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

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Summary

The FY2010 budget that the Navy submitted to Congress last year proposed ending procurement of Zumwalt (DDG-1000) class destroyers at three ships and resuming procurement of Arleigh Burke (DDG-51) class Aegis destroyers. Congress, as part of its action on the FY2010 defense budget, supported this proposal: the FY2010 budget funded the procurement of one DDG-51 (the first to be procured since FY2005), provided advance procurement funding for two DDG-51s the Navy wants to procure in FY2011, completed the procurement funding for the third DDG-1000 (which was authorized but only partially funded in FY2009), and provided no funding for procuring additional DDG-1000s.

The Navy's FY2011 budget submission calls for procuring two DDG-51s in FY2011 and six more in FY2012-FY2015. The two DDG-51s that the Navy wants to procure in FY2011 received $577.2 million in FY2010 advance procurement funding. The Navy's proposed FY2011 budget requests another $2,922.2 million in procurement funding for the two ships, so as to complete their estimated combined procurement cost of $3,499.2 million. The Navy's proposed FY2011 budget also requests $48.0 million in advance procurement funding for the one DDG-51 that the Navy wants to procure in FY2012, and $186.3 million in procurement funding for DDG-1000 program-completion costs.

The Navy's FY2011 budget also proposes terminating the Navy's planned CG(X) cruiser program as unaffordable. Rather than starting to procure CG(X)s around FY2017, as the Navy had previously envisaged, the Navy is proposing to build an improved version of the DDG-51, called the Flight III version, starting in FY2016. Navy plans thus call for procuring the current version of the DDG-51, called the Flight IIA version, in FY2010-FY2015, followed by procurement of Flight III DDG-51s starting in FY2016. Navy plans appear to call for procuring Flight III DDG-51s through at least FY2022, and perhaps until FY2031. Flight III DDG-51s are to carry a smaller version of the new Air and Missile Defense Radar (AMDR) that was to be carried by the CG(X). The Navy's proposed FY2011 budget requests $228.4 million in research and development funding for the AMDR. Detailed design work on the Flight III DDG-51 reportedly is to begin in FY2012 or FY2013.

Issues for Congress for FY2011 include the following:

- whether to approve, reject, or modify the Navy's proposal to develop the Flight III DDG-51 design and start procuring it in FY2016;
- whether to use multiyear procurement (MYP) for Flight IIA DDG-51s that the Navy wants to procure in FY2011-FY2015;
- whether to approve, reject, or modify the Navy's FY2011 funding request for procurement of Flight IIA DDG-51s, for DDG-1000 program-completion costs, and for research and development on the AMDR; and
- the potential impact on the DDG-1000 program of the Department of Defense's (DOD's) determination that the program has experienced a critical cost breach under the Nunn-McCurdy provision.

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- whether to approve, reject, or modify the Navy's FY2011 funding request for procurement of Flight IIA DDG-51s, for DDG-1000 program-completion costs, and for research and development on the AMDR; and
- the potential impact on the DDG-1000 program of the Department of Defense's (DOD's) determination that the program has experienced a critical cost breach under the Nunn-McCurdy provision.

[1] Zachary M. Peterson, "DDG-51 With Enhanced Radar in FY-16, Design Work To Begin Soon," *Inside the Navy*, February 8, 2010.

Congress's decisions on these issues could affect Navy capabilities and funding requirements, and the shipbuilding industrial base. The question of whether to develop Flight III DDG-51 or pursue an alternative path, such as developing a new-design destroyer, could have substantial and long-lasting effects on the Navy.

Background

Navy Destroyer and Cruiser Acquisition Programs

DDG-51 Program

The DDG-51 program was initiated in the late 1970s.[2] 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 the Navy's Ticonderoga (CG-47) class cruisers, 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 Aegis system has been updated several times over the years. All DDG-51s (and also some CG-47s) are being modified to receive an additional capability for ballistic missile defense (BMD) operations.[3]

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 57 were in service as of the end of FY2009, and the 62nd is scheduled to enter service in late 2011 or early 2012. 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 of Pascagoula, MS, which forms part of Northrop Grumman Shipbuilding (NGSB), is the builder of 28.[4] A 63rd DDG-51 was procured in FY2010; the Navy estimates its cost at $2,234.5 million. The ship is being built at the Ingalls shipyard of NGSB.

The DDG-51 design has been modified over time. The first 28 DDG-51s (i.e., DDGs 51 through 78) are called Flight I/II DDG-51s. Subsequent ships in the class (i.e., DDGs 79 and higher) are referred to as Flight IIA DDG-51s. The Flight IIA design, first procured in FY1994, implemented

[2] The program was initiated 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.

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

[4] 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.

a significant design change that included, among other things, the addition of a helicopter hangar. The Flight IIA design has a full load displacement of about 9,500 tons, which is similar to that of the CG-47.

DDG-51s were originally built with 35-year expected service lives. The Navy's report on its FY2011 30-year (FY2011-FY2040) shipbuilding plan states that the Navy intends to extend the service lives of Flight IIA DDG-51s to 40 years.[5] The Navy is implementing a program for modernizing all DDG-51s so as maintain their mission and cost effectiveness out to the end of their projected service lives.[6]

Older CRS reports provide additional historical and background information on the DDG-51 program.[7]

DDG-1000 Program

The DDG-1000 program was initiated in the early 1990s.[8] 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.[9] 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 CG(X) cruiser.

The DDG-1000 is to have a reduced-size crew of 142 sailors (compared to roughly 300 on the Navy's Aegis destroyers and cruisers) so as to reduce its operating and support (O&S) costs. The ship incorporates a significant number of new technologies, including an integrated electric-drive propulsion system[10] and automation technologies enabling its reduced-sized crew.

