Navy DDG-51 and DDG-1000 Destroyer Programs: Background and Issues for Congress

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Summary

The Administration's FY2010 defense budget proposes to end the procurement of DDG-1000 (Zumwalt) class destroyers with the third ship, which was authorized and partially funded in FY2009, and restart procurement DDG-51 (Arleigh Burke) class Aegis destroyers, which were last procured in FY2005. The Administration's budget is consistent with a proposal for stopping DDG-1000 procurement and restarting DDG-51 procurement that the Navy announced in July 2008.

The Navy's plans for destroyer procurement in FY2012 and beyond are somewhat unclear. The Navy since July 2008 has spoken on several occasions about a desire to build a total of 11 or 12 DDG-51s between FY2010 and FY2015, but the Navy also testified to the Seapower subcommittee of the Senate Armed Services Committee on June 16, 2009, that it is conducting a study on destroyer procurement options for FY2012 and beyond that is examining design options based on either the DDG-51 or DDG-1000 hull form. A January 2009 memorandum from the Department of Defense acquisition executive called for such a study.

The proposed FY2010 defense budget requests procurement funding to complete the cost of the third DDG-1000 and to procure one DDG-51, and advance procurement funding for two more DDG-51s that the Navy wants to procure in FY2011.

The House and Senate Armed Services Committees, in their markups of the FY2010 defense authorization bill (H.R. 2647/S. 1390), recommended approving the Administration's request for procurement funding to complete the cost of the third DDG-1000 and to procure one DDG-51. The House committee recommended reducing by $150 million the request for procurement funding to cover cost growth on the first two DDG-1000s, and increasing by $100 million the request for advance procurement funding for procuring two DDG-51s in FY2011. Section 125 of H.R. 2647 would authorize a multiyear procurement (MYP) arrangement for the procurement of DDG-51s beginning in FY2010. Section 113 of S. 1390 would, among other things, prohibit the Navy from obligating or expending funds for surface combatants procured in FY2012 or subsequent years until certain conditions are met.

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The Navy's plans for destroyer procurement in FY2012 and beyond are somewhat unclear. The Navy since July 2008 has spoken on several occasions about a desire to build a total of 11 or 12 DDG-51s between FY2010 and FY2015, but the Navy also testified to the Seapower subcommittee of the Senate Armed Services Committee on June 16, 2009, that it is conducting a study on destroyer procurement options for FY2012 and beyond that is examining design options based on either the DDG-51 or DDG-1000 hull form. A January 2009 memorandum from the Department of Defense (DOD) acquisition executive called for such a study.

The issue for Congress is whether to approve, reject, or modify the Administration's request for FY2010 procurement and advance procurement funding for destroyers, and whether to take any action now regarding the procurement of destroyers in FY2012 and beyond. Decisions that Congress makes on these issues could affect future Navy capabilities, Navy funding requirements, and the shipbuilding industrial base.

Background

FY2010 Funding Request

DDG-51 Program

The Navy's proposed FY2010 budget requests $1,912.3 million for the procurement of a DDG-51. The Navy estimates the total cost of this ship at $2,240.3 million. The ship received $199.4 million in FY2009 advance procurement funding, and the Navy plans to request approval to transfer or reprogram $128.6 million in prior-year funding to help complete the ship's cost. The Navy's proposed FY2010 budget also requests $329.0 million in advance procurement funding for two more DDG-51s to be procured in FY2011.

DDG-1000 Program

The Navy's proposed FY2010 budget requests $1,084.2 million to complete the cost of the third DDG-1000, and $309.6 million in additional procurement funds to cover cost growth on the first two DDG-1000s, which were authorized in FY2007 and funded in FY2007-FY2008. The Navy estimates the combined procurement cost of the first two DDG-1000s at $6,634.2 million, or an average of $3,317.1 million each, and the procurement cost of the third ship at $2,738.3 million. The Navy's proposed FY2010 budget also requests $539.1 million in research and development funding for the DDG-1000 program.

DDG-51 Program

Program Origin

The DDG-51 (Arleigh Burke) Aegis destroyer program was initiated in the late 1970s with the aim of developing a surface combatant to replace older destroyers and cruisers that were projected to retire in the 1990s. The DDG-51 was conceived as an affordable complement to the Navy's Ticonderoga (CG-47) class Aegis cruisers.

Mission Orientation and Design Features

The DDG-51 is a multi-mission surface combatant with an emphasis on air defense (which the Navy refers as anti-air warfare, or AAW) and blue-water (mid-ocean) operations. DDG-51s, like CG-47s, are equipped with the Aegis combat system, an integrated ship combat system named for the mythological shield that defended Zeus. CG-47s and DDG-51s consequently are often referred to as Aegis cruisers and Aegis destroyers, respectively, or collectively as Aegis ships. The current version of the DDG-51 design, called the Flight IIA version, has a full load displacement of about 9,500 tons, which is similar to that of the CG-47.

The DDG-51 design has been changed over time to incorporate various improvements. The Flight IIA design, which was first procured in FY1994, was a significant change that included, among other things, the addition of a helicopter hangar. The Aegis system installed on new DDG-51s has been updated several times.

DDG-51s (and also some CG-47s) are being modified to receive an additional capability for ballistic missile defense (BMD) operations. The modification for BMD operations includes, among other things, the addition of a new software program for the Aegis combat system and the arming of the ship with the SM-3, a version of the Navy's Standard Missile that is designed for BMD operations.[1]

Total Procured Through FY2005 and Construction Shipyards

The first DDG-51 was procured in FY1985, and a total of 62 were procured through FY2005. The first ship entered service in 1991, a total of 54 were in service as of the end of FY2008, and the 62nd is scheduled to enter service in 2011. Of the 62 DDG-51s procured through FY2005, General Dynamics Bath Iron Works (GD/BIW) of Bath, ME, is the builder of 34, and the Ingalls shipyard that forms part of Northrop Grumman Shipbuilding (NGSB) is the builder of 28.[2]

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[1] For more on Navy BMD programs, CRS Report RL33745, *Sea-Based Ballistic Missile Defense—Background and Issues for Congress*, by Ronald O'Rourke.

[2] In the earlier years of the DDG-51 program, when as many as four or five DDG-51s per year were being procured, Bath Iron Works (BIW) of Bath, ME (now a part of General Dynamics) and Ingalls Shipbuilding of Pascagoula, MS (now a part of Northrop Grumman Shipbuilding) competed on an annual basis for contracts to build DDG-51s. In FY1994, when the annual DDG-51 procurement rate dropped to about three ships per year, the Navy ended annual competition between the firms for the purpose of allocating DDG-51 construction contracts and began to allocate DDG-51s between them. Two years later, in FY1996, the Navy began using Profit Related to Offer (PRO) bidding, which granted a higher profit rate to the shipyard that submitted the lower-cost bid for its work. PRO bidding permits the Navy to employ a degree of competition in the acquisition of DDG-51s even though DDG-51s are allocated rather than competitively awarded to the two shipyards.

The Navy has initiated a program for modernizing existing DDG-51s so as maintain their mission and cost effectiveness out to the end of their projected 35-year service lives.[3] In August 2008, it was reported that the Navy had decided to expand the scope of this program to include the installation of a BMD capability, so that every DDG-51 would eventually have a BMD capability.[4]

Older CRS reports provide additional historical and background information on the DDG-51 program.[5]

DDG-1000 Program

Program Origin and Names

The Navy initiated the DDG-1000 (Zumwalt) destroyer program in the early 1990s under the name DD-21, which meant destroyer for the 21st Century. In November 2001, the program was restructured and renamed the DD(X) program, meaning a destroyer whose design was in development. In April 2006, the program's name was changed again, to DDG-1000, meaning a guided missile destroyer with the hull number 1000.

Mission Orientation and Design Features

The DDG-1000 is a multi-mission destroyer with an emphasis on naval surface fire support (NSFS) and operations in littoral (i.e., near-shore) waters. The DDG-1000 was intended in part to replace, in a technologically more modern form, the large-caliber naval gun fire capability that the Navy lost when it retired its Iowa-class battleships in the early 1990s.[6] The DDG-1000 was also intended to improve the Navy's general capabilities for operating in defended littoral waters, to introduce several new technologies that would be available for use on future Navy ships, and to serve as the basis for the Navy's planned next-generation cruiser, called the CG(X).[7]

The DDG-1000 is to have a reduced-size crew of 142 sailors (compared to roughly 300 on the Navy's current destroyers and cruisers) so as reduce its operating and support (O&S) costs. The ship is to incorporate a significant number of new technologies, including a wave-piercing,

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[3] For more on this program, see CRS Report RS22595, *Navy Aegis Cruiser and Destroyer Modernization: Background and Issues for Congress*, by Ronald O'Rourke.

[4] Otto Kreisher, "BMD Boost," Seapower, August 2008: 12-14. Equipping all DDG-51s with a BMD capability would substantially expand the current program of record for Navy BMD platforms, which currently calls for 15 DDG-51s (and 3 Aegis cruisers) to be equipped for BMD operations.

[5] See CRS Report 94-343, *Navy DDG-51 Destroyer Procurement Rate: Issues and Options for Congress*, by Ronald O'Rourke. [April 25, 1994; out of print and available directly from the author], and CRS Report 80-205, *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 Destroyers*, by Ronald O'Rourke. [November 21, 1984; out of print and available directly from the author]

[6] The Navy in the 1980s reactivated and modernized four Iowa (BB-61) class battleships that were originally built during World War II. The ships reentered service between 1982 and 1988 and were removed from service between 1990 and 1992.

[7] For more on the CG(X) program, see CRS Report RL34179, *Navy CG(X) Cruiser Program: Background, Oversight Issues, and Options for Congress*, by Ronald O'Rourke.

tumblehome hull design for reduced detectability,[8] a superstructure made partly of large sections of composite (i.e., fiberglass-like) materials rather than steel or aluminum, an integrated electric-drive propulsion system,[9] 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 vertical launch system (VLS) for storing and firing missiles, and two copies of a 155mm gun called the Advanced Gun System (AGS). The AGS is to fire a new rocket-assisted 155mm shell, called the Long Range Land Attack Projectile (LRLAP), to ranges of more than 60 nautical miles. The DDG-1000 can carry 600 LRLAP rounds (300 for each gun), and additional rounds can be brought aboard the ship while the guns are firing, creating what Navy officials call an "infinite magazine."

