detailed design and nonrecurring engineering costs (DD/NRE) for the class; in 2005 it estimated the cost at \$3,291 million (an increase of about 18%), including \$558 million in DD/NRE costs.
- The Navy in 2004 estimated that the second DD(X) would cost \$2,053 million to procure; in 2005 it estimated the cost at \$3,061 million (an increase of about 49%), including \$219 million in DD/NRE costs.
- The Navy in 2004 estimated that subsequent DD(X)s would cost between \$1.5 billion and \$1.8 billion each to procure; in 2005 it estimated the cost at about \$2.2 billion to \$2.6 billion each (an increase of roughly 45%).

The Cost Analysis Improvement Group (CAIG) within the Office of the Secretary of Defense (OSD) in 2005 reportedly believed that DD(X) procurement costs may be 20% to 33% higher than the Navy's 2005 estimates.

A December 2005 press report states that the Navy in the latter months of 2005 took actions to reduce the cost of the first DD(X) by about \$200 million:

The service already is working on reducing the cost of one of its most expensive warships, the advanced and controversial DD(X) destroyer. A months-long effort to find cost-saving design and production changes has trimmed some \$200 million from the price tag for the first DD(X), which would bring it down from the official estimate of \$3.3 billion to less than \$3.1 billion....

Former Navy acquisition chief John Young, who left office a month ago to take another Pentagon position, set a goal earlier this year of between \$1.8 billion

and \$2 billion for later ships in the class. Few observers believe the Navy can reach those numbers.... The Navy predicts that the fifth ship will still cost about \$2.5 billion.

The service is trying to avoid design changes that would “impact the war-fighting capability,” [a] Navy official said.

One alteration — the elimination of a secondary magazine to store 300 155mm rounds for the ship’s Advanced Gun System — will do just that. The official said this was an acceptable tradeoff.

“With the accuracy of the rounds now, you need fewer rounds to destroy the target,” he said.

Other changes include “deckhouse optimization and how you position equipment in the pilothouse,” he said, along with “design process changes” that would eliminate some costly engineering drawings, standardization of parts, along with possible changes in the propulsion system.³⁹

Table 2 shows funding for the DD(X)/CG(X) program as shown in the FY2006-FY2011 FYDP submitted to Congress in February 2005. The figures on this table will change when the FY2007-FY2011 FYDP is submitted to Congress in February 2006.

³⁹ Christopher P. Cavas, “U.S. Ship Plan To Cost 20% More,” *Defense News*, December 5, 2005: 1, 8.

Table 2. Funding for DD(X)/CG(X) Program, FY2002-FY2011
(millions of then-year dollars, rounded to nearest million)

	02	03	04	05	06	07	08	09	10	11	FY02- FY11
Research, Development, Test & Evaluation, Navy (RDTEN) account											
DD(X)	505	909	1015	1164	1085	794	445	282	279	323	6801 ^a
CG(X)	0	0	0	0	30	110	279	365	397	403	1584 ^a
Subtotal RDTEN	505	909	1015	1164	1115	904	724	647	676	726	8385^a
Shipbuilding and Conversion, Navy (SCN) account											
DD(X) 1	0	0	0	220	666	2405	0	0	0	0	3291
<i>Construction</i>	0	0	0	22	306	2405	0	0	0	0	2733
<i>DD/NRE^b</i>	0	0	0	198	360	0	0	0	0	0	558
DD(X) 2	0	0	0	84	50	163	2764	0	0	0	3061
<i>Construction</i>	0	0	0	5	40	120	2677	0	0	0	2842
<i>DD/NRE^b</i>	0	0	0	79	10	43	87	0	0	0	219
DD(X) 3	0	0	0	0	0	0	51	2492	0	0	2543
DD(X) 4	0	0	0	0	0	0	0	51	2579	0	2630
DD(X) 5	0	0	0	0	0	0	0	0	50	2186	2236
DD(X) 6+	0	0	0	0	0	0	0	0	0	0	0
CG(X) 1	0	0	0	0	0	0	0	0	0	3210	3210
<i>Construction</i>	0	0	0	0	0	0	0	0	0	2710	2710
<i>DD/NRE^b</i>	0	0	0	0	0	0	0	0	0	510	510
CG(X) 2+	0	0	0	0	0	0	0	0	0	0	0
Subtotal SCN	0	0	0	304	716	2568	2815	2543	2629	5396	16971
TOTAL	505	909	1015	1468	1831	3472	3539	3190	3305	6122	25356

Source: U.S. Navy data provided to CRS on Mar. 24, 2005.

- a. Additional funding required after FY2011. Figures do not include \$1,111.4 million in research and development funding provided for the DD-21/DD(X) program in FY1995-FY2001. FY2006 Navy budget justification books reflect a different division of total RDT&E funds between DD(X) and CG(X) for FY2007-FY2011. GAO has reported that total DD(X)/CG(X) research and development costs are roughly \$10 billion.
- b. Detailed design and nonrecurring engineering costs for the class.

The Navy in 2004 proposed incrementally funding the first DD(X) through the Navy's research and development account rather than fully funding the ship through the Navy's ship-procurement account (the Shipbuilding and Conversion, Navy, or SCN, account), where Navy combat ships traditionally have been procured. As part of its action on the FY2005 defense budget, Congress provided \$350.5 million in advance procurement funding for the DD(X) program — \$221.1 million for the first DD(X), and \$84.4 million for the second DD(X) — and directed that procurement of DD(X)s be fully funded in the Navy's ship-procurement account rather than incrementally funded in the Navy's research and development account.

Until September 30, 2005, the DD(X) was being developed by a national industry team lead by Northrop Grumman's Ship Systems (NGSS) division (which

includes the Northrop/Ingalls Shipyard in Pascagoula, MS) and Raytheon Systems Company. The team also included GD/BIW as well as Lockheed Martin, Boeing, and several other companies.⁴⁰ The Navy ended the national industry team arrangement on September 30, 2005. Since then, the Navy has been managing the DD(X) program through a series of separate contracts with major DD(X) contractors, including NGSS, GD/BIW, Raytheon, and BAE Systems (the maker of the AGS).

Under the Navy's previous DD(X) acquisition strategy, which was approved by the Under Secretary of Defense for Acquisition, Technology, and Logistics (USD AT&L) in February 2004, the first DD(X) would be built by NGSS, the second DD(X) would be built GD/BIW, and contracts for building the first six DD(X)s would be equally divided between NGSS and GD/BIW.⁴¹

In February 2005, Navy officials announced that they would seek approval from USD AT&L to instead hold a one-time, winner-take-all competition between NGSS and GD/BIW to build all DD(X)s. On April 20, 2005, the USD AT&L issued a decision memorandum stating that "at this time, I consider it premature to change the shipbuilder portion of the acquisition strategy which I approved on February 24, 2004." The memorandum also agreed to a Navy proposal to separate the system-development and software-development contracts for the DD(X) from the detailed-design effort for the DD(X). The memorandum said this change "is projected to result in savings to the Department [of Defense], and helps to ensure that all shipbuilder acquisition strategy options are preserved."

Several Members of Congress expressed opposition to Navy's proposal for a winner-take-all competition. The Emergency Supplemental Appropriations Act for

⁴⁰ Following the replacement of the DD-21 program with the DD(X) program, the Blue and Gold teams that were competing for the DD-21 program continued to compete for the right to be the lead preliminary design agent for the DD(X) destroyer. On Apr. 29, 2002, the Navy announced it had selected the Gold team to be the lead preliminary design agent for the ship. The team was awarded a \$2.88 billion contract from FY2002-FY2005 to perform preliminary and system design work for the ship and to design, build, and test engineering development models (EDMs — test examples) of several of its key subsystems. On May 9, 2002, GD/BIW filed a protest of the Navy's contract-award decision with the General Accounting Office (GAO). On August 19, 2002, GAO announced that it had denied the Blue team's protest and upheld the Navy's decision. The Gold team was subsequently expanded into the DD(X) national team. The Navy wanted GD/BIW to be involved in the ship-design process to ensure that both yards could compete effectively in a separate competition for the detailed design and construction of the first DD(X) destroyer in FY2005.

⁴¹ The Navy originally anticipated holding another competition for the next phase in the program, which includes completing the ship's design and building the first ship. On Mar. 3, 2004, however, the Navy stated that, to avoid delaying the program, it had decided to award the contract for the next phase on a sole-source basis to Northrop Grumman's Ship Systems (NGSS) division, which includes Northrop/Ingalls. The first DD(X) would be built by Northrop/Ingalls, while the second would be built by GD/BIW. The Navy also stated that "The ship construction contracts will be allocated equally between NGSS and GD/BIW for the first six ships... and will be Cost Plus Incentive Fee (CPIF) type contracts.... The strategy for contracting for construction of the seventh ship and beyond will be proposed at [Milestone B] and will include consideration of limited competition such as exercised under the DDG-51 Program."

2005 (H.R. 1268/P.L. 109-13 of May 11, 2005) contains a provision (Section 1019) that prohibits such a winter-take-all competition. The provision does not prohibit the Navy from shifting to a DD(X) acquisition strategy that limits the second shipyard's involvement to building only one ship in the DD(X) program.

On May 25, 2005, the Navy announced that, in light of Section 1019 of P.L. 109-13, it wants to shift to a "dual-lead-ship" acquisition strategy under which two DD(X)s would be procured in FY2007, with one to be designed and built by NGSS and the other by GD/BIW. Each ship would be split-funded (i.e., incrementally funded) in FY2007 and FY2008. The two yards might then compete for the right to build all subsequent DD(X)s, in which case this strategy could be viewed as a deferred winner-take-all approach.

A Defense Acquisition Board (DAB) meeting scheduled for April 29, 2005, to grant the DD(X) approval "Milestone B" approval to proceed was postponed, reportedly because of disagreement between the Navy and CAIG over estimated DD(X) procurement costs.⁴² The meeting was convened on November 10, 2005, but the DAB did not reach a decision at the meeting. The DAB instead requested more information about the program.⁴³

On November 23, 2005, Kenneth Krieg, the USD AT&L, granted Milestone B approval for the DD(X), permitting the program to enter the System Development and Demonstration (SDD) phase. Krieg also approved a low rate initial production quantity of eight ships. (The Navy now wants to build seven.) Press reports state that Krieg approved the Navy's proposed dual-lead-ship acquisition strategy, and the November 23, 2005, memorandum from Krieg about his decision refers to "the two lead ships." Krieg's memorandum states:

On November 10, 2005, I chaired a Defense Acquisition Board (DAB) review of the Navy's request for Milestone B approval for the DD(X) program. Based on that meeting and subsequent discussions held on November 22, 2005, I approve Milestone B for DD(X) and authorize the program's entry into the System Development and Demonstration phase of the acquisition process....

I have also separately approved the DD(X) Acquisition Program Baseline and Acquisition Strategy Report (ASR). While there are differences between the OSD Cost Analysis Improvement Group's cost estimate and the Navy's cost estimate, I understand the differences and direct the Navy to fund the program to its cost estimate. I direct the Navy to submit, for my approval, an implementation plan for management controls to monitor the major cost estimate differences by January 31, 2006.

⁴² Tony Capaccio, "Destroyer May Cost 33% More Than Navy Budgeted, Pentagon Says," *Bloomberg.net*, May 4, 2005; Christopher P. Cavas, "Rising Costs of DD(X) Threaten U.S. Fleet Plans," *DefenseNews.com*, May 2, 2005; Christopher J. Castelli, "Pentagon Postpones DD(X) DAB Meeting To Resolve Cost Estimates," *Inside the Navy*, May 2, 2005.

⁴³ Jason Ma and Christopher J. Castelli, "Defense Acquisition Board Defers Decision On Navy's DD(X) Destroyer," *Inside the Navy*, Nov. 14, 2005.

The Navy will return for a DAB Program Review before the Navy exercises the contract options for construction of the two lead ships. The Navy will provide an updated ASR and an updated cost assessment prior to this review.

CG(X) Cruiser

The CG(X) is the Navy's planned replacement for the CG-47s. The Navy wants the DD(X) hull design to serve as the basis for the CG(X), and wants the CG(X) to make maximum use of technologies already developed for the DD(X). The CG(X), however, would likely differ from the DD(X) in at least three basic ways:

- Compared to the DD(X), the CG(X) would be equipped with a more powerful radar suite that could support missile-defense operations.
- Instead of the two AGSs in the DD(X) design, the CG(X) would be equipped with additional missile-launching tubes.
- In part due to the more powerful radar system, the CG(X) might be slightly larger and have a some somewhat higher procurement cost than the DD(X).

A notional long-range shipbuilding plan that the Navy submitted to Congress in May 2003 called for the first CG(X) to be procured in FY2018. The FY2006-FY2011 FYDP accelerated the planned procurement of the in the lead CG(X) to FY2011. A March 2005 Navy report to Congress showed a planned total of 15 to 18 CG(X)s. The Navy's new 313-ship plan reportedly calls for a total of 19, with planned procurement during FY2011-FY2015 shown in **Table 1** above.

Funding for the CG(X) program as shown in the FY2006-FY2011 FYDP is shown in **Table 2** above. These funding figures will change when the Navy submits the FY2007-FY2011 FYDP in February 2006.

Littoral Combat Ship (LCS)

The Navy's reported 313-ship plan calls for procuring a total of 55 LCSs.⁴⁴ In addition to the first LCS, which was procured in FY2005, the FY2006-FY2011 FYDP calls for procuring the second LCS in FY2006, another two in FY2007, three more in FY2008, and five per year in FY2009-FY2011.

⁴⁴ As mentioned earlier, the Navy's March 2005 report to Congress on potential future Navy force levels shows, for FY2035, 63 LCSs in a 260-ship fleet and 82 LCSs in a 325-ship fleet. In the case of the 260-ship fleet, the 63-ship LCS figure appeared to be a stable total in the years leading up to FY2035, but in the case of the 325-ship fleet, the total number of LCSs continued to increase in the years leading up to FY2035, suggesting that the total number could have grown beyond 82 ships after FY2035. In early 2005, during his final months as the Chief of Naval Operations, Admiral Vernon Clark mentioned the possibility of building a total of 75 to 100 LCSs. (Dave Ahearn, "CNO Clark Sees LCS Fleet Of 75-100 Ships," *Defense Today*, June 3, 2005: 1-3; Scott C. Truver, "Transformation: A Bridge Too Far," *Jane's Navy International*, March 2005: 24-26, 28-31.)

The primary intended missions of the LCS are countering enemy mines, submarines, and fast attack craft in littoral (near-shore) waters. Secondary missions include intelligence, surveillance, and reconnaissance (ISR); maritime intercept; special operations forces (SOF) support; and logistics support for movement of personnel and supplies. Some observers believe the LCS might also be suitable for homeland defense operations.

The LCS would be much smaller and faster than the Navy's current major surface combatants. It would displace 2,500 to 3,000 tons — about the size of a corvette (i.e., a light frigate) or Coast Guard cutter. It would have a maximum speed of about 45 knots, compared to about 30 knots for the Navy's current surface combatants. The LCS would have a shallower draft than the Navy's current surface combatants, permitting it to operate in certain coastal waters and visit certain ports that are not accessible to the Navy's current surface combatants.

Rather than being a multimission ship like the Navy's current surface combatants, the LCS would be a focused-mission ship that would be equipped to perform one or two types of missions at any one time. The LCS would be capable of having its mission orientation changed relatively quickly. Rather than having a built-in combat system like the Navy's current surface combatants, the LCS would use modular “plug-and-fight” payload packages (including unmanned vehicles [UVs]) for various missions that could be loaded on and off the ship relatively quickly.⁴⁵

The LCS would employ automation to achieve a reduced crew size of 15 to 50 “core” crew members, not including the additional crew members that would operate the embarked mission modules.

The Navy testified in 2003 that the LCS program was its “number one budget priority”⁴⁶ and considers the LCS a key component of efforts to transform the Navy.⁴⁷ Prior to announcing the DD(X) family in November 2001, however, the Navy had no plans to acquire a smaller combatant like the LCS and had resisted proposals for such ships.

The LCS in some ways is reminiscent of a concept for a small, fast Navy surface combatant called the Streetfighter. The Streetfighter study effort began in 1998 and was centered at the Naval War College. It was led by Vice Admiral Arthur

⁴⁵ These payload packages could be boxes, canisters, or containers of some kind that could be quickly bolted onto the deck of the LCS or stored in a garage-like space on the ship. The equipment for performing the mission in question would be stored inside the container. Alternatively, the payload packages could simply be pieces of equipment, such as helicopters or unmanned vehicles, that could be directly loaded aboard ship and tied down on the deck or stored inside a garage-like space.

⁴⁶ Statement of Admiral Vern Clark, U.S. Navy Chief of Naval Operations, U.S. Congress, Senate Armed Services Committee, Seapower Subcommittee, *Navy and Marine Corps Development and Procurement*, Apr. 1, 2003, p. 7.

⁴⁷ For more on naval transformation, see CRS Report RS20851, *Naval Transformation: Background and Issues for Congress*, by Ronald O'Rourke.

Cebrowski, who became the President of the college that year. Cebrowski in the late 1990s helped to develop and publicize the concept of network-centric warfare, and emerged as a leading proponent of naval transformation. He retired from the Navy in 2001. From October 2001 — a month prior the replacement of the DD-21 program with the DD(X) family of ships — through January 31, 2005, he served as the civilian director of DOD's Office of Force Transformation.

The Streetfighter study effort was aimed at generating new naval concepts for fighting in heavily defended littoral waters. The Streetfighter concept for a small, fast surface combatant, unveiled publicly in 1999, generated significant debate. Supporters viewed it as innovative, transformational, and responsive to the Navy's needs for affordable, littoral-oriented forces. Critics doubted the feasibility of combining high speed, overseas sustainability, and significant payload in a small ship, as well as the survivability of a small ship in combat. Navy officials allowed the Streetfighter project to proceed, but most Navy leaders at the time appeared to politely resist the idea of a smaller combatant. Although Navy officials have emphasized that the LCS is not the Streetfighter proposal of 1999-2001,⁴⁸ the LCS — in terms of its littoral orientation, smaller size, high speed, and planned reliance on UVs — does appear broadly rooted in some of the thinking that came out of the Streetfighter project.

Given the LCS's anticipated size, cost, and baseline capabilities, Navy and Coast Guard officials at first noted that the LCS hull design, or a derivative of it, could be suitable for procurement by the Coast Guard as the Offshore Patrol Cutter (i.e., the medium-endurance cutter) that forms part of the Coast Guard's Deepwater recapitalization program.⁴⁹ Subsequently, however, Navy and Coast Guard officials deemphasized this possibility,⁵⁰ and the Offshore Patrol Cutter is now to be built to its own hull design. Navy officials have also noted that the LCS might be suitable for export to foreign countries, many of whose navies and coast guards are built around ships the size of the LCS.

On May 27, 2004, the Navy awarded contracts to teams led Lockheed Martin and General Dynamics (GD) for final system design of two versions of the LCS, with options for detailed design and construction of up to two LCSs each.⁵¹ Under the Navy's plan, the Lockheed team would build the first LCS, which was procured in FY2005, while the GD team would build the second, which the Navy wants to

⁴⁸ See, for example, Randy Woods, "Mullen, Balisle Distance Littoral Combat Ship From 'Street Fighter,'" *Inside the Navy*, Dec. 24, 2001.

⁴⁹ For more on the Deepwater program, see CRS Report RS21019, *Coast Guard Deepwater Program: Background and Issues for Congress*, by Ronald O'Rourke.

⁵⁰ Malina Brown, "Navy, Coast Guard Back Away From Idea of Sharing Littoral Hull," *Inside the Navy*, Aug. 18, 2003.

⁵¹ Three industry teams competed for the LCS program. On May 27, 2004, the Navy announced that it had awarded contracts to teams led by Lockheed Martin and General Dynamics (GD) for final system design of the LCS, with options for detailed design and construction of up to two LCSs each. The third competing team, led by Raytheon, was not awarded a contract. The Lockheed team was awarded a seven-month, \$46.5-million contract, while the GD team was awarded a 16-month, \$78.8-million contract.

procure in FY2006. Lockheed plans to build its LCSs at Marinette Marine of Marinette, WI, and Bollinger Shipyards of Louisiana and Texas,⁵² with the first built by Marinette. GD plans to build its LCSs at Austal USA of Mobile, AL.⁵³ These yards are not among the six yards that have built the Navy's major warships in recent years.

The Navy is procuring the first and second LCSs through the Navy's research and development account rather than the Navy's ship-procurement account. The Navy is procuring LCS mission modules through the Other Procurement, Navy (OPN) account rather than the Navy's ship-procurement account. **Table 3** shows funding for the LCS program through FY2011.

The Navy wants LCSs to have a unit procurement cost of no more than \$220 million, exclusive of their mission modules. Figures in **Table 3** for FY2009-FY2011 (when steady-state production of five ships per year is programmed) suggest that when the cost of mission modules is added in, the LCS program might have an average ship procurement cost of about \$377 million, and that a program of 55 LCSs might therefore have a total acquisition (i.e., research and development plus procurement) cost of about \$22.5 billion.

The conference report (H.Rept. 108-622 of July 20, 2004) on the FY2005 defense appropriations bill (H.R. 4613/P.L. 108-287 of August 5, 2004) approved the Navy's plan to build the first two LCSs using research and development funds rather than shipbuilding funds, funded the first LCS's construction cost, required the second LCS to be built to the second LCS design now being developed, prohibited the Navy from requesting funds in FY2006 to build a third LCS, and required all LCSs built after the lead ships of each design to be funded in the Navy's shipbuilding account rather than its research and development account.

⁵² Bollinger operates about 15 shipyards and ship-related facilities in Louisiana and Texas, of which three, located in Lockport, LA, Gretna, LA, and Amelia, LA, are for building new ships.

⁵³ Austal USA was created in 1999 as a joint venture between Austal Limited of Henderson, Western Australia and Bender Shipbuilding & Repair Company of Mobile, AL. The Lockheed LCS team also includes GD/BIW as prime contractor, to provide program management and planning, to provide technical management, and to serve as "LCS system production lead."

Table 3. Funding for LCS Program, FY2002-FY2011
(millions of then-year dollars; totals may not add due to rounding)

	03	04	05	06	07	08	09	10	11	Total thru FY11
Research, Development, Test & Evaluation, Navy (RDT&EN) account										
Ship 1 construction	0	0	212.5	0	0	0	0	0	0	212.5
Ship 2 construction	0	0	0	240.5	0	0	0	0	0	240.5
Procurement of ship long-lead items	0	0	16.0	0	0	0	0	0	0	16.0
Ships 1 and 2 outfitting/post delivery	0	0	0	8.7	36.7	36.7	7.1	0	0	89.2
LCS ship development	35.3	158.3	224.2	117.3	130.8	57.7	37.1	37.9	16.4	815.0
LCS mission package project	0	0	0	209.9	131.6	65.3	57.1	80.6	34.3	578.8
Subtotal RDT&EN	35.3	158.3	452.6	576.5	299.2	159.8	101.3	118.4	50.6	1952.0
Shipbuilding and Conversion, Navy (SCN) account										
Ships 3-22, (qty)	0	0	0	0	542.4 (2)	779.7 (3)	1127.2 (5)	1112.3 (5)	1110.3 (5)	4671.9 (20)
Subtotal SCN	0	0	0	0	542.4	779.7	1127.2	1112.3	1110.3	4671.9
Other Procurement, Navy (OPN) account (for LCS mission modules)										
Subtotal OPN	0	0	0	36.8	108.4	221.5	748.8	738.7	813.7	2667.9
Weapons Procurement, Navy (WPN) account										
Subtotal WPN	0	0	0	0	0	0	48.3	48.4	59.3	156.0
TOTAL	35.3	158.3	452.6	613.3	950.0	1161.0	2025.6	2017.8	2033.9	9447.8

Source: Navy FY2006 budget justification books.

DD(X)/CG(X) Oversight Issues for Congress

The DD(X) and CG(X) programs raise several potential oversight issues for Congress, including the following:

- the accuracy of DD(X) cost estimates;
- program affordability and cost effectiveness;
- potential program implications for the industrial base;

- potential program implications for force structure;
- program mission requirements;
- DD(X) technology readiness;
- DD(X) as a bridge to CG(X); and
- DD(X) technologies for other Navy ships.

Each of these is discussed below.

