

**STATEMENT OF
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BEFORE THE
HOUSE ARMED SERVICES COMMITTEE
SUBCOMMITTEE ON PROJECTION FORCES
HEARING ON
THE NAVY'S LONG-RANGE FLEET STRATEGY AND
NAVY SHIPBUILDING PROGRAMS
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Chairman Bartlett, Representative Taylor, distinguished members of the subcommittee, thank you for the opportunity to appear before you to discuss the Navy's FY2007 budget submission and Future Years Defense Plan (FYDP) and how it supports the Navy's long-range fleet strategy. As requested, my testimony will focus on the following:

- how the Navy's shipbuilding plans support the Navy's proposed 313-ship fleet (pages 1-8), and the status of the Navy's major shipbuilding programs (pages 8-16);
- the industrial-base implications of the Navy's shipbuilding plan for its proposed 313-ship fleet (pages 16-22); and
- alternative funding approaches for Navy ship procurement (pages 23-26).

Shipbuilding Plan's Support For Proposed 313-Ship Fleet and Status of Navy's Major Shipbuilding Programs

Shipbuilding Plan's Support For Proposed 313-Ship Fleet

Proposed 313-Ship Fleet. The Navy's proposed 313-ship fleet includes the following ships:

- 14 ballistic missile submarines (SSBNs);
- 4 converted Trident cruise missile/special operations forces submarines (SSGNs);
- 48 attack submarines (SSNs);
- 11 aircraft carriers;
- 88 cruisers and destroyers, including
 - 7 DD(X) destroyers,
 - 19 CG(X) cruisers, and
 - 62 Arleigh Burke (DDG-51) class Aegis destroyers;
- 55 Littoral Combat Ships (LCSs);
- 31 amphibious ships, including
 - 9 LHA/LHA-type large-deck amphibious assault ships,
 - 12 LSD-41/49 class amphibious ships, and
 - 10 San Antonio (LPD-17) class amphibious ships;
- 12 new-construction Maritime Prepositioning Force (Future), or MPF(F) ships, including
 - 1 modified LHD-type amphibious assault ship,
 - 2 modified LHA (Replacement), or LHA(R), amphibious assault ships,
 - 3 modified Lewis and Clark (TAKE-1) class cargo ships,
 - 3 modified Large, Medium-Speed, Roll-on/Roll-off (LMSR) sealift ships, and
 - 3 Mobile Logistic Platform Ships (MLPs);
- 30 combat logistics (resupply) ships; and
- 20 other command and support ships.

Navy Shipbuilding Plan. The Navy's shipbuilding plan for supporting its proposed 313-ship fleet includes, over the shorter-term, the FY2007-FY2011 shipbuilding plan, and over the longer term, the 30-year (FY2007-FY2036) shipbuilding plan submitted to Congress in February. **Table 1** below shows new-construction ships in the Navy's FY2007-FY2011 shipbuilding plan. **Appendix A** shows the 30-year Navy shipbuilding plan.

Table 1. Navy FY2007-FY2011 Ship-Procurement Plan
(New-construction ships; ships fully funded in FY2006 shown for reference)

	<i>FY06</i>	FY07	FY08	FY09	FY10	FY11	TOTAL FY07-11
CVN-21			1				1
SSN-774	<i>1</i>	1	1	1	1	1	5
DD(X)		2 ^a	0 ^a	1	1	1	5
CG(X)						1	1
LCS	3 ^b	2	3	6	6	6	23
LPD-17	<i>1</i>		1				1
LHA(R)		1			1		2
TAKE	<i>1</i>	1	1				2
LHA(R)-MPF(F)						1	1
TAKE-MPF(F)				1	1	1	3
LMSR-MPF(F)					1	1	2
MLP-MPF(F)				1		1	2
JHSV				1	1	1	3
TOTAL	<i>6</i>	7	7	11	12	14	51
Subtotal larger ships (i.e., ships other than LCSs)	<i>3</i>	5	4	5	6	8	28

Sources: Department of the Navy, *Highlights of the Department of the Navy FY 2007 Budget*, Chart 15 (p. 5-3), and *Draft Report to Congress on Annual Long-Range Plan for Construction of Naval Vessels for FY 2007*.

Key:

- CVN-21: CVN-21 class nuclear-powered aircraft carrier
- SSN-774: Virginia (SSN-774) class nuclear-powered attack submarine
- DD(X): DD(X) class destroyer
- CG(X) CG(X) class cruiser
- LCS Littoral Combat Ship
- LPD-17 San Antonio (LPD-17) class amphibious ship
- LHA(R) LHA(R) class amphibious assault ship
- TAKE Lewis and Clark (TAKE-1) class resupply ship
- LHA(R)-MPF(F) Modified LHA(R) intended for MPF(F) squadron
- TAKE-MPF(F) Modified TAKE intended for MPF(F) squadron
- LMSR-MPF(F) Modified large, medium-speed, roll-on/roll-off (LMSR) sealift ship intended for MPF(F) squadron
- MLP-MPF(F) Mobile Logistic Platform ship intended for MPF(F) squadron
- JHSV Joint High-Speed Vessel for use as an intratheater connector (i.e., transport) ship

a. Each of the two DD(X)s to be procured in FY2007 is to be split-funded (i.e., incrementally funded) across FY2007 and FY2008.

b. Includes one LCS funded through the Navy's research and development account and two LCSs funded through the Shipbuilding and Procurement, Navy (SCN) account.

Navy Projection Of Total Ship Force Levels. If the Navy's 30-year shipbuilding plan were implemented, the Navy projects that the fleet would increase from the current total of 281 ships to 315 ships in FY2012, peak at 330 ships in FY2017-FY2018, and then decline to less than 313 ships in FY2026 and subsequent years, reaching a minimum of 293 ships in FY2034. The Navy's year-by-year projection is shown in **Appendix B**.

The FY2012 fleet of 315 ships would not match the mix of ships called for in the Navy's 313-ship proposal. For example, the fleet in FY2012 would include 21 LCSs rather than 55, and 2 new-construction MPF(F) ships rather than 12. The fleet would draw closer to the mix in the 313-ship proposal in subsequent years, as the LCS, MPF(F), and other shipbuilding programs continued, and as older ships currently in the force retired from service.

Concept Of Steady-State Replacement Rate¹. Members of Congress and other observers have expressed concern in recent years that the rate of Navy shipbuilding since the early 1990s has been below the so-called steady-state replacement rate for a fleet of about 300 ships. The steady-state replacement rate is the average annual ship procurement rate that would be needed over the long run to maintain a fleet of a certain planned size over the long run. It is equal to the size of the planned fleet divided by the weighted average service life of the ships making up the planned fleet.

For example, a planned 300-ship fleet whose ships had a weighted average service life of 35 years, would have a steady-state replacement rate of 300 divided by 35, or about 8.6 ships per year. Using these figures, maintaining a 300-ship fleet over the long run would require a long-term (i.e., 35-year) average ship procurement rate of about 8.6 ships per year. The ship procurement rate could be below 8.6 ships per year during some years, as long as it was above 8.6 ships per year during other years, so that the average rate for the entire 35-year fleet replacement period came back to 8.6 ships per year.

Steady-State Replacement Rate For Proposed 313-Ship Fleet. As shown in **Table 2**, the steady-state procurement rate for the Navy's proposed 313-ship fleet would be roughly 9.5 ships per year for ships of all types, and roughly 7.3 per year for larger ships (i.e., ships other than LCSs). As shown in **Appendix C**, annual procurement of new Navy ships has been below this rate since FY1993. The planned ship service lives shown in **Table 2** are based on Navy planning data. If actual ship service lives turn out to be shorter than shown in the table, as some observers believe they might be based on historical evidence with previous classes of Navy ships, then the steady-state replacement rate figures would be higher than those shown in the table.

¹This section and the next three sections are adapted from CRS Report RL32665, *Navy Force Structure and Shipbuilding Plans: Background and Issues for Congress*, by Ronald O'Rourke.

Table 2. Steady-State Ship Procurement Rate for 313-Ship Fleet
(average annual procurement rates)

Ship type	Expected service life (years)	313 ships	
		Number	Steady-state rate
SSBNs	42	14	0.33
SSGNs	42	4	0.10
SSNs	33	48	1.45
Aircraft carriers	50	11	0.22
Cruisers, destroyers	35	88	2.51
LCSs	25	55	2.20
Amphibious	35	31	0.89
MPF(F)s	35	12	0.34
CLF ^a	35	30	0.86
Other ^b	35	20	0.57
TOTAL all ships		313	9.47
Subtotal larger ships (i.e., ships other than LCSs)		258	7.27

Source: Prepared by CRS based on U.S. Navy data for ship expected service lives.

a. Combat Logistics Force ships (i.e., ships that resupply Navy combat ships).

b. Includes command ships and support ships.

Rate Needed To Compensate For Below-Steady-State Procurement. To compensate for the below-steady-state rate of Navy ship procurement since the early 1990s, maintaining a fleet of about 313 ships will require an average procurement rate in coming years that is higher than the steady-state rate shown in **Table 2**. Assuming an average 35-year life for Navy ships, the required rate might be about 11.2 ships per year including LCSs, and about 8.7 ships per year for ships other than LCSs.² If average ship life is assumed to be closer to 30 years, which some observers believe to be a more realistic figure, then the required shipbuilding rate might be closer to about 14.7 ships per year including LCSs, and about 11.4 ships per year for ships other than LCSs.³

²As shown in **Appendix C**, the decline in the rate of Navy ship procurement to relatively low levels began about FY1993. During the 14-year period FY1993-FY2006, a total of 78 battle force ships (including 3 LCSs) were procured, or an average of about 5.6 ships per year. Subtracting these 78 ships from a total fleet of 313 ships would leave a total of 235 ships to be procured during the remaining 21 years of a 35-year procurement period for replacing the entire fleet. Procuring these ships over a 21-year period would require an average procurement rate of about 11.2 ships per year. A total of 183 ships other than LCSs (258 ships other than LCSs required minus 75 ships other than LCSs procured during FY1993-FY2006) would need to be procured over these 21 years, or an average of 8.7 ships per year for ships other than LCSs.