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

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[5] U.S. Navy, *Report to Congress on Annual Long-Range Plan for Construction of Naval Vessels for FY 2011*, February 2010, p. 21.

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

[7] 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]

[8] The program was originally designated DD-21, which meant destroyer for the 21st Century. In November 2001, the program was restructured and renamed DD(X), 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.

[9] 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.

[10] 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.

destroyer or cruiser since the nuclear-powered cruiser Long Beach (CGN-9), which was procured in FY1957.

The first two DDG-1000s were procured in FY2007 and split-funded (i.e., funded with two-year incremental funding) in FY2007-FY2008; the Navy estimates their combined procurement cost at $6,324.6 million. The third DDG-1000 was procured in FY2009 and split-funded in FY2009-FY2010; the Navy estimates its procurement cost at $2,723.0 million. All three ships are being built by GD/BIW.

On February 1, 2010, the Navy notified Congress that the DDG-1000 program has experienced a critical cost breach under the Nunn-McCurdy provision. The Nunn-McCurdy provision (10 USC 2433a) requires certain actions to be taken if a major defense acquisition program exceeds (i.e., breaches) certain cost-growth thresholds and is not terminated. A program that experiences a cost breach large enough to qualify under the provision as a critical cost breach has its previous acquisition system milestone certification revoked. The Navy stated in its notification letter that the DDG-1000 program's critical cost breach is a mathematical consequence of the program's truncation to three ships.[11] Since the DDG-1000 program has roughly $10 billion in research and development costs, truncating the program to three ships increased to roughly $3.3 billion the average amount of research and development costs that are included in the acquisition (i.e., research and development plus procurement) cost of each DDG-10000. The resulting increase in average unit acquisition cost was enough to cause a Nunn-McCurdy cost breach.

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

CG(X) Program

The CG(X) cruiser program was announced by the Navy on November 1, 2001.[12] The Navy wanted to procure as many as 19 CG(X)s as replacements for its 22 CG-47s, which are projected to reach the end of their 35-year service lives between 2021 and 2029.[13] The CG-47s are multi-

[11] Source: Letter to congressional offices dated February 1, 2010, from Robert O. Work, Acting Secretary of the Navy, to Representative Ike Skelton, provided to CRS by Navy Office of Legislative Affairs on February 24, 2010.

[12] The Navy on that date announced that that it was launching a Future Surface Combatant Program aimed at acquiring a family of next-generation surface combatants. This new family of surface combatants, the Navy stated, would include three new classes of ships:

- a destroyer called the DD(X)—later redesignated DDG-1000—for the precision long-range strike and naval gunfire mission,
- a cruiser called the CG(X) for the AAW and BMD mission, and
- a smaller combatant called the Littoral Combat Ship (LCS) to counter submarines, small surface attack craft, and mines in heavily contested littoral (near-shore) areas.

The Future Surface Combatant Program replaced an earlier Navy surface combatant acquisition effort, begun in the mid-1990s, called the Surface Combatant for the 21st Century (SC-21) program. The SC-21 program encompassed a planned destroyer called DD-21 and a planned 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, but the start of development work on the CG-21 was still years in the future. The DD(X) program, now called the DDG-1000 or Zumwalt-class program, is essentially a restructured continuation of the DD-21 program. The CG(X) might be considered the successor, in planning terms, of the CG-21. After November 1, 2001, the acronym SC-21 continued for a time to be used in the Navy's research and development account to designate a line item (i.e., program element) that funded development work on the DDG-1000 and CG(X).

[13] A total of 27 CG-47s were procured for the Navy between FY1978 and FY1988; the ships entered service between 1983 and 1994. The first five, which were built to an earlier technical standard, were judged by the Navy to be too (continued...)

mission ships with an emphasis on AAW and (for some CG-47s) BMD, and the Navy similarly wanted the CG(X) to be a multi-mission ship with an emphasis on AAW and BMD. The CG(X) was to carry the Air and Missile Defense Radar (AMDR), a new radar that was to be considerably larger and more powerful than the SPY-1 radar carried on the Navy's Aegis ships.

The Navy assessed CG(X) design options in a study called the CG(X) Analysis of Alternatives (AOA), known more formally as the Maritime Air and Missile Defense of Joint Forces (MAMDJF) AOA. The CG(X) AOA was begun in mid-2006 and completed at the end of 2007. The Navy did not publicly release the results of the CG(X) AOA . Section 1012 of the FY2008 defense authorization act (H.R. 4986/P.L. 110-181 of January 28, 2008) made it U.S. policy to construct the major combatant ships of the Navy, including ships like the CG(X), with integrated nuclear power systems, unless the Secretary of Defense submits a notification to Congress that the inclusion of an integrated nuclear power system is not in the national interest. The Navy studied nuclear power as a design option for the CG(X), but did not announce whether it would prefer to procure the CG(X) as a nuclear-powered ship. Some press reports suggested that a nuclear-powered version of the CG(X) might have had a full load displacement of more than 20,000 tons and a unit procurement cost of $5 billion or more. The issue of nuclear power for Navy surface ships is discussed in more detail in another CRS report.[14]

The Navy's FY2009 budget called for procuring the first CG(X) in FY2011. Beginning in late 2008, however, it was reported that the Navy had decided to defer the procurement of the first CG(X) by several years, to about FY2017.[15] Consistent with these press reports, on April 6, 2009, Secretary of Defense Robert Gates announced—as part of a series of recommendations for the then-forthcoming FY2010 defense budget—a recommendation to "delay the CG-X next generation cruiser program to revisit both the requirements and acquisition strategy" for the program.[16] The Navy's proposed FY2010 budget deferred procurement of the first CG(X) beyond FY2015.