Accuracy of Navy DD(X) Cost Estimates

Procurement Cost Estimates. At a November 2, 2005 hearing before the House Armed Services Committee, John Young, the Assistant Secretary of the Navy for research, development, and acquisition — the Navy’s acquisition executive — defended the accuracy of the Navy’s 2005 DD(X) procurement cost estimates, but acknowledged that the Navy’s much-lower estimates in 2004 (see discussion in Background section) were “totally ridiculous.”⁵⁴ Skeptics could argue that although the Navy’s 2005 estimates are substantially higher than the 2004 estimates, the Navy is still significantly underestimating DD(X) procurement costs:

- The Navy has stated that a single DDG-51 procured in FY2006 would cost about \$1.8 billion. If so, and if DDG-51 and DD(X) procurement costs are roughly proportional to their light-ship displacements,⁵⁵ then a follow-on DD(X) might cost about \$3.2 billion to procure.
- As mentioned earlier, the Cost Analysis Improvement Group (CAIG) within the Office of the Secretary of Defense (OSD) reportedly believes that DD(X) procurement costs may be 20% to 33% higher than the Navy’s estimates.⁵⁶ A Congressional Budget Office (CBO) official stated that the CAIG’s estimate for the cost of the lead DD(X) might be \$4.1 billion, while its estimate for the fifth DD(X) might be \$3.0 billion.⁵⁷

⁵⁴ Zachary M. Peterson, “Young: Cost Estimate For Next-Generation DD(X) Destroyer Is Realistic,” *Inside the Navy*, Nov. 7, 2005.

⁵⁵ Light-ship displacement is the empty weight of the ship, without any fuel, other fluids, or ammunition. The light-ship displacement of the most recent (Flight IIA) version of the DDG-51 is 6,950 tons, while that of the DD(X) is 12,435 tons, or about 79% more.

⁵⁶ Tony Capaccio, “Destroyer May Cost 33% More Than Navy Budgeted, Pentagon Says,” *Bloomberg.net*, May 4, 2005; Christopher P. Cavas, “Rising Costs of DD(X) Threaten U.S. Fleet Plans,” *DefenseNews.com*, May 2, 2005; Christopher J. Castelli, “Pentagon Postpones DD(X) DAB Meeting To Resolve Cost Estimates,” *Inside the Navy*, May 2, 2005.

⁵⁷ Spoken testimony (transcript of hearing) of J. Michael Gilmore, Assistant Director for National Security, Congressional Budget Office, at a July 20, 2005, hearing on the DD(X) program before the Projection Forces Subcommittee of the House Armed Services Committee. Gilmore said these figures are from an unconfirmed report about the CAIG estimates.

- The Congressional Budget Office (CBO), based on its analysis of DDG-51 procurement costs and other data, estimates that the lead DD(X) may cost as much as \$4.7 billion, and that the fifth DD(X) may cost \$3.4 billion.⁵⁸

Table 4 summarizes the above estimates of DD(X) lead ship and follow-ship unit procurement costs.

Table 4. Estimated DD(X) Unit Procurement Costs
(billions of dollars)

	Navy 2005 estimate	If proportionate to follow-on DDG-51	Reported CAIG estimate	CBO estimate
Lead DD(X)	\$3.3	n/a	\$4.1	\$4.7
Follow-on DD(X)s	\$2.1	\$3.2	\$3.0	\$3.4

Source: U.S. Navy data and July 20, 2005 CBO testimony before Projection Forces Subcommittee of House Armed Services Committee. The figure proportionate to the DDG-51 is based on the light-ship displacements of the DDG-51 and DD(X) and the Navy's estimate that a single DDG-51 procured in FY2006 would cost \$1.8 billion. The CAIG figures shown are from the CBO testimony, which CBO stated are according to an unconfirmed report about the CAIG estimates.

CBO presented its cost estimates at a July 20, 2005, hearing on the DD(X) program before the Projection Forces Subcommittee of the House Armed Services Committee. At this hearing, the CBO witnesses — J. Michael Gilmore and Eric Labs — stated:

Gilmore: I can also point out that as a former member of the CAIG — I used to work in the Office of the Secretary of Defense before I worked for the Congressional Budget Office — I have yet to underestimate any ship or any other major program of which I've been responsible for doing a cost estimate.

The independent cost estimators in the Cost Analysis Improvement Group and elsewhere generally are coming in higher than the service estimate. It's not surprisingly because they're not constrained the way the service cost estimators are, who are all quite competent, but they also always come in lower, generally speaking, than the ultimate costs that are realized.

That's the history of independent cost estimating: higher than the services but usually somewhat ... lower than the ultimate costs of the system.

Labs: I was essentially going to add and make the same point.... We've produced a number of cost estimates for individual ships and ships programs as a whole over the last few years, and if we look at sort of how our track record has done over the last — looking at it today, we have been low in every case if you look at what current estimates are right now.

⁵⁸ Ibid.

We have always been higher than the services when those reports were published, but reality catches up with the services first, and then it catches up with our estimates, and we end up being a little bit low, too.⁵⁹

At this same hearing, the GAO witness testified:

The consequences of not meeting the challenges facing the DD(X) program are significant. If the program fails to demonstrate capabilities, develop software, or integrate subsystems as planned, these activities will be pushed into the later stages of design and construction. In these stages, the cost of work and delays is much higher and the schedule much less forgiving than in earlier stages.⁶⁰

A February 2005 GAO report on cost growth in recent Navy shipbuilding programs examined costs for eight recently procured Navy ships — two DDG-51s, two LPD-17 class amphibious ships, two Nimitz-class aircraft carriers, and two Virginia-class submarines. The group included both lead ships and follow-on ships. The report found that the total cost for these ships had increased from initial estimates by about 11% as of early 2005, and that costs could eventually grow further, to about 15% to 17% above initial estimates.⁶¹ The report stated:

Navy practices for estimating costs, contracting, and budgeting for ships have resulted in unrealistic funding of programs, increasing the likelihood of cost growth. Despite inherent uncertainties in the ship acquisition process, the Navy does not account for the probability of cost growth when estimating costs. Moreover, the Navy did not conduct an independent cost estimate for carriers or when substantial changes occurred in a ship class, which could have provided decision makers with additional knowledge about a program's potential costs. In addition, contract prices were negotiated and budgets established without sufficient design knowledge and construction knowledge. When unexpected events did occur, the incomplete and untimely reporting on program progress delayed the identification of problems and the Navy's ability to correct them.⁶²

Operating and Support (O&S) Cost Estimate. CBO has questioned the accuracy of the Navy's estimate regarding the annual operating and support (O&S) cost of a DD(X) compared to a DDG-51. The Navy estimates that over a 35-year life cycle, a DD(X) would cost an average of about \$12 million or \$13 million less per year to operate and support than a DDG-51. CBO estimates that the reduction in O&S costs for a DD(X) relative to a DDG-51 might range from zero to \$10 million per year.⁶³

⁵⁹ Transcript of hearing.

⁶⁰ Government Accountability Office, *Defense Acquisitions[:] Progress and Challenges Facing the DD(X) Surface Combatant Program*, GAO-05-924T. The panel of witnesses that included GAO had its testimony deferred from July 19 to July 20.

⁶¹ Government Accountability Office, *Defense Acquisitions[:] Improved Management Practices Could Help Minimize Cost Growth in Navy Shipbuilding Programs*, GAO-05-183, Tables 3 and 4 on pp. 8 and 9, respectively.

⁶² *Ibid*, p. i.

⁶³ Statement of J. Michael Gilmore, Assistant Director for National Security, Congressional (continued...)

Potential Oversight Questions. Potential oversight questions for Congress include the following:

- Are DD(X) lead-ship and follow-ship procurement costs likely to be closer to the Navy estimates or the CAIG and CBO estimates? Given the cost growth in Navy shipbuilding programs in recent years, how much confidence should be placed in the Navy's estimates?
- Is the difference in annual DD(X) and DDG-51 O&S cost likely to be closer to the Navy's estimate or CBO's estimate?

Program Affordability and Cost Effectiveness

Procurement Cost and Procurement Rate. DOD's decision in the FY2006-FY2011 FYDP to reduce planned DD(X) procurement to one per year during the period FY2007-FY2011 appears to have been driven in large part by the increase in the Navy's estimates for DD(X) procurement costs. If DD(X) procurement costs turn out to be closer to the CAIG or CBO estimates shown in **Table 4** above, then this could make it difficult for the Navy to procure DD(X)s and CG(X)s at planned rates while still adequately funding other Navy needs, including other Navy shipbuilding programs (such as submarines), Navy aircraft and weapon procurement programs, Navy readiness programs, and Navy personnel pay and benefits.

DOD/Navy Views On Maximum Affordable DD(X) Cost. At the end of a July 19, 2005, hearing on the DD(X) program before the Projection Forces Subcommittee of the House Armed Services Committee, DOD and Navy witnesses were asked to provide the subcommittee with their own individual views on the procurement cost figures at which the lead DD(X) and a follow-on DD(X) (defined as the fifth ship) would become unaffordable. At the beginning of part two of the hearing, which was held on July 20, the chairman of the subcommittee, Representative Roscoe Bartlett, stated that the figures provided by the witnesses ranged from \$4 billion to \$4.5 billion for the lead ship and \$2.5 billion to \$2.9 billion for the fifth ship. As shown in **Table 5**, the CAIG and CBO estimates discussed earlier are at or above these figures.

⁶³ (...continued)

Budget Office, [on] *The Navy's DD(X) Destroyer Program*, in U.S. Congress, House Committee on Armed Services, Subcommittee on Projection Forces, July 19, 2005, p. 5.

Table 5. DOD/Navy Views On Maximum Affordable DD(X) Cost
(billions of dollars)

	Navy 2005 estimate	DOD/Navy views on affordability	If proportionate to follow-on DDG-51	Reported CAIG estimate	CBO estimate
Lead DD(X)	\$3.3	\$4.0-\$4.5	n/a	\$4.1	\$4.7
Follow-on DD(X)s	\$2.1	\$2.5-\$2.9	\$3.2	\$3.0	\$3.4

Source: U.S. Navy data and transcript of July 20, 2005, hearing before Projection Forces Subcommittee of House Armed Services Committee. See also the source note for the previous table.

Operating And Support (O&S) Cost And Affordability. The Navy argues that the DD(X) is more affordable than it appears from looking only at procurement costs, because the ship will have lower O&S costs than existing Navy cruisers and destroyers. As mentioned above, the Navy estimates that over a 35-year life cycle, a DD(X) would cost an average of about \$12 million or \$13 million less per year to operate and support than a DDG-51. Over a 35-year life, this equates to a savings of \$420 million to \$455 million in O&S costs relative to a DDG-51. On this basis, the Navy argues that a force of 10 DDG-51s would have a total 35-year O&S cost \$4.2 billion to \$4.5 billion less than that of force of 10 DDG-51s.

Skeptics could respond by arguing the following:

- Reducing a ship's future O&S costs, though desirable, does not make that ship any more affordable to procure in the budget that funds its procurement.
- The Navy's estimated 35-year O&S savings of \$420 million to \$450 million only partially offsets difference between the DD(X)'s higher procurement cost and the procurement cost of a DDG-51 when DDG-51s are procured at a rate of two per year.
- Executive branch guidelines set forth in Office of Management and Budget (OMB) Circular A-94⁶⁴ and standard business practice call for future funding flows to be calculated on a present-value basis so as to capture the investment value of money over time. When calculated on this basis, the single-ship 35-year savings figure is reduced by about 46%, to \$226 million to \$242 million, and the 10-ship 35-year savings figure of \$4.5 billion (assuming procurement

⁶⁴ U.S. Office of Management and Budget, *Circular A-94, Guidelines And Discount Rates For Benefit-Cost Analysis of Federal Programs*, available at [<http://www.whitehouse.gov/omb/circulars/a094/a094.pdf>].

of one ship per year) is reduced by about 53%, to about \$2.1 billion.⁶⁵

- The above calculations accept the Navy’s estimate that a DD(X) would, on a 35-year basis, have an annual O&S cost \$12 million to \$13 million less than that of a DDG-51. As mentioned above, CBO has questioned the accuracy of the Navy’s estimate of relative DD(X) and DDG-51 O&S costs, and has estimated that the difference might range from zero to \$10 million per year.

Table 6 below compares follow-ship DDG-51 and DD(X) total procurement and life-cycle O&S costs using figures from the discussion above. The table uses constant FY2007 dollars, which results in some adjustments to the above figures. As can be seen in the table, on a present-value basis, the combined procurement and 35-year life-cycle O&S cost of the follow-on DD(X) is 16% greater than that of the DDG-51 using the Navy’s estimates, or 91% to 101% greater using CBO’s estimates.

Table 6. Follow-ship DDG-51 and DD(X) Costs
(millions of constant FY2007 dollars)

	Constant FY2007 dollars			Present-value calculation		
	Procurement cost	35-year lifecycle O&S cost	Total	Procurement cost	35-year lifecycle O&S cost	Total
NAVY Estimate						
Follow-on DDG-51	1,393	2,115	3,508	1,393	1,133	2,526
Follow-on DD(X)	2,058	1,627	3,685	2,058	871	2,929
DD(X) less DDG	665	(488)	177	665	(262)	403
DD(X) as % DDG-51	148%	77%	105%	148%	77%	116%
CBO Estimate (with \$10-million annual DD(X) O&S cost savings vs. DDG-51)						
Follow-on DDG-51	1,393	1,120	2,513	1,393	600	1,993
Follow-on DD(X)	3,400	770	4,170	3,400	412	3,812
DD(X) less DDG	2,007	(350)	1,657	2,007	(188)	1,819
DD(X) as % DDG-51	244%	69%	166%	244%	69%	191%
CBO Estimate (with zero annual DD(X) O&S cost savings vs. DDG-51)						
Follow-on DDG-51	1,393	1,120	2,513	1,393	600	1,993
Follow-on DD(X)	3,400	1,120	4,520	3,400	600	4,000
DD(X) less DDG	2,007	0	2,007	2,007	0	2,007
DD(X) as % DDG-51	244%	100%	180%	244%	100%	201%

Source: CRS calculations based on Navy and CBO DD(X) and DDG-51 cost data and a 3.1% real discount rate, as specified in Appendix C to OMB Circular A-94 for discounting constant-dollar flows of 30 years or more. DDG-51 procurement cost is an average unit cost based on a two-per-year procurement. (For a three-per-year procurement rate, the average unit procurement cost would be \$1,251 million.)

⁶⁵ CRS calculations using the 3.1% real discount rate set forth in **Appendix C** (Revised Jan. 2005) for discounting constant-dollar flows of 30 years or more.

Role of Affordability In Earlier Aegis Ship Programs. In considering the prospective affordability of the DD(X)/CG(X) program, a comparison with the Navy's two previous destroyer and cruiser acquisition programs — the Aegis cruiser and DDG-51 programs — may be of value.

Ticonderoga (CG-47) Class Aegis Cruiser Program. In the mid-1970s, when the Navy was selecting the design for its planned Aegis cruiser, the Navy examined three principal alternatives:

- a 17,200-ton nuclear-powered strike cruiser (CSGN);
- a 12,100-ton nuclear-powered cruiser, called CGN-42, derived from the Navy's Virginia (CGN-38) class nuclear-powered cruiser design; and
- a roughly 9,000-ton ship based on the Spruance (DD-963) class destroyer hull design.

The CSGN and CGN-42 were very capable designs. Compared to either, the 9,000-ton design was less capable because it was conventionally powered and would have a smaller total payload. But the 9,000-ton option was substantially less expensive to procure than the other two designs: the estimated procurement cost of the CSGN was roughly twice that of the 9,000-ton option, while the estimated unit procurement cost of the CGN-42 was roughly 30% to 50% greater. In large part because of its lower unit procurement cost, the 9,000-ton design was selected.⁶⁶ This design became the Ticonderoga (CG-47) class Aegis cruiser. The Navy was able to afford to procure 3 of these ships per year, for a total of 27. The CG-47 design received some criticisms, particularly in the earlier years of the program, but the ships are considered quite capable and the program today is generally viewed as a successful acquisition effort.

Arleigh Burke (DDG-51) Class Aegis Destroyer Program. In late 1982 and early 1983, following the selection of a design for the Aegis cruiser, the Navy bounded the problem of what the follow-on Aegis destroyer should look like by:

- projecting the future size of the shipbuilding budget,
- applying to that projection the surface combatant community's historical share of shipbuilding funds (about one-third, exclusive of funding for aircraft carriers), and then
- dividing the resulting projected annual amount of surface combatant procurement funding by the number of Aegis destroyers the Navy wanted to be able to procure each year (five).

The result was an implied unit procurement cost of \$650 million in FY1983 dollars. The Secretary of the Navy (John Lehman) adjusted this figure to \$700

⁶⁶ For a discussion, see Ronald O'Rourke, "US Cruisers[:] Aegis Enters the Fleet," *Navy International*, June 1985: 338-345, particularly 341; Norman Friedman, *U.S. Cruisers, An Illustrated Design History*, Annapolis, U.S. Naval Institute, 1984, pp. 419-422, 488, and Norman Friedman, *U.S. Destroyers, An Illustrated Design History*, Annapolis, U.S. Naval Institute, 1982, pp. 343-347, 426-427.

million in FY1983 dollars, and this became the target unit procurement cost for the follow-on ships in the DDG-51 program.⁶⁷

Remaining within that target required some design tradeoffs, but the target was met, and the Navy in the final years of the Cold War was able to procure 5 DDG-51s per year, as planned. When the Cold War ended and the defense budget was reduced, the Navy was still able to procure 3 DDG-51s per year, for a total of 62 ships through FY2005. The DDG-51 design, like the CG-47 design, has received some criticisms, but DDG-51s, like Aegis cruisers, are considered quite capable and the program is generally viewed as a highly successful acquisition effort.

DD(X) Program. The development of the DD(X) design appears to have unfolded differently from that of the Aegis cruiser and DDG-51. When development of the DD-21 (the precursor to the DD[X]) began in 1994, the initial unit procurement cost target was \$750 million in FY1996 dollars, a target cost that was somewhat lower than the DDG-51's unit procurement cost at the time, and which equates to about \$1,057 million in FY2007 dollars. By 2001, however, the DD-21 design had grown to between 16,000 tons and 18,000 tons, and its estimated cost had grown considerably.

The DD-21 program was restructured in November 2001 into the current DD(X) program, and the Navy subsequently took steps to reduce the size of the ship to about 14,000 tons. But the DD(X), going back to its DD-21 origins, in the main has grown from a less expensive initial concept to a considerably larger and more expensive one. The current DD(X) design is intermediate in displacement between the CSGN and CGN-42 designs that were rejected in the late 1970s due to their estimated unit procurement costs, and the DD(X)'s estimated unit procurement cost is now more than twice the initial DD-21 target procurement cost of \$1,057 million in FY2007 dollars. In addition, the Navy in November 2001 initiated the Littoral Combat Ship (LCS) program. Procuring 5 LCSs per year starting in FY2009, as the Navy currently plans, would absorb more than \$1 billion per year in shipbuilding funds — an expenditure that was not contemplated when the DD-21 program was initiated.

Cost Effectiveness. The Navy argues that the DD(X) would be cost effective because the increased costs of the DD(X) would be more than offset by the DD(X)'s improved capabilities. Compared to the DDG-51, these capability improvements include, among other things:

- a three-fold improvement in capability against anti-ship cruise missiles, including significantly better radar performance in situations involving near-land radar clutter;

⁶⁷ See Jan Paul Hope and Vernon E. Stortz, "Warships and Cost Constraints," *Naval Engineers Journal*, Mar. 1986, pp. 41-52, particularly 43, and CRS Report 84-205 F, *The Navy's Proposed Arleigh Burke (DDG-51) Class Guided Missile Destroyer Program: A Comparison With An Equal-Cost Force of Ticonderoga (CG-47) Class Guided Missile Cruisers*, by Ronald O'Rourke, p. 30, including footnote 23. (Nov. 1984; out of print, available from author at 77610.)

- a 10-fold improvement in overall battle force defense capability, in part because of a 5-fold improvement in networking bandwidth capacity;
- 15% more capability to defend against group attacks by enemy surface craft (i.e., “swarm boats”);
- a 50-fold improvement (i.e., reduction) in radar cross-section, which dramatically enhances survivability and reduces by half the total number of missiles that need to be fired in an intercept engagement;
- a 10-fold increase in operating area against mines in shallow-water regions;
- 3 times as much naval surface fire support capability, including an ability to answer 90% of Marine Corps calls for fire within 5 minutes, permitting the ship to meet stated Marine Corps firepower requirements — a capability otherwise unavailable in the surface fleet — giving the ship a capability roughly equivalent to one-half of an artillery battalion, and permitting a 65% reduction in Marine Corps artillery;
- a ship design that allows underway replenishment of gun shells, creating the equivalent of an almost-infinite ammunition magazine and permitting nearly continuous fire support;
- about 10 times as much electrical capacity available for ship equipment, giving the ship an ability to support future electromagnetic rail guns and high-energy laser weapons; and
- features such as an automated fire-suppression system, peripheral vertical launch system, and integrated fight-through-damage power system that significantly increase ship survivability.⁶⁸

Skeptics can acknowledge these capability improvements but question whether they are worth the ship’s procurement cost or combined procurement and life-cycle O&S cost, particularly if these costs are closer to the CAIG or CBO estimates than to the Navy’s estimates. They could argue that if the Navy procures its planned total of 26 DD(X)s and CG(X)s, each ship would effectively amortize about \$385 million of the DD(X)/CG(X) program’s total estimated research and development cost of \$10 billion, making each ship’s average acquisition (i.e., development plus procurement) cost \$385 million higher than the figures shown in **Table 5**. If fewer than 26 DD(X)s

⁶⁸ Points taken from Statement of Admiral Vern Clark, U.S. Navy, Chief of Naval Operations, Before The House Armed Services Committee Projection Forces Subcommittee, July 19th, 2005, and Statement of The Honorable John J. Young, Jr., Assistant Secretary of the Navy (Research, Development and Acquisition), and RADM Charles S. Hamilton, II, Program Executive Officer For Ships, Before the Projection Forces Subcommittee of the House Armed Services Committee on DD(X) Shipbuilding Program, July 19, 2005.

and CG(X)s are procured, perhaps because their procurement costs turn out to be closer to the CAIG or CBO estimates than to the Navy's estimates, each ship would bear a larger portion of the \$10 billion research and development cost, increasing average ship acquisition cost by something more than \$385 million. Skeptics could also argue that DD(X) funding, if applied to other DOD programs, might yield larger or more critical improvements in military capability.

Potential Oversight Questions. Potential oversight questions for Congress include the following:

- At what procurement cost, or acquisition (i.e., development-plus-procurement) cost, or combined procurement and life-cycle operating cost would the DD(X) program become unaffordable or no longer cost effective? Is the cost of the DD(X) likely to be below, about equal to, or above this cost?
- What other Navy or DOD capabilities would not be funded as a consequence of funding the DD(X) program? If DD(X) costs turn out to be closer to the CAIG and CBO estimates than to the Navy's estimates, what additional reductions in other Navy or DOD programs would be needed, and what would be the effect of these reductions on U.S. military capabilities?

Potential Program Implications for Industrial Base

The reduction in planned DD(X) procurement in the FY2006-FY2011 FYDP to one per year in FY2007-FY2011 is an indication that, unless budget conditions change, DD(X)/CG(X) procurement might never rise above one per year. Such a rate could have implications for the surface combatant construction industrial base.

Sufficiency of Workload For Two Yards. If DD(X)/CG(X) procurement is limited to one ship per year and the program is divided between the two yards that currently build the Navy's larger surface combatants — the Ingalls shipyard of Pascagoula, MS, which forms part of Northrop Grumman Ship Systems (NGSS), and General Dynamics' Bath Iron Works of Bath, ME (GD/BIW) — then the DD(X) program would result in relatively low levels of surface combatant construction work at the two yards.

The light-ship displacement of the DD(X) (about 12,435 tons) is about 79% greater than that of the DDG-51 (about 6,950 tons). If shipyard construction work for these two ship classes is roughly proportional to their light-ship displacements, then procuring one DD(X) per year would provide an amount of shipyard work equivalent to procuring about 1.8 DDG-51s per year. Splitting a one-per-year DD(X) procurement rate evenly between the two yards might thus provide each yard with the work equivalent of about 0.9 DDG-51s per year.

