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Navy CVNX Aircraft Carrier Program: Background and Issues for Congress

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Summary

The Administration's proposed FY2003 defense budget requests $243.7 million in advanced procurement funding for CVNX-1, an aircraft carrier that the Navy plans to procure in FY2007. The FY2003 budget request includes additional research and development funding for the ship. The Navy plans to gradually evolve the design of its aircraft carriers by introducing new technologies into CVN-77 (an aircraft carrier procured in FY2001), CVNX-1, and CVNX-2 (a carrier planned for procurement around FY2011). The Navy estimates that CVNX-1 will cost $2.54 billion to develop and $7.48 billion to procure, bringing its total acquisition (development plus procurement) cost to $10.02 billion. The Navy estimates that CVNX-2 will cost $1.29 billion to develop and $7.49 billion to procure, for a total acquisition cost of $8.78 billion. A Defense Science Board task force is currently assessing how aircraft carriers should serve the nation's needs in the 21st century; it is to report its findings by the end of March 2002. This report will be updated as events warrant.

Background

The Navy's Current Carrier Force. The Navy currently has 12 aircraft carriers and Defense Department plans call for maintaining the force at this level. Table 1 below shows the 12 ships in the current carrier force. The Enterprise is a one-of-a-kind nuclear-powered carrier; all the other nuclear-powered carriers are of the Nimitz (CVN-68) class (with some modifications). Two additional Nimitz-class carriers are under construction – the Ronald Reagan (CVN-76), which was procured in FY1995 at a cost of $4.45 billion and is scheduled to enter service in 2002 as the replacement for the Constellation, and the as-yet-unnamed CVN-77, which was procured in FY2001 at a cost of $4.97 billion and is scheduled to enter service in 2008 as the replacement for the Kitty Hawk.

The Aircraft Carrier Construction Industrial Base. All U.S. aircraft carriers procured since FY1958 have been built by Newport News Shipbuilding (NNS) of Newport News, VA. NNS is the only shipyard in the country that can build large-deck, nuclear-powered aircraft carriers. The aircraft carrier construction industrial base also includes hundreds of subcontractors and suppliers in dozens of states.

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Table 1. U.S. Navy aircraft carriers

Name	Hull number	Propulsion	Length (feet)	Full load displace-ment (tons)	Year procured	Year entered service
Kitty Hawk	CV-63	fossil fuel	1,046	84,000	FY1956	1961
Constellation	CV-64	fossil fuel	1,046	84,000	FY1957	1961
Enterprise	CVN-65	nuclear	1,102	94,000	FY1958	1961
John F. Kennedy	CV-67	fossil fuel	1,052	81,000	FY1963	1968
Nimitz	CVN-68	nuclear	1,092	92,000	FY1967	1975
Dwight D. Eisenhower	CVN-69	nuclear	1,092	92,000	FY1970	1977
Carl Vinson	CVN-70	nuclear	1,092	92,000	FY1974	1982
Theodore Roosevelt	CVN-71	nuclear	1,092	96,000	FY1980	1986
Abraham Lincoln	CVN-72	nuclear	1,092	102,000	FY1983	1989
George Washington	CVN-73	nuclear	1,092	102,000	FY1983	1992
John C. Stennis	CVN-74	nuclear	1,092	102,000	FY1988	1995
Harry S Truman	CVN-75	nuclear	1,092	102,000	FY1988	1998

Navy Aircraft Carrier Acquisition Programs. Navy aircraft carrier acquisition programs currently revolve around three ships – CVN-77, CVNX-1, and CVNX-2.

CVN-77. As part of its action on the FY2001 defense budget, Congress in 2000 approved $4,053.7 million to complete procurement funding for CVN-77. CVN-77's total procurement cost of $4,974.9 million includes $921.2 million that was provided prior to FY2001. CVN-77 will incorporate a variety of new technologies, including several that are intended to reduce the annual operating and support (O&S) cost of the ship compared to other Nimitz-class ships. Where feasible, some of these new technologies might be retrofitted onto the other 9 Nimitz-class carriers. CVN-77 will require 550 fewer sailors to operate than previous Nimitz-class ships and will feature a new integrated combat system to be made by an industry team led by Lockheed Martin.

CVNX-1. CVNX-1 is a further-evolved version of the Nimitz-class design that the Navy plans to procure in FY2007 to replacement for the Enterprise (CVN-65) in 2014. The Navy estimates that CVNX-1 will cost $2.54 billion to develop and $7.48 billion to procure, bringing its total acquisition (development plus procurement) cost to $10.02 billion. Congress appropriated $138.9 million in advanced procurement funding for CVNX-1 in the FY2002 defense budget. For FY2003, the Administration is requesting $243.7 million in advanced procurement funding and additional funding for research and development work on the ship.

The table below shows actual (FY2001-FY2002), requested (FY2003), programmed (FY2004-FY2007), and implied (FY2008) procurement funding for CVNX-1. The FY2002 figure shown reflects an apparent DoD adjustment to the congressionally enacted figure. The large advanced procurement funding figure in FY2004 will fund, among other things, the ship's long-lead-time nuclear-propulsion components. A total of $2,479.8 million, or about 33% of the ship's total procurement cost, is to be provided prior to the procurement year of FY2007.