³Extending the analysis in the previous footnote, a total of 235 ships of all kinds divided by the 16 remaining years in a 30-year procurement period equates to an average rate of about 14.7 ships per year, while a total of 183 ships other than LCSs divided by 16 years equates to an average rate of about 11.4 ships per year for (continued...)

Planned Procurement Rates Compared to These Rates. As shown in **Table 1**, the Navy’s proposed FY2007-FY2011 shipbuilding plan includes a total of 51 ships of all kinds, or an average of 10.2 ships per year. As also shown in **Table 1**, however, 23 of the 51 ships are relatively small and inexpensive LCSs. The remaining 28 larger ships shown in **Table 1** equate to an average procurement rate of 5.6 larger ships per year.

Table 3 compares these planned procurement rates with the steady-state replacement rates for the Navy’s proposed 313-ship Navy and the rates needed to compensate for the relatively low rates of Navy ship procurement since the early 1990s.

Table 3. Average Ship Procurement Rates
(Average number of ships procured per year)

	Average rate in Navy’s FY2007-FY2011 plan	Steady-state rate for 313-ship fleet	Compensatory rate needed for 313-ship fleet ^a
All ships	10.2	9.5	11.2
Larger ships (i.e., ships other than LCSs)	5.6	7.3	8.7

Source: Prepared by CRS using Navy data.

a. Average rate needed over next 21 years (FY2007-FY2027) to compensate for relatively low ship procurement rate during previous 14 years (FY1993-FY2006), so as to achieve required steady-state replacement rate over the entire 35-year replacement period (FY1993-FY2027).

As can be seen in the table, the average of 10.2 ships of all types in the FY2007-FY2011 plan is greater than the steady-state rate of 9.5 ships per year, but less than the 11.2 ships per year that would be needed to compensate for the relatively low rate of ship procurement since FY1993.

As can also be seen in the table, when the relatively small and inexpensive LCSs are set aside, the remaining average of 5.6 larger ships per year is less than both the steady-state rate of 7.3 larger ships per year and the compensatory rate of 8.7 larger ships per year. The average larger-ship procurement rate of 5.6 ships per year, if maintained over a 35-year period, would produce a total of 196 larger ships, or 62 ships less than the total of 258 larger ships included in the 313-ship plan. If these 196 larger ships are added to the planned total of 55 LCSs, it would produce a total fleet of 251 ships.

Force Levels Of Selected Ship Types.

Aircraft Carriers. The 313-ship plan calls for a total of 11 aircraft carriers. The Navy projects that the carrier force will drop to 10 ships in FY2013-FY2014 due to a gap between the retirement of the Enterprise (CVN-65) and the commissioning of CVN-78 (the first of the planned CVN-21 class carriers). The Navy projects that it will maintain a force of 12 carriers starting in FY2019, when CVN-79 is commissioned. The Navy could keep the carrier force at 11 ships in FY2019 and subsequent years by accelerating the retirement of an existing carrier.

³(...continued)
ships other than LCSs.

Ballistic Missile Submarines (SSBNs). The 313-ship plan calls for a total of 14 SSBNs, and the 30-year shipbuilding plan includes a total of 14 replacement SSBNs procured at a rate of one per year during the period FY2022-FY2035. The 14 replacement ships, however, are not procured on a schedule that would permit a timely one-for-one replacement for some of the 14 existing SSBNs. As a result, the Navy projects that the SSBN force will drop to 12 ships in the 2030s, with a dip to 11 during the year 2031. The force would build back up to 14 ships as the final replacement SSBNs enter service around 2040. Accelerating the procurement of some of the SSBNs to earlier years would permit the SSBN force to remain at a steady level of 14 ships while existing ships were replaced by new ones.

Converted Trident Submarines (SSGNs). Although the 313-ship plan calls for a total of four SSGNs, the 30-year shipbuilding plan includes no replacements for the four current SSGNs, which the Navy projects will reach retirement age and leave service in FY2027-FY2029.

Attack Submarines (SSNs). Although the 313-ship plan calls for a total of 48 SSNs, the 30-year shipbuilding plan does not include enough SSNs to maintain a force of 48 boats consistently over the long run. The Navy projects that the SSN force will drop below 48 boats in 2020, reach a minimum of 40 boats (17% less than the required figure of 48) in 2028 and 2029, and remain below 48 boats through 2033. As discussed in **Appendix D**, maintaining a force of 48 boats consistently over the long run would require adding eight SSNs into the 30-year shipbuilding plan.

Cruisers And Destroyers. Although the 313-ship plan calls for a total of 88 cruisers and destroyers, the 30-year shipbuilding plan does not include enough cruisers and destroyers to maintain a force of 88 ships consistently over the long run. As discussed **Appendix E**, CRS projects that the cruiser-destroyer force will drop below 88 ships in 2027, reach a minimum of 62 ships (30% less than the required figure of 88) in 2044-2046, and increase to a long-term plateau of 70 ships (20% less than 88) in the 2050s. The shortfall in cruisers and destroyers will account for much of the shortfall in the overall size of the fleet, relative to the goal of 313 ships, in the 2030s and beyond. To maintain a force of 88 cruisers and destroyers over the long run could require adding 26 cruisers and destroyers into long-term (35-year) shipbuilding plans.

Amphibious Ships. Although the 313-ship plan calls for a total of 10 LPD-17s, the FY2007-FY2011 shipbuilding plan ends procurement of LPD-17s after the procurement of a ninth ship in FY2008. Although the 313-ship plan calls for a total of 31 amphibious ships, the Navy projects that the force will drop to 30 ships in 2020.

Summary. In summary, insufficiencies in the Navy's 30-year shipbuilding plan relative to the proposed 313-ship fleet might be viewed as including one LPD-17, four SSGNs, eight SSNs, 26 cruisers and destroyers (when calculated on a 35-year basis), and the timing of some of the replacement SSBNs.

Executibility of Shipbuilding Plan. The Navy's ability to execute its shipbuilding plan will depend on its ability to increase funding for shipbuilding and build ships at currently estimated costs.

Increasing Funding For Shipbuilding. From FY2000 to FY2005, funding for

construction of new ships averaged about \$10.2 billion per year.⁴ The Navy estimates that executing the 313-ship proposal would require an annual average of about \$13.4 billion per year in 2005 dollars for new ship construction, or about 31% more than the average figure for 2005-2005. In a February 10, 2006, briefing to CRS and the Congressional Budget Office (CBO), Navy officials stated that the Navy's ability to increase shipbuilding funding to projected levels would depend on the following:

- Navy operation and maintenance (O&M) costs remaining flat;
- Navy personnel costs remaining flat; and
- Navy research and development (R&D) costs going down and staying down.

Achieving these three things may prove challenging. The Department of Defense (DOD) in the past has found it difficult to control O&M costs as much as desired. If the Navy attempts to maintain ship and aircraft force levels by keeping older ships and aircraft in service, the annual O&M costs of these platforms might rise with age. An increase in fuel costs from current levels would put upward pressure on O&M costs.

DOD in the past has found it difficult to control personnel costs as much as desired, due to in part to increases in personnel pay and benefits and health care costs. Some in Congress might be interested in increasing pay for uniformed personnel more than the Administration has proposed in its FY2007 budget. The Navy plans to use end-strength reductions to help compensate for increasing per capita personnel costs. If, however, savings from Navy end-strength reductions are used in part to help pay for maintaining Marine Corps or Army end strength, this could reduce the amount of such savings available for transfer to Navy shipbuilding.

Navy officials have stated that Navy R&D costs are projected to decrease over the next few years as major new systems that are completing development transition to procurement. As CBO has noted, however, it is questionable whether R&D costs could remain at this lower level over the long run, since at some point the Navy will likely want to initiate development of other major new systems.

Building Ships At Currently Estimated Costs. CBO estimates that Navy shipbuilding costs could be substantially higher than the Navy estimates. In an analysis released on December 16, 2005, CBO estimated that executing the 30-year shipbuilding plan would require an annual average of about \$18.3 billion per year in 2005 dollars for new ship construction. This is about 37% more than the Navy's estimate of about \$13.4 billion in 2005 dollars, and about 79% more than the average figure for 2000-2005. The report states:

The Navy's plan to achieve a 313-ship fleet with \$14.4 billion in annual new-ship construction spending appears to assume that costs will somehow be controlled more stringently on future classes of ships than they have been on ships that the Navy is building now....

Even if those apparent cost targets for the 313-ship plan can be achieved, however, the [Navy's estimate] does not appear to take into account the higher inflation that the naval

⁴Source: Congressional Budget Office, December 16, 2005.

shipbuilding industry in the United States has been experiencing in the past decade. An analysis by the Navy of the inflationary component of past cost increases in shipbuilding programs indicates that inflation in such programs is expected to be about 1.3 percent higher per year, on average, than the inflation anticipated for the Department of Defense's procurement programs as a whole, at least through 2011. CBO assumes that the difference between inflation for general procurement programs and inflation for ship programs represents real growth in the cost of building ships that should be included in future estimates.⁵

CBO may release an updated cost estimate at this hearing.

Summary. In summary, the Navy's shipbuilding plan — a plan that, as mentioned earlier, might be viewed as falling short of requirements by one LPD-17, four SSGNs, eight SSNs, and (on a 35-year basis) 26 cruisers and destroyers — faces risks to its executibility due to potential challenges in controlling Navy O&M costs, personnel costs, and R&D costs, and in building ships at currently estimated costs. If the Navy experiences difficulties in one or more of these areas, the numbers of ships procured in coming years may fall short of the quantities shown in the Navy's shipbuilding plan, and future force levels may be lower than the Navy projects.