Supporters of Ingalls and GD/BIW argued in the 1990s that a total of three DDG-51s per year (i.e., an average of 1.5 ships per year for each yard), in conjunction with other work being performed at the two yards (particularly Ingalls),

was the minimum rate needed to maintain the financial health of the two yards.⁶⁹ Navy officials in recent years have questioned whether this figure is still valid. Building the equivalent of about 1.8 DDG-51s per year equates to about 60% of this rate. If the minimum rate of 3 DDG-51 equivalents per year is valid today, then a one-per-year procurement rate for the DD(X)/CG(X) program could raise questions about the potential future financial health of the two yards.

As a means of reducing DD(X) procurement costs, the Navy in February 2005 proposed holding a winner-take-all competition to select a single yard that would build all DD(X)s. The Navy stated that procuring a group of 10 DD(X)s in a single yard would cost \$3 billion less, or an average of \$300 million per ship less, than dividing those 10 ships between two yards. Congress legislatively rejected the Navy's proposed acquisition strategy. The Navy responded in May 2005 by proposing an alternate strategy that would assign one DD(X) to each yard and then hold a competition for the right to build all subsequent DD(X)s — an approach that might be thought of as a deferred winner-take-all strategy.

If this strategy were adopted, the yard that loses the competition to build the subsequent DD(X)s could face a difficult business situation, particularly if that yard is GD/BIW. GD/BIW is involved as a shipbuilder in no shipbuilding programs other than the DDG-51 and DD(X).⁷⁰ Consequently, if GD/BIW does not build DD(X)s and does not receive other new ship-construction work, then GD/BIW could experience a significant reduction in workloads, revenues, and employment levels by the end of the decade. Theoretical scenarios for the yard under such circumstances could include closure and liquidation of the yard, the “mothballing” of the yard or some portion of it, or reorienting the yard into one that focuses on other kinds of work, such as building commercial ships, overhauling and modernizing Navy or commercial ships, or fabricating components of Navy or commercial ships that are being built by other yards. Reorienting the yard into one that focuses on other kinds of work, if feasible, could arguably result in workloads, revenues, and employment levels that were significantly reduced from current levels.

If Ingalls were to lose such a competition and other work being done at Ingalls (particularly construction of amphibious ships) does not increase, then Ingalls could similarly experience a reduction in workloads, revenues, and employment levels. The continuation of amphibious-ship construction at Ingalls could make the scenarios of closure and liquidation or mothballing less likely for Ingalls than for GD/BIW, but workloads, revenues, and employment levels could still be reduced from current levels, and the cost of amphibious-ship construction and other work done at Ingalls could increase due to reduced spreading of shipyard fixed overhead costs.

Maintaining One Yard Or Two: Factors To Consider. In light of the Navy's apparent interest in producing most DD(X)s in a single yard, and the

⁶⁹ See, for example, CRS Report 94-343, *Navy DDG-51 Destroyer Procurement Rate: Issues and Options for Congress*, by Ronald O'Rourke, April 1994, pp. 59-62 (out of print, available from author).

⁷⁰ GD/BIW is also the prime contractor for the GD version of the Littoral Combat Ship (LCS), but the GD version is to be built by the Austal USA shipyard, of Mobile, AL.

implications this might have for maintaining two active surface combatant construction shipyards, the DD(X) program raises a potential question about the merits of maintaining two active surface combatant construction yards vs. maintaining one. As discussed in detail in another CRS report,⁷¹ factors to consider in assessing this issue include the following:

- yard production capacities,
- potential future ship procurement rates for the Navy's planned fleet of 313 ships;
- the chance that ship procurement might need to be surged to higher rates to respond to a change in Navy requirements;
- the feasibility of, and potential time and cost that would be required to, reopen a closed surface combatant construction yard, create a new surface combatant construction yard, or start building surface combatants at an active yard that builds other kinds of ships;
- shipyard fixed overhead costs;
- costs associated with split learning curves,
- the cost of government supervision of shipyards,
- competition in ship design,
- competition in, or benchmarking of, ship construction,
- regional labor markets,
- potential work for the yards other than Navy shipbuilding,
- the geographic base of support for Navy shipbuilding, and
- the distribution of the economic benefits of Navy shipbuilding.

Potential Oversight Questions. Potential oversight questions for Congress include the following:

- If DD(X)/CG(X) procurement does not rise above one per year, what are the chances that the number of active surface combatant construction yards would be reduced from two to one? Is support for the DD(X)/CG(X) program consistent with the goal of maintaining two active surface combatant construction yards?
- What are the merits of maintaining one vs. two active surface combatant construction yards?
- Do some parties support the DD(X)/CG(X) program in part due to an expectation or hope that the program would result in the number of active surface combatant construction yards being reduced from two to one?

⁷¹ CRS Report RL32665, *Potential Navy Force Structure and Shipbuilding Plans: Background and Issues for Congress*, by Ronald O'Rourke.

Potential Program Implications for Force Structure

Potential Force Levels. If affordability considerations limit combined DD(X)/CG(X) procurement to one ship per year, this could eventually have significant implications for the size of the Navy's force of larger surface combatants. As discussed in the Background section, the Navy's reported 313-ship plan includes a requirement for a total of 88 larger surface combatants — 19 cruisers (either CG-47s or CG(X)s), 7 DD(X)s, and 62 DDG-51s. Assuming a 35-year average life for larger surface combatants, maintaining a force of 88 larger surface combatants over the long run would require a long-run (i.e., 35-year) average procurement rate of about 2.5 ships per year.

As shown in **Table 7**, if DD(X)/CG(X) procurement is limited to one per year and a total of 26 DD(X)s and CG(X)s are procured, then by the time that force of 26 DD(X)s and CG(X)s was fielded (in 2037), the Navy's force of larger surface combatants could be reduced well below 88 ships, even if DDG-51s are kept in service for 40 years rather than for their originally planned service life of 35 years. (FFG-7s and CG-47s are included in **Table 7** for purposes of completeness, but even assuming a 40-year life for both classes, no FFG-7s or CG-47s would remain in service in 2037.)

Table 7. Potential Number of Larger Surface Combatants
(If 26 a total of DD(X) and CG(X)s are procured at one per year)

Number remaining in service in 2037			Resulting total number of larger surface combatants in 2037, including 26 DD(X)s/CG(X)s
FFG-7s*	DDG-51s (depending on service life assumed)	CG-47s*	
0	9 (assuming 30-year life)	0	35
0	25 (assuming 35-year life)	0	51
0	41 (assuming 40-year life)	0	67

Source: CRS calculation based on U.S. Navy data for commissioning dates of older ships. Calculation assumes that a total of 26 DD(X)s and CG(X)s are procured at one per year starting in FY2007, and that each ship enters service five years after the fiscal year in which it is procured.

* FFG-7s and CG-47s are included for purposes of completeness, but even assuming a 40-year life for both classes of ships, no FFG-7s or CG-47s would remain in service in 2037.

In a one-per-year procurement situation, if CG(X) procurement begins as planned in FY2011 and the Navy decides to continue procuring CG(X)s in subsequent years until the desired number of CG(X)s was reached, the Navy's DD(X) force, for a period of perhaps 19 years, would remain at 4 ships (the ships procured in FY2007-FY2010).

Alternatively, the Navy could decide, following procurement of the first CG(X) in FY2011, to alternate procurement of DD(X)s and CG(X)s. This would permit the number of DD(X)s to continue growing, but would delay the point at which the Navy reached its desired number of CG(X)s. Such a delay could be viewed as inconsistent with the Navy's apparent desire, implicit in its decision to accelerate procurement of the first CG(X) from FY2018 to FY2011, to introduce CG(X)s into the fleet sooner

rather than later. It could also reduce learning-curve efficiencies for producing parts of the DD(X) and CG(X) that are unique to each class of ship.

Potential Oversight Questions. Potential oversight questions for Congress include the following, which relate to the possibility that, due to affordability considerations, DD(X)/CG(X) procurement is limited to one ship per year:

- If certain DD(X) or CG(X) technologies are critical to future Navy operations, would it be adequate to introduce these new technologies into the fleet at a rate of one ship per year?
- What would be the operational implications if the Navy's force of larger surface combatants in 2037 or 2041 included 35, 51, or 67 ships, rather than 88 ships, as called for in the Navy's 313-ship plan?
- Following the procurement of 26 DD(X)s and CG(X)s, could the Navy afford to begin procuring the next larger surface combatant design at the annual rates that would be needed to increase the force of larger surface combatants from 35, 51, or 67 ships to 88 ships? Would a 26-ship DD(X)/CG(X) program procured at one per year, in other words, create an unaffordable downstream requirement for procuring larger surface combatants at a much higher annual rates?
- What would be the operational implications, particularly for meeting Marine Corps requirements for naval surface fire support, if the Navy switched to CG(X) procurement in FY2011 and continued procuring CG(X)s until a total of 19 had been procured, leaving the Navy with a force of 4 DD(X)s, rather than 7, for a period of 19 years?
- Conversely, what would be the operational implications, particularly for introducing CG(X)s into the fleet in sufficient quantities in a timely manner, if the Navy alternated procurement of CG(X)s and DD(X)s after FY2011?

Program Mission Requirements

DD(X) Compared To Other Destroyers and Cruisers. Although the DD(X) is classified as a destroyer (DD) rather than a guided missile destroyer (DDG), guided missile cruiser (CG), gun cruiser (CA), or guided missile gun cruiser (CAG), the DD(X) design, among other things:

- is, at about 14,500 tons full load displacement, about 50% larger than the Aegis cruiser and DDG-51 designs;
- is larger than any cruiser or destroyer that the Navy has procured since the nuclear-powered cruiser Long Beach (CGN-9), which was procured in FY1957;

- has an area-defense anti-air warfare (AAW) capability that in some respects is greater than that of the DDG-51;⁷²
- has command facilities for a flag-level officer and his command staff — a feature that previously has been installed on cruisers but not destroyers;
- has a vertical launch system (VLS) whose weapon storage volume and weapon weight capacity are between that of the DDG-51 and Aegis cruiser designs;⁷³ and
- has more gunfire capability than any cruiser the Navy has built since World War II.

In light of these features, the DD(X) might be closer to a guided missile gun cruiser (CAG) than a traditional destroyer (DD).

Relationship Of Capabilities To Ship Size and Cost. The DD(X)'s size and procurement cost do not appear to have been driven by any one technology or payload element, but rather by the ship's total collection of payload elements. These payload elements include, in addition to its above-mentioned AAW system, flag-level command facilities, VLS battery, and gunfire capabilities, the following:

- sonars and other antisubmarine warfare (ASW) systems that are roughly equivalent to that of the DDG-51;⁷⁴
- a large helicopter flight deck and a hangar and maintenance facilities for two helicopters or one helicopter and three UAVs;

⁷² The Navy states that radars on the DD(X) and DDG-51 are roughly equivalent in terms of dB gain (sensitivity) and target resolution, that the firm track range of the DD(X)'s dual-band radar — the range at which it can maintain firm tracks on targets — is 25% greater for most target types than the firm track range of the DDG-51's SPY-1 radar, that the DD(X)'s radar has much more capability for resisting enemy electronic countermeasures and for detecting targets amidst littoral clutter, that the DD(X)'s AAW combat system would be able to maintain 10 times as many tracks as the DDG-51's Aegis system, and that the two ships can support roughly equal numbers of simultaneous AAW engagements. Given the features of the DD(X)'s AAW system, plus its much-greater C4I/networking bandwidth, the Navy has stated that replacing a DDG-51 with a DD(X) in a carrier strike group would increase the strike group's AAW capability by about 20%.

⁷³ Although the DD(X) has 80 VLS cells, compared to 96 on the DDG-51 and 122 on the Aegis cruiser, the DD(X)'s VLS cells are larger. The Mk 41 VLS cells on DDG-51s and Aegis cruisers can fire a missile up to 21 inches in diameter, 21 feet in length, and about 3,000 pounds in weight. The Advanced VLS (AVLS) cells on the DD(X) can fire a missile up to 24 inches in diameter, 22 feet in length, and about 4,000 pounds in weight.

⁷⁴ The Navy states that due to differences in their sonar designs, the DD(X) would have more littoral-water ASW capability, while the DDG-51 would have more blue-water ASW capability.

- additional berthing, equipment-stowage space, and mission-planning space for a platoon of 20 special operations forces (SOF) personnel; and
- facilities for embarking and operating two 11-meter boats and four rubber raiding craft (as opposed to two 7-meter boats on the DDG-51).

DD(X) Operational Requirements. The payload elements of the DD(X) design reflect an Operational Requirements Document (ORD) for the DD(X) that was approved by the Joint Staff of DOD in February 2004. Key performance parameters included in this document include having two AGSs that can each fire 10 rounds per minute, for a total of 20 rounds per minute.⁷⁵ DOD states that

During the restructuring of the DD-21 program into the DD(X) program, the Navy re-evaluated each DD-21 Key Performance Parameter (KPP) to determine the potential for minimizing the size of the ship and ultimately the cost. The Navy made many adjustments and the resulting DD(X) KPPs represent the Navy's minimum requirements. No other known alternative meets all of the DD(X) KPPs and provide the sustained, precision, long-range naval surface fire support that the United States Marine Corps requires.⁷⁶

Although the DD(X) design reflects the February 2004 ORD, skeptics might question whether the DD(X) design fully takes into account other current or planned Navy capabilities. Skeptics can argue that, notwithstanding the February 2004 DD(X) ORD, GAO reported in November 2004 that there is currently no consensus between the Navy and Marine Corps regarding naval surface fire support requirements. The GAO report concluded that

The Navy and Marine Corps have only recently begun the process to establish validated NSFS requirements that address the overall capabilities needed and the balance between different systems that will be required to provide effective, continuous, and sustaining support fire for forces operating ashore.⁷⁷

Skeptics might argue that with estimated DD(X) costs now much higher than they were in February 2004, and the effect that increased cost appears to have had in reducing planned DD(X) procurement, the February 2004 ORD might not reflect a sufficiently up-to-date consideration of how increasing DD(X) capability (and therefore cost) might reduce DD(X) numbers and therefore reduce the collective capability of the total DD(X) force. In light of the reduction in planned DD(X) procurement, skeptics could argue, certain capabilities that might have been viewed as desirable in February 2004 might now be viewed as less desirable because of their

⁷⁵ Statement by The Honorable Kenneth J. Krieg, Under Secretary of Defense (Acquisition, Technology and Logistics), Before the Subcommittee on Projection Forces, House Armed Services Committee, United States House of Representatives, July, 19, 2005, p. 2.

⁷⁶ Ibid, pp. 6-7.

⁷⁷ Government Accountability Office, *Information on Options for Naval Surface Fire Support*, GAO-05-39R, Nov. 2004, p. 2.

role in increasing DD(X) unit cost and thereby reducing planned DD(X) procurement.

Ship Characteristics Improvement Board (SCIB). A trade press article suggests that growth in DD-21/DD(X) requirements (and cost) over time may have been related to the waning influence or disestablishment of a Navy ship-design board called the Ship Characteristics Improvement Board (SCIB) — an entity that the new Chief of Naval Operations, Admiral Michael Mullen, who became CNO on July 22, 2005, has expressed an interest in reestablishing:

Adm. Michael Mullen, the chief of naval operations, has directed the Navy to re-establish a high-level panel to closely monitor and control the requirements and configurations of new ships in a bid to rein in the skyrocketing cost of new vessel procurement.

Adm. Robert Willard, vice chief of naval operations, is leading the effort as part of a larger undertaking to draw up alternative options for the Navy's current shipbuilding program....

In essence, sources said, Mullen is looking to reconstitute the Ship Characteristics Improvement Board, which eventually became inactive in 2002. For more than 100 years, the Navy has maintained a high-level group of officials to advise service leaders on ship design and configuration. This group, established in 1900 as the General Board has gone through many name changes, including the Ship Characteristics and Improvement Board in the early 1980s and, until 2002, the Ship Characteristics and Improvement Panel.

Navy officials say that the panel's oversight began to wane in the late 1990s, just as the DD-21 program — originally envisioned as a \$750 million replacement for Spruance-class destroyers — took off, before becoming officially inactive in 2002. Requirements during this time were added to the new destroyer program, some of which raised eyebrows in the Navy, such as the need for a flag officer quarters. No other ship in that class has accommodations for an admiral. Still, the DD(X) has come to be regarded as a technology carrier for future surface ships and the price tag has ballooned to \$3 billion a copy.

Mullen's goal, spelled out in a July 25 memo to Willard and provided to *InsideDefense.com*, is to put in place a "process that adequately defines warship requirements and manages changes to those requirements (e.g. Ship Characteristics Improvement Board) in a disciplined manner, with cost and configuration control as the paramount considerations."...

A recent RAND study conducted at the request of Mullen's predecessor, retired Adm. Vern Clark, concluded that a key cause for climbing ship costs is the number of requirements tacked on to a program, according to a consultant familiar with the findings of the study, which has not been made public.

"So, what I think Mullen has in the back of his head is, 'I've got to get the requirements process for ships back under control or we're always going to end up, every time we talk about a new destroyer, with a \$3 billion ship,'" said a former senior Navy official.

This senior official, who was in a key Pentagon position as the DD-21 program commenced, said that without a panel overseeing the ship's configuration and true requirements the new destroyer program became weighed down with capabilities that carried a high price tag.

“In hindsight, we realized that we had put requirements on the ship that no one had really vetted for its cost impact on the ship. For example, it was to operate acoustically silent and risk free in minefields,” said the official. “If the SCIB had existed, this probably would not have happened.”⁷⁸

At a June 20, 2005, symposium on the future of the Navy, John Young, the Assistant Secretary of the Navy for research, development, and acquisition — the Navy's acquisition executive — stated:

I've talked with Admiral [Michael] Mullen [who became the new Chief of Naval Operations on July 22, 2005]. I certainly would not pretend to speak for him, but we're going to sit down and have another discussion. Ron [O'Rourke] was kind enough to point out we had a discussion about DD(X) and said where could we make some more trades and bring the costs down. Lacking insight which gets better and better about budget pressures, not a lot of things came off the table. But we had the discussion and Admiral Mullen agreed to chair another discussion like that.

So we're going to look, and I think you'll see us across the board keep trying to do modest things that don't significantly affect your capability because the analytical rigor is increasingly there to say I need this kind of capability. So an adjustment [in the AGS firing rate] from 12 to 10 [shells per minute] so that instead of loading the gun in any position you always load the gun vertically and then tip it back down and shoot, it doesn't compromise severely the operators' and war fighters' capability and it dramatically reduces the complexity of the auto loader. Can we do things on 53-X [helicopter]? Can we do more things on DD(X)? Can we do things in Virginia class [submarine]? I think people are prepared to table areas there to do business differently.⁷⁹

Potential Oversight Questions. Potential oversight questions for Congress include the following

- **SCIB and DD(X) requirements.** Are the DD(X)'s requirements partly a result of inadequate discipline, following the decline the influence of the SCIB, in the Navy's process for setting requirements for new ships? If the SCIB had retained its earlier influence during the DD-21/DD(X) design process, which of the DD(X)'s current requirements would have been reduced or eliminated? If the SCIB or an equivalent body were reestablished and given the task of reviewing DD(X) requirements, which requirements might it reduce or eliminate?

⁷⁸ Jason Sherman, “Mullen To Bring Back Panel To Control Ship Configuration, Cost,” *Inside the Navy*, Aug. 8, 2005.

⁷⁹ Transcript of conference entitled, “The Future of the United States Navy,” held by the American Enterprise Institute, Washington, DC, June 20, 2005.

- **AGSs.** Since the DD(X) is the only ship planned to carry AGSs, and since AGSs are viewed by the Marine Corps as necessary to meet Marine Corps requirements for naval surface fire support capability, should the AGSs be considered the most-critical payload element on the DD(X), and certain other payload elements, though desirable, as possibly less critical by comparison?
- **Hangar.** In light of the 161 current or planned helicopter hangar spaces on other Navy surface combatants (2 spaces on each of 19 Aegis cruisers and the final 34 DDG-51s, and 1 space on each of 55 LCSs), and the relatively limited number of Navy helicopters available for filling those spaces, how critical is it for the DD(X) to have a hangar with spaces for two helicopters? Would it be acceptable for the DD(X) instead to have only a helicopter landing platform and an ability to refuel and rearm helicopters, like the first 28 DDG-51s?
- **VLS tubes.** In light of the 8,102 vertical launch system (VLS) missile tubes on the Navy's planned force of 84 VLS-equipped Aegis ships (19 cruisers with 122 tubes each, 28 earlier DDG-51s with 90 tubes each, and 34 later DDG-51s with 96 tubes each), the ability of VLS tubes to store and fire either one 21-inch diameter missile or four smaller-diameter Evolved Sea Sparrow Missiles (ESSMs), the ability in a networked force for a ship to control a missile fired by another ship, and the DD(X)'s key role in providing naval gunfire support with its two AGSs, how critical is it for the DD(X) to have 80 enlarged VLS tubes as opposed to a smaller number, such as 64, 48, or 32?
- **Command facilities.** In light of the flag-level command facilities on the 19 Aegis cruisers, as well as additional command facilities on aircraft carriers and planned amphibious assault ships, how critical is it for the DD(X) to have flag-level command facilities?
- **SOF support facilities.** In light of SOF support facilities on the Navy's planned force of four converted Trident submarines, or SSGNs (66 or more SOF personnel for each ship),⁸⁰ support facilities for smaller numbers of SOF on Navy attack submarines (SSNs), and the secondary SOF support role for the Navy's planned force of 55 LCSs, how critical is it for the DD(X) to have SOF support facilities?
- **AAW system.** In light of the Aegis area-defense AAW systems on the Navy's planned force of 84 Aegis ships — which, though not as capable in some respects as the DD(X)'s AAW system in littoral operating environments, would still be quite capable, particularly

⁸⁰ For more on the SSGN program, see CRS Report RS21007, *Navy Trident Submarine Conversion (SSGN) Program: Background and Issues for Congress*, by Ronald O'Rourke.

when numbers of Aegis ships are taken into account — how critical is it for the DD(X) to have an area-defense-capable AAW system, as opposed to a more modest point-defense AAW system capable of defending only the DD(X) itself (which might be closer to the more modest AAW system that was originally envisaged for the DD-21, the precursor to the DD(X)?⁸¹

DD(X) Technology Readiness

GAO Reports and Testimony. The DD(X) will incorporate several significant new technologies — probably more new technologies than any new class of surface combatant that the Navy has built in decades. GAO has expressed concerns several times in reports and testimony about whether these technologies will be sufficiently mature in time for the lead DD(X), about the Navy’s lack of fallback options for many of these technologies, and about the potential for problems in technology development to add time and cost to the D(X) program, and particularly to the effort for building the lead ship. In July 2005, GAO stated:

Demanding requirements and time frames present substantial challenges for the DD(X) program. DD(X)’s revolutionary design and automated operations require multiple technological advances.... At the same time, the DD(X) program has imposed a tight schedule — one that calls for concurrent development, design, and construction.

To reduce risk in the DD(X) program, the Navy is building 10 engineering development models that represent the ship’s most critical subsystems and technologies. While use of these models is a sound approach, planned testing of the models continues through system design and, in some cases, into detailed design and construction, creating risk. Any problems identified through testing could require design changes and result in delays and cost increases. Past GAO work shows that demonstrating technological maturity — that is, the technology has been shown to perform in its intended environment — at the start of system design and development is key to reducing risk and meeting cost, schedule, and performance objectives. In addition, the models are not identical in design to the subsystems that will actually be installed on the first ships and thus will require additional work to reach the final design.

⁸¹ Previous editions of this report also asked the following question:

Gun shell capacity. In light of the DD(X) design feature that allows underway replenishment of gun shells, creating the equivalent of an almost-infinite ammunition magazine and permitting nearly continuous fire support, how critical is it for the DD(X) to have a total gun shell capacity of 920 shells, as opposed to a smaller number, such as 600?

As discussed in the Background section, a December 2005 press states that, as part of an effort to reduce the cost of the DD(X), the Navy has reduced the magazine capacity of the design from 920 shells to 600. (Christopher P. Cavas, “U.S. Ship Plan To Cost 20% More,” *Defense News*, December 5, 2005: 1, 8.)