With an estimated full load displacement of 14,987 tons, the DDG-1000 design is roughly 55% larger than the Navy's current 9,500-ton Aegis 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.

When the DD-21 program was initiated, a total of 32 ships was envisaged. In subsequent years, the planned total for the DD(X)/DDG-1000 program was reduced to 16 to 24, and then to 7. Under the Administration's proposed FY2010 budget, the planned total is to be reduced to three.

For additional background information on the DDG-1000 program, see **Appendix A**.

Estimated Costs and Prior-Year Funding

The first two DDG-1000s were procured in FY2007 and split-funded (i.e., funded with two-year incremental funding) in FY2007-FY2008. In the FY2009 budget, the Navy estimated their combined procurement cost at $6,324.5 million. In the FY2010 budget, the Navy estimates their combined procurement cost at $6,634.2 million—an increase of $309.7 million, or about 4.9%. The Navy states that this increase is not due to growth in the estimated cost to build the ships themselves, but rather to a reallocation to the first two ships of some class-wide program-support costs that were to have been included in the procurement costs of the fourth through seventh ships.[10] To cover this cost growth, the Navy's proposed FY2010 budget requests $309.6 million in procurement funding in a line item in the Navy's shipbuilding account that requests funding to cover cost growth on ships procured in prior fiscal years.[11]

The third DDG-1000 was authorized and partially funded in FY2009. The FY2009 budget estimated the procurement cost of the third DDG-1000 at $2,652.6 million. The FY2010 budget estimates the ship's procurement cost at $2,738.3 million—an increase of $85.7 million, or about 3.2%. The third DDG-1000 received $149.8 million in advance procurement funding in FY2008, and $1,504.3 million in procurement funding in FY209. The Navy's proposed FY2010 budget requests $1,084.2 million to complete the cost of the ship.

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[8] A tumblehome hull slopes inward, toward the ship's centerline, as it rises up from the waterline, in contrast to a conventional flared hull, which slopes outward as it rises up from the waterline.

[9] For more on integrated electric-drive technology, see CRS Report RL30622, *Electric-Drive Propulsion for U.S. Navy Ships: Background and Issues for Congress*, by Ronald O'Rourke.

[10] Source: Navy briefing on DDG-1000 to CRS and Congressional Budget Office (CBO), June 10, 2009.

[11] The difference between the $309.7 million figure and the $309.6 million figure appears to be a consequence of rounding figures to the nearest tenth of a million.

The DD-21/DD(X)/DDG-1000 program has received a total of about $15.3 billion in funding from FY1995 through FY2009. This total includes about $7.4 billion in research and development funding, and about $8.0 billion in procurement funding.

Construction Shipyards

Until July 2007, it was expected that NGSB would be the final-assembly yard for the first DDG-1000 and that GD/BIW would be the final-assembly yard for the second. On September 25, 2007, the Navy announced that it had decided to build the first DDG-1000 at GD/BIW, and the second at NGSB.

On January 12, 2009, it was reported that the Navy, NGSB, and GD/BIW in the fall of 2008 began holding discussions on the idea of having GD/BIW build both the first and second DDG-1000s, in exchange for NGSB receiving a greater share of the new DDG-51s that would be procured under the Navy's July 2008 proposal to stop DDG-1000 procurement and restart DDG-51 procurement.[12]

On April 8, 2009, it was reported that the Navy had reached an agreement with NGSB and GD/BIW to shift the second DDG-1000 to GD/BIW, and to have GD/BIW build all three ships. NGSB will continue to make certain parts of the three ships, notably their composite deckhouses. The agreement to have all three DDG-1000s built at GD/BIW was a condition that Secretary of Defense Robert Gates set forth in an April 6, 2009, news conference on the FY2010 defense budget for his support for continuing with the construction of all three DDG-1000s (rather than proposing the cancellation of the second and third).

Surface Combatant Construction Industrial Base

Shipyards

All cruisers, destroyers, and frigates procured since FY1985 have been built at GD/BIW of Bath, ME, and the Ingalls shipyard in Pascagoula, MS, that forms part of NGSB.[13] 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. (Ingalls also builds amphibious ships for the Navy.) Navy surface combatants are overhauled, repaired, and modernized at GD/BIW, NGSB, other private-sector U.S. shipyards, and government-operated naval shipyards (NSYs).

Combat System Manufacturers

Lockheed Martin and Raytheon are generally considered the two leading Navy surface ship radar makers and combat system integrators. Lockheed is the lead contractor for the DDG-51 combat system (the Aegis system), while Raytheon is the lead contractor for the DDG-1000 combat system, the core of which is called the Total Ship Computing Environment Infrastructure (TSCE-

[12] Christopher P. Cavas, "Will Bath Build Second DDG 1000?" *Defense News*, January 12, 2009: 1, 6.

[13] NGSB also includes the Avondale shipyard near New Orleans, Newport News Shipbuilding of Newport News, VA, and a fourth facility, used for manufacturing ship components and structures made from composites, at Gulfport, MS.

I). Lockheed has a share of the DDG-100 combat system, and Raytheon has a share of the DDG-51 combat system.

TSCE-I and an open-architecture version of the Aegis system[14] are both potential candidates for the basis of the open architecture combat system that is to be installed on the Navy's planned CG(X) cruiser. The CG(X)'s combat system in turn might in turn serve as the basis for the open architecture combat systems of other future Navy surface ships.

Supplier Firms

The surface combatant industrial base also includes hundreds of additional firms that supply materials and components. Many of the suppliers for the DDG-1000 program are not suppliers for the DDG-51 program, and vice versa. The financial health of Navy shipbuilding 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.

Current Navy Destroyer Procurement Plans

The Navy wants to procure one DDG-51 in FY2010 and two more DDG-51s in FY2011. The Navy's plans for destroyer procurement in FY2012 and beyond are somewhat unclear. The Navy since July 2008 has spoken on several occasions about a desire to build a total of 11 or 12 DDG-51s between FY2010 and FY2015, but the Navy also testified to the Seapower subcommittee of the Senate Armed Services Committee on June 16, 2009, that it is conducting a study on destroyer procurement options for FY2012 and beyond that is examining design options based on either the DDG-51 or DDG-1000 hull form.[15] A January 2009 memorandum from the Department of Defense acquisition executive called for such a study.[16]

Rationale For Navy's Shift in Destroyer-Procurement Plans

The Navy announced its desire to end DDG-1000 procurement and restart DDG-51 procurement at a July 31, 2008, hearing before the Seapower and Expeditionary Forces subcommittee of the

[14] In general terms, an open architecture combat system is a combat system that uses non-proprietary computers and software, and can be easily upgraded with new software provided by multiple vendors. The Navy is working with Lockheed, in part through the Aegis ship modernization program, to evolve the Aegis system, which was not originally developed as an open architecture combat system, into an open architecture combat system. For more on the Aegis ship modernization program, see CRS Report RS22595, *Navy Aegis Cruiser and Destroyer Modernization: Background and Issues for Congress*, by Ronald O'Rourke.

[15] Source: Transcript of spoken remarks of Vice Admiral Bernard McCullough at a June 16, 2009, hearing on Navy force structure shipbuilding before the Seapower subcommittee of the Senate Armed Services Committee.

[16] A January 26, 2009, memorandum for the record from John Young, the then-DOD acquisition executive, stated that "The Navy proposed and OSD [the Office of the Secretary of Defense] agreed with modification to truncate the DDG-1000 Program to three ships in the FY 2010 budget submission." The memo proposed procuring one DDG-51 in FY2010 and two more FY2011, followed by the procurement in FY2012-FY2015 (in annual quantities of 1, 2, 1, 2) of a ship called the Future Surface Combatant (FSC) that could be based on either the DDG-51 design or the DDG-1000 design. The memorandum stated that the FSC might be equipped with a new type of radar, but the memorandum did not otherwise specify the FSC's capabilities. The memorandum stated that further analysis would support a decision on whether to base the FSC on the DDG-51 design or the DDG-1000 design. (Memorandum for the record dated January 26, 2009, from John Young, Under Secretary of Defense [Acquisition, Technology and Logistics], entitled "DDG 1000 Program Way Ahead," posted on InsideDefense.com [subscription required].)

House Armed Services Committee. (For the Navy's prepared statement for the hearing, see **Appendix B**.) In testimony at that hearing and subsequent hearings, and in other remarks since July 2008, Navy officials have stated that they decided to propose ending DDG-1000 procurement and restarting DDG-51 procurement because of a reassessment of threats that Navy forces are likely to face in coming years. As a result of this reassessment, Navy officials have stated, the service wants destroyer procurement over the next several years to emphasize three mission capabilities – area-defense AAW, BMD, and open-ocean ASW. Navy officials have also stated that they want to maximize the number of destroyers that can be procured over the next several years within budget constraints. Navy officials state that DDG-51s can provide the area-defense AAW, BMD, and open-ocean ASW capabilities that the Navy wants to emphasize, and that while the DDG-1000 design could also be configured to provide these capabilities, the Navy could procure more DDG-51s than DDG-1000s over the next several years for the same total amount of funding. In addition, the Navy no longer appears committed to the idea of reusing the DDG-1000 hull as the basis for the Navy's planned CG(X) cruiser.[17] If the Navy had remained committed to that idea, it might have served as a reason for continuing DDG-1000 procurement.

A May 11, 2009, letter from Admiral Gary Roughead, the Chief of Naval Operations, to Senator Edward Kennedy, the chairman of the Seapower subcommittee of the House Armed Services Committee, stated:

> In response to your letter of October 24, 2008 concerning the Navy's Long-Range Shipbuilding Plan and the decision to truncate the DDG-1000 program, I stated in my letter on January 5, 2009 that I would provide the cost estimates comparisons you requested when they were developed in conjunction with the Fiscal Year (FY) 2010 Budget.
>
> Specifically, you requested a comparison of "Acquisition Costs for DDG-51s and Modified DDG-1000s" with design specifications for the Modified DDg-1000 reflecting nominally equal capability. Table 1 provides a comparison of acquisition cost of Fiscal Year 2010 ship and average follow ship for a DDG-51 and Modified DDG-1000 based on a multi-hull procurement in constant FY10 dollars. The cost of 10 additional DDG-51s is less than a 7 ship class of DDG-1000s.