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expensive to modernize and were removed from service in 2004-2005. The Navy is currently modernizing the remaining 22 to maintain their mission effectiveness to age 35; for more information, see CRS Report RS22595, *Navy Aegis Cruiser and Destroyer Modernization: Background and Issues for Congress*, by Ronald O'Rourke.

[14] CRS Report RL33946, *Navy Nuclear-Powered Surface Ships: Background, Issues, and Options for Congress*, by Ronald O'Rourke.

[15] Zachary M. Peterson, "Navy Awards Technology Company $128 Million Contract For CG(X) Work," *Inside the Navy*, October 27, 2008. Another press report (Katherine McIntire Peters, "Navy's Top Officer Sees Lessons in Shipbuilding Program Failures," *GovernmentExecutive.com*, September 24, 2008) quoted Admiral Gary Roughead, the Chief of Naval Operations, as saying: "What we will be able to do is take the technology from the DDG-1000, the capability and capacity that [will be achieved] as we build more DDG-51s, and [bring those] together around 2017 in a replacement ship for our cruisers." (Material in brackets in the press report.) Another press report (Zachary M. Peterson, "Part One of Overdue CG(X) AOA Sent to OSD, Second Part Coming Soon," *Inside the Navy*, September 29, 2008) quoted Vice Admiral Barry McCullough, the Deputy Chief of Naval Operations for Integration of Capabilities and Resources, as saying that the Navy did not budget for a CG(X) hull in its proposal for the Navy's budget under the FY2010-FY2015 Future Years Defense Plan (FYDP) to be submitted to Congress in early 2009.

An earlier report (Christopher P. Cavas, "DDG 1000 Destroyer Program Facing Major Cuts," *DefenseNews.com*, July 14, 2008) stated that the CG(X) would be delayed until FY2015 or later. See also Geoff Fein, "Navy Likely To Change CG(X)'s Procurement Schedule, Official Says," *Defense Daily*, June 24, 2008; Rebekah Gordon, "Navy Agrees CG(X) By FY-11 Won't Happen But Reveals Little Else," *Inside the Navy*, June 30, 2008.

[16] Source: Opening remarks of Secretary of Defense Robert Gates at an April 6, 2009, news conference on DOD recommendations for the then-forthcoming FY2010 defense budget.

FY2010 Navy Proposal to End DDG-1000 Procurement and Resume DDG-51 Procurement

At a July 31, 2008, hearing before the Seapower and Expeditionary Forces subcommittee of the House Armed Services Committee, the Navy announced that it wanted to end DDG-1000 procurement and resume DDG-51 procurement. The announcement represented a major change in Navy planning: prior to July 31, 2008, the Navy for years had strongly supported ending DDG-51 procurement in FY2005 and proceeding with DDG-1000 procurement.

In explaining their proposed change in plans, Navy officials cited a reassessment of threats that Navy forces are likely to face in coming years. As a result of this reassessment, Navy officials stated, the service decided that destroyer procurement over the next several years should emphasize three mission capabilities—area-defense AAW,[17] BMD, and open-ocean ASW. Navy officials 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 stated 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 reconfigured DDG-1000s over the next several years for the same total amount of funding. In addition, the Navy by 2008-2009 no longer appeared committed to the idea of reusing the DDG-1000 hull as the basis for the Navy's planned CG(X) cruiser. If the Navy had remained committed to that idea, it might have served as a reason for continuing DDG-1000 procurement.

The Navy's FY2010 budget proposed ending DDG-1000 procurement at three ships and resuming DDG-51 procurement. Congress, as part of its action on the FY2010 defense budget, supported the proposal: The FY2010 budget funded the procurement of one DDG-51 (the first to be procured since FY2005), provided advance procurement funding for two DDG-51s the Navy wants to procure in FY2011, completed the procurement funding for the third DDG-1000 (which was authorized but only partially funded in FY2009), and provided no funding for procuring additional DDG-1000s.

FY2011 Navy Proposal to Terminate CG(X) in Favor of Flight III DDG-51

The Navy's FY2011 budget, submitted to Congress on February 1, 2010, proposes another major change in Navy plans—terminating the Navy's planned CG(X) cruiser program and instead procuring an improved version of the DDG-51 called the Flight III version.[18] The Navy states that

[17] A ship with a point-defense AAW system can defend itself. A ship with an area-defense AAW system can defend both itself and other ships in the area. An area-defense AAW system employs an interceptor missile with a range sufficient to hit a crossing target (i.e., a target that is heading toward another ship). Navy ships equipped with the SM-2 missile can conduct area-defense AAW operations.

[18] It is a source of potential confusion that this is not the first time that the Navy has used the Flight III designation: The Navy in 1988 studied design options for a Flight III version of the DDG-51 design. The Chief of Naval Operations gave initial approval to a Flight III design concept, and the design was intended to begin procurement in FY1994. (Source: Donald Ewing, Randall Fortune, Brian Rochon, and Robert Scott, *DDG 51 Flight III Design Development*, Presented at the Meeting of the Chesapeake Section of The Society of Naval Architects and Marine Engineers, December 12, 1989.) The Flight III design was canceled in late-1990/early-1991. Subsequent studies led to the current Flight IIA design, which began procurement in FY1994. The Flight III DDG-51 that the Navy now wants to begin (continued...)

its desire to terminate the CG(X) program is "driven by affordability considerations."[19] Rather than starting to procure CG(X)s around FY2017, as the Navy had previously envisaged, the Navy wants to begin procuring Flight III DDG-51s in FY2016. Navy plans thus call for procuring the Flight IIA DDG-51s in FY2010-FY2015, followed by procurement of Flight III DDG-51s starting in FY2016.[20] The Navy would continue to procure Flight III DDG-51s through at least FY2022,[21] and perhaps until FY2031.[22]