The consequences of not meeting the challenges facing the DD(X) program are significant. If the program fails to demonstrate capabilities, develop software, or integrate subsystems as planned, these activities will be pushed into the later stages of design and construction. In these stages, the cost of work and delays is much higher and the schedule much less forgiving than in earlier stages. At the same time, the Navy must compete for funding with other programs, while supporting existing platforms and deployments, in a time when the discretionary budget is constrained. In light of the risks framed by the DD(X)'s challenges, decision makers should consider potential trade-offs in advance, including accepting reduced mission performance, increased costs, delayed shipyard work, and/or additional manning. It would be prudent to consider the palatability of such trade-offs now before authorizing the construction of the first ship — a commitment the Navy plans to make by the end of this fiscal year.⁸²

Navy Position. In response, the Navy argues that development of DD(X) technologies is proceeding well, that the new technologies will be sufficiently mature to support the lead DD(X) as currently scheduled, and that allowing more time for further maturing the technologies before proceeding with DD(X) procurement would add time and cost to the DD(X) program (and other Navy shipbuilding programs that would incorporate DD(X) technologies) and result in a ship whose technologies would be less up to date at the time of ship completion.⁸³

Potential Oversight Questions. Potential oversight questions for Congress include the following:

- What is the risk that one or more new technologies being developed for the DD(X) will not be sufficiently mature to support the lead DD(X) as currently scheduled?
- If one or more of these technologies experience development difficulties, how might this affect the schedule, cost, and capabilities of the lead DD(X) and follow-on DD(X)s?

⁸² Government Accountability Office, *Defense Acquisitions[:] Progress and Challenges Facing the DD(X) Surface Combatant Program*, GAO-05-924 T, July 19, 2005. (Testimony Before the Subcommittee on Projection Forces, Committee on Armed Services, House of Representatives. [The panel on which GAO testified had its testimony deferred to July 20, 2005.]) For earlier GAO reports on DD(X) technology maturity, see Government Accountability Office, *Progress of the DD(X) Destroyer Program*, GAO-05-752R, June 14, 2005; Government Accountability Office, *Defense Acquisitions[:] Assessments of Selected Major Weapon Programs*, Mar. 2005; Government Accountability Office, *Defense Acquisitions[:] Challenges Facing the DD(X) Destroyer Program*, GAO-04-973, Sept. 2004; and General Accounting Office, *DEFENSE ACQUISITIONS: Assessments of Major Weapon Programs*, GAO-04-248, Mar. 2004.

⁸³ See, for example, Statement of The Honorable John J. Young, Jr., Assistant Secretary of the Navy (Research, Development and Acquisition), and RADM Charles S. Hamilton, II, Program Executive Officer For Ships, Before the Projection Forces Subcommittee of the House Armed Services Committee on DD(X) Shipbuilding Program, July 19, 2005, pp. 11-20.

DD(X) as Bridge to CG(X)

The Navy argues that the DD(X) will act as a bridge to the CG(X) because the CG(X) will be based on the DD(X) hull design (perhaps slightly enlarged) and use many of the same basic technologies as the DD(X). The Navy states that

The DD(X) hull and propulsion plant will be spiraled into the CG(X) platform with about 80% design overlap, representing a tremendous cost avoidance in the CG(X) program. Without DD(X), CG(X) will be behind schedule and therefore unavailable to counter critical threats and will also require up to four billion dollars (representing a net additional billion dollars of taxpayer money) for non-recurring engineering costs.⁸⁴

Skeptics could argue that DD(X) technologies planned for use in the CG(X) could be developed without building any DD(X)s, or by building a single DD(X) as an integrated technology demonstrator.

DD(X)/CG(X) Technologies for Other Navy Ships

The Navy argues that several DD(X)/CG(X) technologies are to be incorporated into other planned Navy ships:

A significant portion of the DD(X) R&D funding is procuring systems for use on multiple platforms. About 25% of DD(X) R&D investment is common and directly applicable to [the aircraft carrier] CVN-21 and [the amphibious assault ship] LHA(R). With the exception of nuclear propulsion technology, little research and development funding for aircraft carriers has been funded since the inception of the NIMITZ-class carrier almost forty years ago. Consequently, DD(X) is the principal technology driver for CVN-21's radars, computing environment, deckhouse construction and other command and control systems. Without DD(X), CVN-21 will likely be delayed by one year and R&D costs alone will grow by \$1.3 billion, not including the cost of the schedule delay.⁸⁵

Skeptics could argue that DD(X)/CG(X) technologies planned for use in other Navy ships could be developed without building any DD(X)s or CG(X)s, or by building a single DD(X) or single CG(X), or one ship of each kind, as integrated technology demonstrators.

LCS Oversight Issues for Congress

The LCS program raises several potential oversight issues for Congress, including the following, discussed below:

- total program acquisition cost;

⁸⁴ Statement of Admiral Vern Clark, U.S. Navy, Chief of Naval Operations, Before The House Armed Services Committee Projection Forces Subcommittee, July 19, 2005, p. 11.

⁸⁵ Ibid.

- program mission requirements;
- program cost effectiveness;
- rapid acquisition strategy;
- LCS mission modules funded in the Other Procurement, Navy (OPN) account; and
- potential program implications for the industrial base.

Total Program Acquisition Cost

Although this CRS report estimates that a 55-ship LCS program might have a total acquisition cost of about \$22.5 billion, Navy officials acknowledge that the cost of individual LCS mission modules and the ratio of mission modules to LCSs are not yet clear, and that the potential total acquisition cost of the LCS program, including mission modules, is therefore unknown. Supporters could argue that total program cost will become clearer as the Navy works through the details of the program. Skeptics could argue that a major acquisition program like the LCS program should not be initiated until its potential total costs are better understood.

Program Mission Requirements

Primary Missions. The LCS program is based on a Navy requirement for additional capability for countering enemy submarines, surface attack craft and mines

in heavily contested littoral areas.⁸⁶ Has the Navy accurately projected this requirement?

Those who support the notion that the Navy has accurately projected this requirement could argue the following:

- The Navy experienced difficulties countering mines in a 1984 mining incident in the Red Sea, in the 1987-1988 Navy operation to escort reflagged Kuwaiti tankers and other U.S.-flag commercial ships in the Persian Gulf, in the 1991 Persian Gulf War, and (to a smaller degree) in the recent Iraq war. Navy ships were damaged by mines in the 1987-1988 and 1991 operations.

⁸⁶ Mission requirements for the LCS program are technically covered (i.e., “grandfathered”) by the MNS that was issued for the old SC-21 (i.e., DD-21) program. The analysis behind the SC-21 MNS, however, did not focus on potential littoral anti-access challenges in littoral waters. The Navy’s requirement for additional capability for countering enemy submarines, surface attack craft, and mines in littoral waters instead reflects an analysis aimed at identifying gaps or weaknesses in Navy capabilities that the Navy performed initially in February 2001, which did focus on potential littoral anti-access challenges in littoral waters. The Navy refined this analysis further in 2001 and 2002 and then issued mission requirements for the LCS in a Preliminary Design Interim Requirements Document. (U.S. Department of the Navy, *Littoral Combat Ship Flight 0 Preliminary Design Interim Requirements Document [PD-IRD]*, Feb. 10, 2003.) The document states:

The primary threat to sea based U.S. joint forces will be from mines, aircraft, ships, boats, submarines, and coastal defense units armed with Anti-Ship Cruise Missiles (ASCM), and submarine-launched torpedoes. Mines present the most challenging threat because they can be deployed from ships and aircraft, both military and civilian, and can also be deployed from submarines. Significant threats will also come from air and ship launched torpedoes; fighter-launched Tactical Air-to-Surface Missiles; other ordnance carried by sea and land-based aircraft (fixed- and rotary-wing); chemical, biological and nuclear weapons, and in the future, directed energy weapons. While operating in the littoral regions, additional threats from coastal defense sites (artillery, missile, multiple rocket launchers, and possibly torpedoes) small boats and Tactical Ballistic Missiles may be encountered. A third tier threat will include preemptive attacks or covert action from special operations forces, combat divers, and terrorists. The weapons threats may be supported by C3 [command, control, and communications], electronic attack, and electronic support [i.e., electronic eavesdropping] systems.

Further details on existing, projected, and technologically feasible threats are contained in the Classified “Major Surface Ship Threat Assessment”, ONI-TA-018-01, January 2001....

The LCS will deliver focused mission capabilities to enable joint and friendly forces to operate effectively in the littoral. These focused mission capabilities are an enhanced mine warfare capability, a better shallow-water ASW capability, and an effective counter to small craft. There are other capabilities inherent in the LCS that support other missions such as Maritime Interdiction Operations (MIO) and Intelligence, Surveillance, and Reconnaissance (ISR).

- The Navy has also been challenged by surface attack craft while operating in littoral waters, such as during the 1987-1988 escort operation.
- While the Navy does not appear to have been significantly challenged by enemy submarines in littoral waters in recent military operations, proliferation of modern non-nuclear-powered submarines to potential adversaries has been a concern among Navy officials and other observers for several years.
- In light of the many firms globally that are marketing non-nuclear-powered submarines, surface attack craft, and mines to foreign buyers, and the interest that numerous countries, including potential foreign adversaries, have shown in either buying such systems from foreign suppliers or building them indigenously, it is reasonable to expect that the Navy in the future will need additional capability for countering such systems.

Those who question the notion that the Navy needs to acquire additional capability for countering mines and surface attack craft in littoral waters could argue the following:

- recent major U.S. military combat operations — in Kosovo in 1999, in Afghanistan in 2001-2002, and in Iraq in early 2003 — suggest that the Navy faces no immediate crisis in littoral-warfare capabilities; and
- potential U.S. adversaries do not appear to be acquiring submarines, surface attack craft, and mines at the rate that some observers have expected, and may attempt to circumvent the Navy's littoral-warfare plans by focusing on acquiring different kinds of littoral-defense systems, such as autonomous underwater vehicles (AUVs).⁸⁷

⁸⁷ A May 2003 report on DOD programs for countering enemy anti-access and area-denial forces written by the Center for Strategic and Budgetary Assessments (CSBA) — a non-governmental study group generally supportive of defense transformation — argued this point at length, stating:

Although none of these three threats [diesel subs lurking close to shore, mines, and swarming boats] are new, naval and civilian leaders have concluded that their previous efforts to deal with them have been ineffective....

All of these judgments and conclusions are also open to debate. Indeed, the Navy may be preparing to fight the last maritime AD [area-denial] network, and with the wrong tools. As [naval analyst and author] Norman Friedman has noted after a careful review of global naval arms transfers and purchases, coherent maritime AD networks comprised of submarines, mines, and boats — and even ASCMs [anti-ship cruise missiles] — are not materializing. This suggests one of three things: potential adversaries have decided not to develop maritime AD networks; they are attracted to the maritime AD capabilities that currently

(continued...)

⁸⁷ (...continued)

occupy US naval planners, but have elected not to pursue them in the near term for other political or military reasons; or they are pursuing new capabilities to outflank DON transformation plans.

This last circumstance would seem not only plausible, but highly probable. For any adversary contemplating a long-term competition with the US battle fleet, building a maritime AD network that US naval expeditionary forces are being specifically designed to defeat would not appear to be an attractive transformation path. From an adversary's perspective, crewed submarine operations are an extremely expensive pathway, and the prospect of taking on the US attack submarine fleet is not an attractive one. The United States is expending an enormous amount of resources and effort, however belatedly, to sweep *stationary* mines and to effect rapid but relatively narrow penetrations of *static* minefields. For an adversary to embark now on a major procurement program to buy these types of weapons would appear to be huge gamble. And except for surprise attacks, no serious naval opponent is going to emphasize swarming boats (except perhaps in special cases like the Persian Gulf, where sea room for US naval forces is limited). As was conclusively demonstrated at the Battle of Bubiyan Channel, a naval engagement during the first [i.e., 1991] Gulf War, fast attack craft attacking a prepared naval force that enjoys air superiority is not a survivable tactic.

An alternative approach might be to pursue new underwater attack systems combining the technology of torpedoes, mobile mines, and new autonomous underwater vehicles (AUVs). Pursuing new types of stealthy uncrewed attack submarines, or long-range autonomous torpedoes, or mobile mines that constantly shift their position or patrol an engagement area would appear to be a far more attractive competitive strategy for maritime AD, in that it would side-step most, if not all, of US counter-AD plans. Moreover, such a strategy would allow attacks beyond the littoral dead zone to threaten the very viability of the [U.S.] sea base. AUV technology available today could easily allow an adversary to conduct wake-homing attacks on surface vessels at ranges out to 250 miles. In the future, even longer-range attacks will be possible, perhaps extending to ocean basin ranges. In addition, unlike in the past when the military sector dominated the development of underwater systems, today's revolution in remotely operated underwater vehicles and AUVs is being driven by the commercial and scientific communities. Since most of the research and development (R&D) for long-range AUVs is being borne by them, the costs for weaponizing AUVs are likely to be reasonable, meaning that AUV-based weapons might be built in numbers, and quickly, opening the possibility of springing either an operational or tactical surprise. Moreover, once built, weaponized AUVs would require little infrastructure overhead, and they could operate largely autonomously after the start of a war.

(Andrew Krepinevich, Barry Watts, and Robert Work, *Meeting the Anti-Access and Area-Denial Challenge*, Center for Strategic and Budgetary Assessments, 2003, pp. 57-58. Emphasis as in the original. The excerpted passage is from the chapter of the report focusing on Navy programs, which was written by Robert Work, CSBA's naval issues analyst.)

Potential questions for Congress regarding the mission requirements for the LCS include the following:

- The Navy has been aware of challenges posed by enemy mines, surface attack craft, and submarines in littoral waters since its operations in the Persian Gulf in 1987-1988 and 1991, if not before. Why did the Navy not begin to identify these challenges as a source of significant new mission requirements until 2001? Is the Navy exaggerating the threat posed by these area-denial systems to help justify the start of the LCS program?
- Does OSD agree with the Navy's view on the scale and composition of current and projected threats to Navy ships operating in littoral waters?
- What is the latest evidence on whether potential foreign adversaries are developing improved littoral-defense systems based on submarines, surface attack craft, and mines?
- To what degree might potential U.S. adversaries attempt to circumvent current Navy plans for improving its littoral-warfare capabilities by acquiring different kinds of littoral-defense systems, such as AUVs?

Homeland Security Mission. As mentioned in the Background section, some observers believe the LCS might also be suitable for homeland defense operations. Making this an additional mission for the LCS could lead to an increase in the total planned LCS procurement quantity. The Coast Guard, however, could also conduct such operations, and is currently procuring new cutters and aircraft under its Deepwater acquisition program to improve its ability to conduct these and other operations in the future.⁸⁸

Supporters of adding homeland defense as a mission for the LCS could argue that many of the features that make the LCS suitable for Navy operations in littoral waters overseas could make it suitable for homeland defense operations in littoral waters close to the United States. Skeptics could argue that the Coast Guard's new Deepwater cutters and aircraft may be more cost effective than the LCS for conducting these operations, and that a more rigorous examination of potential Navy and Coast Guard methods for performing such operations should be conducted before adding homeland defense as a mission for the LCS and possibly increasing the size and cost of the LCS program.

Program Cost Effectiveness

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

⁸⁸ For more on the Deepwater program, see CRS Report RS21019, *Coast Guard Deepwater Program: Background and Issues for Congress*, by Ronald O'Rourke.

combatant missions (the SC-21 Cost and Operational Effectiveness Analysis [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 now might 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 non-combat littoral support craft (LSC) equipped with UVs, or (5) some 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.

Arguments Supporting LCS as Best Approach. Supporters of the LCS could argue that the LCS program represents the best possible approach for performing the LCS's stated missions because the LCS program:

- builds on about four years of analytical work on small, fast surface combatants done in 1998-2001 at the Naval War College under the Streetfighter project, which showed several potential operational advantages of using a smaller ship like the LCS for performing littoral-warfare missions;
- would respond to the Navy's need for forces that can operate in littoral waters (including shallow-draft waters inaccessible to larger Navy surface ships) to counter enemy submarines, surface attack craft, and mines;
- has been shown in computer simulations and wargames to substantially improve Navy littoral warfare capabilities;
- would be a key Navy program for achieving and exploiting the concept of network-centric warfare, which is a key component of naval transformation;
- would take full advantage of unmanned vehicles, which are another key component of naval transformation;
- would exploit the new concept of modular payload packages to achieve significant mission flexibility and an improved ability to accept upgrades and new missions over its life-cycle;
- would be more numerous and mobile in littoral waters than larger and slower surface ships, and would thus be more effective in terms

of making it difficult for the enemy to plan and react to U.S. operations in littoral waters;

- would achieve survivability through speed, stealth, battlespace awareness, self-defense weapons, and support from other Navy platforms;
- would avoid the need to put at risk larger and more expensive surface ships, with their larger crews, to conduct operations in potentially dangerous littoral waters; and
- would respond to the Navy's need for more affordable ships.

Supporters of the LCS program can also argue that the Navy in the past has built prototype ships without having first done an AMC, and that the Navy is now conducting an AMC for the LCS program.

Arguments Questioning LCS as Best Approach. Skeptics of the LCS program could argue that while many of the above arguments may be true, they do not demonstrate that the LCS is the best or most promising approach for performing the LCS's stated missions, and that the Navy is proposing the LCS program on the basis of "analysis by assertion." More specifically, skeptics could argue the following:

- Although it might be argued that the LCS is covered under the SC-21 COEA, the SC-21 COEA did not examine options for acquiring a small combatant like the LCS and thus cannot in substance provide a formal analytical basis for arguing that the LCS is the best or most promising approach.
- In testimony to the House Armed Services Committee in April 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."⁸⁹
- The four years of analysis done by the Navy prior to announcing the LCS program revolved to a large degree around the Streetfighter

⁸⁹ 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*, Apr. 14, 2003.

concept, which differs in certain respects from the LCS concept.⁹⁰ More important, the analysis focused primarily on what a Streetfighter might look like and what kind of warfighting contribution it could make as part of a larger Navy force, rather than on the more basic question of whether a smaller surface ship represented a better approach than other alternatives for performing the missions in question.

- Although Navy computer simulations and wargames may show that a ship like the LCS would increase the Navy's warfighting effectiveness in the littoral environment, the Navy has not shown that this increase is greater than the increase that might be achieved by investing a similar amount of funding in other approaches for performing littoral warfare missions. The Navy identified a need for additional littoral warfighting capability and leaped to the conclusion that the LCS would be the best way to provide it, without thoroughly examining potential alternative approaches. Helicopters, frigates, and submarines have performed littoral warfare missions for years, and the Navy has not shown through rigorous analysis why these platforms — or unmanned vehicles deployed from manned aircraft, submarines, or larger surface ships operating further from shore — would be inferior to the LCS for performing them.
- The survivability of the LCS in dangerous littoral waters is open to question. Speed, stealth, and battlespace awareness may not be sufficient to avoid being targeted and attacked by modern sensors and weapons, particularly in waters close to an enemy's shore, and the LCS's modest self-defense weapons may not be adequate to counter incoming missiles and torpedoes. Larger ships are generally more capable than smaller ships of withstanding a hit from a weapon of a given size without sinking. The cruise missiles, mines, and boat bomb that in recent years have significantly damaged some of the Navy's current surface combatants and amphibious ships, but not sunk them, would have a higher likelihood of sinking a smaller ship like the LCS, particularly since the LCS is to be built to survivability standards that are closer to those of commercial ships than to the higher survivability standards of other Navy combatant ships. It is not clear that it would be necessary or preferable to send a small and potentially vulnerable manned ship into heavily defended littoral waters to deploy UVs when UVs could also be launched from aircraft or from larger ships operating further offshore.
- The cost-effectiveness of the LCS as a focused-mission ship employing modular mission payload packages (rather than a ship with a built-in multimission combat system) is open to question.

⁹⁰ The Streetfighter, for example, was often described as a ship of several hundred (i.e., less than a thousand) tons displacement, while the LCS is usually described as a larger ship displacing 1,500 to 3,000 tons.

LCS mission modules would not be changed in open waters; they would be changed in a friendly port. If the friendly port is near the LCSs' operating area, then are LCSs needed in that area? If the friendly port is not near the operating area, will the LCSs be able to change mission modules in a timely manner? Where and how will mission modules that are not loaded on the LCSs be stored in the theater of operation? How many LCSs, and how many LCS mission modules, will need to be procured and deployed into a theater to ensure that an adequate number of LCSs equipped with the right mission modules will be on station in the operating area when they are needed?

- While it may be acceptable to build one, two, or a few ships as prototypes without first having analytically validated the cost-effectiveness of the effort, it is quite another thing to propose a 30- to 60-ship procurement program with a potential total acquisition cost of billions of dollars without first examining through rigorous analysis whether this would represent the most cost-effective way to spend such a sum.
- Although the Navy since November 2001 has conducted analyses of the missions to be performed by the LCS, the results of these analyses are of questionable credibility because they were performed well after the fact, in the knowledge that the Navy had already announced that the LCS is the preferred approach for performing these missions. Analyses like these should be performed before the selection of a preferred concept, to help officials identify that concept, not after it has been selected, to provide officials with an after-the-fact justification for their selection.

Potential Oversight Questions. Potential oversight questions for Congress include the following:

- Why did the Navy, prior to announcing the start of the LCS program in November 2001, not perform an analysis of multiple concepts (AMC) showing through a formal, rigorous analysis that a ship like the LCS was not just one way, but the best or most promising way, to perform the LCS's stated littoral warfare missions? If the analysis that the Navy conducted prior to its November 2001 announcement, including its Streetfighter analysis from 1998-2001, was sufficient to serve as an AMC justifying the Navy's decision to initiate the LCS program, why did the Navy not collect this analysis, reformat it, and present it as an AMC? Given differences between the original Streetfighter concept and the LCS as currently proposed (and statements from Navy officials that the LCS is not the Streetfighter), how applicable is the Streetfighter analysis to the question of whether a ship like the LCS represents the best or most promising way to perform the LCS's stated missions?

- Why did the Navy apparently wait until months after announcing the start of the LCS program to begin doing an AMC for the LCS program? Given the Navy's commitment to the LCS program, can an AMC at this point be done in an unbiased manner?
- If the LCS program is granted approval to proceed as the Navy has proposed, would this set a precedent for other major DOD acquisition programs to be initiated without first conducting an AMC showing that the proposed acquisition solution is the best or most promising approach? If so, what might be the potential advantages and disadvantages for DOD acquisition of such a precedent?⁹¹ What might be the potential implications for Congress' ability to conduct effective oversight of future DOD acquisition programs?
- What are the relative operational advantages and disadvantages of performing the LCS's stated littoral warfare missions using (1) a ship like the LCS, (2) a somewhat larger, frigate-sized ship, (3) submarines, (4) manned helicopters and fixed wing aircraft, and (5) unmanned vehicles deployed from manned aircraft, submarines, and ships larger than the LCS operating further from shore? How do these options compare in areas such as payload capacity, ability to deploy payload systems into littoral waters in a timely fashion, ability to maintain on-station for extended periods of time, vulnerability and survivability, and potential acquisition and life-cycle operation and support costs?

⁹¹ At a May 13, 2003, professional conference, Vice Admiral Albert Konetzni, the deputy commander and chief of staff for the Atlantic Fleet, expressed misgivings regarding a number of DOD acquisition programs that he believes were initiated without sufficient prior analysis. An article reporting on Konetzni's remarks stated:

"I feel very strongly that we have lost our bearings when it comes to transformation because most of the talk is not backed up by solid intellectual analysis," states the admiral's prepared speech for event....

Unfortunately, service officials in recent times "have largely abandoned operations analysis," Konetzni said. "Without looking clearly at the mission and rigorously analyzing the potential of new tactics and technologies to improve warfighting, we just get PowerPoint solutions," he said, adding, "I just can't take seeing another slide with red, yellow, and green blocks for effectiveness with nothing mathematical behind them."

A better path would be one in which proposals for innovation are studied analytically and developed with a "complete plan" — including concept of operations, training and maintenance — "before we throw these things on our ships," he said. (Keith J. Costa, "Konetzni: Transformation In Need of 'Solid Intellectual Analysis,'" *Inside the Pentagon*, May 22, 2003.)

Rapid Acquisition Strategy

Compared to previous Navy combat ship acquisition programs, which typically have required 12 or more years to move from program inception to the commissioning of the first ship in the class,⁹² the Navy is proposing to have the first LCS enter service in early 2007, or less than six years after the announcement of the program in November 2001.

Navy officials say that the LCS program's rapid acquisition strategy is consistent with DOD acquisition reform, a chief goal of which is to significantly reduce acquisition "cycle time" — the time needed to move a program from initial conception to first deployment of usable hardware. They also argue that the LCS is urgently needed to meet an urgent Navy need for improved littoral-warfare capabilities.