Although CVNX-1 is to be procured in FY2007, Navy plans call for $2,354.8 million, or about 31%, of the ship's total procurement cost to be provided in FY2008. Dividing the final portion of the ship's procurement cost between FY2007 and FY2008 is called "split funding" and is an apparent departure from the full funding provision – a defense budgeting rule imposed by Congress on the Defense Department about 50 years ago that requires the full procurement cost of any item procured through the procurement title of the defense appropriations act (including Navy ships funded in the Shipbuilding and Conversion, Navy [SCN] appropriation account) to be provided in the year in which the item is procured. The Navy apparently split-funded CVNX-1 between FY2007 and FY2008 to relieve financial pressure on the SCN account in FY2007.

Table 2. Procurement funding for CVNX-1
(millions of then-year dollars)

Fiscal Year								
01	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**Total**
21.9	136.0	243.7	1,262.9	397.9	417.4	2,645.4	2,354.8	7,480.0

The Navy originally wanted CVNX-1 to be a completely new, next-generation aircraft carrier (hence the name CVNX-1, rather than CVN-78). In May 1998, however, the Navy decided that it could not afford to develop an all-new design for the ship and instead decided to continue to modify the Nimitz-class design with each new carrier that is procured. Under this strategy, CVN-77 and CVNX-1 are to be, technologically, the first and second ships in a series of transitional aircraft carrier designs. An all-new carrier design (including a new hull design different from that of the Nimitz class) might eventually emerge under this strategy, but this would not happen until CVNX-2 at the earliest or, perhaps more likely, CVNX-3.

Compared to CVN-77, CVNX-1 would require at least 350 fewer sailors to operate and would feature, among other things, an entirely new and less expensive nuclear reactor plant, a new electrical distribution system, and an electromagnetic (as opposed to steam-powered) aircraft catapult system.

CVNX-2. Under current Navy long-range plans, CVNX-2 would be procured in FY2011 and enter service in 2018 as the replacement for the John F. Kennedy (CV-67), which will then be 50 years old. The Navy estimates that CVNX-2 will cost $1.29 billion to develop and $7.49 billion to procure, for a total acquisition cost of $8.78 billion. Compared to CVNX-1, CVNX-2 would feature further reductions in crew size, a significantly redesigned flight deck, an electromagnetic aircraft recovery system, and hull-design improvements.

Defense transformation and aircraft carriers. The Bush Administration has expressed a strong interest in defense transformation, which can be defined as large-scale, potentially discontinuous or disruptive change military technologies, concepts of operations, and organization. For U.S. naval forces, transformation could involve making changes that better prepare the fleet to contend with so-called maritime anti-access/area-denial capabilities – such as advanced diesel-electric submarines, anti-ship missiles, and mines – that adversaries may deploy to defend their littoral (near-shore) waters against large, capable navies like the U.S. Navy.[1]

Some advocates of defense transformation, including Andrew Marshall of the Pentagon's Office of Net Assessment, have raised questions about the future survivability and cost-effectiveness of large aircraft carriers (and other surface ships) against adversaries with capable anti-access/area-denial forces. They have also advocated increased spending on unmanned air vehicles (UAVs) and unmanned combat air vehicles (UCAVs) to accelerate the transformation of naval aviation.

Defense Science Board Task Force. On September 6, 2001, E.C. "Pete" Aldridge, Jr, the Under Secretary of Defense (Acquisition, Technology and Logistics) directed the Defense Science Board to establish a task force

> to assess how aircraft carriers should service the nation's defense needs in the 21st century and beyond.... The Task Force should concentrate on the increased need to fulfill the presence and warfighting mission that aircraft carriers perform. The carrier battle group has been the mainstay of our combat-credible forward presence and the Task Force should examine its applicability and potential for transformation in the future.... The Task Force should explore the aircraft carrier's contribution to joint operations in the littoral.
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> While significant resources are being expended in the evolution of aircraft carriers to improve performance and life cycle cost, it is not expected that there will be sufficient funds to expand the carrier fleet significantly. The Task Force should examine cost/capability tradeoffs in considering the design of carriers appropriate to the future environments in which naval warfare may occur. In exploring all of these issues, the Task Force should examine the broadest range of alternatives....[2]

The task force is to report its findings by the end of March 2002.

Potential Issues for Congress

Potential implications of UAVs and UCAVs. Congress has expressed an interest in unmanned air vehicles (UAVs) and unmanned combat air vehicles (UCAVs) for several years. Congress in 2000 underscored this interest in Section 220 of the FY2001 defense authorization act (H.R. 4205/P.L. 106-398), which states, "It shall be a goal of the

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[1] For more on defense transformation and how it relates to the Navy, see CRS Report RS20851, *Naval Transformation: Background and Issues for Congress*, by Ronald O'Rourke. Washington, 2002. (Updated periodically) 6 p.

