STATEMENT OF

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Mr. Chairman, Representative Taylor, distinguished members of the subcommittee, thank you for the opportunity to appear before you to discuss oversight issues relating to the Navy's DD(X) destroyer program. As requested, my testimony will focus on the following:

- the prospective affordability and cost effectiveness of the DD(X) program (pages 1-6);
- the requirement for the DD(X) program (pages 7-12);
- industrial-base considerations (pages 12-15); and
- potential cost-reduction alternatives (pages 15-19).[1]

Affordability and Cost Effectiveness

A key issue — perhaps the most important current issue — for the DD(X) program is the procurement affordability of the DD(X) design. Currently estimated DD(X) unit procurement costs could limit the program's long-term annual procurement rate, which could raise questions about the program's overall cost effectiveness.

The Navy's estimated unit procurement costs for follow-on DD(X)s are about 45% higher today than they were a year ago.[2] 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 new estimates. A meeting scheduled for April 29, 2005, to grant the DD(X) Milestone B approval to proceed was postponed, reportedly because of disagreement between the Navy and CAIG over estimated DD(X) procurement costs.

The Navy argues that the DD(X) is more affordable than it might appear from looking only at procurement costs, because the DD(X) is to have lower annual operating and support (O&S) costs than the DDG-51. The DD(X)'s lower O&S costs, however, only partially offset its higher initial procurement cost (see Appendix B). A ship's lower O&S costs, which are financed in future-year budgets, do not make that ship any more affordable to procure in the budget that funds its procurement.

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[1]For more on the DD(X) program, see CRS Report RL32109, *Navy DD(X), CG(X), and LCS Ship Acquisition Programs: Oversight Issues and Options for Congress*, by Ronald O'Rourke, and CRS Report RS21059, *Navy DD(X) and CG(X) Programs: Background and Issues for Congress*, by Ronald O'Rourke.

[2]Since 2004, the Navy's estimate for the first DD(X) has increased from about $2,800 million to $3,291 million, or about 18%; the estimate for the second DD(X) has increased from $2,053 million to $3,061 million, or about 49%; and the estimates for subsequent DD(X)s have increased from about $1.5 billion and $1.8 billion each to about $2.2 billion to $2.6 billion each, or roughly 45%.

The Navy argues that the procurement cost difference between the DD(X) and the DDG-51 is not as great as it might seem because the procurement cost for a single DDG-51 in FY2006 would be about $1.7 billion, as opposed to about $2.4 billion for a follow-on DD(X). As an option for continued series production, however, DDG-51s are affordable enough that under current budget conditions, they could be procured at a rate of two per year, which would reduce the ship's unit procurement cost to about $1.4 billion.

The increase in estimated DD(X) unit procurement costs since 2004 appears to have been a major reason for the Administration's decision to reduce planned DD(X) procurement in the FY2006-FY2011 Future Years Defense Plan (FYDP) to one ship per year in FY2007-FY2011. The reduction in the planned DD(X) procurement rate to one per year suggests that, unless budget conditions change, the combined DD(X)/CG(X) procurement rate might never rise above one per year.

The prospect of a continued one-per-year procurement rate could raise questions concerning the potential adequacy of the DD(X)/CG(X) program in terms of:

- introducing new DD(X)/CG(X) technologies into the fleet in sufficient numbers in a timely manner;
- constraining average DD(X)/CG(X) unit acquisition cost; and
- supporting the surface combatant industrial base.

Each of these points is discussed below. If Congress (or the Navy or OSD) determines that the DD(X)/CG(X) program would be unsatisfactory in one or more of these three areas, policymakers may consider alternatives for reducing surface combatant acquisition costs. The final section of this statement discusses some cost-reduction alternatives.

Introducing New Technologies In Sufficient Numbers In A Timely Manner

Navy officials have argued frequently that the DD(X)/CG(X) program is needed in part because it would introduce important new technologies to the fleet. If DD(X)/CG(X) procurement is limited to one per year, however, it could take many years to introduce these new technologies into the fleet in numbers sufficient to meet the Navy's needs.

If the DD(X)/CG(X) program enters serial production, the Navy might want to procure a combined total of 19 to 34 DD(X)s and CG(X)s.[3] If DD(X) procurement begins in FY2007, as currently planned, and DD(X)s/CG(X)s are procured at one per year, then a 19- to 34-ship

[3]The Navy states that it has a requirement for 8 to 12 DD(X)s. The Navy has not stated how many CG(X)s it might require, but a reasonable lower estimate might be 11 ships (one for each of 11 planned carrier strike groups, or CSGs), while a reasonable higher estimate might be 22 ships (two for each CSG). A total of 22 CG(X)s would also represent a one-for-one replacement of the Navy's Vertical Launch System (VLS)-equipped Aegis cruisers. These figures make for a potential combined DD(X)/CG(X) procurement of 19, 23, 30, or 34 ships.