Status Of Major Shipbuilding Programs

Admiral Michael Mullen, the Chief of Naval Operations (CNO), has directed Navy shipbuilding program offices to take steps to ensure that their respective shipbuilding programs meet certain procurement cost targets. The CNO has indicated that his support for increasing Virginia-class SSN procurement to two boats per year starting in FY2012 is contingent on reducing the Virginia-class unit procurement cost to a certain level.⁶ The potential consequences for other shipbuilding programs of not meeting their own cost targets are less clear. Below are discussions on the status of major Navy shipbuilding programs.

CVN-78 Aircraft Carrier. Last year's budget deferred the planned procurement of CVN-78 by one year, to FY2008, and this year's budget maintains FY2008 as the year of procurement. The Navy estimated in 2005 that the decision to defer the ship's procurement to FY2008 added about \$400 million to its procurement cost. Deferring the ship's procurement to FY2008 pushed back its projected delivery date, increasing the length of the interval between the retirement of the Enterprise and the entry into service of CVN-78. As mentioned earlier, during this interval, the Navy's carrier force will be reduced to 10 ships.

Compared to last year's budget, the Navy's estimate of CVN-78's total estimated acquisition (development plus procurement) cost remains essentially unchanged. The estimate is \$13.7 billion, including \$3.2 billion in development costs and \$10.5 billion in procurement costs. The \$10.5-billion procurement cost includes about \$2.4 billion in CVN-21-class detailed design and nonrecurring engineering (DD/NRE) costs and about \$8.1 billion in hands-on construction costs for

⁵Congressional Budget Office, *Resource Implications of the Navy's 313-Ship Plan*, December 16, 2005. 10 pp. The report is available at [<http://www.cbo.gov>].

⁶See, for example, Dave Ahearn, "Mullen Says \$2 Billion Virginia Class Price A Must For Two-Subs Goal," *Defense Today*, February 13, 2006.

the ship.⁷

Virginia Class SSNs. Compared to last year's budget, estimated procurement costs for Virginia-class boats have changed very little. Estimates for some boats funded in prior years remain unchanged, while estimates for others funded in prior years have changed by amounts ranging from a 0.1% decrease to a 1.2% increase. The estimate for the boat to be procured in FY2007 has increased by about 1.1%, while the estimates for the four boats to be procured in FY2008-FY2011 have decreased by figures ranging from 0.8% to 2.5%. The total estimated cost for the five boats to be procured in FY2007-FY2011 has decreased by 1.0%.

Compared to last year's budget, the estimated delivery date for the Texas (SSN-775), the second boat in the class, has slipped four months, to July 2006. Estimated delivery dates for subsequent boats remain unchanged.

As mentioned earlier, the CNO has stated that his support for increasing Virginia-class procurement to two boats per year is contingent on reducing the Virginia-class unit procurement cost to a certain level. The goal is to reduce the cost from \$2.4 billion in FY2005 dollars to \$2.0 billion in FY2005 dollars, a reduction of about \$400 million in FY2005 dollars, or about 17%. Note that these costs are in FY2005 dollars. A cost of \$2.0 billion in FY2005 dollars becomes a higher cost when translated into future-year (e.g., FY2012) dollars. The Navy believes that it can accomplish roughly one-half of the required reduction in unit cost by taking advantage of the improved economies of scale possible with two-per-year production and more aggressive use of the Economic Order Quantity (EOQ) authority permitted under programs being procured through multiyear procurement (MYP) arrangements. The Navy believes it can accomplish the remaining half of the required reduction in unit cost through the use of new technologies (such as those being pursued under the Tango Bravo research and development program) and other design and production innovations that can reduce procurement costs without reducing ship capability.⁸

DDG-51 Class Destroyers. Compared to last year's budget, estimated procurement costs for DDG-51s funded in FY2005 and prior years — exclusive of procurement funding in FY2006-FY2008 that the Navy calls DDG-51 program-completion costs — remain essentially unchanged. The program-completion costs have changed. The Navy requested \$225.4 million for program-completion costs in the FY2006. Congress provided \$150 million, and post-enactment adjustments reduced this to \$146.9 million, a figure that was \$78.5 million, or 34.8%, below the requested amount. The Navy for FY2007 is requesting \$355.8 million, an increase of \$28.3 million, or 8.6%, over the figure (\$327.5 million) projected for FY2007 in last year's budget. The figure projected for FY2008 is now \$86.0 million, an increase of \$45.8 million, or a 113.9%, over the figure (\$40.2 million) projected for FY2008 in last year's budget. When combined, the \$28.3-million and \$45.8-million increases in the figures for FY2007 and FY2008 are almost equal to the amount by which Congress reduced the FY2006 request.

Compared to last year's budget, projected delivery dates for DDG-51s have changed little. The

⁷For more on the CVN-78 and the CVN-21 program, see CRS Report RS20643, *Navy CVN-21 Aircraft Carrier Program: Background and Issues for Congress*, by Ronald O'Rourke.

⁸For more on the Virginia-class program, see CRS Report RL32418, *Navy Attack Submarine Force-Level Goal and Procurement Rate: Background and Issues for Congress*, by Ronald O'Rourke.

dates for several ships remain unchanged, the dates for three ships have slipped one month, and the dates for two ships have been accelerated one month.

DD(X) Destroyers. The acquisition strategy for the follow-on (i.e., third and subsequent) ships in the DD(X) program remains unclear. Navy witnesses have testified this year that they intend to review the acquisition strategy for follow-on DD(X)s later this year. The Navy does not appear to have ruled out the option of holding a competition to select a single builder for the follow-on ships, and the dual-lead-ships approach for the DD(X) program could support this option by creating a more level playing field between the two DD(X) shipyards for the competition. Section 125 of the FY2006 defense authorization act (H.R. 1815/P.L. 109-163 of January 6, 2006) prohibits the Navy from using a winner-take-all acquisition strategy for the DD(X) program. The provision requires the participation of at least one additional shipyard in the program, but it does not specify the share of the program that is to go to that additional shipyard. In theory, the Navy could argue that Section 125 does not require the second shipyard's participation to include anything more than building one of the two lead ships.

The Navy in recent months has taken steps to reduce the estimated procurement cost of the lead DD(X) by about \$265 million, and that of follow-on DD(X)s by about \$215 million each.⁹ In spite of these actions, the total estimated procurement cost for the first five DD(X)s (\$14,200 million) has increased about 3.2% from the total shown in last year's budget (\$13,761 million). Compared to figures in last year's budget, the estimate for the first DD(X) remains unchanged, the estimate for the second DD(X) has increased by about 7.5% (even though this ship is now to be procured in FY2007, as opposed to FY2008 under last year's budget, and therefore has one less year of inflation built into its cost), and the estimates for the next three ships have increased by an average of about 2.8%.

There continues to be a disagreement between the Navy on the one hand, and CBO and the Cost Analysis Improvement Group (CAIG) within the Office of the Secretary of Defense (OSD) on the other hand, concerning DD(X) procurement costs. The CBO and CAIG estimates are substantially higher than the Navy's estimates. In granting Milestone B approval for the DD(X) program in November 2005, the Under Secretary of Defense for Acquisition, Technology and Logistics (USD AT&L) acknowledged the difference between the Navy and CAIG cost estimates and directed the Navy to budget for the program at the Navy's estimate.¹⁰ **Table 4** shows DD(X) procurement costs as estimated by all three organizations in July 2005.

⁹Source:: Spoken testimony of Rear Admiral Bernard J. McCullough before the Projection Forces Subcommittee of the House Armed Services Committee, March 15, 2006.

¹⁰In his November 23, 2005 memorandum granting Milestone B approval for the DD(X) program, Kenneth Krieg, the USD AT&L stated in part:

While there are differences between the OSD Cost Analysis Improvement Group's cost estimate and the Navy's cost estimate, I understand the differences and direct the Navy to fund the program to its cost estimate. I direct the Navy to submit, for my approval, an implementation plan for management controls to monitor the major cost estimate differences by January 31, 2006.

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

	Navy 2005 estimate	CBO estimate	Reported CAIG estimate
Lead DD(X)	\$3.3	\$4.7	\$4.1
Follow-on DD(X)s	\$2.1	\$3.4	\$3.0

Source: U.S. Navy data and July 20, 2005 CBO testimony before Projection Forces Subcommittee of House Armed Services Committee. The CAIG figures shown are from the CBO testimony. CBO stated that its testimony concerning the CAIG estimates was based on an unconfirmed report about the CAIG estimates. For further discussion, see CRS Report RL32109, *Navy DD(X), CG(X), and LCS Ship Acquisition Programs: Oversight Issues and Options for Congress*, by Ronald O'Rourke.

If DD(X) procurement costs turn out to be closer to the CBO and CAIG estimates than to the Navy's estimate, it could pose a risk to the continuation of the DD(X)/CG(X) program. As shown in **Table 5**, DOD and Navy witnesses last year testified that the DD(X) design would not be affordable above costs similar to those estimated by CBO and CAIG.