[2] Memorandum dated September 6, 2001 from The Under Secretary of Defense (Acquisition, technology, and Logistics) to the Chairman, Defense Science Board, on Terms of Reference – Defense Science Board Task Force on Aircraft Carriers of the Future.

Armed Forces to achieve the fielding of unmanned, remotely controlled technology such that – (1) by 2010, one-third of the aircraft in the operational deep strike force aircraft fleet are unmanned...." Many defense analysts believe the value and potential of UAVs and UCAVs have been demonstrated by the war in Afghanistan, where they have been used extensively.

One potential question for Congress is whether the Navy's plans for incorporating UAVs and UCAVs into naval aviation are sufficient in scope and urgency. As of last year, the Navy planned on incorporating 6 UCAVs into each carrier air wing (or about 8 percent of each air wing's 75 aircraft) by 2017. This plan does not appear to keep pace with the goal established in Section 220 of the FY2001 defense authorization act.

A second potential question for Congress is how UAVs and UCAVs might alter the overall structure of naval aviation, including the carrier fleet. As a part of the Navy's Streetfighter project for generating new naval operational concepts and conceptual ship designs for fighting in contested littoral areas,[3] a class project at the Naval Postgraduate School in Monterrey, CA, recently developed a design for a 13,000-ton UAV/UCAV carrier called Sea Archer that would embark an air wing of 16 UAVs and UCAVs weighing about 15,000 pounds each, plus two manned helicopters. The ship as designed would have a maximum speed of 60 knots (compared with something more than 30 knots for the Navy's aircraft carriers) and an estimated procurement cost of about $1.5 billion. The ship's size and cost could be reduced by lowering its maximum speed to 45 or 50 knots and reducing the size of the UAVs and UCAVs to 10,000 to 12,000 pounds. The ship might enter service as soon as 2020.[4]

Potential questions for Congress include: How many UAVs and UCAVs should be incorporated into future carrier air wings, and how should the design of future aircraft carriers be altered, if at all, to take into account the potential for air wings with various mixes of manned and unmanned aircraft? Should the Navy develop and procure a UAV/UCAV carrier? If so, how many UAVs and UCAVs, with what capabilities, should it embark? How might a UAV/UCAV carrier be used, either independent of or in conjunction with aircraft carriers embarking mostly manned aircraft, and how many traditional aircraft carriers and UAV/UCAV carriers should the fleet have?

Other potential questions. Other potential questions for Congress concerning carriers include the following:

- **Carrier survivability.** How survivable will carriers be in the future against adversary forces, and how might judgements on prospective carrier survivability affect the size and composition of the Navy's future aircraft carrier force?

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[3] For more on the Streetfighter project, see CRS Report RS20851, op cit.

[4] Woods, Randy. Students Design Small, Fast Carrier At Projected Cost of $1.5 Billion. *Inside the Navy*, January 7, 2002; Woods, Randy. Students Envision Fast, Stealthy UAV TO Accompany Small Carrier. *Inside the Navy*, October 15, 2001; Woods, Randy. As Crossbow Design Takes Shape, Students Eye 2040 Readiness Date. *Inside the Navy*, September 10, 2001.

- **Design evolution**. Does the Navy's plan for evolving the design of its carriers through CVN-77, CVNX-1,and CVNX-2 introduce new technologies and design features at the right pace? Should policymakers reconsider the 1998 to abandon the notion of developing a clean-sheet carrier design? At this juncture, what are the merits of the clean-sheet and evolutionary approaches?

- **Construction process.** Is the process for building aircraft carriers sufficiently modern and efficient? Have the Navy and Newport News Shipbuilding taken adequate advantage of computer-aided-design technology and modular design and manufacturing techniques to modernize the process for building carriers? How much have these steps reduced the prospective procurement cost of CVNX-1?

- **Cost growth.** The Navy recently has experienced cost growth in its aircraft carrier construction programs. What were the causes of this cost growth, and what steps have the Navy and Newport News Shipbuilding taken to prevent future cost growth?

- **Stationkeeping multiplier.** The stationkeeping multipliers for aircraft carriers – i.e., the number of carriers that must be in inventory to keep one carrier continuously on station in various overseas operating areas – are higher than the multipliers for other kinds of Navy ships. About 6 U.S.-homeported carriers are required to keep one on station in the Mediterranean, and 7 or more U.S.-homeported carriers are required to keep one on station in the Northern Arabian Sea or Persian Gulf. What is the potential for reducing carrier stationkeeping multipliers through measures such as higher transit speeds to and from the operating areas, greater use of land-based simulators (so as to reduce time at sea spent in non-deployed training operations), double- or multiple-crewing of carriers, or long-duration forward deployments of carriers with rotation of crews that are flown to and from the ship?

- **Electric drive.** The Navy in 1999 issued a report to Congress on electric-drive propulsion technology for Navy ships concluding that the technology would be cost-effective for most kinds of Navy ships, but not for carriers. Have developments in electric-drive technology since 1999 affected this conclusion in any way?[5]

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[5] See CRS Report RL30622, *Electric-Drive* Propulsion for U.S. Navy Ships: Background and Issues for Congress, by Ronald O'Rourke. Washington, 2000. (July 31, 2000) 65 p.