DD(X)/CG(X) force would be in service between 2030 (19 ships) and 2045 (34 ships).[4] Whether these dates would represent a timely schedule for closing projected Navy capability shortfalls is a potential question to consider.

An additional consideration would be the effect of an extended one-per-year DD(X)/CG(X) procurement rate on cruiser-destroyer force levels. The Navy's plan for a fleet of 260 to 325 ships includes a total of 67 to 92 larger surface combatants (i.e., cruisers, destroyers, and frigates). Assuming a 35-year life for larger surface combatants, a one-per-year DD(X)/CG(X) procurement rate would reduce the Navy's force of larger surface combatants below 92 ships in 2022 and below 67 ships in 2031. By 2030, when a 19-ship DD(X)/CG(X) force would be in service, the total force of larger surface combatants would include 68 ships (19 DD(X)s/CG(X)s and 49 Aegis cruisers and DDG-51s). By 2045, when a 34-ship DD(X)/CG(X) force would be in service, the total force would include 35 ships (34 DD(X)s/CG(X)s and one remaining DDG-51).

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 procured, the Navy's DD(X) force, for a period of perhaps a decade or more, would number 4 ships — one-third to one-half of the Navy's stated goal of 8 to 12 DD(X)s.

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.

Constraining Average Unit Acquisition Cost

The Government Accountability Office (GAO) has stated that total DD(X)/CG(X) research and development costs are about $10 billion.[5] If DD(X)/CG(X) procurement is limited to one per year and continues for a total of about 20 years,[6] then each of the roughly 20 DD(X)s and CG(X)s that would be procured would amortize about $500 million of this research and development cost. This

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[4]The completion dates of 2030 and 2045 assume that DD(X)s and CG(X)s enter service 5 years after the year in which they are procured.

[5]U.S., General Accounting Office, *Defense Acquisitions[:] Assessments of Major Weapon Programs*. Washington, 2005. (GAO-05-301, March 2005) p. 47.

[6]A roughly 20-year DD(X)/CG(X) production run would be roughly consistent with:
— a potential desired production quantity of 19 DD(X)s and CG(X)s (the lower end of the potential DD(X)/CG(X) quantity range mentioned above);
— a potential desire to avoid continuing a one-per-year DD(X)/CG(X) procurement rate beyond the point at which it would reduce the Navy's force of larger surface combatants substantially below the 67-ship figure included in the Navy's 260-ship fleet plan;
— the 19-year (FY1970-FY1988) combined procurement period for the Spruance (DD-963) class destroyers and Ticonderoga (CG-47) class Aegis cruisers, which shared a common hull design; and
— the Navy's planned 21-year (FY1985-FY2005) DDG-51 procurement period.

figure, when added to currently estimated DD(X)/CG(X) unit procurement costs, could result in an average DD(X)/CG(X) unit acquisition (i.e., development-plus-procurement) cost of almost $3 billion per ship. Although DD(X)s and CG(X)s would be very capable ships, such an average unit acquisition cost could raise a question concerning the cost effectiveness of the CG(X)/DD(X) acquisition program.

Potential Implications For Industrial-Base

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 (GNSS), 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 12,135 tons) is about 75% 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 1.75 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 seven-eighths of a DDG-51 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.[7] Navy officials in recent years have questioned whether this figure is still valid. Building the equivalent of 1.75 DDG-51s per year equates to about 58% 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 earlier this year proposed holding a winner-take-all competition to select a single yard that would build all DD(X)s. Congress legislatively rejected this proposed acquisition strategy. The Navy responded 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).[8] Consequently, if GD/BIW does not build DD(X)s and does not receive other new ship-construction work, then

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[7]See, for example, CRS Report 94-343 F, *Navy DDG-51 Destroyer Procurement Rate: Issues and Options for Congress*, by Ronald O'Rourke. (April 25, 1994) pp. 59-62. This report is out of print and is available directly from the author.

[8]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.

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 today's.

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.

Procurement Affordability: Comparison With 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.[9] 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

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[9]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.

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 its experience in 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 million in FY1983 dollars, and this became the target unit procurement cost for the follow-on ships in the DDG-51 program.[10]

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.

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[10]See Jan Paul Hope and Vernon E. Stortz, "Warships and Cost Constraints," *Naval Engineers Journal*, March 1986: 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. (November 21, 1984. The report is out of print and is available directly from the author.)