[17] For more on the CG(X) program, see CRS Report RL34179, *Navy CG(X) Cruiser Program: Background, Oversight Issues, and Options for Congress*, by Ronald O'Rourke

Table 1. [In Navy letter to Congress] Acquisition Costs for DDG-51s and Modified DDG-1000s

(Costs in CY2010 $B)

	FY10	Total FY 11 and Out	Avg Follow (FY11-16)
DDG-1000			
RDT&E	0.14	1.76	—
SCN	2.73		2.55
Total	2.87		
DDG 51			
RDT&E	0.01	0.15	—
SCN	2.24		1.90
Total	2.25		

*** Acquisition costs reflect Rought Order of Magnitude (ROM) estimates which reflect uncertainty in some categories of cost (e.g., amount of software reuse). The acquisition costs do not reflect the recent DDG 1000/DDG 51 swap agreement.**

It is important to discuss the assumptions used in formulating Table 1. Specifically:

- Advanced Gun Systems and associated magazines in the current DDG-1000 design deleted and additional missile-launch tubes installed in their place.

- Ship and missile modifications as needed for the ship to successfully employ SM-2, SM-3, and SM-6 missiles and otherwise give the ship a Ballistic Missile Defense (BMD) and are-defense AAW capability not less than that of Flight IIA DDG-51 with Advanced Capability 12.

- The primary system differences between the DDG-51 and DDG-1000 ships with respect to ASW are the bow mounted sonars, the Periscope Detection Radar (PDR) planned for DDG-1000, and the DDG-1000's planned lower ship self noise characteristics. There is a known performance difference at the sensor level between the hull mounted sonars on the DDG-51 and DDG-1000 ships due to physical size and source level differences between the ships. The DDG-51 has slightly better performance, but when factoring the PDR and quieter self noise characteristics, the DDG-1000 could be expected to perform as well as, or possibly better than the DDG-51 under certain scenarios and acoustic conditions. At the campaign level when the ship is utilized in fleet ASW tactics in conjunction with other ship and air assets the magnitude of the performance difference is unclear. Due to the probability that the difference in performance levels at the campaign level would be low, I will forgo the detailed analysis and assess the two ships as equal in this area without modification.

The 10 additional DDG-51s would join an existing fleet force structure of 22 CGs and 62 DDGs. These follow-on DDG-51s build on a common hull and stable combat system configuration incorporating advanced Integrated Air and Missile Defense (IAMD) and Anti Submarine Warfare suite optimized for blue water sea base defense. Besides the enhancements required to gain IAMD capability in DDG-1000, the technical risk and acquisition costs associated with DDG-1000 are not as well defined as the known cost for the DDG-51 hull and combat system. Therefore, the additional capacity and capability gained through continuation of DDG-51s with lower technical risk and defined cost, couple with the

risks associated with the DDG-1000 make the restart of the DDG-51 line the preferred choice for affordable warfighting capability and capacity.

Table 2 provides data for your request to compare "Annual O & S Costs for a DDG-51 and a Modified DDG-1000" in constant FY10 dollars. Although DDG-1000 requires a smaller crew, comparing the individual element of manning costs between the two ships can be misleading. DDG-1000 was able to decrease its crew size through increased automation and by growing shore support primarily to complete maintenance traditionally performed by ship's company. Navy is committee to increasing the shore infrastructure to perform this maintenance however; those added maintenance costs generally negate the savings generated by the smaller crew size.

Table 2. [In Navy Letter to Congress] Annual O & S Costs for a DDG-51 and a Modified DDG-1000

(Average O&S/Ship/Year in CY10 $M)

Cost Element	DDG-51	Modified DDG-1000	Difference (DDG-51 – DDG-1000)
Operating (steaming), assuming crude [oil] cost of:			
$50 per barrel	$6.07	$8.42	$(2.35)
$100 per barrel	$12.14	$16.84	$(4.70)
$150 per barrel	$18.20	$25.26	$(7.05)
Maintenance	$20.39	$33.39	$(13.00)
Manpower*	$37.34	$17.32	$20.02
Total, Assuming crude oil cost of:			
$50 per barrel	$63.80	$59.13	$4.67
$100 per barrel	$69.87	$67.55	$2.32
$150 per barrel	$75.93	$75.97	$(0.04)
Total Crew Size	254 Enlisted, 25 Officers	108 Enlisted, 15 Officers	

* Does not account for increased ashore maintenance costs associated with DDG-1000s decreased crew size

Assumptions used in compiling Table 2 included:

- All costs are expressed in constant FY 2010 dollars
- Reflects average annual cost per ship, calculated on a 35 year service life basis. Includes periodic depot maintenance and fact of life upgrades.
- Annual Fuel Usage rate of 87,373 barrels for DDG-51 and 121,233 barrels for DDG-1000
- Crew Size is based on the following manning documents:
    - DDG-51 FLT IIA Part 3 (DDG 91 – DDG 102) Final Ship Manpower Document, 9 April 2007

- DDG-1000 Program Preliminary Ship Manpower Document, DCDRL-C.12 Rev b, Attachment 2, 31 August 2007
- Three additional crew members added to each ship class for BMD
- Reduced manning benefits are best realized over a large class of ships such as LCS with 55 ships.

In my role as Chief of Naval Operations, I will continue to develop a shipbuilding program which provides affordable combat capability in sufficient capacity to maintain our position as the dominant naval power in the world. For less cost and risk, truncating DDG-1000 and building additional DDG-51s is the clearest path to that end.

Thank you for your continued interest in our shipbuilding program and for your unwavering support of our Navy. If I can be of any further assistance, please let me know.[18]

Issues for Congress

Potential issues for Congress for FY2010 include the following:

- The merits of the Administration's proposal to stop DDG-1000 procurement and restart DDG-51 procurement, compared to an alternative of continuing DDG-1000 procurement while modifying the DDG-1000 design to align its capabilities more closely with the Navy's revised mission priorities for destroyers procured in FY2010 and beyond.[19]
- Whether to approve, reject, or modify the Administration's request for FY2010 procurement funding to complete the procurement cost of the third DDG-1000 and to cover cost growth on the first two DDG-1000s.
- Whether to approve, reject, or modify the Administration's request for FY2010 procurement and advance procurement funding to procure a DDG-51 in FY2010 and to support the procurement of two more DDG-51s in FY2011.
- Whether to direct the Navy to build the second and third DDG-1000s to a design featuring additional missile-launch tubes in the place of the current DDG-1000 design's Advanced Gun Systems (AGSs).[20]
- Whether to provide direction to the Navy regarding destroyers to be procured in FY2012 and beyond.

[18] Letter dated May 11, 2009 from Admiral Gary Roughead to Senator Edward Kennedy, posted on InsideDefense.com (subscription required) on June 26, 2009.

[19] In considering this issue, Congress may consider the relative costs and capabilities of DDG-51s and modified DDG-1000s (see the May 11, 2009, letter reprinted above, as well as the information in **Appendix C**), as well as the industrial-base implications of building one kind of ship or the other.

[20] In considering this option, potential factors to consider include cost of conducting the necessary ship redesign work, the impact on the ships' procurement cost, the operational impact of the resulting improvement in the ships' area-defense AAW, ASW, and strike capabilities (by being able to store and fire additional SM-2 AAW missiles, anti-submarine rockets [ASROCs], and Tomahawk land-attack cruise missiles), and the operational impact of the resulting reduction in the ships' naval surface fire support (NSFS) capabilities.

FY2010 Legislative Activity

Summary of Action on Funding Request

Table 3 summarizes action on FY2010 funding requests for the DDG-1000 and DDG-51 programs.

Table 3. Summary of Action on FY2010 Funding Request

Millions of dollars

Item	Request	HASC	SASC	Authorization conference	HAC	SAC	Appropriation conference
Procurement funding							
Procurement of third DDG-1000 in FY2010	1,084.2	1,084.2	1,084.2				
Cost growth on first two DDG-1000s	309.6	159.6	309.6				
Procurement of one DDG-51 in FY2010	1,912.3	1,912.3	1,912.3				
Advance procurement funding for two DDG-51s in FY2011	329.0	429.0	329.0				
Research and development funding							
DDG-1000 program	539.1	539.1	539.1				

Sources: HASC report (H.Rept. 111-166 of June 18, 2009) on H.R. 2647, and Division D of SASC-reported (S.Rept. 111-35 of July 2, 2009) version of S. 1390.

Note: HASC is House Armed Services Committee; SASC is Senate Armed Services Committee; HAC is House Appropriations Committee; SAC is Senate Appropriations Committee.

FY2010 Defense Authorization Bill (H.R. 2647/S. 1390)

House

Section 125 of H.R. 2647 would authorize a multiyear procurement (MYP) arrangement for the procurement of DDG-51s beginning in FY2010.