Skeptics, while acknowledging that the LCS program's rapid acquisition strategy is consistent with DOD acquisition reform, could question whether such a strategy is needed to meet an urgent Navy operational need. They could argue the following:

- Recent major U.S. military combat operations — in Kosovo in 1999, in Afghanistan in 2001-2002, and in Iraq in early 2003 — suggest that the Navy faces no immediate crisis in littoral-warfare capabilities.
- If improved enemy littoral anti-access/area-denial capabilities do emerge, they are likely to do so gradually, over a period of many years, as potential adversaries incrementally acquire and learn to use such capabilities, permitting time for a less-hurried start to LCS procurement; and
- The Navy's argument about having an urgent operational need for LCSs is undercut by its own 2003 procurement profile for the LCS program, which would procure a total of 56 ships over a relatively long 15-year period, with the final ships in the program not delivered until about 2021.

Some observers believe that the LCS program's rapid acquisition strategy is motivated primarily not by concerns for the Navy's near-term littoral warfare capabilities, but rather by one or more of the following four factors, all of which are essentially political in nature rather than operational:

⁹² The Virginia (SSN-774) class submarine program, for example, was announced in early 1991, and the first ship in the class is scheduled to enter service in 2004. The DDG-51 program was begun in the late 1970s and the first ship in the class entered service in 1991. The DD-21 program is the de facto successor to the DD-21 program, which began in 1994-1995, and the first DD(X) is scheduled to enter service in 2011.

- **A belief that LCS production must start before there is a change in administration.** Some observers believe the Navy adopted a rapid acquisition strategy for the LCS program due to a belief that, to maximize the LCS program's chances of survival, the Navy must start building the first LCS before there is a change in administration. The DD-21 program, these observers believe, was vulnerable to termination because it was initiated during the Clinton administration but was still years away from production when the Clinton administration was succeeded by the Bush administration. This, they believe, made it easier for the Bush administration to view the DD-21 program as a Clinton administration initiative in which the Bush administration had no stake, and easier for the Bush administration to consider terminating because defense firms at that point had not become dependent on the construction of DD-21s as a significant source of revenue. Navy officials, these observers believe, have "learned the lesson" of the DD-21 program and have concluded that starting to build the first LCS before there is a change in administration is important, if not critical, to the LCS program's chances of survival.
- **A belief that funding to begin LCS production must be secured before there was a change in the Chief of Naval Operations.** Other observers (including some in the group above) believe the Navy adopted a rapid acquisition strategy for the LCS program due to a belief that, to maximize the LCS program's chances of survival, the Navy must secure funding for building the first LCS before there was a change in the Chief of Naval Operations (CNO). Admiral Vernon Clark became the CNO in July 2000 and it was originally expected that Clark, like most CNOs in recent years, would serve a four-year term in office, meaning that he would remain CNO through the end of June 2004. At that point, the House and Senate Armed Services Committees would likely have reported their versions of the FY2005 defense authorization bill, and the House and Senate Appropriations may have reported their versions of the FY2005 defense appropriation bill. Admiral Clark, a surface warfare officer by training, is perhaps the leading proponent of the LCS program. Some observers might have believed Clark's successor might not be as strong a supporter of the LCS. LCS supporters, these observers believe, may have "learned the lesson" of the arsenal ship program and concluded that securing funding to build the first LCS before there is a change in CNO is important, if not critical, to the LCS program's chances of survival.⁹³

⁹³ On Oct. 21, 2003, DOD announced that Admiral Clark's term in office would be extended by two years, through the end of June 2006. The Senate in July 2004 confirmed Clark for an additional two years ending July 2006. In late Jan. 2005, however, it was reported that Clark would step down as CNO in July 2005. Clark left office on July 22, 2005.

- **A belief that LCS procurement must not be scheduled to start after the start of DD(X) procurement.** Other observers (including some of those in the groups above) believe that Navy officials who support the LCS adopted a rapid acquisition strategy for the LCS program due to a belief that, to maximize the LCS program's chances of survival, LCS procurement must not start after DD(X) procurement. In the eyes of these observers, since the LCS and DD(X) programs may compete for a limited amount of surface combatant procurement funding, starting DD(X) procurement before LCS procurement would create an opportunity — a window of time following the start of DD(X) procurement but prior to the start of LCS procurement — for DD(X) supporters to advocate terminating the LCS program so as to better ensure that there will be sufficient surface combatant procurement funds in the future to continue the DD(X) program. Navy officials, these observers believe, understand this potential dynamic and adopted a rapid acquisition strategy for the LCS program so that the LCS procurement start date could match the then-planned DD(X) procurement start date of FY2005, thereby depriving DD(X) supporters of such an opportunity.
- **A desire to limit congressional review of the program prior to seeking congressional approval for starting procurement.** A fourth group of observers (including some in the above three groups) believe that Navy officials adopted a rapid acquisition strategy for the LCS program in part to limit the amount of time available to Congress to assess the merits of the LCS program and thereby effectively rush Congress into approving the start of LCS procurement before Congress fully understands the details of the program.

John Young, the Assistant Secretary of the Navy for research, development, and acquisition — the Navy's acquisition executive — rejected the above theories about the LCS program's rapid acquisition strategy saying, "This is ridiculous."⁹⁴ Skeptics could argue that Admiral Vernon Clark, who was the Chief of Naval Operations when the LCS program was initiated and was program's leading advocate during his time as CNO, had an appreciation for how a program's chances for winning approval could be influenced by the way it was structured, reportedly telling one reporter while he was still CNO, for example, that "I've learned you can get away with murder if you call it a pilot program."⁹⁵

With regard to the possibility of rushing Congress into a quick decision on LCS procurement, it can be noted that announcing the LCS program in November 2001

⁹⁴ Dave Ahearn, "Young: Navy Needs Both DD(X) For Major Threat, LCS For Terrorism," *Defense Today*, Aug. 9, 2005.

⁹⁵ Thomas P. M. Barnett, "Donald Rumsfeld: Old Man In A Hurry," *Esquire*, July 2005. The article appeared in the June 11, 2005 issue of the DOD Early Bird clipping service. Admiral Clark served as CNO until July 22, 2005. The article presents Admiral Clark's comment in the context of a discussion about a new Navy personnel-management system.

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

- **2002 budget-review season (for FY2003 budget).** The Navy's original FY2003 budget request, submitted to Congress in February 2002, contained no apparent funding for development of the LC⁹⁶S. In addition, the Navy in early 2002 had not yet announced that it intended to employ a rapid acquisition strategy for the LCS program. As a result, in the early months of 2002, there may have been little reason within Congress to view the LCS program as a significant FY2003 budget-review issue. In the middle of 2002, the Navy submitted an amended request asking for \$33 million in FY2003 development funding for the LCS program. Navy officials explained that they did not decide until the middle of 2002 that they wanted to pursue a rapid acquisition strategy for the LCS program, and consequently did not realize until then that there was a need to request \$33 million in FY2003 funding for the program. By the middle of 2002, however, the House and Senate Armed Services committees had already held their spring FY2003 budget-review hearings and marked up their respective versions of the FY2003 defense authorization bill. These two committees thus did not have an opportunity to use the spring 2002 budget-review season to review in detail the Navy's accelerated acquisition plan for the LCS program or the supporting request for \$33 million in funding.
- **2003 budget-review season (for FY2004 budget).** To support a more informed review of the LCS program during the spring 2003 budget-review season, the conferees on the FY2003 defense authorization bill included a provision (Section 218) requiring the Navy to submit a detailed report on several aspects of the LCS program, including its acquisition strategy. In response to this legislation, the Navy in February 2003 submitted a report of eight pages in length, including a title page and a first page devoted mostly to a restatement of Section 218's requirement for the report. The House and Senate Armed Services committees, in their reports on the FY2004 defense authorization bill, have expressed dissatisfaction with the thoroughness of the report as a response to the requirements of Section 218. (For details, see the "Legislative Activity" section of this report.) It is thus not clear whether the

⁹⁶ The conference report (H.Rept. 107-772) on the FY2003 defense authorization bill (H.R. 4546) states: "The budget request for FY2003 included no funding for research and development for a littoral combat ship (LCS)," p. 562.

defense authorization committees were able to conduct their spring 2003 budget-review hearings on the FY2004 budget with as much information about the LCS program as they might have preferred.

On October 14, 2005, the Navy awarded a \$223 million contract to General Dynamics for the detailed design and construction of the LCS in the Navy's FY2006 budget, even though, at the time of the award, final legislation for FY2006 defense authorizations and appropriations had not been enacted. The award was characterized as the exercising of an option to a \$9-million LCS preliminary design contract that the Navy awarded General Dynamics on July 2003.⁹⁷

Potential oversight questions for Congress concerning the LCS program's rapid acquisition strategy and October 14, 2005 contract award⁹⁸ include the following:

- Did the Navy pursue a rapid acquisition strategy for the LCS program to meet an urgent operational requirement for improved littoral warfare capabilities, or for essentially political purposes that are aimed at maximizing the LCS program's chances of survival? What would be the operational risk of deferring the start of LCS procurement by one or two years, so as to provide additional time for learning about and assessing the merits of the program?
- Did the Navy employ a rapid acquisition strategy for the LCS program in part in an attempt to rush Congress into a quick decision on LCS procurement before Congress fully understands the details of the program? If so, and if DOD later concludes that this strategy worked for the LCS program, would this encourage DOD to use a similar approach for securing congressional approval on other defense acquisition programs in the future? If so, what might be the potential consequences for future congressional oversight of proposed DOD acquisition programs?
- Was the Navy's October 14, 2005 contract award the first time DOD has awarded a contract for the construction of a major procurement end item, even though no bills authorizing or appropriating funds specifically for the construction of that item had, at the time of the award, passed Congress and become law? If not, what were the other instances?

⁹⁷ See, for example, General Dynamics press release, "General Dynamics Awarded \$223 Million Contract for First Trimaran Littoral Combat Ship Construction," October 14, 2005. A General Dynamics press release from July 2003 describes a \$9-million contract awarded to the firm that month to develop a preliminary design for the LCS. (General Dynamics press release, "General Dynamics Bath Iron Works Wins Preliminary Design Award for U.S. Navy's Littoral Combat Ship," July 17, 2003.)

⁹⁸ The questions relating to the Oct. 14, 2005, contract award are adapted from an October 20, 2005, CRS memorandum to the Senate Appropriations Committee, and are included here (along with this footnote) with the permission of the Committee.

- Is the Navy's award consistent with the spirit as well as the letter of policies and laws relating to defense authorizations and appropriations, including (1) the full funding policy as applied to DOD programs; (2) the Antideficiency Act of 1870, as amended (31 USC 1341); (3) the Adequacy of Appropriations Act of 1861 (41 USC 11); (4) 10 USC 114(a), which states: "No funds may be appropriated for any fiscal year to or for the use of any armed force or obligated or expended for — (1) procurement of aircraft, missiles, or naval vessels; (2) any research, development, test, or evaluation, or procurement or production related thereto;... unless funds therefor have been specifically authorized by law;" and (5) Section 102(a) of the FY2006 continuing resolution which states: "No appropriation or funds made available or authority granted pursuant to section 101 [of this act] for the Department of Defense shall be used for: (1) the new production of items not funded for production in fiscal year 2005 or prior years...."?
- If the FY2006 LCS were not authorized or fully funded in the final law or laws relating to FY2006 defense authorizations and appropriations, what would be the implications for the execution of the contract to build the second LCS? What are the terms of the contract-cancellation provisions in this contract?
- If this award is justified on the basis that it exercises an option to a previously awarded design contract, what would prevent DOD from including similar options in future research, development, and design contracts, and then using these options as a basis for awarding contracts for the procurement of other end items before bills authorizing or appropriating funds specifically for the construction of these items had become law?
- If DOD can, by exercising options on previously awarded design contracts, award contracts for the construction of end items that have not been specifically authorized and funded, how might this affect Congress' ability to maintain year-to-year oversight of, and spending control on, DOD acquisition programs? Would any program given initial approval by Congress for research, development, and design work be potentially open to subsequent procurement at DOD's own discretion, provided that DOD has access to non-specific funding that DOD can apply to that program?
- Is the Navy's view that it can make this award related in any way to the fact that the second LCS, like the first, is being acquired through the Navy's research and development account rather than through the Shipbuilding and Conversion, Navy (SCN) account or some other DOD procurement account?⁹⁹

⁹⁹ One press report suggests that this may be a factor; see William Matthews, "U.S. Navy (continued...)"

Mission Modules Funded in OPN Account

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

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

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

Potential oversight questions for Congress include the following:

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

⁹⁹ (...continued)

Finds Budget Leeway to Begin LCS," *DefenseNews.com*, Oct. 31, 2005.

Potential Program Implications for Industrial Base

As mentioned in the Background section, current plans call for LCSs to be built in shipyards other than GD/BIW and Northrop/Ingalls. Supporters of this plan could argue that this will help constrain LCS construction costs because the yards in question are smaller facilities than GD/BIW and Northrop/Ingalls that, unlike GD/BIW and Northrop/Ingalls, do not include equipment for installing, integrating, and testing complex surface combatant combat systems like the Aegis system. As a result, supporters could argue, the fixed overhead costs of these yards are lower than those of GD/BIW and Northrop/Ingalls, and these lower costs can be passed on to the Navy. In this way, supporters could argue, building LCSs in a yard or yards other than GD/BIW and Northrop/Ingalls could reduce LCS procurement costs by breaking the “lock” that large, higher-cost yards like GD/BIW and Northrop/Ingalls have maintained on major Navy shipbuilding programs. They could also argue that building LCSs at yards other than those that have traditionally built major Navy ships could broaden the geographic base of support for Navy shipbuilding programs.

Skeptics of the idea of building LCSs in yards other than GD/BIW and Northrop/Ingalls could argue that GD/BIW and Northrop/Ingalls have considerable unused building capacity, and that building LCSs at GD/BIW or Northrop/Ingalls could reduce the cost of other Navy shipbuilding programs being performed at these yards (including potentially the DD(X) program) by spreading GD/BIW’s or Northrop/Ingalls’ fixed overhead costs over a larger amount of shipbuilding work. In this sense, skeptics could argue, the savings associated with building LCSs at a smaller yard with lower fixed overhead costs will be offset by the higher costs associated with reduced spreading of fixed costs at GD/BIW or Northrop/Ingalls. They could argue, in light of the effect on spreading of shipyard fixed costs, that building LCSs at a smaller yard might even be intended by OSD or the Navy to improve the apparent affordability of the LCS relative to other Navy shipbuilding programs while perhaps not significantly reducing overall Navy shipbuilding costs. Skeptics could also argue that the six large shipyards that have built all the Navy’s major ships in recent years¹⁰⁰ currently have much more capacity than the Navy now needs, and that building some or all LCSs in a smaller shipyard would exacerbate this excess-capacity situation by effectively creating a seventh yard with a strong dependence on Navy shipbuilding contracts.

Potential oversight questions for Congress include the following:

- What are the potential implications for the combined cost of all Navy shipbuilding programs if LCSs are built in yards other than GD/BIW or Northrop/Ingalls?

¹⁰⁰ These six yards are GD/BIW; GD/Electric Boat of Groton, CT, and Quonset Point, RI; GD/National Steel and Shipbuilding Company (NASSCO) of San Diego, CA; Northrop/Ingalls, Northrop/Avondale of New Orleans, LA; and Northrop/Newport News (NGNN) of Newport News, VA.

- What effect would building LCSs in yards other than the six yards that have built the Navy's major ships in recent years have on the balance between Navy shipbuilding capacity and prospective Navy programs for using that capacity? Would it in effect create additional yards with a strong dependence on Navy shipbuilding contracts?
- Does OSD or the Navy support building LCSs in yards other than the six major Navy shipbuilders supported in part as a strategy for improving the apparent affordability of the LCS relative to other Navy shipbuilding programs while perhaps not significantly reducing overall Navy shipbuilding costs?
- Does OSD or the Navy support building LCSs at yards other than the six major Navy shipbuilders supported in part as a strategy for pressuring GD or Northrop to reduce production capacity at their six yards so as to bring capacity more into alignment with prospective levels of Navy shipbuilding work?

Options for Congress

This section presents potential options for Congress for DD(X) and CG(X) programs, and for the LCS program.

DD(X)/CG(X) Program

Potential options for Congress on the DD(X) and CG(X) programs, some of which can be combined, include the following:

- approve the DD(X) program as proposed by the Navy and supplement the industrial base, if needed, with additional DDG-51s, additional amphibious ships, transferred LCSs, modernizations of existing Aegis ships, or Coast Guard Deepwater cutters;
- defer procurement of the second DD(X) until FY2008 to permit that ship to more fully benefit from lessons learned in building the first ship;
- procure two or more DD(X)s per year to reduce DD(X) unit procurement costs and better support the industrial base;
- build DD(X)s at a single yard, or build each DD(X) jointly at two yards;
- terminate the DD(X) program now, or after procuring one or two ships as technology demonstrators, and supplement the industrial base with additional DDG-51s, additional amphibious ships,

transferred LCSs, modernizations of existing Aegis ships, or Deepwater cutters until the start of CG(X) procurement; and

- start design work now on a new-design ship that is smaller and less expensive than the DD(X), and procure this new design, rather than DD(X)s or CG(X)s, starting around FY2011.

The following paragraphs contain additional notes on some of these options.

Options for a Smaller, Less Expensive, New-Design Ship.

Surface Combatant Of Less Than 14,000 Tons (SC(X)). One option for a smaller, less expensive, new-design ship would be a new-technology surface combatant of less than 14,000 tons displacement. Such a ship, which might be called the SC(X) (meaning surface combatant, in development) could:

- be intended as a replacement for either the CG(X) program or both the DD(X) and CG(X) programs;
- incorporate many of the same technologies now being developed for the DD(X) and CG(X), including, for example, a wave-piercing, tumblehome hull, an integrated deckhouse and apertures, radar technologies, the AGS, the advanced vertical launch system, the total ship computing environment, integrated electric-drive propulsion, and technologies (such as the autonomic fire-suppression system) permitting a reduced-sized crew;
- cost less, and perhaps substantially less, to procure than a DD(X) or CG(X);
- be similar to the DD(X) and CG(X) in terms of using a reduced-size crew to achieve annual operation and support costs that are considerably less than those of the current DDG-51 design;
- carry a payload — a combination of sensors, weapon launchers, weapons, and aircraft — that is smaller than that of the DD(X) or CG(X), but still sizeable.

A land-attack oriented version of the SC(X) might preserve the DD(X)'s two AGSs while reducing other payload elements. An air- and missile-defense version of the SC(X) would preserve DD(X)/CG(X) radar capabilities while reducing other payload elements.

The Navy in 2002 identified the following ship-design characteristics as items that, if varied, would lead to DD(X) concept designs of varying sizes, capabilities, and procurement costs:

- cruising range,
- maximum sustained speed,
- number of Advanced Gun Systems (AGSs) and AGS shells,

- hangar space for helicopters and UAVs,
- undersea warfare systems (i.e., sonars and mine countermeasures systems), and
- numbers and types of boats for special operations forces.

Using these variables, the Navy in 2002 developed notional DD(X) concept designs with estimated full load displacements ranging from 12,200 tons to about 16,900 tons. One of the concept designs, with an estimated full load displacement of about 12,700 tons, included 32 Advanced Vertical Launch System (AVLS) cells (rather than the DD(X)'s 80), 2 AGSs (like the DD(X)), 600 AGS shells (rather than the DD(X)'s 920), a maximum sustained speed a few knots lower than the DD(X)'s, and a helicopter flight deck smaller than the DD(X)'s. Another concept design, with an estimated full load displacement of about 12,200 tons, included 64 AVLS cells, 1 AGS, 450 AGS rounds, a maximum sustained speed a few knots lower than the DD(X)'s, and helicopter flight deck smaller than the DD(X)'s.

The Navy in 2003 developed another set of notional DD(X) concept designs with estimated full load displacements ranging from 11,400 tons to 17,500 tons. One of the concept designs, with an estimated full load displacement of 13,400 tons, included 64 AVLS cells, 1 AGS, and 450 AGS rounds. Another concept design, with an estimated full load displacement of 11,400 tons, included 32 AVLS cells, 1 AGS, and 300 AGS rounds.

The 2002 and 2003 notional DD(X) concept designs with displacements of less than 14,000 tons appear to have preserved other DD(X) features, such as the wave-piercing, tumblehome hull, the integrated electric drive system (though with reduced total power in at least some cases), the total ship computing environment, the autonomic fire-suppression system and other features permitting a reduced-sized crew, the DD(X) radar suite, the hull and towed-array sonars, medium-caliber guns for use against surface targets, and a helicopter hangar (though not necessarily as large a hangar as on the DD(X)).

Reducing payload DD(X)s features more extensively than in the 2002 and 2003 notional DD(X) concept designs discussed above might lead to designs with displacements of less than 12,200 or 11,400 tons. One possibility would be a ship that preserves the DD(X)'s 2 AGSs while reducing other features to minimum levels consistent with a core mission of providing naval gunfire support. Another possibility would be a ship that preserves DD(X)/CG(X) radar capabilities (but not necessarily the current DD(X) deckhouse) while reducing other features to minimum levels consistent with a core mission of serving as a radar platform for fleet air and missile defense operations. CRS on June 23, 2005, requested the Navy to provide information about the potential sizes of such ships, so as to provide a basis for better understanding the potential impact of various ship features on DD(X)/CG(X) ship size and cost. The Navy on August 4, 2005, indicated to CRS that it is reluctant to provide this information to CRS. The Navy's 2002 and 2003 notional DD(X) concept designs suggest that such ships might have displacements of less than 12,200 or 11,400 tons.

According to one press report, the Navy estimates that a ship with about 30 VLS tubes and 600 rounds of ammunition might cost about \$1.9 billion,¹⁰¹ which would be about \$200 million less than the Navy's current estimate of about \$2.1 billion for a follow-on DD(X).

The Navy has viewed DD(X) designs of less than 14,000 tons as unsatisfactory because of their reduced individual capabilities. It is not clear, however, to what degree the Navy's assessment of such designs also takes into account the differences that size (and thus unit procurement cost) can have on the total number of ships that might be procured within available resources. John Young, the Assistant Secretary of the Navy for research, development, and acquisition — the Navy's acquisition executive — reportedly has argued that procuring a smaller and less-capable alternative to the DD(X)/CG(X) would “be choosing to gamble the nation's supremacy on the seas.”¹⁰² Skeptics could argue that procuring the DD(X)/CG(X) at a rate of one per year for 23 to 30 years, which could eventually reduce the Navy's force of larger surface combatants to 35 to 67 ships,¹⁰³ would itself gamble the nation's supremacy on the seas, and that a less-expensive design, though less capable, would encourage policymakers to support a higher annual procurement rate and thereby support, over the long run, a larger surface combatant force with greater combined capability.

Roughly 6,000-Ton Frigate (FFG(X)). A second option for a smaller, less expensive, new-design ship would be a frigate intended as a replacement for both the DD(X)/CG(X) effort and the LCS program. The option for a new-design frigate was outlined in a March 2003 CBO report on surface combatants.¹⁰⁴ CBO estimated that such a ship, which it called the FFG(X), might displace about 6,000 tons. CBO estimated that a 6,000-ton FFG(X) might have a unit procurement cost of about \$700 million.

A 6,000-ton FFG(X) might be too small to be equipped with the AGS, in which case it could not provide the additional naval gunfire capability that would be provided by the DD(X). A 6,000-ton FFG(X) might, however, be capable of performing the non-gunfire missions that would be performed by both the DD(X) and the LCS. A 6,000-ton FFG(X) would could be viewed as a replacement in the surface combatant force structure for the Navy's FFG-7s and DD-963s. Since a 6,000-ton FFG(X) would be roughly midway in size between the 4,000-ton FFG-7 design and the 9,000-ton DD-963 design, it might be suitable for carrying more modern versions of the mission equipment currently carried by the FFG-7s and DD-963s.

Low-Cost Gunfire Support Ship. A third option for a smaller, less expensive, new-design ship would be a low-cost gunfire support ship — a relatively

¹⁰¹ Dave Ahearn, “Young: Navy Needs Both DD(X) For Major Threat, LCS For Terrorism,” *Defense Today*, Aug. 9, 2005.

¹⁰² *Ibid.*

¹⁰³ See earlier section on potential DD(X)/CG(X) program implications for force structure.