Requirement For DD(X) Program

DD(X) Compared To Other Navy Cruisers And Destroyers

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;[11]
- 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;[12] 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).

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. In addition to its above-mentioned AAW system, flag-level command facilities, VLS battery, and gunfire capabilities, the DD(X) design also includes:

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[11]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%.

[12]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.

- sonars and other antisubmarine warfare (ASW) systems that are roughly equivalent to that of the DDG-51;[13]

- a large helicopter flight deck and a hangar and maintenance facilities for two helicopters or one helicopter and three UAVs;

- 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).

The variety of capabilities that contribute to the overall DD(X) payload raises a potential question regarding the requirements-setting process that led to the decision to include all these payload elements in the DD(X) design. The following sections discuss DD(X) and CG(X) mission requirements.[14]

DD(X) Mission Requirements in General

The September 1994 Mission Need Statement (MNS) that sets forth the mission requirements for the earlier DD-21 destroyer continues to serve as the foundation mission-requirements document for the DD(X) destroyer. In light of developments since 1994, including the war on terrorism and the new emphasis on defense transformation, potential oversight questions for Congress include the following:

- Is the 1994 DD-21 MNS still valid as a foundation description of the missions to be performed by the DD(X)? To what extent has the Department of Defense (DOD) or the Navy reviewed the 1994 MNS to assess its current validity?

- How might mission requirements as set forth in the 1994 MNS be affected by transformation-related developments such as the new emphasis in U.S. military operations on precision-guided weapons and unmanned vehicles, and new warfighting concepts such as effects-based warfare?

- Did uncertainty over future Navy mission demands make it difficult to know for certain which capabilities might not be critical for the DD(X) to have, and thereby increase the chances that various potential DD(X)s capabilities would be designated as required capabilities?

DD(X) Naval Gunfire Support Mission

The decision to equip the DD(X) with two 155mm Advanced Gun Systems (AGSs) reflects a desire to replace the high-volume, all-weather, naval surface fire support (NSFS) capability for

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[13]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.

[14]These sections were adapted from CRS Report RL32109, op cit.

supporting Marines and other friendly forces ashore that the Navy lost in 1990-1992 when it removed the four reactivated Iowa-class battleships from service. Is the DD(X) requirement to carry two AGSs still valid?

A November 2004 Government Accountability Office (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.[15]

Supporters of the requirement could argue that the decision for the DD(X) to carry two AGSs is still valid for the following reasons:

- Much of the world's population and major areas of economic activity — and thus many of the areas where U.S. military forces might operate in the future — are located within about 100 miles of the shore, within the range of the AGS.

- Ship-mounted guns are more economical than ship- or air-launched missiles for providing high-volume fire support, because gun shells are much less expensive than missiles.

- Ship-mounted guns can provide more timely fire support than aircraft because aircraft might not be close to the scene of the ground fighting and might need to spend time flying there before they can launch their weapons against the enemy ground forces.

- Ship-mounted guns can provide fire support in adverse weather conditions that can degrade aircraft operations.

Skeptics could argue that the decision about carrying two AGSs is no longer necessarily valid for the following reasons:

- The two most recent U.S. military operations — the wars in Afghanistan and Iraq — suggest that in the future, the United States might rely more on operations conducted by smaller-sized ground-force units that are supported by smaller but more precise amounts of fire support, which could reduce requirements for high-volume fire support.

- Ship-launched missiles have much longer potential ranges than do guns, which have a practical maximum range of about 100 miles. All U.S. ground operations in Afghanistan were conducted more than 300 miles inland, and a large share of U.S. and coalition ground operations in Iraq were conducted more than 100 miles inland. Ship-mounted guns like the AGS, with a maximum range of about 100 miles, would thus have been of no direct value in supporting operations in Afghanistan, and

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

would have played only a limited role in supporting operations in Iraq.

- U.S. operations in Afghanistan and Iraq demonstrated that U.S. air superiority can permit manned aircraft and unmanned air vehicles (UAVs) to orbit over the battlefield on a virtually round-the-clock basis, enabling them to provide timely fire support to friendly ground forces. In contrast, it is not clear whether a ship-mounted gun can provide timely fire support to friendly ground forces at ranges of 100 miles.[16]

- The advent of relatively inexpensive, GPS-guided, air-delivered precision-guided munitions (PGMs) that can work in all weather conditions, such as the Joint Direct Attack Munition (JDAM), give manned aircraft and UAVs an improved ability to provide precision fire support to friendly ground forces under adverse-weather conditions.