In addition to the funding recommendations noted in **Table 3**, the House Armed Services Committee's report (H.Rept. 111-166 of June 18, 2009) on H.R. 2647 states: "The committee supports the re-start of the DDG 51 class and believes that a minimum of two of these vessels should be requested per year." (Page 72). The report also states:

> The committee notes that the Secretary of Defense has decided to truncate the DDG 1000 program to three ships and restart the Burke class destroyer (DDG 51) program. The committee agrees with this decision and understands the agreement reached between the Department and the prime shipbuilding contractors for construction of the three DDG 1000 ships and the re-start of the first three DDG 51 ships will ensure industrial stability at both of

> the surface combatant construction shipyards while the Department plans for future surface combatant capability and force structure. (Pages 72-73)

The report also states:

> *Surface combatants*
>
> The committee will closely monitor the costs to complete the DDG 1000 class. The committee is encouraged by the robustness of design completion prior to the start of fabrication of the first ship. The committee expects the extra effort to complete design prior to the start of construction and the significant investment in infrastructure at the construction yard will set a new standard for first of class vessels in meeting target cost. However, the committee notes that approximately $1.5 billion in research and development efforts still need to be completed to realize the full combat capability of the ship.
>
> The committee supports the re-start of procurement of DDG 51 class destroyers. The committee supports the views of the Chief of Naval Operations that these vessels are required to counter emerging ballistic missile threats and for the conduct of deep ocean antisubmarine warfare. Therefore, the committee includes in title I of this Act, a provision that would authorize the Secretary of the Navy to enter into a multi-year procurement contract for additional DDG 51 destroyers. (Page 76)

Senate

In addition to the funding recommendations noted in **Table 3**, Section 113 of S. 1390 would, among other things, prohibit the Navy from obligating or expending funds for surface combatants procured in FY2012 or subsequent years until certain conditions are met. The text of Section 113 is as follows:

> SEC. 113. PROCUREMENT PROGRAMS FOR FUTURE NAVAL SURFACE COMBATANTS.
>
> (a) Limitation on Availability of Funds Pending Reports About Surface Combatant Shipbuilding Programs- The Secretary of the Navy may not obligate or expend funds for the construction of, or advanced procurement of materials for, a surface combatant to be constructed after fiscal year 2011 until the Secretary has submitted to Congress each of the following:
>
> (1) An acquisition strategy for such surface combatants that has been approved by the Department of Defense.
>
> (2) The results of reviews by the Joint Requirements Oversight Council for an Acquisition Category I program that supports the need for an acquisition strategy to procure surface combatants after fiscal year 2011.
>
> (3) A verification by an independent review panel convened by the Secretary of Defense that, in evaluating the shipbuilding program concerned, the Secretary of the Navy considered each of the following:
>
> (A) Modeling and simulation, including war gaming conclusions regarding combat effectiveness for the selected ship platforms as compared to other reasonable alternative approaches.

(B) Assessments of platform operational availability.

(C) Life cycle costs from vessel manning levels to accomplish missions.

(4) An intelligence analysis reflecting a coordinated threat assessment of the Defense Intelligence Agency that provides the basis for deriving the mix of platforms in the shipbuilding program concerned when compared with the surface combatants in the 2009 shipbuilding plan.

(5) The differences in cost and schedule arising from the need to accommodate new sensors and weapons in future surface combatants to counter the future threats referred to in paragraph (4) when compared with the cost and schedule arising from the need to accommodate sensors and weapons on surface combatants as contemplated by the 2009 shipbuilding plan for the vessels concerned.

(6) A verification by the commanders of the combatant commands that the shipbuilding program for the vessels concerned would be preferable to the surface combatants included in the 2009 shipbuilding plan for the vessels concerned in meeting all of their future mission requirements.

(7) A joint review by the Navy and the Missile Defense Agency setting forth additional requirements for investment in Aegis ballistic missile defense (BMD) beyond the number of DDG-51 and CG-47 vessels planned to be equipped for this mission area in the budget of the President for fiscal year 2010 (as submitted to Congress pursuant to section 1105 of title 31, United States Code).

(b) Future Surface Combatant Acquisition Strategy- Not later than the date upon which President submits to Congress the budget for fiscal year 2012 (as so submitted), the Secretary of the Navy shall submit to the congressional defense committees a plan to provide for full and open competition on the combat systems for surface combatants proposed in the future-years defense program submitted to Congress under section 221 of title 10, United States Code, together with such budget. The plan shall include specifics on the intent of the Navy to satisfy criteria described in subsection (a) and evaluate applicable technologies during the request for proposal and selection process.

(c) Naval Surface Fire Support- Not later than 120 days after the enactment of this Act, the Secretary of the Navy shall submit to the congressional defense committees an update to the March 2006 Report to Congress on Naval Surface Fire Support. The update shall identify how the Department of Defense intends to address any shortfalls between required naval surface fire support capability and the plan of the Navy to provide that capability. The update shall include addenda by the Chief of Naval Operations and Commandant of the Marine Corps, as was the case in the 2006 report.

(d) Technology Roadmap for Future Surface Combatants and Fleet Modernization-

(1) IN GENERAL- Not later than 120 days after the date of the enactment of this Act, the Secretary of the Navy shall develop a plan to incorporate into surface combatants constructed after 2011, and into fleet modernization programs, the technologies developed for the DDG-1000 destroyer and the DDG-51 and CG-47 Aegis ships, including the following:

(A) For the DDG-1000 destroyer—

(i) combat system;

(ii) multi-function and dual-band radars;

(iii) hull, mechanical and electrical systems achieving significant manpower savings; and

(iv) integrated electric propulsion technologies.

(B) For the DDG-51 and CG-47 Aegis ships—

(i) combat system, including missile defense capability;

(ii) hull, mechanical and electrical systems achieving manpower savings; and

(iii) anti-submarine warfare sensor systems designed for operating in open ocean areas.

(2) SCOPE OF PLAN- The plan required by paragraph (1) shall include sufficient detail for systems and subsystems to ensure that the plan—

(A) avoids redundant development for common functions;

(B) reflects implementation of Navy plans for achieving an open architecture for all naval surface combat systems; and

(C) fosters full and open competition.

(e) Definition- In this section:

(1) The term `2009 shipbuilding plan' means the 30-year shipbuilding plan submitted to Congress pursuant to section 231, title 10, United States Code, together with the budget of the President for fiscal year 2009 (as submitted to Congress pursuant to section 1105 of title 31, United States Code).

(2) The term `surface combatant' means a cruiser, a destroyer, or any naval vessel under a program currently designated as a future surface combatant program.

Regarding Section 113, the Senate Armed Services Committee's report (S.Rept. 111-35 of July 2, 2009) on S. 1390, states:

> The committee recommends a provision [Section 113] that would prevent the Navy from obligating any funds for building surface combatants after 2011 until the Navy conducts particular analyses, and completes certain tasks that should be required at the beginning of major defense acquisition programs (MDAP).
>
> For at least the past couple of years, the Navy's strategy for modernizing the major surface combatants in the fleet has been in upheaval. The Navy was adamant that the next generation cruiser had to begin construction in the 2011–2012 timeframe. After 15 years of consistent, unequivocal support of the uniformed Navy for the fire support requirement, and for the DDG–1000 destroyer that was intended to meet that requirement (i.e., gun fire support for Marine Corps or Army forces ashore), the Navy leadership, in the middle of last year, decided that they should truncate the DDG–1000 destroyer program and buy DDG–51 destroyers instead.
>
> The Defense Department has announced that the Navy will complete construction of the three DDG–1000 vessels and will build three DDG–51 destroyers, one in fiscal year 2010 and two in fiscal year 2011. Beyond that, the plan is less well defined, and includes building only a notional ''future surface combatant,'' with requirements, capabilities, and costs to be determined.

Notwithstanding Navy protests to the contrary, this was mainly due to the Navy's affordability concerns. The committee notes with no little irony that this sudden change of heart on the DDG–1000 program is at odds with its own consistent testimony that ''stability'' in the shipbuilding programs is fundamental to controlling costs and protecting the industrial base.

The Navy claims the change of heart on the DDG–1000 program was related to an emerging need for additional missile defense capability that would be provided by DDG–51s and is being requested by the combatant commanders, and would be used to protect carrier battle groups against new threats.

The committee certainly believes that the services should have the ability to change course as the long-term situation dictates. However, since we are talking about the long-term and hundreds of billions of dollars of development and production costs for MDAPs, the committee believes that the Defense Department should exercise greater rigor in making sure such course corrections are made with full understanding of the alternatives and the implications of such decisions, rather than relying on inputs from a handful of individuals. The committee has only to look at the decision-making behind the major course correction in Navy shipbuilding that yielded the Littoral Combat Ship (LCS) to be concerned by that prospect.

Before deciding on a course of action regarding acquisition of surface combatants after 2011, we collectively have time to perform the due diligence that should be and must be performed at the beginning of any MDAP. That is what this section will ensure.

In addition, in order to deter any delaying action on conducting and completing the activities required by this section before 2011, the committee directs that the Secretary of the Navy obligate no more than 50 percent of the funds authorized for fiscal year 2010 in PE 24201N, CG(X), until the Navy submits a plan for implementing the requirements of this section to the congressional defense committees. (Pages 13-14)

Appendix A. Additional Background Information on DDG-1000 Program

This appendix presents additional background information on the DDG-1000 program. It presents information on the DDG-1000 program *as it existed just prior to the Navy's July 2008 change in position on future destroyer procurement.*

Program Origin

The program known today as the DDG-1000 program was announced on November 1, 2001, when the Navy stated that it was replacing a destroyer-development effort called the DD-21 program, which the Navy had initiated in the mid-1990s, with a new Future Surface Combatant Program aimed at developing and acquiring a family of three new classes of surface combatants:[21]

- **a destroyer called DD(X)** for the precision long-range strike and naval gunfire mission,
- **a cruiser called CG(X)** for the air defense and ballistic missile mission,[22] 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.[23]

On April 7, 2006, the Navy announced that it had redesignated the DD(X) program as the DDG-1000 program. The Navy also confirmed in that announcement that the first ship in the class, DDG-1000, is to be named the Zumwalt, in honor of Admiral Elmo R. Zumwalt, the Chief of Naval operations from 1970 to 1974. The decision to name the first ship after Zumwalt was made by the Clinton Administration in July 2000, when the program was still called the DD-21 program.[24]

[21] The DD-21 program was part of a Navy surface combatant acquisition effort begun in the mid-1990s and called the SC-21 (Surface Combatant for the 21st Century) program. The SC-21 program envisaged a new destroyer called DD-21 and a new cruiser called CG-21. When the Navy announced the Future Surface Combatant Program in 2001, development work on the DD-21 had been underway for several years, while the start of development work on the CG-21 was still years in the future. The current DDG-1000 destroyer CG(X) cruiser programs can be viewed as the descendants, respectively, of the DD-21 and CG-21. The acronym SC-21 is still used in the Navy's research and development account to designate the line item (i.e., program element) that funds development work on both the DDG-1000 and CG(X).