The Flight III DDG-51 is to carry a version of the AMDR that is smaller and less powerful than the one envisaged for the CG(X). The Flight III DDG-51's AMDR is to have a diameter of about 14 feet, while the AMDR intended for the CG(X) might have had a diameter of about 22 feet.[23] In addition to improving the DDG-51's AAW and BMD capability through the installation of the AMDR, the Navy is also studying options for modifying the DDG-51 design in other ways for purposes of reducing crew size, achieving energy efficiency and improved power generation, improving effectiveness in warfare areas other than AAW and BMD, and reducing total ownership cost.[24] Detailed design work on the Flight III DDG-51 will reportedly begin in FY2012 or FY2013.[25]

The Navy's desire to cancel the CG(X) and instead procure Flight III DDG-51s apparently took shape during 2009: at a June 16, 2009, hearing before the Seapower subcommittee of the Senate Armed Services Committee, the Navy testified that it was conducting a study on destroyer procurement options for FY2012 and beyond that was examining design options based on either the DDG-51 or DDG-1000 hull form.[26] A January 2009 memorandum from the Department of Defense acquisition executive had called for such a study.[27] In September and November 2009, it

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procuring in FY2016 is not the same as the Flight III design of 1988-1991.

[19] Department of the Navy, Office of Budget, *Highlights of the Department of the Navy FY 2011 Budget*, February 2010, p. 5-7.

[20] See, for example, Zachary M. Peterson, "Navy To Launch Technical Study And Cost Analysis For New DDG-51s," *Inside the Navy*, February 19, 2010.

[21] Source: Memorandum dated February 2, 2010, from Director, Surface Warfare Division (N86) to Commander, Naval Sea Systems Command (SEA 05) on the subject "Technical Study In Support Of DDG 51 Class Resource Planning And Requirements Analysis," posted on InsideDefense.com (subscription required) February 19, 2009. See also Zachary M. Peterson, "Navy To Launch Technical Study And Cost Analysis For New DDG-51s," *Inside the Navy*, February 19, 2010.)

[22] Source: Supporting data on FY2011 Navy 30-year (FY2011-FY2040) shipbuilding plan provided by Navy Office of Legislative Affairs to CRS and the Congressional Budget Office on February 4, 2009.

[23] Sources for 14-foot and 22-foot figures: Zachary M. Peterson, "DDG-51 With Enhanced Radar in FY-16, Design Work To Begin Soon," *Inside the Navy*, February 8, 2010; Amy Butler, "STSS Prompts Shift in CG(X) Plans," *Aerospace Daily & Defense Report*, December 11, 2010: 1-2; "[Interview With] Vice Adm. Barry McCullough," *Defense News*, November 9, 2009: 38.

[24] Source: Memorandum dated February 2, 2010, from Director, Surface Warfare Division (N86) to Commander, Naval Sea Systems Command (SEA 05) on the subject "Technical Study In Support Of DDG 51 Class Resource Planning And Requirements Analysis," posted on InsideDefense.com (subscription required) February 19, 2009. See also Zachary M. Peterson, "Navy To Launch Technical Study And Cost Analysis For New DDG-51s," *Inside the Navy*, February 19, 2010.)

[25] Zachary M. Peterson, "DDG-51 With Enhanced Radar in FY-16, Design Work To Begin Soon," *Inside the Navy*, February 8, 2010.

[26] 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.

[27] 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-
(continued...)

was reported that the Navy's study was examining how future requirements for AAW and BMD operations might be met by a DDG-51 or DDG-1000 hull equipped with a new radar.[28] On December 7, 2009, it was reported that the Navy wanted to cancel its planned CG(X) cruiser and instead procure an improved version of the DDG-51.[29] In addition to being concerned about the projected high cost and immature technologies of the CG(X),[30] the Navy reportedly had concluded that it does not need a surface combatant with a version of the AMDR as large and capable as the one envisaged for the CG(X) to adequately perform projected AAW and BMD missions, because the Navy will be able to augment data collected by surface combatant radars with data collected by space-based sensors. The Navy reportedly concluded that using data collected by other sensors would permit projected AAW and BMD missions to be performed adequately with a radar smaller enough to be fitted onto the DDG-51.[31] Reports suggested that the new smaller radar would be a scaled-down version of the AMDR originally intended for the CG(X).[32]

The Navy's report on its FY2011 30-year (FY2011-FY2040) shipbuilding plan, submitted to Congress in conjunction with the FY2011 budget, states that the 30-year plan:

> Solidifies the DoN's [Department of the Navy's] long-term plans for Large Surface Combatants by truncating the DDG 1000 program, restarting the DDG 51 production line, and continuing the Advanced Missile Defense Radar (AMDR) development efforts. Over the past year, the Navy has conducted a study that concludes a DDG 51 hull form with an AMDR suite is the most cost-effective solution to fleet air and missile defense requirements over the near to mid-term....
>
> The Navy, in consultation with OSD, conducted a Radar/Hull Study for future destroyers. The objective of the study was to provide a recommendation for the total ship system solution required to provide Integrated Air and Missile Defense (IAMD) (simultaneous ballistic missile and anti-air warfare (AAW) defense) capability while balancing affordability with capacity. As a result of the study, the Navy is proceeding with the Air and Missile Defense Radar (AMDR) program....

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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].)