In addition to the above arguments, a comparison of the DD-21 and DD(X) programs raises other potential questions regarding future NSFS needs. The Navy previously planned to procure a force of 32 DD-21s with a total of 64 AGSs. The Navy now plans to procure 8 to 12 DD(X)s with a total of 16 to 24 AGSs. In addition, as part of the effort to reduce the size and cost of DD(X) design, the Navy reduced the firing rate of the AGS (i.e., the number of shells that an AGS can fire per minute) by about 20%. As a result, an individual DD(X) would provide about 80% as much firing-rate capability as an individual DD-21, and a force of 8 to 12 DD(X)s would provide 20% to 30% as much combined firing-rate capability as the originally planned force of 32 DD-21s.[17]

In light of this reduction in firing-rate capability, would the Navy's planned force of 8 to 12 DD(X)s provide sufficient large-caliber naval gunfire capability to meet the Marine Corps' requirements in this area? If a force of 8 to 12 DD(X)s equipped with AGSs whose firing rate has been reduced by 20% is sufficient to meet a naval gunfire capability requirement that previously was to have been met by a force of 32 DD-21s with faster-firing AGSs, then how firmly defined is the requirement for additional naval gunfire capability? If 20% to 30% of the previously planned firing-rate capability is sufficient, then would less than 20% to 30% still be sufficient?

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[16]If naval surface fire support is to be effective, some observers argue, no more than 8 to 10 minutes should elapse between the time that the Marines or other friendly ground forces ask the ship for supporting fire and the time that the ship's gun shells arrive on target. Within this 8- to 10-minute period, all of the following would need to occur: the ground forces contact the ship and request the ship to fire on targets at certain coordinates; the ship receives and processes the request; an AGS becomes available and is allocated to the task; the AGS fires the shell, and the shell flies to the target. If this sequence of events requires more than 8 to 10 minutes to complete, they argue, the fire support will arrive too late, since the ground forces after about 8 to 10 minutes will likely have either sustained casualties from attacking enemy forces or moved to a new location to avoid being attacked. Some observers question whether, at ranges approaching 100 nautical miles (the approximate maximum range of the AGS), this sequence of events is likely to be completed within 8 to 10 minutes, even with advanced communication links that are designed to minimize the time needed to transmit, receive, and process the request for fire.

[17]Twenty-five percent to 37.5% as many ships (8 or 12 ships rather than 32) times 80% as much rate of fire per ship equals 20% to 30% as much total firing-rate capability.

DD(X) Missions Other Than Naval Gunfire Support

The DD(X), like the DD-21, is to be not just a naval gunfire support ship, but a multimission ship. This can be viewed as a reflection of the fact that the DD-21 was to be the Navy's sole surface combatant program for replacing the various mission capabilities resident in the Navy's multimission Spruance (DD-963) class destroyers and Oliver Hazard Perry (FFG-7) class frigates. Now, however, the Navy plans to procure not just a new destroyer (the DD[X]), but a smaller combatant (the LCS) as well. The LCS is to perform some missions — such as ASW and (as a secondary mission) maritime intercept — that have been performed by DD-963s and FFG-7s.

In light of the planned mission capabilities of the LCS, potential oversight questions for Congress include the following:

- How much capability does the DD(X) need to have for performing missions other than naval gunfire support?

- If gunfire support is the DD(X)'s primary mission, and if the DD(X) is no longer to be the sole platform for replacing the capabilities resident in the DD-963s and FFG-7s, should requirements for the non-gunfire mission capabilities of the DD(X) design be reduced further?

- How much further might the cost of the DD(X) design be reduced if its non-gunfire capabilities are reduced and the ship's design is modified to make the ship more of a pure naval gunfire support platform?

Analysis Supporting Choice Of DD(X) To Perform Missions

If mission requirements have been accurately identified, a follow-on question is whether a ship like the DD(X) the best or most promising approach for performing those missions. DD(X) supporters could argue that this question was resolved by the extensive SC-21 Cost and Operational Effectiveness (COEA) study that the Navy performed in 1995-1997 in support of the DD-21 destroyer program. That study, they could argue, reviewed several surface combatant acquisition options for performing the missions set forth in the 1994 SC-21 MNS and identified the acquisition of a ship like the DD-21 as the best possible approach. The DD(X), they could argue, is covered by the SC-21 COEA and will broadly resemble the DD-21.