[22] For more on the CG(X) program, see CRS Report RL34179, *Navy CG(X) Cruiser Program: Background, Oversight Issues, and Options for Congress*, by Ronald O'Rourke.

[23] For more on the LCS program, see CRS Report RL33741, *Navy Littoral Combat Ship (LCS) Program: Background, Oversight Issues, and Options for Congress*, by Ronald O'Rourke.

[24] For more on Navy ship names, see CRS Report RS22478, *Navy Ship Names: Background for Congress*, by Ronald O'Rourke.

Acquisition Strategy

Navy Management

Since September 30, 2005, the Navy has managed the DDG-1000 program through a series of separate contracts with major DDG-1000 contractors, including Northrop Grumman Shipbuilding (NGSB), General Dynamics Bath Iron Works (GD/BIW), Raytheon, and BAE Systems (the maker of the AGS). Under this arrangement, the Navy is acting as the overall system integrator for the program.

Earlier Proposal for Winner-Take-All Acquisition Strategy

Under a DDG-1000 acquisition strategy approved by the Under Secretary of Defense for Acquisition, Technology, and Logistics (USD AT&L) on February 24, 2004, the first DDG-1000 was to have been built by NGSB, the second ship was to have been built by GD/BIW, and contracts for building the first six were to have been equally divided between NGSB and GD/BIW.

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 NGSB and GD/BIW to build all DDG-1000s. On April 20, 2005, the USD AT&L issued a decision memorandum deferring this proposal, stating in part, "at this time, I consider it premature to change the shipbuilder portion of the acquisition strategy which I approved on February 24, 2004."

Several Members of Congress also expressed opposition to Navy's proposal for a winner-take-all competition. Congress included a provision (Section 1019) in the Emergency Supplemental Appropriations Act for 2005 (H.R. 1268/P.L. 109-13 of May 11, 2005) prohibiting a winner-take-all competition. The provision effectively required the participation of at least one additional shipyard in the program but did not specify the share of the program that is to go to the additional shipyard.

On May 25, 2005, the Navy announced that, in light of Section 1019 of P.L. 109-13, it wanted to shift to a "dual-lead-ship" acquisition strategy, under which two DDG-1000s would be procured in FY2007, with one to be designed and built by NGSB and the other by GD/BIW.

Section 125 of the FY2006 defense authorization act (H.R. 1815/P.L. 109-163) again prohibited the Navy from using a winner-take-all acquisition strategy for procuring its next-generation destroyer. The provision again effectively requires the participation of at least one additional shipyard in the program but does not specify the share of the program that is to go to the additional shipyard.

Milestone B Approval for Dual-Lead-Ship Strategy

On November 23, 2005, the USD AT&L, granted Milestone B approval for the DDG-1000, permitting the program to enter the System Development and Demonstration (SDD) phase. As part of this decision, the USD AT&L approved the Navy's proposed dual-lead-ship acquisition strategy and a low rate initial production quantity of eight ships (one more than the Navy subsequently planned to procure).

Contract Award For Two Lead Ships

On February 14, 2008, the Navy awarded contract modifications to GD/BIW and NGSB for the construction of the two lead ships. The awards were modifications to existing contracts that the Navy has with GD/BIW and NGSB for detailed design and construction of the two lead ships. Under the modified contracts, the line item for the construction of the dual lead ships is treated as a cost plus incentive fee (CPIF) item.

Procurement Cost Cap

Section 123 of the FY2006 defense authorization act (H.R. 1815/P.L. 109-163 of January 6, 2006), limited the procurement cost of the fifth DDG-1000 to $2.3 billion, plus adjustments for inflation and other factors.

Appendix B. Navy Testimony of July 31, 2008

This appendix reprints in its entirety the text of the Navy's prepared statement for the July 31, 2008, hearing on destroyer procurement before the Seapower and Expeditionary Forces subcommittee of the House Armed Services Committee.[25] The text states:

> Chairman Taylor, Ranking Member Bartlett, and distinguished Members of the Seapower and Expeditionary Forces Subcommittee, the Department is committed to executing the Cooperative Maritime Strategy, modernizing our fleet, and building the fleet of tomorrow. The Navy urges your support to fully fund the Department's 2009 shipbuilding request. The Navy requests the Committee's support for the Navy's recent plan to truncate the DDG 1000 program at two ships and reopen the DDG 51 line to better align our surface combatant investment strategy with our nation's warfighting needs. The Navy continues to address the dynamic capability requirements of the Fleet while balancing the demands placed on limited resources and producing a plan that provides maximum stability for the industrial base. Modernizing the Fleet's cruisers and destroyers and executing an affordable shipbuilding plan are crucial to constructing and maintaining a 313 ship Navy with the capacity and capability to meet our country's global maritime needs. In an age of rapidly evolving threats and fiscal constraints, we must ensure we are building only to our highest priority requirements and that the mission sets we envision for the future represent the most likely of those potential futures.
>
> Surface combatants are the workhorses of our Fleet and central to our traditional Navy core capabilities. Our cruisers, destroyers, and the new littoral combat ships bring capabilities to the fleet, that enable us to deter our enemies, project power, deploy forward and control the seas.
>
> **Strategic Environment**
>
> Rapidly evolving traditional and asymmetric threats continue to pose increasing challenges to Combatant Commanders. State actors and non-state actors who, in the past, have only posed limited threats in the littoral are expanding their reach beyond their own shores with improved capabilities in blue water submarine operations, advanced anti-ship cruise missiles and ballistic missiles. A number of countries who historically have only possessed regional military capabilities are investing in their Navy to extend their reach and influence as they compete in global markets. Our Navy will need to outpace other Navies in the blue water ocean environment as they extend their reach. This will require us to continue to improve our blue water anti-submarine and anti-ballistic missile capabilities in order to counter improving anti-access strategies.
>
> The Navy remains committed to having the capability and capacity to win our Nation's wars and prevent future wars. The rise of violent extremism has become a greater threat as it rapidly evolves with diverse and adaptive capabilities. These often stateless organizations pose further challenges with their aspirations of weapons of mass destruction development and desire to proliferate missiles and other highly, technologically advanced weapons. All of these threats require the Navy to have the capacity to build partnerships and continue our efforts of investing in maritime domain awareness; intelligence, surveillance, and

[25] Statement of Vice Admiral Barry McCullough, Deputy Chief of Naval Operations for Integration of Capabilities and Resources, and Ms. Allison Stiller, Deputy Assistant Secretary of the Navy (Ship Programs), before the Subcommittee on Seapower and Expeditionary Forces of the House Armed Services Committee, on Surface Combatant Requirements and Acquisition Strategies, July 31, 2008, 11 pp.

reconnaissance programs; and having both kinetic and non-kinetic effects capabilities. We call on our surface combatants to conduct these operations and execute the Maritime Strategy today, and we will continue to call on them to provide maritime supremacy from the ungoverned spaces of the littorals to vast expanses of our world's oceans.

Challenges

The challenge for the Navy is to maintain traditional core naval capabilities while simultaneously enhancing our ability to conduct expanded core roles and missions to ensure naval power and influence can be applied on the sea, across the littorals, and ashore. It is no longer feasible or affordable to purchase the most capable, multi-mission platform and then limit its use to execute tailored mission areas or focus on specific threats. As asymmetric threats continue to evolve, so will traditional threats. The Navy must find affordable and adaptable ways to fill current and future warfighting gaps.

Beyond addressing capability requirements, the Navy needs to have the right capacity to remain a global deterrent and meet Combatant Commander warfighting requirements. Combatant Commanders continue to request more surface ships and increased naval presence to expand our cooperation with new partners in Africa, the Black Sea, the Baltic Region, and the Indian Ocean and maintain our relationships with our allies and friends. Therefore, we must increase surface combatant capacity in order to meet Combatant Commander demands today for ballistic missile defense, theater security cooperation, steady state security posture and to meet future demands as we standup Africa Command (AFRICOM) and the FOURTH Fleet in SOUTHERN Command. The Navy also continues to remain committed to our Ballistic Missile Defense partners around the globe, including Japan, Korea, the Netherlands, and Spain.

Future Force

The 30 year ship building plan was designed to field the force structure to meet the requirements of the national security strategy and the Quadrennial Defense Review meeting the FY 2020 threat. The 313-ship force floor represents the maximum acceptable risk in meeting the security demands of the 21st century. In the balance of capability and capacity, the Navy has found that there are increased warfighting gaps, particularly in the area of integrated air and missile defense capability. Capacity also matters, and capacity is capability for the Irregular War we are in today.

The DDG 1000 program is developing a capable ship which meets the requirements for which it was designed. The DDG 1000, with its Dual Band Radar and sonar suite design are optimized for the littoral environment. However, in the current program of record, the DDG 1000 cannot perform area air defense; specifically, it cannot successfully employ the Standard Missile-2 (SM-2), SM-3 or SM-6 and is incapable of conducting Ballistic Missile Defense. Although superior in littoral ASW, the DDG 1000 lower power sonar design is less effective in the blue water than DDG-51 capability. DDG 1000's Advanced Gun System (AGS) design provides enhanced Naval Fires Support capability in the littorals with increased survivability. However, with the accelerated advancement of precision munitions and targeting, excess fires capacity already exists from tactical aviation and organic USMC fires. Unfortunately, the DDG 1000 design sacrifices capacity for increased capability in an area where Navy already has, and is projected to have sufficient capacity and capability.

The DDG 51 is a proven, multi-mission guided missile destroyer. She is the Navy's most capable ship against ballistic missile threats and adds capacity to provide regional ballistic missile defense. DDG 51 spirals will better bridge the ballistic missile defense gap to the next generation Cruiser. Production costs of DDG 51s are known. The risks associated with

re-opening the DDG 51 line are less than the risks of continuing the DDG 1000 class beyond 2 ships when balanced with the capability and capacity of pursuing the 313 ship fleet.

Current Execution

The Department is committed to executing the acquisition plan for our future force. Acquisition Professionals and Requirements Officers are working closely to maintain the Department's commitment to an affordable shipbuilding and modernization plan.