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

	DOD/Navy views on maximum affordable cost	Navy 2005 estimate	CBO estimate	Reported CAIG estimate
Lead DD(X)	\$4.0-\$4.5	\$3.3	\$4.7	\$4.1
Follow-on DD(X)s	\$2.5-\$2.9	\$2.1	\$3.4	\$3.0

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

The projected long-term shortfall in cruisers and destroyers under the Navy's 30-year shipbuilding plan suggests that in a situation of finite resources, there may be a basic tension, over the long run, between the 88-ship cruiser-destroyer force-level goal and projected cruiser-destroyer procurement costs. In light of this tension, it is possible that the Navy at some point will restructure its cruiser-destroyer plans. Such a restructuring might include one or more of the following actions:

- Adding up to 26 additional DD(X)s, CG(X)s, or DDG(X)s¹¹ to the long-term shipbuilding plan. This could substantially reduce funding available for procuring other kinds of Navy ships or for meeting other Navy needs.
- Reducing the cruiser-destroyer force-level goal, perhaps to a figure between 53 and 70, which are the force sizes that can be maintained over the long term by procuring an average of 1.5 or 2 cruisers and destroyers per year. The Navy's shipbuilding plan calls for procuring an average of about 1.5 DD(X)s/CG(X)s per year over the next 17 years (i.e., between now and FY2023), and 2 DDG(X)s per year starting in FY2024. The Navy's early-2005 proposal for a fleet of 260 to 325 ships included,

¹¹The DDG(X), not to be confused with the DD(X), is the Navy's long-term projected replacement for today's DDG-51s. The Navy's 30-year shipbuilding plan calls for procuring the first DDG(X) in FY2023.

for the 260-ship fleet, a total of 67 cruisers and destroyers.

- Reducing projected cruiser-destroyer unit procurement costs, perhaps by an average of 29.5%, which would be enough so that funding sufficient for procuring 62 cruisers and destroyers at currently projected costs would now be sufficient to procure 88 cruisers and destroyers. This could involve designing and procuring a new cruiser-destroyer that is smaller, less expensive, and less capable than the DD(X)/CG(X) design. CRS has discussed the option of developing a cruiser-destroyer that might displace about 11,000 tons, or about 25% less than the current 14,500-ton DD(X)/CG(X) design, and procuring this smaller ship starting in FY2011 in lieu of additional DD(X)s or CG(X)s.¹²

Littoral Combat Ships (LCSs). The acquisition strategy for follow-on ships in the LCS program remains unclear. The potential point at which the Navy might switch from the current Flight 0 (i.e., initial) designs of the ships to one or more successor designs has not been firm, and the potential long-term division of the program between the two current industry teams is uncertain. The Navy may use the teams' performances on earlier ships in the program to determine the teams' shares of the program in later years. Whether the Navy intends to continue building two designs throughout the program, or downselect to a single design at some point, is unclear.

Estimated LCS sea frame procurement costs as presented in the budget have increased from figures shown in last year's budget. The estimate for the first LCS has increased from \$212.5 million to \$274.5 million, an increase of about 29%, and the estimate for the second LCS has increased from \$256.5 million to \$278.1 million, an increase of about 8%. Navy officials, in comments to reporters following a March 1, 2006, hearing before the House Armed Services Committee, stated that, after permitted adjustments for inflation and other factors are taken into account, the \$520 million estimated combined cost for the two LCSs requested for FY2007 is consistent with the FY2006 legislation (Section 124 of P.L. 109-163, the FY2006 defense authorization act) limiting the cost of these two ships to \$220 million each.¹³

As shown in **Table 5**, the estimate for follow-on ships to be procured in FY2009-FY2011, when the LCS program is to reach its maximum annual procurement rate of 6 ships per year, has increased from an average of \$223.3 million in then-year dollars to an average \$298 million in then-year dollars, an increase of about 33%. This increase is in spite of the FY2007 budget having a higher maximum production rate (6 ships per year), and thus a greater potential for achieving production economies of scale, than the FY2006 budget (5 ships per year).

¹²For more on the DD(X)/CG(X) program, see CRS Report RL32109, *Navy DD(X), CG(X), and LCS Ship Acquisition Programs: Oversight Issues and Options for Congress*, by Ronald O'Rourke, and CRS Report RS21059, *Navy DD(X) and CG(X) Programs: Background and Issues for Congress*, by Ronald O'Rourke.

¹³Dave Ahearn, "CNO Says LCS Cost Increase Doesn't Breach Lawmakers' Cap," *Defense Today*, March 2, 2006.

Table 5. Estimated LCS Sea Frame Unit Procurement Costs

(Costs in millions of then-year dollars)

	FY07	FY08	FY09	FY10	FY11	FY09-11
<i>FY2006 budget submission</i>						
Total procurement cost	542.4	779.7	1,127.2	1,112.3	1,110.3	3,349.8
Number of ships	2	3	5	5	5	15
Unit procurement cost	271.2	259.9	225.4	222.5	222.1	223.3
<i>FY2007 budget submission</i>						
Total procurement cost	520.7	947.6	1,764.3	1,774.2	1,825.4	5,363.9
Number of ships	2	3	6	6	6	18
Unit procurement cost	260.4	315.9	294.1	295.7	304.2	298.0
% change in unit proc. cost, FY07 compared to FY06	(4%)	21%	30%	33%	37%	33%

Source: Prepared by CRS using Navy data from FY2006 and FY2007 Navy budget submissions.

Navy officials have explained to CRS that the estimated hands-on construction cost of LCSs has not increased, at least not substantially, but that LCS procurement costs as shown in the budget have increased because the FY2006 budget submission for the LCS program mistakenly did not include Navy program-management costs or the effects of inflation — cost factors that are regularly included in the budgeted procurement costs of Navy ships.¹⁴ This explanation raises potential oversight questions for Congress, including the following:

- Why were Navy program-management costs and inflation excluded from LCS procurement costs in the FY2006 budget submission? Was this an oversight? If so, how could such an oversight occur, given the many people involved in assembling the Navy’s budget and checking it prior to submission to Congress? Why did this oversight occur on the LCS program but not other programs? Was anyone held accountable for this oversight, and if so, how? If this was not an oversight, why were these costs excluded?
- Do LCS procurement costs as presented in the FY2007 budget submission now include all costs that, under traditional budgeting practices, should be included in LCS procurement costs? How many other costs, if any, are still unacknowledged? Have personnel or resources from other Navy programs been used for the LCS program in any way? If so, have the costs of these personnel or resources been fully charged to the LCS program and fully reflected in LCS program costs shown in the FY2007 budget submission?
- The Navy’s FY2006 budget submission increased estimated procurement costs for follow-on DD(X)s by roughly 45% from figures in the Navy’s FY2005 budget submission. John J. Young, Jr., who was the Navy’s acquisition executive when the FY2005 and FY2006 budgets were considered by Congress, later testified that the

¹⁴CRS conversation with Navy officials, March 15, 2006. See also Chris Johnson, “CRS Report Cites Higher Cost For LCS, But Navy Says Cost Unchanged,” *Inside the Navy*, March 13, 2006.

Navy's early cost estimates for building follow-on DD(X)s were "ridiculous."¹⁵ In light of the significant increases in estimated DD(X) procurement costs between the FY2005 and FY2006 budgets, and the significant increases in estimated LCS procurement costs between the FY2006 and FY2007 budgets, what is the likelihood that the Navy in future budget submissions will substantially increase procurement cost estimates for other Navy shipbuilding programs, such as the CVN-21, the LHA(R), and the ships intended for the MPF(F) squadron? Does the Navy believe there is no substantial risk of being penalized for submitting to Congress a budget presentation for a shipbuilding program that, for whatever reason, significantly underestimates procurement costs?¹⁶

LHD-8 Amphibious Assault Ship. Compared to last year's budget, the estimated procurement cost for LHD-8, which was procured in FY2002 with incremental funding completed in FY2006, remains essentially unchanged, and its projected delivery date has not changed.

LHA-6 (LHA[R]) Class Amphibious Assault Ships. The Navy estimates the procurement cost of LHA-6 — the lead LHA (Replacement), or LHA(R), class ship — at \$2,813.6 million. The ship is to be procured in FY2007 using split funding (i.e., incremental funding) in FY2007 and FY2008. The Navy estimates the procurement cost of the second ship in the class, which is to be procured in FY2010 using split funding in FY2010 and FY2011, at \$3,731.6 million, or about 33% more than the figure for first ship. Inflation between FY2007 and FY2010 would appear to explain less than half of the 33% increase, suggesting that the second ship may incorporate design changes that add to its cost.

LPD-17 Class Amphibious Ships. Compared to last year's budget, this year's budget defers the procurement of the ninth LPD-17 class ship by one year, to FY2008. The Navy explained to CRS that the deferral was due to constraints on the FY2007 budget and concerns about the shipyard's ability, following Hurricane Katrina, to execute the construction of a ship procured in FY2007. The Navy also stated to CRS that the FY2007 advance procurement funding requested for this ship is sufficient to support the amount of work that would have occurred in FY2007 had the ship been fully funded in FY2007, and that consequently, the official delivery date for the ship has not changed from last year's budget.¹⁷

The estimated procurement cost of the ninth LPD-17 (\$1,701.8 million) has increased 7.4% from the figure shown in last year's budget (\$1,584.2 million). Some portion of this increase — perhaps more than half — might be due to the added inflation resulting from the one-year deferral of the ship's year of procurement. An additional portion may be due to the now-longer production interval between this ship and the eighth ship in the class, which can reduce efficiencies in shifting from production of the eighth ship to production of the ninth. One or both of explanations, however,

¹⁵Zachary M. Peterson, "Young: Cost Estimate For Next-Generation DD(X) Destroyer Is Realistic," *Inside the Navy*, November 7, 2005. Young's testimony occurred on November 2, 2005, the same day that, according to his biography [http://www.dod.mil/ddre/director_print.htm], he was appointed as DOD's Director, Defense Research and Engineering.

¹⁶For more on the LCS program, see CRS Report RL32109, *op cit*, and CRS Report RS21305, *Navy Littoral Combat Ship (LCS): Background and Issues for Congress*, by Ronald O'Rourke.