[28] Zachary M. Peterson, "Navy Slated To Wrap Up Future Destroyer Hull And Radar Study," *Inside the Navy*, September 7, 2009. Christopher P. Cavas, "Next-Generation U.S. Warship Could Be Taking Shape," *Defense News*, November 2, 2009: 18, 20.

[29] Christopher J. Castelli, "Draft Shipbuilding Report Reveals Navy Is Killing CG(X) Cruiser Program," *Inside the Navy*, December 7, 2009.

[30] Christopher J. Castelli, "Draft Shipbuilding Report Reveals Navy Is Killing CG(X) Cruiser Program," *Inside the Navy*, December 7, 2009.

[31] Amy Butler, "STSS Prompts Shift in CG(X) Plans," *Aerospace Daily & Defense Report*, December 11, 2009: 1-2.

[32] Cid Standifer, "NAVSEA Plans To Solicit Contracts For Air And Missile Defense Radar," *Inside the Navy*, December 28, 2009; "Navy Issues RFP For Phase II of Air And Missile Defense Radar Effort," *Defense Daily*, December 24, 2009: 4.

> As discussed above, the DDG 51 production line has been restarted. While all of these new-start guided missile destroyers will be delivered with some BMD capability, those procured in FY 2016 and beyond will be purpose-built with BMD as a primary mission. While there is work to be done in determining its final design, it is envisioned that this DDG 51 class variant will have upgrades to radar and computing performance with the appropriate power generation capacity and cooling required by these enhancements. These upgraded DDG 51 class ships will be modifications of the current guided missile destroyer design that combine the best emerging technologies aimed at further increasing capabilities in the IAMD arena and providing a more effective bridge between today's capability and that originally planned for the CG(X). The ships reflected in this program have been priced based on continuation of the existing DDG 51 re-start program. Having recently completed the Hull and Radar Study, the Department is embarking on the requirements definition process for these AMDR destroyers and will adjust the pricing for these ships in future reports should that prove necessary.[33]

In testimony to the House and Senate Armed Services Committees on February 24 and 25, 2010, respectively, Admiral Gary Roughead, the Chief of Naval Operations, stated:

> Integrated Air and Missile Defense (IAMD) incorporates all aspects of air defense against ballistic, anti-ship, and overland cruise missiles. IAMD is vital to the protection of our force, and it is an integral part of our core capability to deter aggression through conventional means....
>
> To address the rapid proliferation of ballistic and anti-ship missiles and deep-water submarine threats, as well as increase the capacity of our multipurpose surface ships, we restarted production of our DDG 51 Arleigh Burke Class destroyers (Flight IIA series). These ships will be the first constructed with IAMD, providing much-needed Ballistic Missile Defense (BMD) capacity to the Fleet, and they will incorporate the hull, mechanical, and electrical alterations associated with our mature DDG modernization program. We will spiral DDG 51 production to incorporate future integrated air and missile defense capabilities....
>
> The Navy, in consultation with the Office of the Secretary of Defense, conducted a Radar/Hull Study for future surface combatants that analyzed the total ship system solution necessary to meet our IAMD requirements while balancing affordability and capacity in our surface Fleet. The study concluded that Navy should integrate the Air and Missile Defense Radar program S Band radar (AMDR-S), SPY-3 (X Band radar), and Aegis Advanced Capability Build (ACB) combat system into a DDG 51 hull. While our Radar/Hull Study indicated that both DDG 51 and DDG 1000 were able to support our preferred radar systems, leveraging the DDG 51 hull was the most affordable option. Accordingly, our FY 2011 budget cancels the next generation cruiser program due to projected high cost and risk in technology and design of this ship. I request your support as we invest in spiraling the capabilities of our DDG 51 Class from our Flight IIA Arleigh Burke ships to Flight III ships, which will be our future IAMD-capable surface combatant. We will procure the first Flight III ship in FY 2016.[34]

[33] U.S. Navy, *Report to Congress on Annual Long-Range Plan for Construction of Naval Vessels for FY 2011*, February 2010, pp. 12, 13, 19. The first reprinted paragraph, taken from page 12, also occurs on page 3 as part of the executive summary.

[34] Statement of Admiral Gary Roughead, Chief of Naval Operations, before the House Armed Services Committee on 24 February, 2010, pp. 10-11; and Statement of Admiral Gary Roughead, Chief of Naval Operations, before the Senate Armed Services Committee on 25 February, 2010, pp. 10-11.

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.[35] 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. (The Ingalls shipyard 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 combatant radar makers and combat system integrators. Northrop Grumman is a third potential maker of Navy surface combatant radars. 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-I). Lockheed has a share of the DDG-100 combat system, and Raytheon has a share of the DDG-51 combat system. Lockheed, Raytheon, and Northrop are potential makers of the AMDR to be carried by the Flight III DDG-51.

Supplier Firms

The surface combatant industrial base also includes hundreds of additional firms that supply materials and components. 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.

FY2011 Funding Request

The two DDG-51s that the Navy wants to procure in FY2011 received $577.2 million in FY2010 advance procurement funding. The Navy's proposed FY2011 budget requests another $2,922.2 million in procurement funding for the two ships, so as to complete their estimated combined procurement cost of $3,499.2 million. The Navy's proposed FY2011 budget also requests $48.0 million in advance procurement funding for the one DDG-51 that the Navy wants to procure in FY2012, $186.3 million in procurement funding for DDG-1000 program-completion costs, and $228.4 million in research and development funding for the AMDR.

[35] 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.