DDG 51 Destroyer Program and Production Restart Assessment

The capability of DDG 51 Class ships being built today is markedly more advanced than the initial ships of the class. The DDG 51 Class was developed in three incremental flights, with upgraded technology and capability built into each subsequent hull. Ships are currently being constructed at both General Dynamics (GD) Bath Iron Works (BIW) and Northrop Grumman Shipbuilding (NGSB). 62 ships have previously been authorized and appropriated, with the most recent procurement of three ships in FY 2005. A total of 53 ships have been delivered to the Navy. Five ships remain under construction at GD BIW, and 4 at NGSB. The last ship currently under construction, DDG 112, is scheduled for delivery in FY 2011. All material for DDG 51 Class ships currently under construction has been procured, with the majority of the long lead material purchased in an Economic Order Quantity buy in FY 2002.

DDG 51 class production has been extremely stable, with successful serial production at both shipbuilders. Despite some setbacks, such as the impacts of Hurricane Katrina at NGSB, the costs associated with DDG 51 class shipbuilding are well understood. The Aegis Weapon System has been incrementally developed successfully to add increased capabilities and transition to the use of open architecture and increased use of commercial systems.

Additionally, the DDG 51 modernization program is currently modernizing the Hull, Mechanical, and Electrical (HM&E) and Combat Systems. These combined upgrades support a reduction in manpower and operating costs, achieve expected service life, and allow the class to pace the projected threat well into the 21st century.

Based upon a Navy assessment, including discussions with both current shipbuilders, to explore any subcontractor issues, a restart of DDG 51 procurement in FY 2009 is feasible. However, several ship and Government Furnished Equipment vendor base issues (including configuration change issues and production line re-starts) must be addressed in order to award and construct additional ships, which will increase ship costs above the most recently procured ships. The most notable being the restart of the DDG 51 reduction gear production. The Navy is confident that these issues can be resolved to support a FY 2009 restart. DDG 51 class restart beyond FY 2009 presents significant risks and therefore additional costs.

However, both shipbuilders have indicated to the Navy that these lead time challenges can be mitigated with advance procurement and an adjusted build sequence, and that DDG 51 restart in FY 2009 is executable in both shipyards. Regarding the combat systems, the last production contracts were awarded in 2006. The cost and ease of restarting those production lines is a function of time, and part availability on military specification items which would need to be addressed.

Given the truncation of the DDG 1000 program at two ships, the Navy estimate for procurement of a single DDG 51 class ship in FY 2009 is $2.2 billion. This estimate utilizes the latest audited Forward Pricing Rate Agreements (FPRAs) rates. Impacts for production line restart and contractor furnished equipment/government furnished equipment obsolescence are included. The Navy has not finalized the acquisition strategy for a FY 2009

DDG 51 and follow-on procurements. The Navy will carefully consider stability of the industrial base during the planning of the specific strategy.

DDG 1000 Class Destroyer Program

The Navy remains ready to begin construction of DDG 1000. A rigorous systems engineering approach for the program has been employed to mitigate the risk involved with building a complex lead ship surface combatant. This approach included successful building and testing of the 10 critical technologies via Engineering Development Models. Naval Vessel Rules were also fully incorporated prior to commencing detail design. Design of the Mission Systems is now nearly 100 percent complete. Detail design will be approximately 85 percent complete prior to the start of fabrication, and will be more complete than any other previous surface warship.

The systems engineering approach for DDG 1000 has been well conceived and well executed. However, overall, the remaining program risk involved in integrating the Mission Systems, 10 EDM's, and the ship detail design is still moderate. Particularly, the Dual Band Radar and Integrated Power System have further land-based testing to complete, and the software development for the Total Ship Computing Environment continues. Careful planning has been conducted so that where further development does continue on systems, these have been partially tested to the point that any potential changes are not likely to affect software or system interfaces, with a low risk of affecting either detail design or software development.

As such, the maturity of the ship design, critical technologies, and mission systems support commencement of production. However, it is accurate that the integration of a complex, lead ship, surface combatant with significant new technologies always entails risk. And though the Navy cost estimate for DDG 1000 is based on a detailed, bottoms-up approach, this complex integration does increase the cost risk.

Truncation of the program at two ships will result in cost impacts due to program shutdown, continuation of required class service tasks, and potential increased costs for DDG 1000 and 1001 and other programs. Additionally, the RDT&E efforts for the DDG 1000 program, which include software development and other critical efforts, must continue in order to deliver completed ships and in the CVN 78 Class.

Conclusion

Your Navy remains committed to building the fleet of the future and modernizing our current fleet. The Navy's top shipbuilding priority remains achieving a surface combatant shipbuilding program that is equally capable of assuring peace today and access to the global economy tomorrow regardless of the threats posed in an uncertain future. To accomplish this, we are steadfast in our intention to not use procurement accounts for other Navy program offsets. Procurement and R&D investments made today will serve our country and fleet well beyond 2020 as we modernize the fleet we have and build the fleet we need. Continuing to build DDG 51s enables us to expand warfighting capacity and capability in areas needed by Combatant Commanders and allows us to reach the 313 ship level sooner. Meeting evolving blue water and near-land threats that the DDG 51 can match provides less risk to the joint warfighter. There is less risk associated with the affordability of maintaining DDG 51 line versus continuing the DDG 1000 line. The Navy is ready to restart DDG 51 production, and is committed to successfully delivering DDG 1000 and 1001 from which, we will inform new ship class designs. The Navy has not finalized the acquisition strategy for FY 2009 DDG 51 and follow-on procurements, however acquisition planning is fully underway to execute this change in the Navy's shipbuilding requirements. The Department urges the Committee's support for full funding of the surface combatant procurement

account for FY 2009 and approving our proposal regarding DDG's. Thank you for your continued support and commitment to our Navy. I look forward to continuing to work closely with you to make our maritime services and nation more secure and prosperous.

Appendix C. Comparisons of DDG-51 and DDG-1000

This appendix provides information on the capabilities and costs of the DDG-51 and DDG-1000 designs. It includes information presented by the Navy and DOD on five occasions prior to the July 31, 2008, hearing on destroyer procurement before the Seapower and Expeditionary Forces subcommittee of the House Armed Services Committee at which the Navy announced its change in destroyer procurement plans:

- at a June 10, 2005, Navy briefing to CRS;
- in July 19, 2005, Navy testimony before the Projection Forces subcommittee of the House Armed Services Committee;
- at an April 10, 2008, Navy briefing to CRS and CBO; and
- in a May 7, 2008, Navy letter to Senator Kennedy; and
- in a July 2, 2008, DOD letter to Representative Taylor.

Overview

The DDG-1000 and DDG-51 are both multimission destroyers, but they have somewhat different mission emphases. The DDG-1000 design features a stronger emphasis on land-attack operations and operations in littoral waters. The DDG-51 design is more oriented toward blue-water operations.

Consistent with its larger size, higher procurement cost, and greater use of new technologies, the DDG-1000, the Navy believes, is more capable than the DDG-51 design in several respects. The Navy states that it designed the DDG-1000 for "full-spectrum littoral dominance" and believes the DDG-1000 would be considerably more capable than the DDG-51 in littoral operations. The Navy believes that because of its reduced signatures, defensive systems, number of gun shells in its magazine, and ability to resupply gun shells while underway, the DDG-1000 would have considerably more capability than the DDG-51 to enter defended littoral waters and conduct sustained operations there. The Navy believes that because of its guns, aviation capabilities, special operations forces (SOF) support capabilities, and small-boat capabilities, the DDG-1000 would be able to perform more littoral missions than the DDG-51. The Navy believes that because of its radars and C4I/networking capabilities, replacing a DDG-51 with a DDG-1000 in a carrier strike group would increase the strike group's anti-air warfare (AAW) capabilities by about 20%. The Navy believes that because of differences in their sonar capabilities, the DDG-51 has more blue-water anti-submarine warfare (ASW) capability than the DDG-1000.

June 10, 2005, Navy Briefing to CRS

The following comparison of DDG-1000 and DDG-51 capabilities is based on information provided by the Navy to CRS at a briefing on June 1, 2005. The information has been updated in some places to account for changes since 2005.

Growth Margin

The DDG-51 and DDG-1000 designs each have about a 10% growth margin. For the roughly 9,000-ton DDG-51, this equates to about 900 tons of growth margin, while for the 14,987-ton DDG-1000, this equates to about 1,400 tons of growth margin.

Ship Mobility

The two designs are roughly equivalent in terms of maximum sustained speed, cruising endurance, and seakeeping (i.e., stability in rough seas). The DDG-1000's draft (28 feet) is somewhat less than the DDG-51's (31 feet). Other things held equal, this might give the DDG-1000 an ability to operate in (or be berthed at) places where the water depth is sufficient for the DDG-1000 but not for the DDG-51. The DDG-1000's length (600 feet) is greater than the DDG-51's (505 feet). Other things held equal, this might give the DDG-51 an ability to be berthed in spaces that are long enough for the DDG-51 but not for the DDG-1000.

Electrical Power for Weapons and Systems

The DDG-51 has 7.5 megawatts (MW) of electrical power for its weapon systems, while the DDG-1000 design, with its integrated electric-drive system, can provide up to 78 MW for its weapons and power systems by diverting power from propulsion to weapons and systems.

Signatures and Detectability

The DDG-1000 has a smaller radar cross-section and lower infrared, acoustic, and magnetic signatures than the DDG-51. The two designs are roughly equivalent in terms of the detectability of their radar and other electromagnetic emissions. The DDG-1000's reduced signatures, DDG-1000 supporters, will make the DDG-1000 harder to detect, localize, classify, and target, giving the DDG-1000 a significant advantage in engagements against enemy forces.

Survivability and Damage Control

The Navy states that the DDG-1000 would be able to keep fighting after an attack like the one that disabled the USS Cole (DDG-67) on October 12, 2000.