¹⁷Navy Office of Legislative Affairs telephone conversation with CRS, March 13, 2006.

may be inconsistent with the Navy's statement to CRS that the FY2007 budget request for the ship is sufficient to support the amount of work that would have occurred in FY2007 had the ship been fully funded in FY2007, and with the unchanged delivery date for the ship. Some portion of the increase in the ship's estimated cost may be due to Hurricane Katrina's effects on the shipyard and supplier firms. For the ninth LPD-17, such effects could include a workforce with an increased proportion of less-experienced and therefore less-productive production workers than previously projected.

Compared to last year's budget, the estimated cost for LPD-18 (procured in FY1999) has increased by 7.3%, and the estimated combined cost for LPDs 19 and 20 (procured in FY2000) has increased by 6.4%. Some of these increases may be due Hurricane Katrina's effects on the shipyard and supplier firms. Estimated procurement costs for LPDs 21 through 24 (funded in FY2003-FY2006), which are less far along in the construction process, have remained unchanged or have declined by amounts ranging from 0.1% to 1.5%.

Compared to last year's budget, the estimated delivery date for LPD-18 has slipped one month, to January 2006, and that of LPD-22 has slipped two months, to February 2009. Estimated delivery dates for subsequent ships (including the ninth ship) remain unchanged, but the Navy states that delivery dates for all LPD-17s now under construction are being reviewed as a result of Hurricane Katrina.¹⁸

TAKE-1 Class Resupply Ships. As part of a March 22, 2006, acquisition decision memorandum on the MPF(F) program (see section on MPF(F) program below), the Under Secretary of Defense for Acquisition, Technology and Logistics (USD AT&L) "authorize[d] the Navy to include options for three additional T-AKE vessels in contract renegotiations with the shipbuilder on the existing Combat Logistics Force T-AKE contract subject to the Navy's execution of the required Justification and Approval. The Navy will obtain my approval before exercising these options."¹⁹

Compared to last year's budget, estimated procurement costs for some TAKE-1 class ships procured in prior years remain unchanged, while estimates for others procured in prior years have declined by amounts ranging from 0.1% to 1.0%. The estimated procurement cost for the FY2007 and FY2008 ships (the 10th and 11th ships in the class) have each increased by 3.3%. The three ships included in this year's budget for FY2009-FY2011 were not included in last year's budget, so a year-to-year comparison of estimated costs for these three ships cannot be made.

Compared to last year's budget, estimated delivery dates for the first eight TAKE-1 class ships have slipped substantially. In order of procurement, the delivery dates of these ships have slipped by 12 months, 12 months, 10 months, 6 months, 6 months, 8 months, 3 months, and 5 months, respectively. The estimate for the ninth ship remains unchanged, and the estimate for the 10th ship has changed from May 2010 in last year's budget to TBD in this year's budget. The P-27 (i.e.,

¹⁸For more on the LHD, LHA(R), and LPD-17 programs, see CRS Report RL32513, *Navy-Marine Corps Amphibious and Maritime Prepositioning Ship Programs: Background and Oversight Issues for Congress*, by Ronald O'Rourke.

¹⁹Memorandum For Secretary of the Navy (Attn: Acquisition Executive) dated March 22, 2006, entitled Maritime Prepositioning Force (Future) (MPF(F)) Acquisition Decision Memorandum. A copy of the memorandum was posted online at [<http://www.insidedefense.com/>].

production schedule) exhibit in this year's budget, unlike the P-27 exhibit in last year's budget, states that "Delivery dates are planned dates, not contractual dates."

MPF(F) Squadron Ships. The MPF(F) squadron includes some of the LHA/LHD-type and TAKE-1 class ships discussed above, plus additional LMSRs and MLPs. In the March 22, 2006, acquisition decision memorandum discussed above in connection with the TAKE-1 program, the USD AT&L approved the MPF(F) program's entry into the technology development phase and directed the Navy to plan for "a MPF(F) Milestone B Defense Acquisition Board (DAB) or other integrated investment review in mid-FY 2007." The USD AT&L also approved a set criteria for exiting the technology development phase, stated that a separate Milestone B review is planned for the MLP program in mid-FY2008, directed the Navy to update its test and evaluation strategy for the MPF(F) program, and initiated a technical review of the "connector" ships associated with the MPF(F) squadron.²⁰

Completion of Prior-Year Shipbuilding Programs. This line item in the Navy's shipbuilding budget requests funding to cover cost growth on ships procured in prior years that the Navy is not able to finance through transfers of prior-year funding from other programs. The Navy requested \$394.5 million in FY2006 for this line item, and Congress in Division A of the FY2006 defense appropriation act appropriated \$517.5 million. With post-enactments adjustments, this figure became \$512.1 million, an increase of \$117.6 million, or 29.8%, over the requested amount. Congress appropriated additional funding for this line item in Division B of the act — the part of the act that provided emergency supplemental funding to address the hurricanes in the Gulf and pandemic influenza. With post-enactment adjustments, this additional funding came to \$1,688.7million, bringing the total FY2006 funding for this line item to \$2,200.8 million.

The amount requested for FY2007 for this line item (\$577.8 million) is 28.4% higher than the amount projected in last year's budget (\$449.8 million), while the amount projected for FY2008 (\$467.5 million) is 7.0% lower than the figure projected in last year's budget (\$502.5 million). The amount projected for FY2009 (\$21.0 million) remains unchanged.

Industrial-Base Implications

As requested, this section discusses, among other things, the impact of the delay in funding for programs such as CVN-21 and LPD-17.

Total Number of Ships Per Year

Under the Navy's 30-year shipbuilding plan, procurement would increase to 10 to 14 ships per year in FY2009-FY2016, decrease to 4 to 6 ships per year in FY2017-FY2020, and then increase again to 10 or 11 ships per year starting in FY2022. This pattern could put the shipbuilding industry through a production roller coaster that could reduce shipbuilding efficiencies and, other things held equal, increase shipbuilding costs.

²⁰Ibid. For a news article discussing the memorandum, see Christopher J. Castelli, "Krieg Signs Acquisition Decision Memo For Future Prepositioning Ships," *Inside the Navy*, March 27, 2006.

Larger Ships

Although the total number of ships to be procured under the Navy's FY2007-FY2011 shipbuilding plan increases from 7 ships per year in FY2007 and FY2008 to 11 ships in FY2009, 12 ships in FY2010, and 14 ships in FY2011, much of this increase is due the planned increase in the number of LCSs procured each year. When the LCSs are set aside, the total number of larger ships to be procured grows from five in FY2007 to eight in FY2011.

As mentioned earlier, the Navy's FY2007-FY2011 plan includes a total of 28 larger ships (i.e., ships other than LCSs), or an average of about 5.6 larger ships per year. This average rate, if implemented, would be similar to rate of procurement that has been maintained for larger ships since the early 1990s (see **Appendix C**). Consequently, for the six yards that build the Navy's larger ships, the Navy's FY2007-FY2011 shipbuilding plan would, if implemented, result in a continuation, more or less, of the relatively low workloads and employment levels these yards have experienced in recent years.

Aircraft Carriers

The decision to defer the procurement of CVN-78 from FY2007 to FY2008, which was introduced in last year's budget and maintained in this year's budget, lengthened the procurement interval between CVN-77 (which was procured in FY2001) and CVN-78, reducing the shipyard's ability to efficiently shift from production of CVN-77 to production of CVN-78. As mentioned earlier, the Navy in 2005 estimated that the decision to defer the ship's procurement to FY2008 increased its cost by about \$400 million. Accelerating procurement of CVN-78 back to FY2007 would reduce the interval between CVN-77 and CVN-78 and avoid at least some of this additional \$400 million cost.

If procurement of CVN-78 were accelerated to FY2007, the shipyard might not be able to build the ship on the schedule originally associated with an FY2007 procurement, because the yard since last year has not been taking certain actions consistent with preparing for such a schedule, such as the hiring of designers and engineers by a certain date. As a result, even if the ship's procurement were accelerated back to FY2007, some of the \$400 million in additional costs resulting from the decision to defer its procurement to FY2008 might not be recovered, and the gap between the retirement of the Enterprise and the commissioning of CVN-78 might not be shortened as much as it might have been if the FY2007 procurement date had never been changed. Accelerating CVN-78 to FY2007 would lengthen the procurement interval between CVN-78 and CVN-79 to five years, thus potentially reducing the yard's ability to efficiently shift production from CVN-78 to CVN-79, unless procurement of CVN-79 were similarly accelerated by a year.

The Navy's 30-year shipbuilding plan calls for procuring one carrier every four of five years, starting with CVN-78 in FY2008. In terms of the shipyard's ability to efficiently shift production from one carrier to the next, a four-year interval might be better than a five-year interval (and a three-year interval might be better still). None of the intervals in the Navy's 30-year plan are as long as the planned seven-year interval between CVN-77 and CVN-78.

Submarines

Submarine Construction. For the two submarine shipbuilders — General Dynamics' Electric Boat Division (GD/EB) and Northrop Grumman Newport News (NGNN) — the Navy's plan to continue procuring one Virginia-class SSN per year through FY2011 would maintain Virginia-class submarine construction work at levels about the same as those in recent years. If, as part of an effort to reduce Virginia-class procurement costs, the two firms agree to alter the division of work done under their Virginia-class joint-production agreement, it might shift the division of work somewhat away from the current 50-50 split.

The Navy is planning to increase the SSN procurement rate from the current one ship per year to two ships per year starting in FY2012. The submarine industrial base could execute an increase to two ships per year by an earlier date, although the construction times for the additional boat or boats procured might be somewhat longer than usual. The CNO has expressed misgivings about accelerating the start of two per year prior to FY2012, in large part because the additional funding that would be required in the years in question could force reductions in other Navy programs in those years.