¹⁰⁴ U.S. Congressional Budget Office, *Transforming the Navy's Surface Combatant Force*, Mar. 2003, pp. 27-28, 63.

simple ship equipped with one or two AGSs and only such other equipment that is needed for basic ship operation. Other than the AGSs and perhaps some advanced technologies for reducing crew size and thus total life-cycle cost, such a ship could use existing rather than advanced technologies so as to minimize development time, development cost, and technical risk. Some of these ships might be forward-stationed at sites such as Guam or Diego Garcia, so as to be available for rapid crewing and movement to potential contingencies in the Western Pacific or Indian Ocean/Persian Gulf regions. The goal would be to procure specialized AGS-armed ships as a niche capability for the Navy, and then forward-station some of that capability so as to maximize the odds of being able to bring a desired number of AGSs to an overseas theater of operation in a timely manner on those occasions when it is needed.

Options for Supplemental Work for the Industrial Base.

Additional DDG-51s. Additional DDG-51s that would be procured under this option could be modified to include new technologies permitting crew size to be reduced by about 100 sailors, bringing the ship's crew size closer to the intended crew size of the DD(X) and thereby capturing much of the savings in annual operation and support costs that were to be generated by the DD(X)'s reduced crew size.¹⁰⁵

Opponents of procuring additional DDG-51s this option could argue that the Navy does not have an urgent operational need for any DDG-51s beyond those already planned for procurement, and that funding should not be spent to procure expensive Navy ships solely for the purpose of bolstering the industrial base. Supporters could argue that uncertainty over the planned size and composition of the Navy implies that the Navy might indeed have an operational need for additional DDG-51s; and that the Navy in any event would make good use of any additional DDG-51s that are procured. They might also argue that the Navy originally planned on procuring a total of about 57 DDG-51s, and that bolstering the defense industrial base consequently was an important reason, if not the primary reason, for procuring most of the DDG-51s procured in FY2004 and FY2005.

Additional Amphibious Ships. Procuring additional LHD or LHA(R) amphibious ships might occur as part of a plan for implementing the new sea basing concept for conducting expeditionary operations ashore. Procuring these ships during the FY2006-FY2011 period might in some cases be facilitated by using incremental funding or advance appropriations.

Transferred LCSs. This option would transfer production or some or all LCSs to GD/BIW, Northrop/Ingalls, or both. This would likely increase the

¹⁰⁵ GD/BIW, the lead designer of the DDG-51, has proposed modifying the DDG-51 design to permit such a reduction in crew size. GD/BIW made this proposal not to support the option described here, but rather to provide the Navy with an option for how to build the remaining DDG-51s in the Navy's ship-procurement plan, and how to modify DDG-51s already in service. A DDG-51 modified along the lines proposed by GD/BIW, however, could be procured in larger numbers to support the option described here.

construction cost of LCSs due to the higher overhead costs of GD/BIW and Northrop/Ingalls compared to the smaller yards where LCSs are currently scheduled to be built, but it could also reduce the cost of other ships being built at GD/BIW and Northrop/Ingalls (e.g., DD(X)s, amphibious ships, and Deepwater cutters) by spreading overhead costs at these yards over a larger volume of work.

Modernizations Of Existing Aegis Ships. This option could involve assigning most or all of the Navy’s planned work to modernize existing Aegis cruisers and destroyers to GD/BIW, Northrop/Ingalls, or both. It could also involve expanding the scope of the work to be done under these modernization programs.

Additional Coast Guard Deepwater Cutters. This option would involve accelerating procurement of new cutters to be procured under the Coast Guard Deepwater acquisition program.¹⁰⁶ It could also involve expanding the total number of cutters to be procured under the program.

The Coast Guard Deepwater program is a 25-year program for replacing and modernizing the Coast Guard’s aging fleet of deepwater-capable cutters, patrol boats, and aircraft. The program currently envisages procuring, among other things,

- **8 new National Security Cutters (NSCs):** 421 feet long with 3,900 ton displacement (fully loaded) (i.e., ships roughly analogous to the Coast Guard’s current high-endurance cutters); and
- **25 new Offshore Patrol Cutters:** 341-feet long with 2,900 ton displacement (fully loaded) (i.e., ships roughly analogous to today’s medium-endurance cutters).

Some supporters of the Deepwater program are interested in the idea of compressing the Deepwater acquisition period from 20 or 25 years to as few as 10 or 15 years. This idea, which would accelerate into earlier years the procurement of cutters (and aircraft) now planned for later years, would increase the annual funding requirements of the Deepwater program in the nearer term but reduce its total cost by permitting the acquisition of new cutters (and aircraft) at more efficient annual rates.

Supporters of the Deepwater program may also be interested in expanding the number of cutters to be procured under the program. They could argue that the current planned procurement totals are insufficient to meet the Coast Guard’s post-9/11 mission requirements. A September 2003 report on the Deepwater program by the RAND Corporation states:

The Coast Guard’s ambitious effort to replace and modernize many of its ships and air vehicles — conceived and put in motion before the September 11, 2001 terrorist attacks and officially known as the Integrated Deepwater System program — will not provide the USCG [U.S. Coast Guard] with adequate assets and capabilities to fulfill traditional and emerging mission demands. To satisfy

¹⁰⁶ For more on the Deepwater program, see CRS Report RS21019, *Coast Guard Deepwater Program: Background and Issues for Congress*, by Ronald O’Rourke.

these demands, the USCG will need the capabilities of twice the number of cutters and 50 percent more air vehicles than it has been planning to acquire over the next two decades. It cannot gain these capabilities merely by buying the assets in the current program over 10 or 15 years instead of over 20. Rather, it can only gain these capabilities by acquiring significantly more cutters, unmanned air vehicles and helicopters than are in the current acquisition program, or by mixing into the program other platforms and technologies that provide the same or additional capabilities.¹⁰⁷

Table 8 compares quantities of NSCs and OPCs to be procured under the Coast Guard's current Deepwater plan with RAND's estimate (based in part on work done by the Center for Naval Analyses, or CNA) of the number of NSCs and OPCs that would need to be procured to fully meet traditional and emerging Coast Guard mission demands:

Table 8. Coast Guard Deepwater Cutter Procurement Quantities

Type	Deepwater plan	RAND Estimate for Traditional Missions ^a	CNA Estimate for Emerging Missions ^b	Total (RAND + CNA)
NSC	8	35	9	44
OPC	25	36	10	46

Source: John Birkler, et al., *The U.S. Coast Guard's Deepwater Force Modernization Plan: Can It Be Accelerated? Will It Meet Changing Security Needs?*, RAND, National Security Research Division, MR-3128.0-USCG, Sept. 2003, Table 4-2.

- a. RAND estimate of numbers needed to fully meet traditional mission demands.
 b. CNA estimate of additional numbers needed to fully meet emerging mission demands.

The 90 NSCs and OPCs shown in the final column of **Table 5** have a combined light-ship displacement equal to that of 20.7 DD(X)s.¹⁰⁸ Similarly, about four NSCs or about five OPCs would have a light-ship displacement comparable to that of one DD(X). Procuring four or five NSCs and OPCs per year might thus generate about as much shipyard construction work as procuring one DD(X) per year, and procuring eight to 10 NSCs and OPCs per year might generate about as much shipyard construction work as procuring two DD(X)s per year. Building NSCs and OPC, however, would likely require a somewhat different mix of shipyard construction skills than building DD(X)s.

¹⁰⁷ John Birkler, et al., *The U.S. Coast Guard's Deepwater Force Modernization Plan: Can It Be Accelerated? Will It Meet Changing Security Needs?*, RAND, National Security Research Division, MR-3128.0-USCG, Sept. 2003.

¹⁰⁸ The NSCs have a light-ship displacement of 3,290 tons; the OPCs have a light-ship displacement of 2,350 tons. Forty-four NSCs and 46 OPCs would thus have a combined light-ship displacement of 251,000 tons, which is equivalent to the light-ship displacement of 20.7 DD(X)s.

Northrop Grumman's Ship Systems (NGSS) division, which includes Northrop/Ingalls, is the co-leader, along with Lockheed Martin, of the team selected by the Coast Guard as the prime contractor for the Deepwater program. Accelerating and expanding procurement of Deepwater cutters could thus provide significant amounts of additional shipbuilding work to Northrop/Ingalls. If the total number of cutters to be procured is expanded beyond the currently planned figure, it might also be possible to award some cutter construction contracts to GD/BIW, if the various parties now involved in the Deepwater program could agree to the idea.

The Coast Guard is part of the new Department of Homeland Security (DHS). Coast Guard programs are therefore funded primarily through the DHS budget rather than the DOD budget. Accelerating and expanding the cutter portion of the Deepwater program as a means of compensating for a reduced DD(X) procurement rate or the termination of the DD(X) program could therefore require close coordination between DHS and DOD, and between the various congressional committees that oversee the Coast Guard and Navy budgets.

LCS Program

Potential options for Congress on the LCS program, some of which can be combined, include the following:

- shift procurement funding for LCS mission modules from the Other Procurement, Navy (OPN) account to the Navy's ship-procurement account (the Shipbuilding and Conversion, Navy [SCN] account) to provide more visibility to LCS mission module procurement costs and to the combined procurement cost of LCSs and LCS mission modules;
- procure a few LCSs and then evaluate them in exercises before deciding whether to put the LCS into larger-scale series production;
- procure LCSs at a rate of up to 10 per year to get LCSs into the fleet sooner and achieve better production economies of scale;
- procure LCSs at a rate of less than five per year so as to reduce annual LCS funding requirements;
- terminate the LCS program (and also the DD(X) program) and instead procure a new-design frigate as a common replacement; and
- terminate the LCS program and invest more in other littoral-warfare improvements.

The following paragraphs contain additional notes on some of these options.

Procure a Few and Then Evaluate. Under this option, a few LCSs would be procured and evaluated in tests and exercises while judgment is reserved on the question of whether to approve the LCS program as a series-production effort that could lead to the procurement of 55 ships. This option was proposed in a May 2003

CSBA report on anti-access/area-denial challenges and a February 2004 CSBA report on the LCS program. The February 2004 report states:

Despite its promise, the LCS represents the first small US battle force capable combatant to be designed and built by the Navy and the US shipbuilding industry in over 60 years. Moreover, the LCS battle network system will introduce an entirely new concept of battle modularity that has no US or foreign naval precedent. There are therefore a number of unresolved issues about this ship and its associated organizational and support structure. Many of these issues appear to be irreducible through paper analysis. Therefore, a second proposition is that *the LCS program must undergo thorough operational experimentation in addition to any continued analytical study.*

Current Navy LCS production plans appear to be overly ambitious. Accordingly, the Navy should consider a modification to its current plans to allow more thorough testing of the ship as a battle network component system.

— Given the many degrees of design freedom in meeting the Flight 0 LCS requirements (six initial designs and three remaining designs, including a steel semi-planing monohull, a trimaran, and a surface effects ship), the Navy would be advised to build at least two different operational prototypes. However, choosing two different prototypes will not completely resolve many of the operational issues. It seems clear that only by testing squadron prototypes will the Navy be able to fully resolve some of the outstanding issues surrounding the LCS and its support structure.

— The currently approved shipbuilding profile for the LCS could be modified to build two operational squadrons and to reduce the risk associated with the current, significantly compressed, LCS program. Assuming the Navy down-selects to two different designs, it should award one competitor a Research and Development (R&D) contract for a ship in FY05 and a follow-on version in FY06 paid for by ship construction money. Similarly, it should then award a second competitor a R&D ship contract in FY06 and a follow-on version in FY07. In this way, the Navy could have two different two-ship squadrons by FY08, which would seem to be the minimum size needed to conduct comparative squadron operational tests. The Navy could also opt for slightly larger squadrons by dividing the planned ships in FY08 and FY09 among the builders. Once the squadrons were organized, however, the Navy should then delay the final production decision for at least one year to conduct meaningful operational testing.

A counter argument is made by those who believe the fleet is too small for its current global commitments, particularly those associated with the global war on terror. They argue that the LCS is needed now, in numbers. However, the Chief of Naval Operations undercut this position when he recently elected to retire some older ships early, and to accept a smaller fleet in the near term in order to free up the resources required to build up the fleet over the long term. Moreover, current strategic circumstances indicate the Navy appears to have some time before having to confront a serious naval competitor in the littorals. As a result, delaying the final LCS production run for a short period while squadron prototypes are tested would appear to appreciably lower the program's

developmental risk without appreciably raising the fleet's overall operational risk.¹⁰⁹

Procure New-Design Frigate (FFG(X)) Instead. This is the same frigate discussed earlier as a new-design alternative to the DD(X) and CG(X).

Invest in Other Littoral-Warfare Programs. Other littoral-warfare programs in which additional funds could be invested as an alternative to the LCS include the following:

- littoral-oriented aircraft, such as certain kinds of helicopters;
- littoral-oriented sensors and weapons for airplanes, helicopters, and submarines;
- a non-combat littoral *support* craft (LSC) for deploying helicopters and unmanned vehicles into littoral waters; and
- unmanned vehicles that can be launched from aircraft, submarines, or other larger surface ships (either existing types or LSCs) operating further from shore than would the LCS.

The idea of a non-combat LSC is presented as an option in the May 2003 CSBA report, which states:

Helicopters and unmanned surface and air systems, employed by large multi-mission combatants or sea base support ships operating within the protected confines of the sea base, and augmented by submarines and unmanned underwater vehicles, would appear to be a viable, lower risk option than those outlined in DON plans. Such an option might forego a littoral combat ship, and instead pursue a vessel along the lines of the littoral support craft (LSC) studied by the Office of Naval Research since 1997, or HSVs [high-speed vessels] like the HSV-X1, a high-speed wave-piercing catamaran leased by the Navy in 2001. Like the LCS, the LSC and HSV are both designed to operate at high speeds, but they both trade stealth for larger deck areas and more storage volume. Both would be able to employ helicopter detachments and unmanned vehicle detachments, or both, in a maritime AD [area-denial] environment — and in larger numbers than could be carried by an LCS. These detachments would operate from roll-on, roll-off container vans. In lower threat environments, or once maritime AD threats had been rolled back, they could then perform important logistics functions in support of the sea base, serving as high speed ship-to-shore delivery craft....¹¹⁰

A decision to pursue this option could reflect a view that one or more of these alternative approaches represent a better or more promising approach than the LCS for performing littoral-warfare missions.

¹⁰⁹ Robert O. Work, *Naval Transformation and the Littoral Combat Ship*, Center for Strategic and Budgetary Assessments, 2004, p. vi., emphasis as in the original. The May 2003 CSBA report on anti-access/area-denial challenges is: Andrew Krepinevich, Barry Watts, and Robert Work, *Meeting the Anti-Access and Area-Denial Challenge*, Center for Strategic and Budgetary Assessments, 2003.

¹¹⁰ *Ibid.*, op. cit., p. 59, emphasis as in the original.

FY2006 Legislative Activity

DD(X)/CG(X) Program

H.R 1815/S. 1042 (FY2006 Defense Authorization Bill). The FY2006 defense authorization bill (H.R. 1815) as reported by the **House Armed Services Committee** (H.Rept. 109-89) includes a provision (Section 123) that limits the procurement cost of the “future major surface combatant, destroyer type,” to \$1.7 billion per ship. The provision also directs the Navy to develop an acquisition plan for a future major surface combatant, destroyer type, that uses technologies from the DD(X) and CG(X) programs, is at least as capable as the Navy’s current Arleigh Burke (DDG-51) class Aegis destroyer, and would be ready for lead-ship procurement in FY2011. Since the current DD(X) design likely could not be built for \$1.7 billion, Section 123 would effectively restructure the DD(X) program into an effort aimed at developing a new surface combatant design that could meet the \$1.7-billion cost limit. Such a ship would likely be smaller and less capable in some respects than the DD(X). With a capability at least equal to that of the DDG-51 design, however, it would still have a substantial capability. The bill as reported recommends no FY2006 advance procurement funding for the DD(X) program and reduces the program’s FY2006 research and development request to \$700 million. The bill would also authorize \$2.5 billion for procurement of two additional DDG-51s, to help support the surface combatant industrial base.

Section 123 states:

SEC. 123. FUTURE MAJOR SURFACE COMBATANT, DESTROYER TYPE.

(a) Limitation of Costs- Except as provided in subsection (b), the total amount obligated or expended for procurement of each ship for the future major surface combatant, destroyer type, may not exceed \$1,700,000,000 (such amount being the estimated total procurement end cost of that ship in the fiscal year 2006 budget).

(b) Adjustment of Limitation Amount- The Secretary of the Navy may adjust the amount set forth in subsection (a) for the ship type referred to in that subsection by the following:

(1) The amounts of increases or decreases in costs attributable to economic inflation after September 30, 2005.

(2) The amounts of increases or decreases in costs attributable to compliance with changes in Federal, State, or local laws enacted after September 30, 2005.

(c) Written Notice of Change in Amount- The Secretary of the Navy shall annually submit to Congress, at the same time as the budget is submitted under section 1105(a) of title 31, United States Code, written notice of any change in the amount set forth in subsection (a) during the preceding fiscal year that the Secretary has determined to be associated with a cost referred to in subsection (b).

(d) Authorization of Appropriations- Of the amount provided in section 201(2) for Research and Development, Navy, for fiscal year 2006, \$700,000,000 is

available for technology development and demonstration for the ship referred to in subsection (a).

(e) Acquisition Plan- In developing the acquisition plan for the future major surface combatant, destroyer type, the Secretary shall ensure that the resulting acquisition program —

(1) uses technologies from the DD(X) and CG(X) programs, as well as any other technology the Secretary considers appropriate;

(2) has an overall capability not less than that of the Flight IIA version of the Arleigh Burke (DDG-51) class destroyer; and

(3) would be ready for lead-ship procurement not later than fiscal year 2011.

H.Rept. 109-89 states:

The committee is deeply concerned with the skyrocketing costs of weapon systems that cannot be explained by inflation or by reduced economies of scale. In many instances, these increases result from the addition of costly, and often unneeded, requirements to the Department's most expensive platforms. To affect the changes proposed in this bill, both the Department and Congress must accept that current DOD acquisition culture and processes are no longer affordable....

The committee is particularly concerned by the Navy's rising shipbuilding costs and by recent statements from the Navy's officials that they are uncertain about what to do about the problem. With an annual shipbuilding budget of approximately \$10.0 billion, the committee is concerned with the amount of capability and military presence that can be maintained with new weapons systems. For example, the proposed Future Major Surface Combatant (DD(X)), has price estimates of over \$3.0 billion per ship. The committee is also concerned with the effect the Navy's procurement strategy will have on the shipbuilding industrial base. These rising costs threaten to undermine the Navy's shipbuilding program, putting future naval capabilities in jeopardy.

This year, the committee asks the fundamental question of how the Navy's appetite for "mega-ships" will affect the industrial base and sustain production rates necessary to deploy an operational fleet of sufficient size to meet global commitments. The committee believes that early designs for many platforms successfully addressed the missions of the global war on terrorism by being light, agile and cost-effective. However, the committee notes with dismay that costly features redundantly supported by other platforms and systems are now contributing to spiraling program costs. (Pages 11-12)

The FY2006 defense authorization bill (**S. 1042**) as reported by the **Senate Armed Services Committee** (S.Rept. 109-69 of May 17, 2005) contains a provision (Section 121) that prohibits a winner-take-all acquisition strategy for the DD(X). The report recommends increasing the DD(X) program's FY2006 advance procurement funding request by \$50 million, with the additional \$50 million to be used for the second DD(X), and recommends increasing the program's FY2006 research and development funding request by \$10 million.

H.R. 2863 (FY2006 Defense Appropriations Bill). The **House Appropriations Committee**, in its report (H.Rept. 109-119 of June 10, 2005) on

H.R. 2863, recommends deleting the \$716 million FY2006 advance procurement funding request for the DD(X) program and rescinding the program's \$304 million in FY2005 advance procurement funding, "consistent with the recommendations of the House in H.R. 1815" (page 146); reducing DD(X) FY2006 research and development to \$670 million; and adding \$50 million in FY2006 research and development funding for the CG(X) program (page 251). The report states:

The DD(X) program has encountered serious problems over the past year, on two separate fronts:

Outyear funding and acquisition strategy. — When internal budget decisions in late 2004 reduced the planned buy of this ship class to one per year, unit costs rose significantly, causing the Navy to propose an early downselect and "winner take all" competition. This change to the program of record was denied by the Congress. With such low quantities, ships included in the current FYDP would cost approximately \$2.75 billion each. This is double the cost of DDG — 51 destroyers procured in fiscal year 2005.

Technological difficulties. — The development program has run into difficulties over the past year. The integrated power system, the volume search radar, the peripheral vertical launch system, and the integrated deckhouse have all experienced problems. Although not unusual for a program of this size and complexity, these difficulties highlight the fact that much development work remains to be done. In addition, several changes have added weight to the ship design, which raises technical risk and reduces flexibility for potential changes in the future.

Considering the uncertainty in this program and the lack of authorization, the Committee believes the program is likely to be restructured, and a new cost and acquisition strategy developed, before proceeding to advance procurement. (Pages 146-147; italics as in the original)

The report also states:

The Committee recommends \$670,000,000 for further development of the next generation DD(X) destroyer. As discussed under 'Shipbuilding and conversion, Navy', this program has experienced numerous difficulties over the past year, and the total requirement for these vessels is still uncertain. Despite these issues, however, the Committee believes there is value in keeping the DD(X) development effort moving forward. In addition, many of these technologies are expected to have utility for the next generation CG(X) cruiser, currently funded for lead ship procurement in fiscal year 2011 and discussed further below. Considered together, the bill includes \$750,000,000 for development of the DD(X) and CG(X).

CG(X)

The Committee recommendation accelerates concept design, concept studies, and other development work for the CG(X) next generation cruiser. Given the age of the current CG — 47 Ticonderoga class and the potential use of CG(X) to fulfill ballistic missile defense and other missions, the Committee believes it is imperative to accelerate this work. The Committee bill raises this funding from \$30,000,000 to \$80,000,000. (Page 251)

The **Senate Appropriations Committee**, in its report (S.Rept. 109-141 of September 29, 2005) on H.R. 2863, recommended increasing the DD(X) program's \$716 million advance procurement funding request by \$50 million (page 124), and the program's \$1,115 million research and development funding request by \$13 million (pages 194 and 201). Of the additional \$13 million, \$11 million is for permanent magnet motor development work, and \$2 million is for "naval smartships that anticipate and manage."

H.R. 1268/P.L. 109-13 (FY2005 Emergency Supplemental). The conference report (H.Rept. 109-72) on the Emergency Supplemental Appropriations Act for 2005 (H.R. 1268/P.L. 109-13) contains a provision (Section 1019) that states:

PROHIBITION ON COMPETITION OF THE NEXT GENERATION DESTROYER (DD(X))

SEC. 1019. (a) No funds appropriated or otherwise made available by this Act, or by prior Acts, may be obligated or expended to prepare for, conduct, or implement a strategy for the acquisition of the next generation destroyer (DD(X)) program through a winner-take-all strategy.

(b) WINNER-TAKE-ALL STRATEGY DEFINED- In this section, the term 'winner-take-all strategy', with respect to the acquisition of destroyers under the next generation destroyer program, means the acquisition (including design and construction) of such destroyers through a single shipyard.

This provision would effectively prohibit the Navy from using a winner-take-all competition for the right to build all DD(X)s. The provision does not prohibit the Navy from shifting to a DD(X) acquisition strategy that limits the second shipyard's involvement to building only one ship in the DD(X) program.

The Senate report on the bill (S.Rept. 109-52) contains also states:

DD(X) Integrated Power System. — Land-based testing of the Integrated Power System for DD(X), the next-generation Navy destroyer, is scheduled for this summer. During this testing, the Navy plans to use a fall back motor option instead of the Permanent Magnet Motor [PMM] being developed as part of the DD(X) program. The Committee is aware the PMM is significantly lighter and smaller than the fall back option and is much more efficient than any other motor option. The Committee, therefore, directs the Navy to continue PMM development efforts and evaluate conducting land-based testing of the PMM prior to Production Readiness Review [PRR]. (Page 25; italics and bracketed material as in the original)

H.Con.Res. 95. The conference report (H.Rept. 109-62) contains a provision (Section 507) stating:

SEC. 507. SENSE OF THE SENATE REGARDING THE ACQUISITION OF THE NEXT GENERATION DESTROYER (DDX).

(a) SENSE OF THE SENATE- It is the sense of the Senate that —

(1) it is ill-advised for the Department of Defense to pursue a winner-take-all strategy for the acquisition of destroyers under the next generation destroyer (DDX) program; and

(2) the amounts identified in this resolution assume that the Department of Defense will not acquire any destroyer under the next generation destroyer program through a winner-take-all strategy.