The two designs are roughly equivalent in terms of degree of compartmentalization and ship stability when flooded. The DDG-1000's vertical launch system (VLS) is more heavily armored than the DDG-51's. The DDG's fire-suppression system is automated only in the engine room and magazine, while the DDG-1000's system is automated throughout the ship, making it safer and more effective. The DDG-51's flood-control system is not automated, while the DDG-1000's is, which the Navy believes will make it more effective. The DDG-1000's electrical power distribution system is an "integrated fight-through" system, meaning that it is designed to automatically isolate damaged areas and reroute electrical power around them. All critical DDG-1000 systems are dual-fed, meaning that if power from one source is cut off, it can be routed through a second source. The DDG-51's electrical power distribution system lacks these features.

C4I/Networking Bandwidth

The C4I[26] and networking systems on the DDG-1000 would have five times as much bandwidth as those on the DDG-51. The C4I/networking capability of the DDG-1000 is equivalent to that on the LHD-8 amphibious assault ship. In addition to improved warfighting capability, this increased bandwidth would provide sailors aboard the DDG-1000 a better ability to "reach back" to information sources ashore when conducting at-sea maintenance of shipboard equipment, potentially increasing the availability rates of shipboard equipment.

Flag-Level Command Facilities

The DDG-1000 has facilities for embarking and supporting a flag-level officer and his staff, so that they could use the ship as platform for commanding a group of ships. The DDG-51 does not have such facilities.

Anti-Air Warfare/Ballistic Missile Defense (AAW/BMD)

The radars on the two ships are roughly equivalent in terms of dB gain (sensitivity) and target resolution. The firm track range of the DDG-1000'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. The DDG-1000's AAW combat system would be able to maintain about 10 times as many tracks as the DDG-51's Aegis system. The DDG-1000's radar has much more capability for resisting enemy electronic countermeasures and for detecting targets amidst littoral "clutter." As a result of the better performance amidst littoral clutter, the Navy believes that ships escorted by the DDG-1000 in defended littoral waters would have three times as much survivability as ships escorted by the DDG-51.

The two designs would use the same types of area-defense and point-defense interceptor missiles.[27] They would also use the same flares, chaff, and decoys to confuse enemy anti-ship cruise missiles, but the Navy believes these devices would be more effective on the DDG-1000 because of the DDG-1000's reduced signatures.

Anti-Surface Warfare/Strike Warfare

The DDG-1000 would have considerably more naval surface fire support (NSFS) capability than the DDG-51. The DDG-51 has one 5-inch gun, while the DDG-1000 has two 155mm Advanced Gun Systems (AGSs). The DDG-51's gun can fire an initial salvo of 20 rounds per minute and can subsequently fire at a sustained rate of four rounds per minute (20/4). The DDG-1000's two guns have a combined firing rate of 20/20. The shells currently fired by the DDG-51's gun have a range of 13 nm. Future shells are to have a range of up to 50 nm. The shells to be fired by the DDG-1000's guns are to have a range of 63 to 74 nm, and consequently could cover (at 74 nm) more than three times as much area ashore (assuming a 25 nm standoff from shore) as a shell with a range of 50 nm. The shells fired by the DDG-51 carry 8 pounds of explosive, while those fired

[26] C4I stands for command and control, communications, computers, and intelligence.

[27] As discussed earlier, the Navy, as part of its testimony at the July 31, 2008, hearing on destroyer procurement before the Seapower and Expeditionary Forces subcommittee of the House Armed Services Committee, stated that the DDG-1000 cannot successfully employ the SM-2 or perform area-defense AAW.

by the DDG-1000 are to carry 24 pounds of explosive. When fired at less than maximum range, the shells fired by the DDG-1000 can alter their flight paths so that six to eight of them can hit a target at the same time; the shells to be fired by the DDG-51 do not have this capability. The DDG-51 carries 600 of the 13nm-range shells or 230 of 62nm-range shells, while the DDG-1000 carries a total of 600 of its shells. It might be possible to fit the DDG-51 with one of the 155mm guns to be carried by the DDG-1000; it would likely require the removal of both the DDG-51's 5-inch gun and its forward (32-cell) VLS. In this configuration, the DDG-51 might carry about 120 of the gun's 155mm shells.

The 155mm guns on the DDG-1000 could be replaced in the future with an electromagnetic rail gun or directed-energy weapon. The DDG-51 does not have enough electrical power to support such weapons.

Antisubmarine Warfare (ASW)

The DDG-51's sonar system is more capable for blue-water ASW operations, while the DDG-1000's system is more capable for littoral ASW operations. The DDG-1000's bow-mounted sonar and towed array can interact to more rapidly triangulate targets. The Flight IIA DDG-51 lacks a towed array. The DDG-1000's radar would have more capability than the DDG-51's radar for detecting submarine periscopes.

The DDG-51 has six torpedo tubes for firing lightweight (12.75-inch diameter) anti-submarine torpedoes, while the DDG-1000 has none, but the Navy does not believe these tubes to be of significant operational value against potential future threats. Both ships can launch lightweight torpedoes from their helicopters or fire the Vertical Launch Antisubmarine Rocket (VLA), which is armed with a lightweight torpedo.

The ships would use the same countermeasures for confusing enemy torpedoes, but the Navy believes these countermeasures would be more effective on the DDG-1000 because of the DDG-1000's reduced signatures.

Mine Warfare (MIW)

The DDG-1000's bow-mounted sonar includes an in-stride mine-avoidance capability; the DDG-51's sonar suite has less capability for detecting mines. The DDG-51 can be built to a design that permits the ship to embark and operate the Remote Minehunting System (RMS); six ships in the DDG-51 program (DDGs 91 to 96) have been built to this design. The Navy says that the DDG-1000's reduced acoustic and magnetic signatures would translate into a significantly greater operating area in mined waters.

Missiles for Performing Above Missions

The DDG-51 has 90 missile-launching tubes in its VLS, while the DDG-1000 has 80. The DDG-51's VLS tubes can accommodate a missile up to 21 inches in diameter, 21 feet in length, and about 3,000 pounds in weight. The DDG-1000's VLS tubes can accommodate a missile up to 24 inches in diameter, 22 feet in length, and about 4,000 pounds in weight. The gas-management (i.e., heat-management) system of the DDG-1000's VLS tubes can accommodate a hotter-burning missile than the gas-management system of the DDG-51's VLS, so the DDG-1000 might be more capable of using future missiles if they are hotter-burning.

Aviation for Performing Above Missions

The DDG-51 can embark and operate two SH-60 helicopters but does not have electronics for launching and recovering unmanned aerial vehicles (UAVs). The DDG-1000 can embark, operate, and provide full maintenance for two SH-60 helicopters or one SH-60 helicopter and three UAVs. The DDG-1000's flight deck is larger than the DDG-51's and can accommodate all joint rotary-wing aircraft, including the MV-22, the CH-53, and the H-47. The DDG-1000's flight deck is 10 feet higher off the water and can therefore be used for full flight operations in a sea state (i.e., sea condition) that is at least one step higher (i.e., rougher) than is possible for the flight deck on the DDG-51.

Special Operations Forces (SOF) Support

The DDG-1000 has additional berthing for 20 SOF personnel (i.e., a platoon), as well as a space for SOF mission planning and spaces for stowing SOF gear. The DDG-51 lacks these features.

Boats

The DDG-51 can embark two seven-meter boats that are deployed and recovered with a davit. The DDG-1000 can embark two 11-meter boats and four rubber raiding craft that are deployed and recovered with a stern ramp, which permits faster and safer launching and recovering, and launch/recovery operations in higher sea states.

Habitability Features for Crew

On the DDG-51, enlisted crew berthing spaces accommodate 20 to 60 sailors each. On the DDG-1000, every sailor would have a stateroom, and each stateroom would accommodate four sailors. The Navy believes these features would improve crew quality of life, which can improve retention rates.

July 19, 2005, Navy Testimony

At the July 19 portion of a July 19-20, 2005, hearing before the Projection Forces subcommittee of the House Armed Services Committee, Navy officials testified that, compared to the DDG-51 design, the DDG-1000 design's capability improvements include, among other things,

- a threefold improvement in capability against anti-ship cruise missiles, including significantly better radar performance in situations involving near-land radar clutter;
- 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;
- three times as much naval surface fire support capability, including an ability to answer 90% of Marine Corps calls for fire within five 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;
- almost 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.[28]

April 10, 2008, Navy Briefing to CRS and CBO

At an April 10, 2008, briefing to CRS and CBO, Navy officials presented a briefing slide providing a comparison of the DDG-1000 design's capabilities relative to the DDG-51 design's capabilities. The briefing slide is reprinted below (with some editing changes for readability) as **Table C-1**.

Table C-1. DDG-1000 Capabilities Relative to DDG-51 Capabilities

Item	DDG-1000 compared to DDG-51
Radar cross section	Significantly smaller
Ship detectability by threat aircraft	Threat must fly lower and closer to detect the ship
Firm track range on enemy anti-ship cruise missiles	Significant improvement, especially in land-clutter environments
Performance against small boat swarm raids	Engage small boats at 3 times the effective range and engage 10 times more threats
Safe operating area in areas with enemy bottom mines	Significantly larger
Land attack capability	3 times as much lethality and 40% greater range than Extended Range Guided Munition (ERGM)[a]
Manning	50% less crew
Electrical power	Sufficient capacity for rail gun, laser weapons, and future radar upgrades

[28] Source: 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.

Source: Navy briefing slide #7, entitled "Multi-Mission Combatant," in Navy briefing to CRS and CBO, April 10, 2008. CRS has edited the words in the table to make them easier to understand.

a. ERGM was a 5-inch extended-range guided munition for the 5-inch guns on Navy cruisers and destroyers. The Navy in 2008 canceled development of ERGM.

In addition to the information presented in **Table C-1**, another slide in the Navy briefing stated that the DDG-1000's radar cross section will be similar to that of a fishing boat.[29] Navy officials have also stated separately that the DDG-1000's acoustic signature will be similar, at certain speeds, to that of certain U.S. Navy submarines.[30]

In elaborating on the point in **Table C-1** pertaining to the DDG-1000's electrical power, Navy officials stated at the briefing that at a speed of 20 knots, the DDG-1000 would have 58 megawatts of power available for powering non-propulsion shipboard systems. The briefing stated that the DDG-51, by comparison, has 7.5 megawatts of power available for non-propulsion systems.