As explained in a CRS report, the absence of prior-year advance procurement funding for an additional ship that Congress might wish to procure in a given year would not prevent the procurement of that ship. The ship can be procured that year, and the interval between the year of procurement and the year of commissioning would simply be extended by the two years or so needed to manufacture the long-lead items for the ship that normally would have been funded through advance procurement funding. The Congress in the past has procured nuclear-powered ships for which there was no prior-year advance procurement funding, perhaps the most significant example being the procurement of the aircraft carriers CVN-74 and CVN-75 as a two-ship buy in FY1988.²¹

Submarine Design And Engineering. Navy and industry officials are concerned about the future of the submarine design and engineering base, which currently faces the prospect, for the first time in about 50 years, of not having a new submarine design project on which to work. Since many of the design and engineering skills needed for submarines are not exercised fully, or at all, through the design of surface ships, attempting to maintain the submarine design and engineering base by giving it surface-ship design work is viewed by Navy and industry officials as a risky approach. This view has been reinforced by the recent experience of the United Kingdom, which attempted unsuccessfully to maintain its submarine design and engineering base by giving it surface-ship design work. The UK later experienced substantial difficulties in its subsequent Astute-class SSN design and engineering effort. These difficulties were substantial enough that employees from GD/EB's design and engineering staff were used to help overcome problems in the Astute-class effort.

One option for maintaining the submarine design and engineering base would be to develop a new design for the Advanced Swimmer Delivery System (ASDS). Such a project, however, would provide work for only certain parts of the design and engineering base, and only for a while.

A second option would be to design a non-nuclear-powered submarine for Taiwan. Such a

²¹For additional discussion, see CRS Report RL32418, op cit.

project would help support many, but not all, of the skills needed for designing nuclear-powered submarines. Skills that would not be supported would include those associated with designing nuclear propulsion plants. A project to design a submarine for export to a foreign country also poses potential issues relating to the possibility of technology transfer.²²

A third option would be to begin design work now on a new SSN — an option that was supported by the House Armed Services Committee in its markup of the FY2006 defense authorization bill, but not supported by the Navy.

A fourth option would be to accelerate the start of design work on the next SSBN. Under traditional practices, such design work might not need to start until FY2014-FY2017, so as to support the procurement of the lead ship in FY2020-FY2023 and the commissioning of this ship in FY2026-FY2029.²³ The traditional six-year design approach reflected in this schedule, however, would involve a sharp build-up in the number of submarine designers and engineers, followed a few years later by an equally sharp decline. If the volume of work under the traditional six-year design curve were instead flattened out by bringing the start of the design effort forward to FY2007, it might be able to sustain an adequate critical mass of submarine designers for a number of years.

SSBN Procurement. The Navy’s 30-year shipbuilding plan calls for procuring 14 replacement SSBNs at a rate of one ship per year starting in FY2022. Accelerating the start of SSBN procurement by a couple of years could enable the Navy to maintain an SSBN force closer to 14 ships, rather than one that drops to 12 ships during the earlier 2030s before recovering to 14 ships later on.

Given the potential procurement cost of the replacement SSBN, procuring one SSBN per year for 14 years while also funding other Navy ships might pose a financial challenge. If so, then one

²²Prior to the Administration’s announcement in April 2001 that it had decided to sell eight non-nuclear-powered submarines to Taiwan as part of a package of arms intended to modernize Taiwan’s armed forces, the U.S. Navy had strongly resisted the idea of building non-nuclear-powered submarines in a U.S. shipyard for export to foreign buyers on the grounds that such a program would create a risk of transmitting (even if only inadvertently) highly sensitive U.S. nuclear submarine design and construction know-how to foreign countries. Navy concerns on the issue, however, may have abated or been overruled by the Administration, at least with regard to submarines intended for Taiwan. For further discussion, see the section entitled “Building Non-Nuclear Submarines At Ingalls For Export” in CRS Report RL31400, *Navy Shipbuilding: Recent Shipyard Mergers — Background and Issues for Congress*, by Ronald O’Rourke, which discusses the situation as of May 2002. See also George Cahlink, “Lawmaker Pushes For Submarine Sales to Taiwan, Hurdles Remain,” *Defense Daily*, February 28, 2006; Wendell Minnick, “Taiwan Claims US Navy Is Sabotaging SSK Plans,” *Jane’s Defence Weekly*, February 15, 2006; “US Navy Rejection Of Bush Commitment To Taiwan Hardens, Reportedly Reinforced By SecNav,” *Defense & Foreign Affairs Daily*, October 12, 2004; “US Navy Nuclear Advocates Sabotage Presidential Move To Aid Taiwan On Submarines,” *Defense & Foreign Affairs Daily*, September 23, 2006; “Taiwan Seeks U.S. Technology transfer In Sub Deal,” *DefenesNews.com*, October 16, 2003; Jason Ma, “Navy: U.S. Construction Of Taiwan Diesel Subs Is ‘Highly Desirable,’” *Inside the Navy*, December 23, 2002; Nathan Hodge, “Top Submariner Woories About Diesel-Sub Exports,” *Defense Week*, November 25, 2002; and Bill Gertz and Rowan Scarborough, “Inside the Ring,” *Washington Times*, November 2002 (item entitled “Diesel Navy”).

²³The Navy earlier accredited its 14 SSBNs with a service life of 42 years, but now believes this can be extended to 43 to 45 years. The oldest of the 14 SSBNs would be 42 years old in 2026, 43 years old in 2027, and 45 years old in 2029.

option would be to accelerate the procurement of the lead ship by a greater number of years, and perhaps also attempt to extend the service lives of the youngest existing SSBNs a few more years, so as to potentially permit a procurement profile of two ships every three years or, if possible, one ship every two years. A less-compressed SSBN procurement profile, if achieved, could move the SSBN force away from a procurement boom-bust cycle in which the ships are procured in a relatively compressed time period and then, many years later, need to be replaced in a similarly compressed period — a cycle that can pose affordability challenges for Navy leaders in office during the boom part of the cycle.

Cruisers and Destroyers

As mentioned earlier, the 30-year shipbuilding plan calls for procuring an average of about 1.5 DD(X)s/CG(X)s over the next 17 years. The light-ship displacement of the DD(X) (about 12,435 tons) is about 79% greater than that of the DDG-51 Flight IIA design (about 6,950 tons). If shipyard construction work for these two ship classes is roughly proportional to their light-ship displacements, and if the CG(X) is about the same size as the DD(X), then procuring an average of 1.5 DD(X)s/CG(X)s per year might provide an amount of shipyard work equivalent to procuring about 2.7 DDG-51s per year. Splitting this work evenly between the two yards that build larger surface combatants — General Dynamics's Bath Iron Works (GD/BIW) of Bath, ME, and the Ingalls shipyard of Pascagoula, MS, that forms parts of Northrop Grumman Ship Systems (NGSS) — might thus provide each yard with the work equivalent of about 1.35 DDG-51s per year.

Supporters of these two yards argued in the 1990s that a total of 3 DDG-51s per year (i.e., an average of 1.5 DDG-51s per year for each yard), in conjunction with other work being performed at the two yards (particularly Ingalls), was the minimum rate needed to maintain the financial health of the two yards.²⁴ Navy officials in recent years have questioned whether this figure is still valid. Building the equivalent of about 2.7 DDG-51s per year equates to about 90% of this rate.

If GD/BIW were to build the second and fourth DD(X)s, then the rather lengthy interval between GD/BIW's first ship (to be procured in FY2007) and its second ship (to be procured in FY2010) could reduce GD/BIW's ability to efficiently shift production from one ship to the next.

Increasing procurement of cruisers and destroyers to an average rate of about 2.5 ships per year — the steady-state replacement rate for the force of 88 cruisers and destroyers within the Navy's proposed 313-ship fleet — would provide the cruiser-destroyer industrial base with substantially more work than would result under the Navy's 30-year shipbuilding plan.

Conversely, if affordability considerations limit DD(X)/CG(X) procurement to one ship per year in FY2011 and subsequent years, the workload for the cruiser-destroyer industrial base in those years would be reduced substantially from levels that would be achieved under the Navy's 30-year plan. Procuring one DD(X)/CG(X) per year might provide an amount of shipyard work equivalent to procuring about 1.8 DDG-51s per year, and splitting this work evenly between GD/BIW and Ingalls might provide each yard with the work equivalent of about 0.9 DDG-51s per year, which would be equivalent to 60% of the rate cited in the 1990s by supporters of the two shipyards as the minimum needed to maintain the financial health of the two yards.

²⁴See, for example, CRS Report 94-343, *Navy DDG-51 Destroyer Procurement Rate: Issues and Options for Congress*, by Ronald O'Rourke, April 1994, pp. 59-62 (out of print, available from author).

If the Navy at some point holds a competition between the two yards for the right to build all remaining DD(X)s, the yard that loses the competition could face a difficult business situation, particularly if that yard is GD/BIW which is involved as a shipbuilder in no shipbuilding programs other than the DDG-51 and DD(X).²⁵ Consequently, if GD/BIW does not build DD(X)s and does not receive other new ship-construction work, then GD/BIW could experience a significant reduction in workloads, revenues, and employment levels by the end of the decade. Theoretical scenarios for the yard under such circumstances could include closure and liquidation of the yard, the “mothballing” of the yard or some portion of it, or reorienting the yard into one that focuses on other kinds of work, such as building commercial ships, overhauling and modernizing Navy or commercial ships, or fabricating components of Navy or commercial ships that are being built by other yards. Reorienting the yard into one that focuses on other kinds of work, if feasible, could arguably result in workloads, revenues, and employment levels that were significantly reduced from current levels.

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

Littoral Combat Ships

The Navy’s plan to increase LCS procurement to a maximum sustained rate of six ships per year starting in FY2009 would, if implemented, provide a substantial and continuing amount of work for the firms involved in this program. The two LCSs that the Navy has requested for FY2007 represent a decline from the three LCSs funded in FY2006, and would, if implemented, put these firms through a bit of a roller coaster by reducing the LCS workload in FY2007 before increasing it again in FY2008 to a projected level of three ships. Such a roller coaster might introduce some inefficiency into the LCS production effort.