(b) **WINNER-TAKE-ALL STRATEGY DEFINED-** In this section, the term 'winner-take-all strategy', with respect to the acquisition of destroyers under the next generation destroyer program, means the acquisition (including design and construction) of such destroyers through a single shipyard.

This provision was added to the Senate version of the bill (S.Con.Res 18) on March 17, 2005, an amendment (S.Amdt 182) that became Section 510 of the Senate version of the bill.

LCS Program

H.R. 1815/S. 1042 (FY2006 Defense Authorization Bill). H.R. 1815 as reported by the **House Armed Services Committee** (H.Rept. 109-89) contains a provision (Section 124) that limits the procurement cost of each LCS, including its mission modules, to \$400 million. The report also recommends increasing the research and development funding request for the LCS program by \$12 million to fund work on high-strength composite material. (Page 165)

In its report (S.Rept. 109-69) on **S. 1042**, the **Senate Armed Services Committee** stated:

The budget request included \$36.8 million in Other Procurement, Navy (OPN), for mission modules for the littoral combat ship (LCS). These mission modules will enable the LCS to operate in the littorals by providing capability in the mine warfare, small boat neutralization, and anti-submarine warfare missions. The budget request did not include funding for a spare engine for the first ship of the class, which will use the MT30 marine gas turbine engine. If there were a main engine casualty after delivery of the ship, much valuable time would be lost in the testing and validation of its concept of operations without a spare engine. The committee recommends an increase of \$8.6 million in OPN for a spare MT30 marine gas turbine engine for the LCS. (Pages 72-73)

S.Rept. 109-69 also stated:

The Navy recently completed construction of the experimental littoral [support] craft [or LSC-X, also known as the X-craft] and has been authorized to procure one flight 0 littoral combat ship (LCS). Funding for the second flight 0 vessel from the second contractor team is included in the fiscal year 2006 budget request. These ships were intended to provide experience upon which the Navy would base decisions on how to proceed with acquisition of flight 1 LCS vessels, now scheduled to begin in fiscal year 2008.

The original plan put forth by the Navy implied that the contracts for flight 1 vessels would be awarded competitively. The Navy now appears to be

changing the acquisition approach to narrowing the selection of flight 1 proposals to a selection from between the two successful bidders for the flight 0 program. The committee understands that this could be the most convenient approach from an administrative standpoint, but is concerned that this would discourage other potential contractor teams from continuing work to mature concepts and technologies for potential implementation on later LCS vessels.

Therefore, the committee directs the Navy to report to the congressional defense committees at the same time as the submission of the fiscal year 2007 budget on its acquisition strategy for the flight 1 portion of the LCS program. That report should provide details on the testing and experimentation that the Navy intends to conduct prior to awarding the flight 1 contracts; the acquisition strategy for acquiring flight 1 vessels, including any reasons for having changed that strategy if it has changed; and the Navy's plans for transitioning technologies from other Navy research and development activities, with particular emphasis on technologies being developed in the DD(X) program that may be appropriate for applying to the LCS program. (Page 110)

FY2006 Defense Appropriations Bill (H.R. 2863). The **House Appropriations Committee**, in its report (H.Rept. 109-119 of June 10, 2005), recommends approving the program's research and development funding request (page 251), which includes funds for building the second LCS, and adding \$440 million in the SCN account for the procurement of two additional LCSs, for a total FY2006 procurement of three LCSs (page 146). The report states:

The Committee remains very supportive of the LCS program, and believes that further procurement in fiscal year 2006 is prudent and reasonable given the status of the program at this point in time. The Committee directs that, prior to obligation of SCN funds for the third and fourth 'flight zero' LCS ships, the Navy certify in writing to the congressional defense committees that the ship designs from each prime contractor are sufficiently stable to allow further construction. The Committee also believes that, while the LCS ship itself is of stable and mature design, the mission modules essential to LCS warfighting capabilities are less mature. A number of these technologies have not been demonstrated in an operational environment, and cost estimates for the mission modules appear immature as well. To address this issue, the Committee directs the Navy to submit, not later than February 1, 2006, a report on the development and procurement plan for LCS mission modules, including a description of the development status of each subsystem. The report shall include a schedule showing how production of those modules align with planned LCS ship delivery schedules and an allocation scheme showing how modules would be allocated among LCS-class ships. (Page 146; see also page 251)

The **Senate Appropriations Committee**, in S.Rept. 109-141 on **H.R. 2863**, recommended increasing the LCS program's \$576 million research and development funding request by \$5 million for remote operation of active sonar technology." (Pages 192 and 200) The committee stated:

The Committee remains supportive of the LCS program and the unique warfighting capabilities these small modular combatants promise to provide. However, the Committee is concerned about the lingering instability of program requirements and thus costs. Since program inception, the total number of LCSs

reportedly required to attain an effective warfighting capability has fluctuated significantly. Such fluctuations create concern that LCS is being used as a mechanism to artificially inflate the total number of ships in an already unstable shipbuilding program. The Committee remains focused on the warfighting prowess each ship and submarine provides the fleet rather than on the total number of vessels in the Navy's inventory. The Committee views the LCS as a supplement to naval warfighting rather than a replacement for major combatants. In terms of program costs, the Committee understands that both hull and mission module performance specifications and thus projected costs for the LCS program are dramatically increasing. The Committee reminds the Navy that the appeal of the LCS is its relative simplicity of design and "low cost." (Page 87)

Prior-Year Legislative Activity

DD(X)/CG(X) Program

FY2005.

Authorization. The House Armed Services Committee, in its report (H.Rept. 108-491) on the FY2005 defense authorization bill (H.R. 4200), recommended disapproval of the \$221.1 million in the DD(X) program's FY2005 funding request for beginning detailed design, non-recurring engineering work, and construction of the lead DD(X). The committee recommended deferring the initiation of construction of the lead DD(X) to FY2006. The report stated:

The committee has strongly supported the DD(X) program since its inception....

In its report, 'Defense Acquisitions — Assessments of Major Weapons Programs,' dated March 2004, the General Accounting Office (GAO) assessed the DD(X) as entering system development with none of its 12 critical technologies fully mature (and thereby subject to a higher risk of completing development at the planned cost and schedule). The program manager is pursuing risk mitigation by constructing and testing engineering development models for the critical technologies; however, the acquisition strategy calls for engineering development model construction and testing to be done concurrently with system design. The decision to reduce the weight of the ship prompted redesign of the advanced gun system and hull form engineering development models. Because of schedule slippage, only two engineering development models (the hull form and the integrated power system) would be mature by the award of the lead ship construction contract, currently planned for September 2005. Current testing schedules call for the integrated power system, dual band radar suite, total ship computing environment, and peripheral vertical launching system to continue development beyond the lead ship production decision. In the GAO's view, should any of these innovative technologies encounter challenges that cannot be accommodated within the current design margins, redesign of other technologies and of the integrated ship system may be needed. Redesign would likely result in additional costs and schedule delays and affect the planned installation schedule. In addition, because the DD(X) acquisition strategy focuses on developing and maturing technologies that could be leveraged across multiple ship classes, delay in the maturation of critical technologies would increase the risk for other development programs.

The committee notes that the engineering development models of the integrated power system and the advanced gun system are scheduled to complete land-based testing by the end of fiscal year 2005 and the multi-function radar will have completed two-thirds of its land-based and at-sea testing by that date. The committee believes that it would be prudent to delay the award of the contract for construction of the first ship of the class from fiscal year 2005 to fiscal year 2006 in order to accommodate any results from the testing of these critical systems in the design of the ship prior to beginning construction. The committee recommends that the DD(X) program be restructured to reduce concurrency and develop technology “off-ramps” for technologies that do not mature.

Accordingly, the committee recommends a decrease of \$221.1 million in PE 64300N and deferring the initiation of construction of the lead ship from fiscal year 2005 to fiscal year 2006. (Pages 174-175).

The committee recommended a \$10-million increase in funding for developing the DD(X)'s AGS (page 166) and a \$2-million increase for developing and demonstrating improvements in manufacturing methods and process technology for high power switches and conversion equipment to be used in the DD(X) program (page 191).

The report also stated:

The committee has observed the increasing use of funds designated for research and development (R&D) purposes to acquire operational platforms. The fiscal 2005 budget proposal would take the practice to unprecedented levels, with three DD(X) and two LCS ships, three E — 2C aircraft, and eleven VH-XX helicopters proposed for acquisition with R&D funds.

The use of R&D funds for prototypes and truly developmental items is both proper and prudent. This practice also makes sense when, following the completion of testing, a test asset still has useful capability to bring to the operational fleet. However, it is difficult to believe that nearly half of the VH-XX fleet, for example, qualifies as prototypes or dedicated test assets. The fact that the platforms may occasionally be used for some testing purposes does not, in the committee's view, qualify them as research craft. Indeed, the committee would be surprised were the department actually proposing to regularly carry the President on prototype aircraft.

While the committee recognizes the increased flexibility of R&D funds in acquiring platforms, there is concern that placing acquisition programs in the R&D budget, particularly at their early, least stable stage, threatens other programs, particularly in science and technology. The R&D budget is a very small pool from which to fund acquisitions of large items like ships, and as procurements are must-pay bills, typical procurement cost-growth would put the rest of the R&D budget at risk.

The committee's action with regard to particular programs funded in R&D should therefore be seen not only as a reflection of the merits of those items, but also as an expression of concern over the rapidly expanding portion of the R&D budget being used for purposes other than R&D. (Pages 248-249)

The Senate Armed Services Committee, in its report (S.Rept. 108-260) on the FY2005 defense authorization bill (S. 2400), approved the start of construction of the lead DD(X) in FY2005 and increased the program's FY2005 funding request by \$99.4 million to begin design work on the second DD(X) (page 173). The committee included a provision in the bill (Section 211) authorizing the use of FY2005 funds for the second DD(X) and stating that \$99.4 million shall be available in FY2005 for the detail design of the second DD(X). In discussing Section 211, the committee's report stated:

The Committee on Armed Services of the Senate, in its report (S.Rept. 108-46) to accompany the National Defense Authorization Act for Fiscal Year 2004, directed the Secretary of the Navy to provide a report on the viability of the surface combatant industrial base, with specific focus on the transition from the DDG — 51 Arleigh Burke-class destroyers to the DD(X). This report was delivered to the congressional defense committees in March 2004. The report included a workload analysis that showed that if the DD(X) schedule slips, the shipyard that is scheduled to build the follow ship, the second destroyer of the DD(X)-class, could experience significant workload issues which, depending on the length of the schedule slip, could affect the financial viability of the this shipyard. This is exacerbated by the fact that this shipyard's workload and resultant viability is solely dependent on the design and construction of surface combatants.

The committee remains concerned about the viability of the competitive industrial base for the design and construction of surface combatants for the Navy. According to the Future Years Defense Program (FYDP), there will be no surface combatants in the budget request for fiscal year 2006. The budget request for fiscal year 2005 includes \$3.5 billion for the construction of the last three DDG — 51 Arleigh Burke-class destroyers, bringing the inventory to 62 of these multi-mission ships. The next class of destroyers will use the DD(X) design. The first of these ships is being funded with incremental RDTE,N funding starting with \$221.1 million of construction money in fiscal year 2005. If the current schedule is maintained, the contract for the second ship of the DD(X)-class will not be awarded for about eighteen months, and is expected in fiscal year 2007 using Shipbuilding and Conversion, Navy (SCN), funding. This gap could jeopardize the design and production capability of the shipyard scheduled for the second ship.

The Navy had originally planned to compete the construction phase of the first DD(X), but recently made a decision to award that contract on a sole-source basis to the shipyard with lead design responsibility. The committee expects the Navy to take all actions necessary to ensure the viability of the second shipyard in order to maintain a healthy and competitive industrial base for surface combatants. The committee believes that the Navy is responsible for ensuring that both shipyards share equitably in the DD(X) design effort from this point forward to facilitate a smooth transition from design to fabrication to construction of DD(X).

The committee believes that if the flexibility provided by using RDTE,N funds for the lead ship at the lead shipyard is justified, that same flexibility is necessary for the follow ship at the second shipyard as well.

The budget request included \$1.4 billion in PE 64300N for DD(X) total ship engineering. The committee recommends an increase of \$99.4 million in PE 64300N to accelerate design efforts at the follow shipyard for the second DD(X)-class destroyer, for the purpose of sustaining a competitive industrial base for surface combatant ships. (Pages 130-131)

The conference report (H.Rept. 108-767) on H.R. 4200 (P.L. 108-375) states:

The conferees have strongly supported both the DD(X) program and the Navy's acquisition strategy, which uses the construction and test of engineering development models (EDMs) to mitigate technical risk.

The conferees are aware of the assessment by the Government Accountability Office (GAO) of the maturity of 12 technologies critical to DD(X), as the program entered the system development and demonstration (SDD) phase, and the GAO's further assessment that DD(X) technology maturity and design stability will not be demonstrated before the Milestone B decision scheduled for March 2005. Many of the tests to demonstrate technical maturity will occur around the time of the critical design review (CDR) late in fiscal year 2005. Program officials acknowledge the risks associated with the advanced technologies, but the conferees believe that taking such risks is warranted to ensure that the DD(X) technologies are not obsolete, and that the Navy has taken adequate steps to mitigate the risks before ship construction begins. These steps include the identification of fall back options if new technologies are not available.

In particular, the conferees note the concerns expressed in the House report (H.Rept. 108-491) regarding the schedule for land-based testing of the integrated power system and advanced gun system EDMs. These two system EDMs are not scheduled to complete land-based testing until late in fiscal year 2005, coincident with the DD(X) CDR.

The conferees agree that the integrated power system and advanced gun system are key elements which drive much of the DD(X) design, and that land-based testing of these systems should be essentially complete prior to the DD(X) CDR. The conferees direct the Secretary of the Navy, in coordination with the Under Secretary of Defense for Acquisition, Technology and Logistics, to report to the congressional defense committees following completion of the DD(X) CDR. That report should include the results of the CDR and an assessment of the readiness of the program to proceed beyond the SDD phase of the program.

The conferees share the concerns raised in the Senate Report (S.Rept. 108-260) regarding maintaining the viability of a competitive industrial base for the design and construction of Navy surface combatants. As noted in that report, the Navy had originally planned to compete the construction phase of the DD(X), but made a decision to award that contract on a sole-source basis to the shipyard with lead design responsibility. The conferees expect the Navy to take all actions necessary to ensure the viability of the second shipyard in order to maintain a healthy and competitive industrial base for surface combatants. (Pages 590-591)

Appropriation. The House Appropriations Committee, in its report (H.Rept. 108-284) on the FY2005 defense appropriations bill (H.R. 4613), recommended deferring the initiation of construction of the lead DD(X) from

FY2005 to a future year and reducing the program's FY2005 funding request by a net \$248.8-million. The report stated:

The Committee believes the DD(X) development schedule does not provide sufficient time for the proper maturation and testing of transformational technologies prior to initiating construction of the first ship, presenting a potential 'rush to failure.' According to the Navy's schedule, detailed design drawings necessary for the construction of the ship will not be completed prior to the award of this initial construction contract. It is the Committee's view that it is not prudent to proceed with the construction of a ship without first completing detailed design drawings and concluding basic testing of the technologies that will be integrated into the ship. According to the General Accounting Office, none of the twelve critical technologies for DD(X) will reach maturity prior to entering product development. Further, based on the Navy's schedule, land based testing of two critical technologies will not be complete prior to the conclusion of the Critical Design Review (CDR).

Accordingly, the Committee recommends eliminating the \$221,000,000 requested for the first increment for construction of the first DD(X) ship. This recommendation is based on the Committee's judgment that the highly concurrent, extremely aggressive DD(X) development program does not support a fully informed acquisition decision in fiscal year 2005, making a request for construction funding premature. The Committee believes that additional time for development prior to the construction contract award will provide time for the program to stabilize and for the maturation and testing of critical technologies.

The Committee also recommends a reduction of \$43,800,000 from the \$191,400,000 requested for Critical Design Review (CDR), scheduled for the last quarter of fiscal year 2005. This recommendation reflects the Committee's conclusion that the CDR schedule must slip in order to complete land-based testing of critical components of the leading technologies prior to completion of CDR. The Committee directs the Navy to extend the time frame for the CDR to ensure that land-based testing has been completed on all twelve DD(X) critical technologies prior to the completion of CDR.

Finally, the Committee recommends an increase of \$13,000,000 only for the completion of the DD(X) alternative engine construction and its delivery to the Navy for testing, an increase of \$1,000,000 for Floating Area Networks, and an increase of \$2,000,000 for smart ships that anticipate and manage. (Pages 287-288. See also page 278.)

The report also stated:

The Committee recommends an increase of \$125,000,000 to initiate advance procurement of materiel necessary for the construction of an additional DDG — 51 Guided Missile Destroyer in the 2006 or 2007 budget.

This recommendation is based on the Committee's view that the additional system development and testing required for the DD(X), the next generation destroyer, will lead to a delay in the Initial Operating Capability of the DD(X). With this delay, the Committee believes operational requirements of the Navy necessitate the construction of at least one more DDG — 51.

The Committee expects the Navy to fully fund the construction of this DDG — 51 in a future budget request. (Pages 164-165)

The Senate Appropriations Committee, in its report (S.Rept. 108-284) on the FY2005 defense appropriations bill (S. 2559), supported the program's research and development funding request but stated that it believes that construction of the lead ship should be funded in the Navy's shipbuilding account. The committee approved the total amount requested for the program, but transferred the \$221 million intended for initiating lead ship detailed design and construction to the Navy's shipbuilding account. The committee also recommended an additional \$99.4 million in the shipbuilding account as advance procurement funding for the second DD(X), which the report stated is to be built at a second-source shipyard. The report stated:

The Committee recommends supporting the President's budget request for the DD(X) Destroyer program but holds that construction of the ship should be funded within the shipbuilding and conversion account in a manner consistent with prior shipbuilding programs. The Committee is encouraged by the Navy's willingness to propose nontraditional means of overcoming the enormous financial burden that ship cost overruns and prior year bills place upon the shipbuilding budget, but finds that such costs would not be eliminated but rather obscured by funding ship construction in the research and development account. Therefore, the Committee recommends transferring \$221,116,000 of research and development funding to the Shipbuilding and Conversion, Navy account and directs the Navy to fund future ship construction programs within the shipbuilding and conversion account. In addition, the Committee recommends providing \$99,400,000 in advance procurement funding for the second DD(X) ship to be constructed at a second source shipyard. (Page 83. See also page 157.)

The conference report (H.Rept. 108-622) on H.R. 4613 (P.L. 108-287) provides \$350.5 million in advance procurement (AP) funding in the SCN account for the DD(X) program — \$221.1 million for the lead DD(X) (transferred from the Navy's research and development account), and \$84.4 million for the second DD(X). The designation of this funding as AP funding implies that the nominal year of procurement for both ships is not FY2005, but rather a future fiscal year. The report stated:

The conferees agree to provide a total of \$305,516,000 for advance procurement for the DD(X) class of ships instead of \$320,516,000 as proposed by the Senate and no appropriation as proposed by the House. The conferees direct the Navy to include future funding requests for the DD(X) in the Shipbuilding and Conversion, Navy appropriation.

Within the funds provided, \$221,116,000 is only for design and advance procurement requirements associated with the first ship of the DD(X) class and \$84,400,000 is only for design and advance procurement requirements associated with construction of the second ship at an alternative second source shipyard. The conferees direct that no funds shall be available for the procurement of long lead time material for items that are dependent upon delivery of a DD(X) key technology unless that technology has undergone testing, thereby reducing risk to overall program costs.

The conferees direct that full funding of the remaining financial requirement for these ships, not including traditional advance procurement requirements, shall be included in a future budget request. (Page 188; see also pages 185 and 187.)

The conference report also provides \$1,176.5 million in research and development funding for the DD(X) program. After accounting for the \$221.1 million transferred to the SCN account, this equates to a \$34-million reduction from the request. The report stated:

The conferees agree to provide \$1,176,469,000 for the DD(X) program instead of \$1,182,785,000 as proposed by the House and \$1,210,469,000 as proposed by the Senate.

The conferees agree that prior to the completion of the Critical Design Review (CDR), the Navy should complete land-based testing of the Advanced Gun System (AGS) and the Integrated Power System (IPS). The conferees believe it is not advisable to complete CDR prior to ensuring that at least two of the 12 key technologies have completed testing due to historical trends of ship cost growth based on re-design to accommodate changes in technological requirements.

The conferees direct the Navy to submit a report to the congressional defense committees that addresses the Navy's plan to transition DD(X) key technologies through development, testing, acquisition, and installation. This report should also address "back up" technologies that could be inserted into the DD(X) program should the maturity of the planned technology not materialize within a timeline necessary to meet the stated DD(X) schedule. (Page 310; see also pages 278 and 300)

FY2004.

Authorization. The House Armed Services Committee, in its report (H.Rept. 108-106) on the FY2004 defense authorization bill (H.R. 1588), recommended increasing the Administration's request for development funding for the DD(X) program by \$4 million, to \$1,042 million (pages 160, 175, and 182). The committee noted that the Navy is currently reviewing the ship's operational requirements and key performance parameters, which will affect the design and size of the ship, and asked to be kept informed of the review and its impact on the ship's capabilities and design (page 175).

In its report (S.Rept. 108-46) on the FY2004 defense authorization bill (S. 1050), the Senate Armed Services Committee recommended approving the Administration's request for \$1,038 million in development funding for the DD(X) destroyer (page 165). The committee stated that it was aware of the debate within DOD and the Navy over the ship's size, and that key performance parameters for the ship are under review. The committee noted its support for the Marine Corps' requirements for naval surface fire support, and directed the Navy to ensure that these requirements are taken into account in reviewing operational requirements for the DD(X) (page 241). The committee stated that it believed that demands for surface combatants are expanding beyond the 116-ship surface combatant force called for in the 2001 Quadrennial Defense Review (QDR). The committee stated that it

remained concerned about the surface combatant industrial base, particularly during the transition from DDG-51 procurement to DD(X) procurement in FY2006-FY2008, and directed the Navy to submit an updated report on the surface combatant industrial base by March 1, 2004 (page 126).

Appropriation. The House Appropriations Committee, in its report (H.Rept 108-187) on the FY2004 defense appropriations bill (H.R. 2658), stated:

The Committee is highly supportive of the Navy's concept of DD(X), but is concerned by the lack of a final decision on such elemental things as design requirements, including weight, size, and armament. In addition, the Navy's stated mission for DD(X) continues to evolve, making it difficult for the Committee to match the appropriation request to tasks the Navy desires to accomplish in fiscal year 2004. Although funds requested will be used to initiate Phase IV of DD(X), the Committee is not convinced the Navy has a clear acquisition strategy for this next phase.

The Committee is also concerned that the Navy and the Office of the Secretary of Defense (OSD) appear to have "withheld" a significant level of funds previously appropriated for DD(X). While the Committee recognizes a Navy and OSD tradition of not releasing all funds appropriated for programs for management flexibility and the application of certain financial adjustments, the percentage withheld from the DD(X) program appears greater than that applied to other programs.

The Committee recommends a reduction of \$100,000,000 for DD(X) design. The Committee's recommendation is based on the lack of a definitive requirement, lack of a final decision on design, low execution of previously appropriated funds, and a lack of an acquisition strategy for Phase IV of DD(X).

The Committee recommends an increase of \$20,000,000 for DD(X) which is only for developing an alternative engine as the prime power source. The Committee's intent is that the Navy pursue a risk mitigation strategy for the engine which could deliver overall program cost savings in a potential competitive scenario. (Page 255)

In its report (S.Rept. 108-87) on the FY2004 defense appropriation bill (S. 1382), the Senate Appropriations Committee commented on the Navy's proposal to fund the first DD(X) and the first LCS in the Navy's research and development account rather than in the Navy's ship-procurement account:

The Committee is aware that the Department of the Navy plans to fund the purchase of ships in fiscal year 2005 within the Research and Development, Navy account. These ships — the first in their class — the DD(X) next-generation destroyer and the Littoral Combat Ship [LCS] are currently planned to be procured with research and development dollars with the second ship in each class to be procured with Shipbuilding and Conversion, Navy [SCN] funds in fiscal year 2006.

The Committee understands that there are seeming advantages to this approach — reducing prior year shipbuilding costs and providing these programs with the additional flexibility that is inherent in research and development funding. The Committee is concerned, however, that the Department will not

reap the benefits it seeks. Central to the argument that supports building the first ship in a class with research and development funding is the necessity to learn lessons from the research, development and testing being done. If the Navy plans, as it currently does, to fund the second ship in each of these classes in fiscal year 2006 in SCN before actual construction even begins on the research and development-funded ships, the distinction between funding in research and development and SCN only becomes one of full-funding.