Issues for Congress

Overview

Issues for Congress for FY2011 include the following:

- whether to approve, reject, or modify the Navy's proposal to develop the Flight III DDG-51 design and start procuring it in FY2016;
- whether to use multiyear procurement (MYP) for Flight IIA DDG-51s that the Navy wants to procure in FY2011-FY2015;
- whether to approve, reject, or modify the Navy's FY2011 funding request for procurement of Flight IIA DDG-51s, for DDG-1000 program-completion costs, and for research and development on the AMDR; and
- the potential impact on the DDG-1000 program of DOD's determination that the program has experienced a critical cost breach under the Nunn-McCurdy provision.

The first of these three issues is discussed in detail below.

Navy Proposal to Develop and Procure Flight III DDG-51s

Although the first Flight III DDG-51 would not be procured under Navy plans until FY2016, Navy activities starting in FY2011 will increasingly commit the Navy to this path. An alternative to the Flight III DDG-51 that Congress may wish to consider would be a new-design destroyer that would be more capable in certain respects than the Flight III DDG-51, but more affordable than the CG(X). If development of a new-design destroyer were begun in FY2011, the first ship might be ready for procurement as early as FY2017.

In considering whether to approve, reject, or modify the Navy's proposal to develop and procure Flight III DDG-51s, potential questions for Congress to consider include the following:

- Is there an adequate analytical basis for procuring Flight III DDG-51s in lieu of CG(X)s? Should an analysis of alternatives (AOA) or the equivalent of an AOA be performed before committing to the development and procurement of Flight III DDG-51s?
- Would a Flight III DDG-51 have sufficient AAW and BMD capability to perform projected AAW and BMD missions?
- Would a Flight III DDG-51 have sufficient growth margin for a projected 35- or 40-year service life?
- Would a Flight III DDG-51 have sufficiently low life-cycle ownership costs?
- How would a new-design destroyer compare to a Flight III DDG-51 in terms of capabilities, costs, and risks?
- What would be the potential industrial-base consequences of developing and procuring a new-design destroyer instead of the Flight III DDG-51?

Each of these questions is discussed below.

Analytical Basis

Is there an adequate analytical basis for procuring Flight III DDG-51s in lieu of CG(X)s? Should an analysis of alternatives (AOA) or the equivalent of an AOA be performed before committing to the development and procurement of Flight III DDG-51s?[36]

Those who believe there is an adequate analytical basis for canceling the CG(X) and instead procuring Flight III DDG-51s could argue the following:

- Shifting to procurement of Flight III DDG-51s in FY2016, like shifting to procurement of Flight IIA DDG-51s in FY1994, would simply extend the DDG-51 production effort, and therefore would not amount to the initiation of a new shipbuilding program that would require an AOA or the equivalent of an AOA.
- The Navy's proposal to cancel the CG(X) and instead procure Flight III DDG-51s reflects substantial analytical work in the form of the CG(X) AOA, additional Navy studies that were done to support the 2008-2009 proposal to end DDG-1000 procurement and restart DDG-51 procurement, and the 2009 Navy destroyer hull/radar study that examined options for improving the AAW and BMD capabilities of the DDG-51 and DDG-1000 destroyer designs through the installation of an improved radar and combat system modifications.

Those who question whether there is an adequate analytical basis for canceling the CG(X) and instead procuring Flight III DDG-51s could argue the following:

- Procuring Flight III DDG-51s starting in FY2016 represents a significant change from the previous plan to procure CG(X)s starting around FY2017. Given the scope of the design modifications incorporated into the Flight III DDG-51 and the number of years that the design would be procured, the Navy's plan amounts to the equivalent of a new shipbuilding program whose initiation would require an AOA or the equivalent of an AOA.

[36] The issue of whether there is an adequate analytical basis for canceling the CG(X) and instead procuring Flight III DDG-51s is somewhat similar to an issue raised by CRS several years ago as to whether there was an adequate analytical basis for the Navy's decision that a ship like the LCS—a small, fast ship with modular payload packages—would be the best or most cost-effective way to fill gaps the Navy had identified in its capabilities for countering submarines, small surface attack craft, and mines in heavily contested littoral areas. (See, for example, the September 5, 2002, update of CRS Report RS21305, *Navy Littoral Combat Ship (LCS): Background and Issues for Congress*, by Ronald O'Rourke, or the October 28, 2004, and the October 28, 2004, update of CRS Report RL32109, *Navy DDG-51 and DDG-1000 Destroyer Programs: Background and Issues for Congress*, by Ronald O'Rourke.)

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

- The CG(X) AOA focused mainly on examining radar and hull-design options for a cruiser with a large and powerful version of the AMDR, rather than radar- and hull-design options for a smaller destroyer with a smaller and less powerful version of the AMDR. The Navy's 2009 destroyer hull/radar study was focused on answering a somewhat narrowly defined question: what would be the lowest-cost option for improving the AAW and BMD performance of a DDG-51 or DDG-1000 by a certain amount through the installation of an improved radar and an associated modified combat system? An adequate analytical basis for a proposed program change of this magnitude would require an AOA or equivalent study that rigorously examined a broader question: given projected Navy roles and missions, and projected Navy and DOD capabilities to be provided by other programs, what characteristics of all kinds (not just AAW and BMD capability) are needed in surface combatants in coming years, and what is the most cost-effective acquisition strategy to provide such ships?

AAW and BMD Capability

Would a Flight III DDG-51 have sufficient AAW and BMD capability to perform projected AAW and BMD missions?

The Flight III DDG-51 would have more AAW and BMD capability than the current DDG-51 design, but less AAW and BMD capability than was envisioned for the CG(X), in large part because the Flight III DDG-51 would be equipped with a roughly 14-foot-diameter version of the AMDR that would have more sensitivity than the SPY-1 radar on Flight IIA DDG-51s, but less sensitivity than the roughly 22-foot-diameter version of the AMDR that was envisioned for the CG(X). The CG(X) also may have had more missile-launch tubes than the Flight III DDG-51.