The Navy has included two additional LCSs on its FY2007 unfunded requirements list (URL). Funding one of these two ships along with the two ships in the FY2007 budget would maintain last year’s funded production level of three ships, while funding both of the ships in the URL would continue to increase LCS production toward the planned sustained rate of six ships per year. The Navy, however, projects that it will request funds for three ships in FY2008, so increasing the FY2007 production total to three or four ships might set the stage for putting the firms through a roller coaster unless production in FY2008 were increased to four or five ships. A production level of three or four ships in FY2007 and four or five ships in FY2008 could ease the transition to the planned production level of six ships in FY2009.

²⁵GD/BIW is also the prime contractor for the GD version of the Littoral Combat Ship (LCS), but the GD version is to be built by the Austal USA shipyard, of Mobile, AL.

Amphibious Ships

Large-Deck Amphibious Assault Ships. The Navy's FY2007-FY2011 shipbuilding plan and the draft version of the Navy's 30-year shipbuilding plan dated December 30, 2005, which breaks out the Navy's 30-year plan in greater detail, show a total of four LHA (Replacement), or LHA(R), large-deck amphibious assault ships, including variants built for the Navy's MPF(F) force, being procured in FY2007, FY2010, FY2011, and FY2013, followed by no further procurement of large-deck amphibious assault ships until the start of a projected class called the LHD(X) in FY2026. The procurement of four LHA(R)s in the seven-year period FY2007-FY2013 would provide a substantial amount of work to NGSS, the expected builder of these ships, and to other firms that would provide materials or components for the ships. The uneven spacing of the four LHA(R)s within the seven-year period might reduce some production efficiencies in the building of these ships. The lengthy interval between the last of these four LHA(R)s and the start of LHD(X) procurement in FY2026 could pose a challenge to any elements of the shipbuilding industrial base that are unique to, or heavily dependent on, production of large-deck amphibious assault ships.

LPD-17 Class Ships. As mentioned earlier, the decision in this year's budget to defer procurement of the ninth LPD-17 by one year, to FY2008, reflected in part a Navy concern about the potential ability of NGSS, following Hurricane Katrina, to support the construction of this ship if it were procured in FY2007. As also mentioned earlier, however, the Navy states that the FY2007 advance procurement funding requested for this ship is sufficient to support the amount of work that would have occurred in FY2007 had the ship been fully funded in FY2007. Accelerating the procurement of this ship back to FY2007 is an item on the Navy's FY2007 URL.

Auxiliary And Sealift Ships

The Navy's plan to procure a squadron of Maritime Prepositioning Force (Future), or MPF(F), ships will provide additional work to NGSS in the form of additional large-deck amphibious ships (discussed above), and additional work to General Dynamics' National Steel and Shipbuilding Company (GD/NASSCO) in the form of three additional TAKE-1 class ships. The MPF(F) squadron will also include three new-construction Large, Medium-speed, Roll-on/Roll-off (LMSR) sealift ships and three new-construction Mobile Logistic Platform (MLP) ships. GD and Northrop could compete for the LMSRs, and both these firms and potentially others could compete for the MLPs. Since the builders of the LMSRs and MLPs have not been determined, the industrial-base impact of the MPF(F) plan is partly unclear.

Alternative Funding Approaches

As requested, this section discusses the Navy's proposed use of split funding for procuring LHA-6, the first two DD(X)s, and CVN-78, and the impact of this use of incremental funding on current and future shipbuilding budgets. The Navy, as part of its FY2007-FY2011 shipbuilding plan, is proposing to use split funding in FY2007 and FY2008 to procure LHA-6 and the first two DD(X)s, and split funding in FY2008 and FY2009 to procure CVN-78.

Incremental Funding

Split funding is a two-year form of incremental funding. As discussed in two CRS reports,²⁶ incremental funding and another funding approach called advance appropriations are proposed alternatives to the traditional full funding approach that has been used in most defense procurement since the 1950s. Although incremental funding is not consistent with the full funding policy, it has been used in recent years to fund the procurement of certain Navy ships. Congress's decisions regarding the use of incremental funding or other alternative funding approaches for procuring Navy ships could be significant because the full funding policy relates to Congress's power of the purse and its responsibility for conducting oversight of DOD programs.

Using incremental funding can mitigate budget spikes that can occur when full funding is used to procure very expensive Navy ships that are procured once every several years. The ships that most closely fit this description are aircraft carriers and large-deck amphibious assault ships, but the two lead DD(X)s might also be viewed fitting the description somewhat, because the procurement costs of these ships include the detailed design and non-recurring engineering (DD/NRE) costs for the class, and because the third DD(X) is not to be procured until FY2009.

Since budget spikes can be inconvenient for budget planners and policymakers, the full funding policy could in theory create a bias in the budget process against the procurement of very expensive items whose procurement, if fully funded in a single year, could cause a spike. If so, then incremental funding, by mitigating the spike, might reduce that bias.

If the budget in a certain year cannot accommodate a spike without there also being an offsetting reduction in one or more other programs, then mitigating the spike through use of incremental funding could reduce the need to shift other programs out of the spike years. Since shifting these other programs out of the spike year could increase their costs by disrupting their procurement schedules, avoiding such shifts could avoid these cost increases, which might be considered a form of savings.

Potential Effects Of Proposed Split Funding

Regarding potential effects on funding policies, using split funding for LHA-6, the first two DD(X)s, and CVN-78 would add to precedents that have been accumulating since the early 1990s for using incremental funding in one form or another for the procurement of certain Navy ships.

²⁶See CRS Report RL32776, *Navy Ship Procurement: Alternative Funding Approaches -- Background and Options for Congress*, by Ronald O'Rourke, and CRS Report RL31404, *Defense Procurement: Full Funding Policy — Background, Issues, and Options for Congress*, by Ronald O'Rourke and Stephen Daggett.

Regarding financial effects, using split funding for LHA-6 and the first two DD(X)s would defer from FY2007 to FY2008 about \$4,684 million in ship-procurement costs, including about \$1,380 million (49%) of the procurement cost of LHA-6, and about \$3,304 million (50%) of the procurement cost of the first two DD(X)s. Using split funding for CVN-78 would defer from FY2008 to FY2009 about \$3,407 million (about 33%) of the procurement cost of CVN-78 from FY2008 to FY2009.

Amounts Deferred Under DD(X) And CVN-78 Split Funding

Under the Navy's plan, the amount of DD(X) procurement funding that would be deferred from FY2007 to FY2008 (\$3,304 million) is comparable to the amount of CVN-78 procurement funding that would be deferred from FY2008 to FY2009 (\$3,407 million). The need to split-fund CVN-78 in FY2008 and FY2009 might therefore be viewed, in financial terms, as a consequence of the decision to split-fund the two lead DD(X)s in FY2007 and FY2008. If a way could be found to fully fund the procurement of the two lead DD(X)s in FY2007, this could permit CVN-78 to be fully funded in FY2008 with about \$100 million in additional offsets to the FY2008 budget. Fully funding CVN-78 in FY2008 would in turn would permit the \$3,407 million in funding currently programmed for CVN-78 in FY2009 to be used for other purposes.

Option For Avoiding Split Funding On First Two DD(X)s

The need for using split funding for the two lead DD(X)s could be avoided by procuring the first DD(X) in FY2007 and the second in FY2008. Under this approach, the funding now programmed for FY2007 could be used to fully fund the first ship, and the funding now programmed for FY2008 could be used to fully fund the second ship. This approach might be viewed as undesirable by those who want to establish a level playing field between the two DD(X) shipyards for a potential subsequent competition to select a single builder for all follow-on DD(X)s. It might also be viewed as undesirable by those who want to ensure that the first DD(X) cannot be funded without also funding the second DD(X).

Option For Accelerating Ninth LPD-17 To FY2007 With Split Funding

As mentioned earlier, accelerating the procurement of the ninth LPD-17 back to FY2007 is an item on the Navy's FY2007 URL. The Navy estimates that fully funding the ninth LPD-17 in FY2007 would require an additional \$1,285 million in FY2007 procurement funding. If \$1,285 million in additional funding is not available, one option would be to accelerate procurement of the ninth LPD-17 to FY2007 and use split funding for the ship in FY2007 and FY2008. Under this approach, roughly \$640 million in additional FY2007 funding might be needed, rather than \$1.285 million.

If LPD-17 were procured in FY2007 using split funding in FY2007 and FY2008, a follow-on possibility, consistent with the Navy's goal for a force of 10 LPD-17s within its proposed 313-ship fleet, would be to procure a tenth LPD-17 in FY2008 using split funding in FY2008 and FY2009. Under this approach, LPD-17 procurement funding currently programmed FY2008 might change little, but would now be used to pay for the second half of the ninth LPD-17 and the first half of the tenth.

Options For Multiyear Procurements And Block Buys

In addition to alternative funding methods, there are also options relating to contracting methods. Most defense procurement uses annual contracting, in which one or more contracts are used to contract for each year's worth of procurement in a procurement program. Alternatives to annual contracting include multiyear procurement (MYP) and block-buy procurement. Under these two alternatives, a single contract is used to contract for the procurement of multiple units of a given item that are to be procured across a period of up to five fiscal years.

Both MYP and block-buy procurement require confidence on the part of DOD and the Congress that the units to be procured in future years will in fact be procured, because both MYP and block buy contracts include clauses requiring the government to pay a significant termination liability to the contractor if planned future-year items are not procured. This termination liability helps give the contractor the planning confidence needed to make decisions (including investments) needed to optimize the workforce and production equipment for production of the future-year units. Such optimization is part of what reduces procurement costs under MYP, and much of what reduces costs under block-buy procurement.