Supporters could also argue that a surface combatant like the DD(X) is the best approach for performing its stated missions for the basic reason that surface combatants are better suited than aircraft, submarines, aircraft carriers, and amphibious ships for carrying and operating a larger-caliber gun like the AGS. Aircraft and submarines, they could argue, cannot (or cannot easily) carry and operate a larger-caliber gun like the AGS, and putting a larger-caliber gun on an aircraft carrier or an amphibious ship could interfere with these ships' primary respective missions of supporting aircraft operations and embarked Marine forces.

Skeptics could argue that technological developments since the 1995-1997 COEA, such as the advent of network-centric warfare, raise potential questions as to whether a ship like the DD(X) still represents the best or most promising approach to performing the DD(X)'s stated missions. Network-centric warfare, they could argue, is associated with concepts of distributed firepower and ships operating as part of a larger system of systems. Such concepts, they could argue, might make it possible for mission requirements to be better performed by platforms significantly different than the DD(X). Skeptics can also argue that the Navy's 1995-1997 COEA did not examine options for acquiring a small combatant like the LCS and thus did not explore how the presence in the force of a small combatant like the LCS might affect the analysis of the best or most promising approach for performing mission requirements other than those being met by a ship like the LCS.

CG(X) Missile-Defense Mission

CG(X) supporters argue that the ship would be cost-effective in part because of its missile-defense capabilities, which include its powerful radar and its ability to fire missile-defense interceptors. Skeptics could argue that this radar could be incorporated into a new-design surface combatant that could be smaller than the CG(X) and thus affordable in larger numbers, and that both this smaller surface combatant and other Navy ships could fire missile-defense interceptors.[18]

Industrial-Base Considerations

One vs. Two Surface Combatant Yards: Factors To Consider

The potential industrial-base implications of a one-per-year DD(X)/CG(X) procurement rate were discussed in the earlier section on the prospective affordability and cost effectiveness of the DD(X) program. In light of the Navy's apparent interest in producing most DD(X)s in a single yard, and the 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 a CRS report,[19] 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 260 to 325 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

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[18]Some supporters of the CG(X) have cited its ability to fire a proposed large interceptor called the Kinetic Energy Interceptor (KEI). Skeptics could argue that development funding for the KEI was substantially reduced in the FY2006 budget, that if the KEI is based at sea, it might be better to base it on submarines (for boost-phase missile defense) or non-combatant surface ships (for mid-course defense), and that if KEIs are to be based on a surface combatant, the Navy could retrofit them onto some of its existing Aegis cruisers or destroyers.

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

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.

Options For Supporting Surface Combatant Industrial Base

Options Available In The Near Term. Options available in the near term for supporting the surface combatant industrial base, many of which could be combined, include the following:

- accelerating procurement of the first one or two DD(X)s by a year;
- procuring additional DD(X)s;
- procuring additional DDG-51s;
- procuring additional amphibious ships;
- transferring construction of LCSs to Ingalls, GD/BIW, or both;
- modernizing Aegis cruisers;
- modernizing Arleigh Burke (DDG-51) class Aegis destroyers, perhaps more extensively than currently planned by the Navy; and
- accelerating and expanding procurement of large and medium Deepwater cutters for the Coast Guard.

The potential for accelerating procurement of the first one or two DD(X)s would depend on the readiness of DD(X) technologies. If DD(X) technology readiness would support accelerating procurement of the first one or two DD(X)s, then implementing this option might be facilitated by transferring DD(X) detailed design and nonrecurring engineering (DD/NRE) costs to the Navy's research and development account, where they could be incrementally funded, or by using incremental funding or advance appropriations to procure these ships.

The Navy has no requirement for additional DDG-51s, but the last five DDG-51s were arguably procured in part for industrial-base purposes.[20] It can be argued that if additional DDG-51s were procured, the Navy would find ways to make good use of them.

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 period FY2006-FY2011 period might in some cases be facilitated by using incremental funding or advance appropriations.

Transferring construction of LCSs to GD/BIW or Ingalls would likely increase the cost of these ships due to the higher overhead costs of these yards compared to the smaller yards where these ships are currently planned to be built. It might, however, reduce the cost of other work being done at GD/BIW or Ingalls by spreading the fixed overhead costs of these over a broader workload. It might also avoid the risk of the LCS program creating one or more new yards that are highly dependent on Navy shipbuilding work, which could make more complex the task of managing the shipbuilding industrial base.

Options for modernizing DDG-51s more extensively than currently planned by the Navy include making changes to reduce crewing requirements to about 200 people per ship, and lengthening the ships with a plug that would permit an increased payload.