Supporters of the Navy's proposal to procure Flight III DDG-51s could argue that a roughly 14-foot-diameter version of the AMDR would provide the DDG-51 with sufficient AAW and BMD capability to perform projected AAW and BMD missions because this radar would be substantially more capable than the SPY-1 radar currently on DDG-51s, and because Flight III DDG-51s (and other Navy ships) would also benefit from data collected by other sensors, including space-based sensors.

Skeptics could argue that Flight III DDG-51s might not have sufficient AAW and BMD capability because a roughly 14-foot-diameter AMDR would be substantially less capable than the roughly 22-foot-diameter AMDR that the Navy previously believed would be needed to adequately perform projected AAW and BMD missions, and because the off-board sensors and data-communications links on which the Flight III DDG-51 would rely for part of its sensor data that could be vulnerable to enemy attack.

Growth Margin

Would a Flight III DDG-51 have sufficient growth margin for a projected 35- or 40-year service life?

A ship's growth margin refers to its capacity for being fitted over time with either additional equipment or newer equipment that is larger, heavier, or more power-intensive than the older equipment it is replacing, so as to preserve the ship's mission effectiveness. Elements of a ship's growth margin include interior space, weight-carrying capacity, electrical power, cooling capacity

(to cool equipment), and ability to accept increases in the ship's vertical center of gravity. Navy ship classes are typically designed so that the first ships in the class will be built with a certain amount of growth margin. Over time, some or all of the growth margin in a ship class may be used up by backfitting additional or newer systems onto existing ships in the class, or by building later ships in the class to a modified design that includes additional or newer systems.

Modifying the DDG-51 design over time has used up some of the design's growth margin. The Flight III DDG-51 would have less of a growth margin than what the Navy would aim to include in a new destroyer design of about the same size.

Supporters of the Navy's proposal to procure Flight III DDG-51s could argue that the ship's growth margin would be adequate because the increase in capability achieved with the Flight III configuration reduces the likelihood that the ship will need much subsequent modification to retain its mission effectiveness over its projected service life. They could also that, given technology advances, new systems added to the ship years from now might require no more (and possibly less) space, weight, electrical power, or cooling capacity than the older systems they replace.

Skeptics could argue that there are uncertainties involved in projecting what types of capabilities ships might need to have to remain mission effective over a 35- or 40-year life, and that building expensive new warships with relatively modest growth margins consequently would be imprudent. The Flight III DDG-51's growth margin, they could argue, could make it more likely that the ships would need to be removed from service well before the end of their projected service lives due to an inability to accept modifications needed to preserve their mission effectiveness. Skeptics could argue that it might not be possible to fit the Flight III DDG-51 in the future with a high-power directed-energy weapon (DEW), such as a laser, because the ship would lack the electrical power required for such a weapon. Skeptics could argue that DEWs could be critical to the Navy's ability years from now to affordably counter large numbers of enemy anti-ship cruise missiles (ASCMs) and anti-ship ballistic missiles (ASBMs) that might be fielded by a wealthy and determined adversary,[37] and that procuring Flight III DDG-51s could delay the point at which lasers could be introduced into the cruiser-destroyer force, and reduce for many years the portion of the cruiser-destroyer force that could ultimately be backfitted with lasers. This, skeptics could argue, might result in an approach to AAW and BMD on cruisers and destroyers that might ultimately be unaffordable for the Navy to sustain in a competition against a wealthy and determined adversary.

Life-Cycle Ownership Costs

Would a Flight III DDG-51 have sufficiently low life-cycle ownership costs?

Supporters of the Navy's proposal to procure Flight III DDG-51s could argue that the annual operating & support (O&S) cost of the Flight IIA DDG-51 design is not onerous, and that the

[37] The cost for an adversary to build and field an additional land-based ASCM or ASBM might be much less than the cost for the Navy to build and field an additional sea-based missile-launch tube and procure an additional interceptor missile to place in that tube. If so, then it might become unaffordable for the Navy at some point in the future to match each additional ASCM and ASBM that a wealthy and determined adversary might field with an additional launch tube and interceptor missile. DEWs, if successfully developed, promise to reverse this unfavorable cost equation by lowering the marginal cost per shot for intercepting ASCMs and ASBMs to a level well below what it costs an enemy to build an additional ASCM or ASBM.

annual O&S cost of a Flight III DDG-51 would not be markedly different. They could also argue that the Navy is studying options for modifying the DDG-51 design to reduce crew size and otherwise reduce total ownership cost.[38] Skeptics could argue that the crew size and other elements of the Flight III DDG-51's life-cycle ownership cost could be reduced only so much, given certain unchangeable features of the basic DDG-51 design, and that building significant numbers of Flight III DDG-51s—rather than ships designed from scratch to achieve significant reductions in crew size and other life-cycle ownership costs—would produce a surface combatant fleet with relatively high life-cycle ownership costs.

Alternative New-Design Destroyer

How would a new-design destroyer compare to a Flight III DDG-51 in terms of capabilities, costs, and risks?

As an alternative to the Flight III DDG-51, a new-design destroyer could be designed with the following characteristics:

- a version of the AMDR that is larger than the roughly 14-foot-diameter version envisioned for the Flight III DDG-51, but smaller than the roughly 22-foot-diameter version that was envisioned for the CG(X);
- enough electrical power to permit the ship to be backfitted in the future with a high-power DEW, such as a laser, for AAW and/or BMD operations;
- more growth margin than on the Flight III DDG-51;
- producibility features for reducing construction cost per ton that are more extensive than those on the DDG-51 design;
- automation features permitting a crew that is smaller than what can be achieved on a Flight III DDG-51, so as to reduce crew-related life-cycle ownership costs;
- physical open-architecture features that are more extensive than those on the Flight III DDG-51, so as to reduce modernization-related life-cycle ownership costs;
- no technologies not already on, or being developed for, other Navy ships, with the possible exception of technologies that would enable an integrated electric drive system that is more compact than the one used on the DDG-1000; and
- DDG-51-like characteristics in other areas, such as survivability, maximum speed, cruising range, and weapons payload.