May 7, 2008, Navy Letter to Senator Kennedy

A May 7, 2008, letter from Admiral Gary Roughead, the Chief of Naval Operations (CNO), to Senator Edward Kennedy that was obtained by a defense trade publication and posted on its website provided information on the comparative costs and capabilities of the DDG-1000 and DDG-51. The letter stated:

> Thank you for your letter of April 21, 2008, concerning cost estimates for the continuation of the DDG 51 program and the DDG 1000 program.
>
> As you indicated in your letter, without firm contracts for future ships of either class, we are only able to provide a best estimate of the costs we would incur in either of these programs. Since we are phasing out production of the DDG 51 class, there would be start-up costs associated with returning this line to production. As a result, the estimated end cost to competitively procure a lead DDG-51 (Flight IIa—essentially a repeat of the final ships currently undergoing construction) in Fiscal Year (FY) 2009 assuming a truncation of the DDG 1000 class after the two lead ships would be either $2.2B for a single ship or $3.5B for two lead ships (built at competing production yards). This estimate is based on a Profit Related to Offer (PRO) acquisition strategy. The average cost of subsequent DDG 51 Flight IIa class ships would be about $1.8B (FY09) per ship compared to the $2.6B estimated cost of subsequent DDG 1000 class ships. Below is the breakdown of the one and two ship FY09 DDG 51 estimates, compared to that of the DDG 1000 in the same year. DDG 1000 costs include FY08 advanced procurement funds:

[29] Navy briefing slide #8, entitled "Zumwalt Advantage," in Navy briefing to CRS and CBO, April 10, 2008.

[30] Source: Spoken testimony of Navy officials at hearing before Seapower subcommittee of Senate Armed Services Committee on April 8, 2008.

(FY$M)	DDG 51 (FY09)	DDG 51 (FY09)	DDG 1000 (FY09)
Qty	1	2	1
Plans/Basic [construction]	854.4	1607.8	1393.3
Change Orders	39.1	76.1	66.0
Government Furnished Equip	1138.2	1556.7	1126.8
Other	56.4	57.5	66.6
Total Ship Cost	2088.1	3298.1	2652.6

The table provided below compares the annual operations and support costs for the DDG 51 and DDG 1000 class ships.

(FY$M)	DDG 1000	DDG 51
Operating (steaming)	$18.5	$15.7
Maintenance	$10.3	$5.6
Manpower	$8.5	$19.9
Total	$37.3	$41.2
Crew Size	14 officers	24 Officers
	106 enlisted	272 Enlisted

The total annual cost for the DDG 51 is a class average based on 17 years of operations and maintenance, and does not include personnel reduction savings expected from the DDG Modernization program. While there are cost savings associated with the DDG 1000's smaller crew, they are largely offset by higher estimated maintenance costs for this significantly more complex ship.

Clearly the relative value of the DDG 1000 resides in the combat system (Dual-Band Radar, Volume Search Radar, ASW Suite, etc) that provide this ship with superior warfighting capability in the littoral. However, the DDG 51 can provide Ballistic Missile Defense capability against short and medium range ballistic missiles and area Anti-Air Warfare capability (required in an anti-access environment) where the DDG 1000 currently does not. Upgrading the DDG 1000 combat system with this capability would incur additional cost. The DDG 51 class also possesses better capability in active open ocean Anti-Submarine Warfare than does the DDG 1000.

On balance, the procurement cost of a single DDG 51 is significantly less than that of a DDG 1000, and the life-cycle costs of the two classes are similar. I appreciate the opportunity to share my perspective on these two alternatives with you. A similar letter has been sent to Senator Martinez. As always, if I can be of further assistance, please let me know.[31]

On June 3, 2008, John Young, the Under Secretary of Defense for Acquisition, Technology, and Logistics, in testimony to the Senate Armed Services Committee, questioned the accuracy of the cost figures in the May 7 letter, stating, among other things, that he believed the annual operating

[31] Source: Letter dated May 7, 2008, from Admiral G. Roughead to the Honorable Edward M. Kennedy, posted on the Internet at *InsideDefense.com* (subscription required) on May 30, 2008. Emboldening in the second table as in the original. See also Thomas Duffy, "Navy Says DDG-100, DDG-51 Annual Operating Costs Are Rated Even," *Inside the Navy*, June 2, 2008.

and support cost of the DDG-1000 would be about $10 million less than that of a DDG-51, and that the procurement cost figures in the letter relied on certain assumptions that might not prove accurate. Young's testimony was viewed as defending the DDG-1000 more strongly than did the CNO's May 7, 2008, letter.[32]

July 2, 2008, DOD letter to Representative Taylor

A July 2, 2008, letter from John Young, the Under Secretary of Defense for Acquisition, Technology and Logistics (i.e., the DOD acquisition executive), to Representative Gene Taylor that was obtained by a defense trade publication and posted on its website provides additional comments regarding the DDG-1000 and DDG-51, as well as information about the readiness of the DDG-1000 design to enter production. The letter stated:

> I agree that the Navy's preliminary design analysis for the next generation cruiser indicates that, for the most capable radar suites under consideration, the DDG 1000 hull cannot support the radar. This applies just as well to the DDG 51 hull. However, it is my understanding that engineering analysis shows that the existing DDG 1000 hull design can support significantly more capable radar suites than the existing DDG 51 hull design. Moreover, while it is not possible to quickly estimate the production cost of a redesigned DDG 51 alternative, I suspect that, given the dense and complex nature of the DDG 51 hull, as compared to that of the DDG 1000 hull, the cost of a redesigned DDG 51 very likely will be equal to or greater than that of a DDG 1000.
>
> Your letter also warns that cost over-runs for the DDG 1000 program might cripple the Navy's shipbuilding programs. I am equally concerned that restarting the DDG 51 program would pose risk to the shipbuilding budget and inject additional cost for the following reasons:
>
> —Direct production hours for one DDG 1000 ship are about 2.5 times that of one DDG 51 restart ship. This validates DOD's experience that two to three DDG 51 destroyers need to be purchased annually to sustain the production workload base for two surface combatant shipyards. That number of DDG 51 ships costs more per year than one DDG 1000 follow ship. The cost per year for modified DDG 51 ships would be even higher.
>
> —Several ship and vendor base issues, including equipment obsolescence, main reduction gears, configuration change issues, and re-start of production lines, would need to be resolved in order to award and construct additional DDG 51 class ships.
>
> —The costs for the two DDG 1000 ships would increase if that program is truncated to only two ships.
>
> —There will be program shutdown costs for the DDG 1000 program if the program is truncated to only two ships.
>
> —The Research, Development, Test, & Evaluation efforts for the DDG 1000 program must continue in order to deliver two complete lead ships and to support the Dual Band Radar for the CVN 21 program.

[32] See, for example, Emelie Rutherford, "Young Claims Inaccuracies, Assumptions In Navy Destroyer Cost Comparison," *Defense Daily*, June 5, 2008; and Dale Eisman, "Warning: Delay On Ship Will Run Up Navy's Costs," *Norfolk Virginian-Pilot,"* June 4, 2008: D1.

In reference to your concern that there is no Joint Requirements Oversight Council (JROC) or U.S. Marine Corps requirement for fire support that can only be provided by the DDG 1000, the JROC validated the Operational Requirements Document (ORD) for the DDG 1000 program. The ORD includes a requirement to provide precise and sustained naval fires at extended ranges. The DDG 1000 with its advanced Gun System firing the Long Range Land Attack Projectile is the only ship that can achieve that validated requirement.

I remain convinced that the DDG 1000 program is poised for proper execution. Unlike DDG 51, LPD 17, and LCS, where the level of concurrent design, development, and construction were critical flaws, leading to significant cost increases on the lead ships, the DDG 1000 program benefits from early technology maturation, and experienced design team using a mature design tool, proven production processes, and other factors as outlined below:

—Design Drawing Status: DDG 1000 is significantly more mature in detail design than was LPD 17 or DDG 51 at the same points in the program. For example, at the time of the Detail Design and Construction (DD&C) contract award, DDG 1000 detail design products were 55 percent complete, compared to 0 percent for LPD 17 and DDG 51. At the start of fabrication, DDG 1000 detail design products will be approximately 80-85 percent complete, compared to 20 percent for DDG 51 and 20-30 percent for the two LCS designs. While design products for the LPD 17 were also in the 80 percent complete range at the start of fabrication, this came about only after a long delay to fix and prove the design tool during the detail design phase, a lesson learned and avoided for the DDG 1000 program.

—Initial Module Construction: The jointly developed design of DDG 1000 is on schedule to be more mature than any previous shipbuilding program at start of construction. The design and build of the machinery block in advance of first ship construction completed in June 2008. This effort has been extremely beneficial as a risk reduction measure.

—Design Tool Maturity: The DDG 1000 team of contractors worked together on 3-D modeling during preliminary and system design for 6 years in advance of the DD&C phase.

—Early Technical Product Definition: Contractor-developed technical products enabled early development of design products (system diagrams, vendor statements of work, etc.), which are typically developed during the early stages of detail design. DDG 1000 leveraged these early developments to help the program reduce the risk of rework and poor quality than undermine early-start initiatives such as those experienced on other shipbuilding programs.

—Technology Maturity: The combined DDG 1000 design team learning and use of the 3-D Product Modeling Tool 6 years in advance of the DD&C ensures that the right quantity of qualified human capital resources are allocated in support of the DD&C phase.

—Phase III Cost Performance: Cost performance on DDG 1000 was within 2.5 percent of budget on the $2.7B development effort on Phase III, leading to the DD&C phase.

—Current Phase Cost Performance: The current design, development, and integration contract is performing at an overall cost performance index of 1.02 and a schedule performance index of 0.99 through April 2008. Detail design and transition to production are on cost and schedule.[33]

[33] Source: Letter dated July 2, 2008, from John J. Young, Jr., to the Honorable Gene Taylor, posted on the Internet at *InsideDefense.com* (subscription required) on July 11, 2008. See also Geoff Fein, "DDG-1000 Hull Can't Support Most Capable Radar Planned For CG(X), Pentagon Official Says," *Defense Daily*, July 11, 2008.

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