The revised Deepwater implementation plan that the Coast Guard submitted to Congress in March calls for procuring 31 to 33 large and medium cutters (6 to 8 large cutters and 25 medium cutters) over a period of many years at low annual production rates. Some analysts believe that more than 31 to 33 of these cutters will be needed to fully meet the Coast Guard's expanded post-9/11 mission requirements. Members of Congress and others have expressed interest in accelerating procurement of these cutters and in expanding the total number of cutters to be procured.

In terms of light-ship displacement, four or five large or medium Deepwater cutters would be roughly equivalent to one DD(X). Procuring four or five of these cutters per year might therefore generate about as much shipyard construction work as one DD(X) per year. Although the skill mix for building Deepwater cutters is somewhat different than the skill mix for building DD(X)s, accelerating and expanding procurement of Deepwater cutters could:

- reduce the Coast Guard's unit procurement costs for these ships by procuring them at more economic annual rates;
- increase Coast Guard capabilities toward post-9/11 requirements more quickly;
- more quickly replace the high O&S costs of the Coast Guard's aging cutters with the lower O&S costs of new cutters; and

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[20]The Navy for several years stated that it planned to build a total of 57 DDG-51s. A total of 62 have been procured through FY2005.

- help sustain the Navy's surface combatant industrial base through a program funded in the budget of the Department of Homeland Security (DHS), the Coast Guard's parent department, rather than the Navy or DOD budget.[21]

Additional Option That Could Become Available A Few Years From Now. An additional option for supporting the surface combatant industrial base that could become available a few years from now would be to procure a smaller and less expensive alternative to the basic DD(X)/CG(X) design. If design work on such a ship were begun now, the first such ship might be ready for procurement around FY2011. Such a ship might be easier to procure within available resources at a rate of two ship per year, which is a rate that, compared to one DD(X) per year, might better support the surface combatant industrial base, and be easier to divide between two surface combatant yards. The following section of this statement discusses notional options for what such a ship might look like.

If the DD(X)/CG(X) effort is terminated at some point due to dissatisfaction regarding its affordability and cost effectiveness, and an alternative large surface combatant design is not ready to be put into procurement, it could place pressures on the surface combatant industrial base that are significantly higher than those it currently faces under the Navy's current plan for procuring DD(X)s, with consequences that could be more severe.

Potential Cost-Reduction Alternatives

Potential options for reducing surface combatant acquisition costs include but are not limited to the following:

- terminating the LCS program or reducing planned LCS procurement, and perhaps transferring some of the associated funding to procurement of larger surface combatants;

- terminating the DD(X)/CG(X) program without procuring any DD(X)s, or after procuring one or two DD(X)s, and procuring modified DDG-51s instead; and

- terminating the DD(X)/CG(X) program without procuring any DD(X)s, or after procuring a small number of DD(X)s, and procuring a new-design surface combatant that is smaller and less expensive than the DD(X)/CG(X) design.

Each of these options is discussed below.

Terminate or Reduce LCS Procurement

Although LCSs individually are much less expensive than larger Navy surface combatants, the Navy plans to increase LCS procurement to 5 ships per year starting in FY2009. The FY2006-FY2011 FYDP projects the annual cost to procure 5 LCSs and LCS mission modules at about $1.9

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[21] For additional discussion of the Deepwater program, see CRS Report RS21019, *Coast Guard Deepwater Program: Background and Issues for Congress*, by Ronald O'Rourke.

billion per year.[22] If LCS procurement were terminated or reduced, some portion of this $1.9 billion per year could be transferred to procurement of larger surface combatants. This option would also, however, reduce or eliminate the mission capabilities associated with introducing LCSs into the fleet.

Terminate DD(X)/CG(X) and Procure Modified DDG-51s

Under this option, development of DD(X)/CG(X) technologies could continue, so that these technologies would be available for future use elsewhere in the fleet. Development of the DD(X) radar, for example, could continue so that this radar could be used on future aircraft carriers. Development of these technologies might continue without any DD(X)s being procured. Alternatively, a single DD(X) might be procured as an integrated technology demonstrator, and a second DD(X) might be procured to give a second yard experience in building the DD(X) design.

The DDG-51s procured under this option could include modifications to significantly reduce crew size and annual O&S costs, to increase ship capabilities, or to better align ship capabilities with littoral missions that would have been performed by DD(X)s.

Potential advantages of this option compared to the Navy's current plan include reduced technical risks, reduced detailed design and nonrecurring engineering costs, and reduced unit procurement costs. Potential disadvantages include procuring ships whose capabilities are insufficient or misaligned for closing projected Navy capability shortfalls, higher ship O&S costs, and reduced introduction of planned DD(X)/CG(X) technologies into the fleet.