Therefore, the Committee directs that if these ships — the DD(X) and LCS — are funded in research and development, all research and development acquisition rules will apply, including technology readiness reviews, milestone decisions, and test and evaluation before these ships may enter Shipbuilding and Conversion, Navy for procurement.

If the Navy chooses not to follow the acquisition policies required of research and development programs before they enter procurement, funding for these first ships in their class shall be requested in Shipbuilding and Conversion, Navy, as has been the tradition. (Pages 154-155)

The conference report (H.Rept. 108-283) on the FY2004 defense appropriations bill (H.R. 2658/P.L. 108-87) stated:

The conferees agree with the Senate concerning the Navy's plans to fund the purchase of ships — DD(X) and LCS — in fiscal year 2005 within the Research, Development, Test and Evaluation (RDT&E) appropriation. The conferees believe that the use of research and development funding to procure first ships of a class is not in keeping with budgetary guidelines regarding full-funding. The conferees agree that should the fiscal year 2005 request include these ships — DD(X) and LCS — within RDT&E, all research and development acquisition rules shall apply, including technology readiness reviews, milestone decisions, and test and evaluation before these ships may transition to procurement. (Page 292)

FY2003.

Authorization. Section 1025 of **the conference report** (H.Rept. 107-772) on the FY2003 defense authorization bill (P.L. 107-314/H.R. 4546) requires DOD to submit a report to Congress by March 31, 2003 on

the effect of the contract award announced on April 29, 2002, for the lead design agent for the DD(X) ship program on the industrial base for ship combat system development, including the industrial base for each of the following: ship systems integration, radar, electronic warfare, and launch systems.... The report shall include the following: (1) The Secretary's assessment of the effect of the contract award referred to in that subsection on ship combat system development and on the associated industrial base. (2) A description of any actions that the Secretary proposes to ensure future competition in the ship combat system development and industrial base.

LCS Program

FY2005.

Authorization. The House Armed Services Committee, in its report (H.Rept. 108-491) on the FY2005 defense authorization bill (H.R. 4200), recommended disapproval of the \$107.7 million requested for FY2005 to begin building the lead LCS. The committee recommended that construction of the lead ship be delayed until FY2006. The committee recommended approval of the remainder of the program's FY2005 funding request. The report stated:

Prior to announcing the LCS program, the Navy did not conduct a formal analysis of alternatives to demonstrate that a ship like the LCS would be more cost-effective for performing the stated missions than potential alternative approaches. In the statement of managers accompanying the conference report on H.R. 4546 (H.Rept. 107-772), the conferees raised a number of issues with respect to the development of LCS. The Secretary of the Navy's report on those issues was a brief, summary document that provided little detail with regard to the analysis performed by the Navy in developing the requirement and the concept for LCS. The Navy's March 2004 report on LCS requirements, concepts of operations, acquisition strategy, and systems that would be replaced by LCS was also a relatively brief summary document that provided little new information about the LCS program. Congress has directed the General Accounting Office to report by March 1, 2005, on the LCS program's analytical justification, concept of operations, technical maturity, and potential costs.

The committee continues to have concerns about the lack of a rigorous analysis of alternative concepts for performance of the LCS mission, the justification for the force structure sought by the Navy, and whether the program's acquisition strategy is necessary to meet an urgent operational need. In view of continued unfunded requirements for mission module development and experimentation and what the committee believes is the need for more thorough evaluation program, the committee is concerned about the Navy's ability to resolve these issues before committing to the design for the LCS and beginning construction of the first ship. Finally, the committee is concerned about whether the program schedule provides sufficient time and capabilities for experimentation and evaluation of the operational concepts for LCS before committing to major serial production of the ship.

Consequently, the committee recommends \$244.4 million in PE 63581N for the LCS, a decrease of \$107.7 million for LCS construction. The committee also recommends that the construction of the first Flight 0 LCS be delayed until fiscal year 2006. (Page 184-185)

The Senate Armed Services Committee, in its report (S.Rept. 108-260) on the FY2005 defense authorization bill (S. 2400), recommended approval of the program's funding request for FY2005 (page 170) but otherwise did not discuss the program.

The conference report (H.Rept. 108-767) on H.R. 4200 (P.L. 108-375) stated:

The conferees note the concerns expressed in the House report accompanying H.R. 4200 (H.Rept. 108-491) regarding whether the LCS program schedule provides sufficient time and opportunities for experimentation and evaluation of the operational concepts for LCS in Flight Zero before committing to major serial production of the ship with Flight One. The program plan provided with the fiscal year 2005 budget request had construction starting on Flight One ships before delivery and evaluation of Flight Zero ships. This concurrency could require expensive retrofit to Flight One ships after lessons have been learned from operating Flight Zero ships.

The conferees are concerned with a potential industrial impact induced by making fiscal year 2006 a gap year in LCS production, which could lead to increased ship costs or technology insertion challenges. However, the conferees agree with the rationale of section 8092 of the Department of Defense Appropriations Act for Fiscal Year 2005 (section A of Public Law 108 — 287), which directs that no funds be obligated for construction of a third vessel in the fiscal year 2006 budget request. The conferees expect that the Navy will include a plan that reduces the risk of concurrency in the LCS justification submitted as part of the fiscal year 2006 budget request. (Page 540)

Appropriation. The House Appropriations Committee, in its report (H.Rept. 108-553) on the FY2005 defense appropriations bill (H.R. 4613), recommended a net \$57-million increase in funding for the LCS program, consisting of a \$107-million increase to fully fund the lead LCS in FY2005 at a total cost of \$214 million, and a \$50-million decrease for Phase I pre-design/concept studies for a subsequent improved version of the LCS design. The committee stated that it views the lead LCS as a prototype and that design and construction of the next version of the LCS should not proceed until the prototype is completed and tested. The report stated:

The Committee remains impressed with the Navy's initiative in pursuing the LCS program, which promises to address significant operational gaps in Navy capability while presaging new ways of developing and fielding technology to the Fleet. The Committee has agreed to the Navy's request to fund construction of LCS in the research, development, test and evaluation appropriation, recognizing the Navy's desire to more readily accommodate potential changes to the program. The Committee approves this request because it views the Flight 0 ship as a prototype of a completely new class of ship. Once the Navy has completed and tested the prototype, it should proceed with the preliminary design and construction of the first Flight 1 ship.

The Committee recommendation includes increasing the budget request for the construction of the first Flight 0 LCS by \$107,000,000, fully funding this construction effort at \$214,000,000. The fiscal year 2005 request included only \$107,000,000 for the first increment of the LCS construction. Budget documentation indicates the Navy plans to request an additional \$107,000,000 for the second and final increment for the first ship in fiscal year 2006. The Committee strongly opposes incremental funding of ship construction and therefore has provided a total of \$214,000,000 in 2005 for construction of the first LCS, fully funding the construction requirement in one year.

The Committee recommendation reduces the LCS request by \$50,000,000 for Phase I pre-design/concept studies for the development of a request for

proposal for the preliminary design of the Flight 1 ship. This recommendation is based on the Committee's judgment that the preliminary design of the first Flight 1 ship should commence after test and evaluation of the Flight 0 prototype to avoid potential costly re-design efforts. (Page 288-289. See also page 274.)

The Senate Appropriations Committee, in its report (S.Rept. 108-284) on the FY2005 defense appropriations bill (S. 2559), recommended approval of the FY2005 funding request for the program. The committee stated that it views the lead LCSs as prototypes and directed the Navy to include no funding in its FY2006 budget request for construction of a second ship of either prototype design. The report stated:

The Committee supports the budget request for the Littoral Combat Ship [LCS] and consents to the Navy's request to fund construction of the first prototype ship for each of two ship designs in the Research and Development, Navy account. Approval for funding LCS in the research and development account is strictly based on the acknowledgment of the prototypical nature and high level of technical risk inherent in this program. The Committee finds LCS to be unique and unlike any other shipbuilding program the Navy has previously pursued; and therefore, grants the Navy's request for the increased flexibility that funding within the research and development account affords. However, the Committee directs that all follow-on ships beyond one prototype for each LCS ship design be fully funded in the Shipbuilding and Conversion, Navy account. The Committee also believes that substantial testing of the LCS and the associated mission modules is required to evaluate each ship design and validate operational requirements. Therefore, the Committee directs that no funds shall be obligated to prepare a fiscal year 2006 budget request for construction of the second ship of either prototype design. This directive is intended to provide for a "gap" year between the construction of the first prototype ship and second ship of each design, thereby ensuring that design problems discovered during the construction of each ship design are identified and fixed before construction of the follow-on ships. In addition, the consent to build the LCS prototype ships with research and development funding should in no way be interpreted as approval for other ship construction programs to be funded within the Research and Development, Navy account.

The Committee is also concerned that the development of various LCS mission modules, which will be procured independently from the vessel, will obscure the actual cost of the weapon system. Therefore, the Committee directs the Navy to identify LCS mission module funding separately within the Research and Development, Navy and Other Procurement, Navy accounts. (Page 156-157)

The report also stated:

A central feature of the LCS design is modular Mission Packages. The planned Mission Packages may consist of a combination of modules, manned and unmanned off-board vehicles, deployable sensors, and other support equipment. The Navy plans to begin funding Mission Modules, which will be procured independently from Seaframe development, in the fiscal year 2006 budget request under the "Other Procurement, Navy" account. The Committee feels strongly about creating an appropriate level of visibility to ensure an accurate accounting of total program costs. The Committee, therefore, directs the Navy to establish a "LCS Mission Packages" line within the account and to request all

items (modules, vehicles, sensors, etc.) related to the development of LCS Mission Packages in this line as part of the fiscal year 2006 budget request. (Page 93.)

The conference report (H.Rept. 108-622) on H.R. 4613 (P.L. 108-287) includes a provision (Section 8092) that provides \$214.7 million in the Navy's research and development account for construction of the lead LCS. The provision also states:

None of the funds provided in this Act may be obligated to prepare a fiscal year 2006 budget request for a third vessel under the Littoral Combat Ship program in fiscal year 2006: Provided, That funds for the second vessel shall be for a second source supplier: Provided further, That all subsequent ships shall be purchased with "Shipbuilding and Conversion, Navy" funds beginning in fiscal year 2007.

The conference report stated:

The conferees agree to provide \$457,089,000 for the Littoral Combat Ship (LCS) program instead of \$409,089,000 as proposed by the House and \$352,089,000 as requested and proposed by the Senate.

The conferees agree with the Senate that all follow-on ships, beyond one of each prototype design, should be fully funded in the Shipbuilding and Conversion, Navy appropriation. The conferees also agree that substantial testing of the LCS and associated mission modules is required to evaluate each ship design and validate operational requirements. Therefore, the conferees direct that no funds shall be obligated to prepare a fiscal year 2006 budget request for construction of a third vessel, as reflected in the conference agreement including Section 8092 as originally proposed by the Senate. This directive is intended to provide for a "gap" year between construction of the prototype ships and the follow-on construction of a second ship of each design, thereby ensuring that design problems discovered during the prototype phase of each ship design are identified and corrected before construction of follow-on ships. The conferees also agree with the Senate that beginning in the fiscal year 2006 budget request, the Navy should identify LCS mission module funding separately within the Research, Development, Test and Evaluation, Navy and Other Procurement, Navy appropriations. (Pages 310-311)

FY2004.

Authorization. The House and Senate Armed Services Committees, in their reports (H.Rept. 108-106 and S.Rept. 108-46, respectively) on the FY2004 defense authorization bill (H.R. 1588/S.1050), recommended increasing the FY2004 funding request for the LCS program by \$35 million to fund additional development of LCS mission modules (pages 158 and 183-184 in the House report, and page 162 in the Senate report).

The House report noted that the Navy did not perform an analysis of alternatives prior to announcing the LCS program. The report noted the various issues about the program that were raised in the conference report on the FY2003

defense authorization bill (see above), and stated that the February 2003 Navy report submitted in response to Section 218 of the FY2003 defense authorization bill

was a brief, summary document that provided little detail with regard to the analysis performed by the Navy in developing the requirement and the concept for the LCS. The committee expects that the Secretary of the Navy will address more completely the issues raised in the [conference report] prior to proceeding to an Acquisition Program Initiation decision in mid-fiscal year 2004. (Page 183)

The committee noted concerns about the Navy's strategy for developing LCS mission modules that were expressed in the FY2003 conference report and stated that it was recommending a \$35-million increase to reduce development risk in this area. (Pages 183-184)

The Senate report stated:

The committee is concerned that the analysis underpinning the LCS requirement is not sufficient. Section 218 of the National Defense Authorization Act for Fiscal Year 2003 (Public Law 107-314) required the Secretary of the Navy to submit a report on LCS which addressed in detail the analytical process to examine alternatives, and establish relative priorities to meet valid requirements. The committee believes that the report, which was delivered pursuant to last year's requirement, did not provide the necessary analysis.

The Navy believes that this ship would offer a way to achieve a fleet size of 375 ships, a number that the Chief of Naval Operations has said is required to support the Sea Power 21 vision. The committee is concerned that the larger surface combatant force [included in the 375-ship plan] will decline to a number even below that which is projected in the near term as a result of the acquisition of LCS. While the cost of the LCS seaframe has been estimated, and is included in the preliminary design interim requirements document, there is no firm estimate of what LCS will cost with its focused mission modules. Overall Navy affordability constraints may well lead to a fleet with the number of Navy ships close to the number now in commission, only of lesser capability.

The committee directs the Comptroller General to submit a report to the committee by March 1, 2005, that (1) details the Navy's progress in further defining the concept of operations for the LCS; (2) assesses the analytical basis for the establishment of LCS requirements; (3) assesses the technical maturity of the focused mission modules for flight zero ships, and, to the extent possible, for flight one ships; and, (4) estimates the recurring LCS weapons system cost, to include seaframe and focused mission modules, at a production rate similar to that in the Navy plan.

The committee believes that the Navy will have to conduct significant experimentation to determine the utility of the LCS concept. The focused mission modules are required to enable that experimentation, yet the Navy failed to fully fund focused mission modules in the budget request. The committee believes that before committing to production of more than a few ships, the Navy should have determined, through analysis and experimentation, that this ship will deliver the Navy's expected capabilities. To accelerate this process, the

committee recommends an increase of \$35.0 million ... for LCS modules. (Pages 179-180)

Appropriation. The House Appropriations Committee, in its report (H.Rept. 108-187) on the FY2004 defense appropriation bill (H.R. 2658), recommended reducing funding for the ship portion of the LCS program by \$15 million and increasing funding for the development of LCS mission modules by \$25 million. The report states:

The Committee is very supportive of the Navy's concept of the LCS. It is an innovative approach to meeting the threats and through the use of "mission modules" will be able to quickly transform to meet emerging threats. Future enhancements include the use of unmanned aerial vehicles and unmanned undersea vehicles. The spiral development approach will provide sufficient flexibility to implement the LCS in "flights", providing increasing levels of warfighting capability.

The Committee is concerned, however, with the lack of final requirements documentation and a spiral development plan for LCS. It is clear that the initial system will not provide all of the warfighting capabilities promised with LCS, but there is no definition of the requirement and no "roadmap" of how the Navy will achieve the system required. It is also of concern that LCS capabilities will overlap those of existing systems operating in the littoral battlespace, an issue that the Navy has not fully addressed.

The Committee requests the Navy submit by March 1, 2004, a final requirements document and a spiral development plan for advancing the LCS through its development and acquisition. Additionally, the Navy should continue to refine its concept of operations in the littoral battlespace to ensure no duplication of effort.

The Committee recommends an increase of \$25,000,000 for LCS only to accelerate mission module development and the integration of these modules into LCS Flight 0. These funds may not be obligated or expended until the submission of the March 1, 2004 report previously requested.

The Committee recommends a reduction of \$15,000,000 for the LCS. The Committee's recommendation is based on the lack of a final design or development plan for LCS. (Pages 254-255)

The Senate Appropriations Committee, in its report (S.Rept. 108-87) on the FY2004 defense appropriation bill (S. 1382), recommended approving the Administration's funding request for research and development work on the LCS program, but recommended increasing the portion of this funding that is to be used for developing LCS mission modules. The report states:

The Committee is supportive of the Navy's Littoral Combat Ship [LCS] program, but is concerned that the Navy has underestimated the technological challenges the development of this ship may face. While considerable effort has been made and careful thought has been taken regarding plans for the sea frame, the Committee remains unconvinced that similar efforts have been taken regarding the ship's mission modules. Unfortunately, of the \$158,071,000 the Department of Navy requested for LCS research and development, the

Department only requested \$41,000,000 for sea frame-related mission module activities. The Committee, therefore, has earmarked \$76,000,000 of the request for LCS and directs the Navy to establish a fully-funded mission module research and development program for the Flight 0 LCS that extends beyond the patchworked mine warfare plan. (Page 156)

As noted in the section on legislative action concerning the DD(X), the committee also commented on the Navy's proposal to fund the first DD(X) and the first LCS in the Navy's research and development account rather than in the Navy's ship-procurement account. This report language appears in the section on legislative activity concerning the DD(X).

The conference report (H.Rept. 108-283) on the FY2004 defense appropriations bill (H.R. 2658/P.L. 108-87) stated:

The conferees have included \$168,071,000 for continued research and development of the Littoral Combat Ship (LCS), the amount recommended by the House and \$10,000,000 above the amount recommended by the Senate.

The conferees agree with the House language regarding the need to refine the Navy's concept of operations in the littoral battlespace to ensure that there is no duplication of effort between LCS and other platforms. To this end, the conferees direct the Navy to provide a report to the House and Senate Committees on Appropriations, no later than March 1, 2004 that details the missions LCS will conduct in the littoral battle space, which platforms and systems currently conduct these missions, and what changes, if any, will be made to future years' budgets to eliminate any duplication of effort.

In addition, in order to maintain focus on the LCS' mission module development and integration, the conferees agree that \$51,000,000 of the funds provided for LCS is available only for these efforts. (Pages 291-292)

(In response to this language, the Navy submitted a report on March 3, 2004.)

As noted in the section on legislative action concerning the DD(X), the conference report also commented on the Navy's proposal to fund the first DD(X) and the first LCS in the Navy's research and development account rather than in the Navy's ship-procurement account. This report language appears in the section on legislative activity concerning the DD(X).

FY2003.

Authorization. Section 218 of **the conference report** (H.Rept. 107-772) on the FY2003 defense authorization bill (H.R. 4546/P.L. 107-314) authorized \$4 million for requirements development for the LCS, and stated that the Navy may not obligate any funds for the construction of an LCS until the Navy submitted a detailed report on the LCS program's acquisition strategy that "address[es] the plan and schedule for fulfilling the requirements of Department of Defense Instruction 5000-series for a major defense acquisition Milestone A decision for initiation of concept and technology development for" the LCS. The LCS acquisition strategy must also

include a “robust” concept and technology demonstration phase. The conferees stated:

An LCS program may be necessary to provide capabilities to carry out the National Military Strategy. However, neither the Office of the Secretary of Defense, the Joint Chiefs of Staff, nor the Navy has provided any indication that they have completed sufficient work on any number of prerequisites that the Department of Defense (DOD) is required to meet before concluding that new development is required to provide the capabilities inherent in an LCS. These include requirements in title 10, United States Code, and internal DOD directives, such as DOD 5000.2-R Mandatory Procedures for Major Defense Acquisition Programs and Chairman, Joint Chiefs of Staff (CJCS) Instruction 3170.01B.

The LCS has not been vetted through the Joint Requirements Oversight Council (JROC) process, particularly regarding possible alternatives and the relative priority to meet valid requirements. This should be completed prior to initiation of any program which is intended to support joint combat operations.

The conferees believe that the Navy needs to assess the adequacy of existing and planned platforms to test the littoral combat ship concept and how these platforms will be used in the development, test, and evaluation of the LCS and its mission modules. The conferees strongly believe that the Navy must capitalize on ongoing and planned experiments, demonstrations, and evaluations of existing, prototype, and experimental hull forms and platforms to better inform the Navy’s decisions on the LCS. Some of these have been completed, but others are planned and await modification or construction of the hull form and platform demonstrators.

The conferees are also concerned that the Navy’s strategy for the LCS does not clearly identify the plan and funding for development and evaluation of the mission modules upon which the operational capability of the LCS will depend. The conferees believe that the strategy for LCS development must provide for the identification, transition, and integration of the component technologies and subsystems to be included in the several mission modules and for the evaluation of each mission module as a system before its deployment on the LCS.

The conferees expect the JROC and the Navy to specifically deal with a number of concerns in fulfilling the requirements in the LCS provision. These include:

- (1) Assessing the extent to which unmanned systems could be capable of completing the missions instead of a manned LCS vessel. Briefings on the LCS indicate that an LCS would be used for operations determined to be “too risky” for larger surface combatants. This raises questions about the level of risk the Navy has determined to be acceptable for an LCS that is unacceptable for larger surface combatants.

- (2) Identifying the threat or threats that have negated the Navy’s previous investments in multi-mission ships and made the missions of anti-submarine warfare, anti-surface warfare, and antimine warfare “too risky” for these ships. The Navy has invested heavily in providing combatants of all types and displacements with onboard and offboard sensors, weapons, and information

connectivity. This investment was directed to ensure that multimission ships could operate at any time and in any place.

(3) Determining the level of support from other combatants and auxiliaries that LCS vessels will require, and whether this will lead to altered planning assumptions for sizing the force. An open question regarding a “focused mission” vessel such as an LCS is whether the vessel will be able to operate with impunity in the presence of threats outside its focused mission warfare area. If not, the Navy may have to adjust operating and support concepts in more significant ways than merely adding LCS vessels to the current battle group.

(4) Identifying the appropriate level of helicopter support in the baseline LCS vessel. The naval helicopter has been a proven key capability for combatant surface ships when conducting the three primary warfare areas stated for LCS. Navy briefings indicate that the LCS will require a helicopter capability to carry out its missions and will operate forward of the battle group. Nevertheless, the Navy appears to have forgotten the lessons learned from the first flight of *Arleigh Burke*-class destroyers and has not included a naval helicopter hangar as a key requirement for the LCS.

(5) Assessing the implications of using and supporting nonmarinized systems as component capabilities on LCS vessels. For example, the Navy has indicated the desire for using OH-58D helicopters on LCS. Although these Army helicopters have flown from Navy ships for short periods, they have limited capabilities for LCS mission areas. Naval helicopters, however, have the durability and system integration required to provide joint and battle group synergism for LCS missions.

(6) Identifying whether there are changes in tactics and procedures which the Navy could apply to current platforms and concepts of operations that would accomplish the envisioned LCS missions without putting additional pressure on an already underfunded ship acquisition plan.

(7) Assessing the assignment of LCS-unique missions to the U.S. Coast Guard, close allies, or coalition partners. If we are to continue assuming joint and coalition warfare, perhaps the U.S. Navy could count on the Coast Guard or smaller navies of allies to contribute more effectively by performing “small ship” mission[s]. (Pages 562-564)

(In response to this section, the Navy submitted a report on February 10, 2003.)

Appendix A. Acronyms

AAW	Anti-air warfare
AGS	Advanced Gun System
AMC	Analysis of multiple concepts
AOA	Analysis of alternatives
ASuW	Anti-surface warfare
ASW	Antisubmarine warfare
AUV	Autonomous underwater vehicle
BIW	Bath Iron Works shipyard of Bath, ME
CBO	Congressional Budget Office
COEA	Cost and operational effectiveness analysis
CSBA	Center for Strategic and Budgetary Assessments
DOD	Department of Defense
DON	Department of the Navy
EA/SD	Evolutionary acquisition with spiral development
EDM	Engineering development model
FYDP	Future Years Defense Plan
GD	General Dynamics Corporation
ISR	Intelligence, surveillance, and reconnaissance
LCS	Littoral Combat Ship
LSC	Littoral support craft
LSC-X	Littoral support craft — experimental
MIW	Mine warfare
O&S	Operating and support
OPN	Other Procurement, Navy appropriation account
OSD	Office of the Secretary of Defense
PANMC	Procurement of Ammunition, Navy and Marine Corps appropriation account
R&D	Research and development
SCN	Shipbuilding and Conversion, Navy appropriation account — the Navy's ship-procurement account
SOF	Special operations forces
UAV	Unmanned Air Vehicle
UV	Unmanned Vehicle
VLS	Vertical launch system
WPN	Weapons Procurement, Navy appropriation account