Such a ship might have a full load displacement of roughly 11,000 to 12,000 tons, compared to about 10,000 tons for the Flight III DDG-51, about 15,000 tons for an AAW/BMD version of the DDG-1000, and perhaps 15,000 to 23,000 tons for a CG(X).

[38] Source: Memorandum dated February 2, 2010, from Director, Surface Warfare Division (N86) to Commander, Naval Sea Systems Command (SEA 05) on the subject "Technical Study In Support Of DDG 51 Class Resource Planning And Requirements Analysis," posted on InsideDefense.com (subscription required) February 19, 2009. See also Zachary M. Peterson, "Navy To Launch Technical Study And Cost Analysis For New DDG-51s," *Inside the Navy*, February 19, 2010.)

The cost and technical risk of developing the new destroyer's hull design could be minimized by leveraging, where possible, existing surface combatant hull designs. The cost and technical risk of developing its combat system could be minimized by using a modified version of the DDG-51 or DDG-1000 combat system. Other development costs and risks for the new destroyer would be minimized by using no technologies not already on, or being developed for, other Navy ships (with the possible exception of some integrated electric drive technologies). Even with such steps, however, the cost and technical risk of developing the new destroyer would be greater than those of the Flight III DDG-51. The development cost of the new destroyer would likely be equivalent to the procurement cost of at least one destroyer, and possibly two destroyers.

The procurement cost of the new destroyer would be minimized by incorporating producibility features for reducing construction cost per ton that are more extensive than those on the Flight III DDG-51. Even with such features, the new destroyer would be more expensive to procure than the Flight III DDG-51, in part because the Flight III DDG-51 would leverage many years of prior production of DDG-51s. In addition, the new destroyer, as a new ship design, would pose more risk than the Flight III DDG-51 of procurement cost growth. The procurement cost of the new destroyer would nevertheless be much less than that of the CG(X), and might, after the production of the first few units, be fairly close to that of the Flight III DDG-51.

Although the new destroyer would use a reduced-size crew and physical open architecture features to reduce life-cycle ownership costs, it is unclear how the life-cycle ownership costs of the new destroyer would compare with those of the Flight III DDG-51.

Table 1 summarizes potential relative merits of the Flight III DDG-51 and the potential new destroyer considered here. The Flight III DDG-51 offers near-term benefits of lower development cost and risk and lower procurement cost and risk, while the new destroyer would offer longer-term benefits of greater AAW and BMD capability and greater growth margin.

Table 1. Flight III DDG-51 Compared to Potential New-Design Destroyer

(X indicates the design that would likely have greater capability or growth margin, or lower cost or risk)

	Flight III DDG-51	New-design destroyer
Capability of AMDR for AAW/BMD operations		X
Electrical power to support future high-power DEW for AAW/BMD operations		X
Growth margin		X
Development cost	X	
Development risk	X	
Procurement cost	X	
Procurement cost growth risk	X	
Life-cycle ownership cost	unclear which design would have lower cost	

Source: Prepared by CRS.

Industrial-Base

What would be the potential industrial-base consequences of developing and procuring a new-design destroyer instead of the Flight III DDG-51?

Developing and procuring a new-design destroyer would provide an opportunity for the Navy to conduct a competition between Lockheed and Raytheon (and perhaps other firms) to be the lead contractor on the ship's combat system. Procuring Flight III DDG-51s would mean that Lockheed would likely continue its current status as the lead contractor of Navy cruiser and destroyer combat systems. Developing and procuring either ship would provide the Navy with an opportunity to conduct a competition between Lockheed, Raytheon, and Northrop to build the AMDR. The supplier firms for a new-design destroyer could be different in some cases from the supplier firms for a Flight III DDG-51.

FY2011 Legislative Activity

The Navy's proposed FY2011 budget was submitted to Congress on February 1, 2010. The two DDG-51s that the Navy wants to procure in FY2011 received $577.2 million in FY2010 advance procurement funding. The Navy's proposed FY2011 budget requests another $2,922.2 million in procurement funding for the two ships, so as to complete their estimated combined procurement cost of $3,499.2 million. The Navy's proposed FY2011 budget also requests $48.0 million in advance procurement funding for the one DDG-51 that the Navy wants to procure in FY2012, $186.3 million in procurement funding for DDG-1000 program-completion costs, and $228.4 million in research and development funding for the AMDR.

Appendix. Additional Background Information on DDG-1000 Program

This appendix presents additional background information on the DDG-1000 program.

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:[39]

- **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, 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.[40]

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.[41]

New Technologies

The DDG-1000 incorporates a significant number of new technologies, including a wave-piercing, tumblehome hull design for reduced detectability,[42] a superstructure made partly of large sections of composite (i.e., fiberglass-like) materials rather than steel or aluminum, an integrated

[39] 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).

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

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

[42] 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.

electric-drive propulsion system,[43] a total-ship computing system for moving information about the ship, automation technologies enabling its 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."

Planned Quantity

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, then to 7, and finally to 3.

Construction Shipyards

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.

[43] 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.

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).

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.

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.[44]

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).

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. Given the truncation of the DDG-1000 program to three ships, this unit procurement cost cap appears moot.

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

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