Terminate DD(X)/CG(X) and Procure Smaller New-Design Alternative

Under this option, development of DD(X)/CG(X) technologies would continue so that they would be available for use on the smaller new-design surface combatant. Development of these technologies might continue without any DD(X)s being procured. Alternatively, a single DD(X) might be procured as an integrated technology demonstrator, a second DD(X) might be procured to give a second yard experience in building the DD(X) design, and a small number of additional DD(X)s (perhaps another one or two) might be procured to help support the surface combatant industrial base until the smaller new-design surface combatant was ready for procurement.

Roughly 9,500-Ton Surface Combatant (SC(X)). One option for a smaller new-design ship would be surface combatant about equal in size to the Navy's current 9,500-ton Aegis cruisers and destroyers. Such a ship, which might be called the SC(X) (meaning surface combatant, in development) could:

- incorporate many of the same technologies now being developed for the DD(X) and CG(X), including, for example, radar technologies, technologies permitting a reduced-sized crew, and integrated electric-drive propulsion;

- cost substantially less to procure than a DD(X) or CG(X);

[22]See the table on LCS program funding in either CRS Report RL32109, op cit, or CRS Report RS21305, *Navy Littoral Combat Ship (LCS): Background and Issues for Congress*, by Ronald O'Rourke.

- be similar to the DD(X) and CG(X) in using a reduced-size crew to achieve an O&S cost lower than that of the current DDG-51 design;

- carry a payload — a combination of sensors, weapon launchers, weapons, and aircraft — about two-thirds as large as that of the DD(X) or CG(X), and about equal to that of current DDG-51s or Aegis cruisers.

A naval gunfire variant of the SC(X) could carry two AGSs, like the DD(X), but have reduced capabilities in other areas. A radar variant of the SC(X) could carry the CG(X) radar, but have reduced capabilities in other areas.

A 9,500-ton new-design SC(X) using DD(X) and CG(X) technologies would be less capable than the DD(X) or CG(X) due to its smaller payload, but would still be quite capable. Due to its more-comprehensive use of new technologies, it would likely have more overall capability than an Aegis cruiser or DDG-51.

A decision to design and procure one or more 9,500-ton SC(X) variants in lieu of continued DD(X)/CG(X) procurement could be viewed as analogous to the late-1970s decision discussed earlier to field the Aegis system on a 9,000-ton cruiser rather than on a more-capable but more-expensive 12,100-ton or 17,100-ton nuclear-powered cruiser. One difference between then and now would be that the 9,000-ton Aegis option involved fitting the Aegis system onto an existing destroyer hull design, whereas a 9,500-ton SC(X) would include a new-design hull that would be sized to accommodate the ship's intended payload and take maximum advantage of new technologies.

A potential lower cost target for a 9,500-ton SC(X) would be for follow-on SC(X)s to have a unit procurement cost equal to that of the DDG-51. A potential higher cost target would be for follow-on SC(X)s to have a unit procurement cost that would permit 2 SC(X)s to be procured for the same amount of funding as 3 DDG-51s. Establishing a maximum SC(X) displacement of 9,500 tons, though an arbitrary device, could help the Navy meet a target unit procurement cost by placing an upper bound on the ship's size and payload.

A decision to establish a target unit procurement cost for the SC(X) would be analogous to the 1982-1983 decision discussed earlier to establish a unit procurement cost target for the DDG-51 program.

Table 1 on the next page compares selected features of the DD(X) design to those of a notional SC(X) variant equipped with 2 AGSs and a notional SC(X) variant equipped with CG(X) radar.

Table 1. Selected Features of DD(X) and Notional SC(X) Variants

Feature	DD(X)	Notional SC(X) variants compared to DD(X)	
		Variant with 2 AGSs	Variant with CG(X) radar
AAW			
Radar suite	VSR/MFR	candidate for reduction	CG(X) radar
Missiles	SM-2, ESSM	ESSM	SM-2, ESSM
ASuW			
AGSs	2	2	0
AGS rounds	920	600-920	0
ASW sonars	Hull, MFTA	candidate for reduction	candidate for reduction
VLS cells	80 AVLS	32 Mk 41	60 AVLS
Aviation			
landing platform	large	candidate for reduction	candidate for reduction
hanger and maintenance	1 helo +3 UAVs	0	0
Flag command facilities	yes	no	yes
SOF facilities	yes	no	no
Boats			
number	two 11m + 4 RRC	candidate for reduction	candidate for reduction
davit or ramp	stern ramp	candidate for reduction	candidate for reduction
Displacement (tons)	14,564	9,500	9,500

Source for DD(X) features: U.S. Navy.

"Candidate for reduction" defined as follows: For radar, perhaps no more capability than needed to support point-defense operations with ESSM. For sonar, perhaps no multi-function towed array (MFTA) or a less expensive hull sonar or MFTA. For landing platform, perhaps a platform equal to that on DDG-51 Flight I ships. For boats, perhaps a capability equal to that of the DDG-51 (two 7-meter boats and no rubber raiding craft [RRC]). For davit or stern ramp, whichever results in lower total ship cost. Other SC(X) features (e.g., speed, endurance, signature reduction, survivability, electrical power for weapons and systems, and C4I/networking bandwidth) could be set at a basic level consistent with the primary mission orientation of each variant (i.e., serving as a naval fire-support or CG(X) radar platform). The number of VLS cells in the SC(X) variant with the 2 AGSs reflects the ability of each VLS cell to store and fire 4 ESSMs. The number of VLS cells in the SC(X) variant with the CG(X) radar reflects this, as well as the presence in the fleet of more than 8,000 VLS cells on the Navy's Aegis cruisers and destroyers and the ability in a networked force for a ship to control missiles launched by other ships.

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 Congressional Budget Office (CBO) report on surface combatants and CBO's February 2005 report on options for the FY2006 federal budget.[23] CBO estimates that such a ship, which it called the FFG(X), might displace about 6,000 tons and have a unit procurement cost of about $875 million in FY2007 dollars.

A 6,000-ton FFG(X) would likely be too small to be equipped with the AGS and therefore likely 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 Oliver Hazard Perry (FFG-7) class frigates and Spruance (DD-963) class destroyers. 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 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 needed.

Mr. Chairman, distinguished members of the subcommittee, this concludes my testimony. Thank you again for the opportunity to appear before you to discuss these issues. I will be pleased to respond to any questions you might have.

[23] U.S. Congressional Budget Office, *Transforming the Navy's Surface Combatant Force*, Mar. 2003, pp. 27-28, 63; and U.S. Congressional Budget Office, *Budget Options*, Feb. 2005, pp. 18-19.

Appendix A: DD(X)/CG(X) Program Costs

Table 2. DD(X)/CG(X) Funding, 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 (including advance procurement)											
DD(X) 1	0	0	0	220	666	2405	0	0	0	0	3291
Construction	*0*	*0*	*0*	*22*	*306*	*2405*	*0*	*0*	*0*	*0*	*2733*
DD/NRE[b]	*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
Construction	*0*	*0*	*0*	*5*	*40*	*120*	*2677*	*0*	*0*	*0*	*2842*
DD/NRE[b]	*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
Construction	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*2710*	*2710*
DD/NRE[b]	*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 RDT&E funding provided for DD-21/DD(X) program in FY1995-FY2001. GAO has reported that total DD(X)/ CG(X) RDT&E costs are roughly $10 billion.

b. Detailed design and nonrecurring engineering costs for the class.

Appendix B: DDG-51 And DD(X) Procurement And O&S Costs

Table 3 below shows DDG-51 and DD(X) procurement and 35-year operating and support (O&S) costs. The present-value calculation discounts future-year expenditures at a 3.1% real discount rate, consistent with OMB Circular A-94.[24] A-94 also mentions certain instances where a 7% real discount rate might be used. With a 7% real discount rate, the total procurement and life-cycle O&S cost would become $1,990 million for the DDG-51 and $2,836 million for the DD(X), a difference $846 million in absolute terms or about 43% in percentage terms.

Table 3. DDG-51 and DD(X) Procurement And 35-Year O&S Costs
(millions of dollars)

	Constant FY2007 dollars			Present-value calculation		
	Procure-ment cost	**35-year life-cycle O&S cost**	**Total**	**Procure-ment cost**	**35-year life-cycle O&S cost**	**Total**
DDG-51	1,393	2,115	3,508	1,393	1,133	2,526
Follow-on DD(X)	2,377	1,627	4,004	2,377	871	3,248
DD(X) difference from DDG-51						
Absolute	984	(488)	496	984	(262)	722
Percentage	71	(23)	14	71	(23)	29

Source: CRS calculation based on U.S. Navy DD(X) and DDG-51 cost data. 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.)

[24] U.S., Office of Management and Budget, *Circular A-94, Guidelines And Discount Rates For Benefit-Cost Analysis of Federal Programs*. The 3.1% real discount rate is set forth in Appendix C (Revised January 2005) for discounting constant-dollar flows of 30 years or more. Circular A-94 is online at: [http://www.whitehouse.gov/omb/circulars/a094/a094.pdf]