Multiyear Procurement (MYP). MYP requires a demonstration of design stability in the item being procured, and is therefore suitable for shipbuilding programs that have been underway for a number of years. MYP can reduce the cost of the ships being procured by a few or several percent. It has been used in the past on the DDG-51 program, where it reduced the cost of the ships procured by several percent, and it is currently being used on the Virginia-class program, where it has reduced the cost of the boats being procured by a few percent. As a potential option for furthering the use of MYP in Navy shipbuilding, MYP might also be suitable for procuring some or all of the five TAKE-1 class cargo ships proposed for FY2007-FY2011. Delivery of the lead TAKE-1 class ship, which is currently projected for May 2006, plus perhaps the delivery of the second ship, which is currently projected for December 2006, might be viewed as sufficient to demonstrate that the TAKE-1 program has achieved a stable design.

Block Buys. The block buy approach was created for, and used on, the first four Virginia-class SSNs. It does not require proof of design stability in the item being procured, and can therefore be suitable for the first ships in a shipbuilding program. The block buy approach does not include the Economic Order Quantity (EOQ) authority included in MYP. The EOQ authority accounts for part of the savings that can be generated by using an MYP,²⁷ so the percentage reduction in the cost of ship that might be achieved through the use of a block buy is generally smaller than what can be accomplished through MYP. The block buy approach can nevertheless help reduce the cost of the ships being procured by giving the shipyard the planning confidence it needs to make decisions that can better optimize the shipyard for the production of the future-year ships. Given the procurement costs of Navy ships, even a small percentage savings might translate into a substantial absolute

²⁷MYP permits advance procurement (AP) funding to be used to finance, at the outset of an MYP arrangement, the procurement of long-lead components for all of the end items to be procured under the MYP arrangement. The MYP arrangement to procure a total of five Virginia class SSNs over the five-year period FY2004-FY2008, for example permitted the Navy to procure, in the first years of the arrangement, five sets of long-lead nuclear-propulsion components. This up-front procurement of long-lead items is called an "economic order quantity" (EOQ) because it procures (i.e., places an order for) these items in the form of a group that can be manufactured in an efficient (i.e., economic) manner.

amount of savings.

Potential options for block buys in Navy shipbuilding include:

- CVN-78 and CVN-79;
- the first five DD(X)s;
- the 23 LCSs planned for FY2007-FY2011;
- the first three LHA(R)s;
- some or all of the five TAKE-1 class cargo ships proposed for FY2007-FY2011 (if MYP is not suitable because design stability has not been demonstrated);
- the three modified LMSRs;
- the three MLPs; and
- the three Joint High-Speed Vessels (JHSVs).

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

Appendix A. Navy 30-Year Shipbuilding Plan

Figure A-1 below shows the 30-year Navy shipbuilding plan submitted to Congress in February 2006.

Figure A-1. Navy 30-Year Shipbuilding Plan

Table 4. Long-Range Naval Vessel Construction Plan

Type/Class	Near Term					Mid Term										Far Term													
	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
Aircraft Carrier ¹		1				1				1					1				1				1					1	
Surface Combatants	2		1	1	2	1	2	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Littoral Combat Ships	2	3	6	6	6	6	6	6	6	5													1	3	2	3	6	6	6
Attack Submarines	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	2	1
Cruise Missile Submarines																													
Ballistic Missile Submarines																1	1	1	1	1	1	1	1	1	1	1	1	1	1
Expeditionary Warfare Ships	1	1		1								1			1	1	1	2	1	1	2	2	1	2	1	1	1		1
Combat Logistics Force	1	1										1		1	2	2	2	2	3	3	2	1							
Misc Warfare Ships																													
Maritime Prepositioning Force (Future)			2	2	4	2	1																						
Support Vessels			1	1	1	1	2	2	1	1					1	2	3	2		1	1		1	2					
Total New Construction Plan	7	7	11	12	14	13	12	11	11	10	4	6	4	3	9	10	11	11	10	10	10	8	7	10	8	8	12	10	11

- Note:
- Public Law section 128 of FY06 NDAA (HR 1815 Sec 128) authorizes the Navy to enter into a detail design and construction contract for CVN 78 in FY 2007 with funding appropriated in FY 2007, 2008, 2009.
 - Navy assumes split funding for large capital ships (aircraft carriers and amphibious ships) and a one time authority for DDX dual lead ships (FY07/08).

Source: Report to Congress on Annual Long-Range Plan for Construction of Naval Vessels for FY 2007.

Appendix B. Navy Projection Of Future Ship Force Levels

Figure B-1 shows the Navy's projection of ship force levels that would result from implementing the 30-year shipbuilding plan shown in Appendix A.

Figure B-1. Navy Projection Of Future Force Levels

Table 5. Naval Force Ship Inventory (2007-2036)

Type/Class	Near Term					Mid Term										Far Term														
	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
Aircraft Carrier ¹	11	11	11	11	11	11	10	10	11	11	11	11	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Surface Combatants	103	108	110	112	113	112	106	99	93	91	92	93	94	95	93	93	93	92	89	88	87	85	82	79	77	75	73	73	73	73
Littoral Combat Ships	1	4	6	9	13	21	27	33	38	44	50	53	53	55	55	53	53	53	53	53	53	53	53	55	55	55	55	55	55	55
Attack Submarine	32	33	34	33	33	34	35	33	32	30	30	28	28	27	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12
Cruise Missile Submarine	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	2	1	0	0	0	0	0	0	0	0
Ballistic Missile Submarine	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	13	13	11	12	13	12	12	12
Expeditionary Warfare Ships	34	33	33	33	33	33	32	32	31	31	31	31	31	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
Combat Logistics Force	32	33	33	33	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
Mine Warfare Ships	14	14	14	14	14	14	14	14	14	13	12	10	8	6	5	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Maritime Prepositioning Force (Future) ²	0	0	0	0	0	2	4	7	10	11	11	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	
Support Vessels	18	18	18	18	19	20	21	19	17	17	18	20	21	21	21	21	22	23	21	22	22	22	22	21	22	21	21	21	21	
Total Naval Force Inventory	283	294	299	301	300	315	317	315	314	317	324	330	330	327	326	323	320	319	314	311	307	303	299	296	292	294	294	293	294	

- Notes:
1. Aircraft carrier force structure will temporarily decrease to 10 in FY 2013 upon decommissioning of CVN 65 after 52 years of service.
 2. Assumes transfer of 1 steam LHD from the expeditionary warfare ships to the MPF(F) squadron.

Source: Report to Congress on Annual Long-Range Plan for Construction of Naval Vessels for FY 2007.

Appendix C. Navy Shipbuilding Rate

Table C-1 below shows past (FY1982-FY2006) and projected (FY2007-FY2011) rates of Navy ship procurement.

Table C-1. Battle Force Ships Procured (FY1982-FY2006) or *Projected* (FY2007-FY2011)

82	83	84	85	86	87	88	89	90	91	92	93	94	95	96
17	14	16	19	20	17	15	19	15	11	11	7	4	4	5
97	98	99	00	01	02	03	04	05	06	07	08	09	10	11
4	5	5	6	6	6	5	7	8	6	7	7	11	12	14

Source: CRS compilation based on examination of defense authorization and appropriation committee and conference reports for each fiscal year. The table excludes non-battle force ships that do not count toward the 310- or 375- ship goal, such as sealift and prepositioning ships operated by the Military Sealift Command and oceanographic ships operated by agencies such as the National Oceanic and Atmospheric Administration (NOAA).

Appendix D. SSN Procurement Rates And Resulting Force Levels²⁸

Force-Level Consequences Of Various Steady Procurement Rates

Table D-1 presents the force-level consequences through FY2050 of steady SSN procurement rates of 1, 1.5, and 2 boats per year. The table also shows the 30-year SSN procurement profile from Navy's 30-year shipbuilding plan, which increases the procurement rate to 2 boats per year in FY2012, and then decreases it to 1.5 boats per year for FY2029-FY2036.

The force-level consequences of these procurement rates reflect the age distribution of the SSN force. The SSN force is not evenly distributed in age because it includes a large number of boats procured in the 1980s and a relatively small number procured since FY1990.

The table shows, among other things, that none of these procurement profiles — not even 2 boats per year starting in FY2007 — is sufficient to avoid dropping below 48 SSNs for some period of time starting between FY2018 and FY2026.

²⁸This appendix is adapted from a portion of CRS Report RL32418, *Navy Attack Submarine Force-Level Goal and Procurement Rate: Background and Issues for Congress*, by Ronald O'Rourke.

Table D-1. Steady Procurement Rates & Resulting Force Levels

(number procured each [left] and number in service that year [right])

FY	1/year		1.5/year starting FY12		1.5/year starting FY09		Navy 30-year plan (Feb. 06)		2/year starting FY12		2/year starting FY09		2/year starting FY07	
07	1	56	1	56	1	56	1	56	1	56	1	56	2	56
08	1	57	1	57	1	57	1	57	1	57	1	57	2	57
09	1	57	1	57	2	57	1	57	1	57	2	57	2	57
10	1	56	1	56	1	56	1	56	1	56	2	56	2	56
11	1	57	1	57	2	57	1	57	1	57	2	57	2	57
12	1	58	2	58	1	58	2	58	2	58	2	58	2	58
13	1	59	1	59	2	59	2	59	2	59	2	59	2	59
14	1	55	2	55	1	55	2	55	2	55	2	55	2	55
15	1	55	1	55	2	56	2	55	2	55	2	56	2	58
16	1	51	2	51	1	52	2	51	2	51	2	53	2	55
17	1	49	1	49	2	51	2	49	2	49	2	52	2	54
18	1	46	2	47	1	48	2	47	2	47	2	50	2	52
19	1	45	1	46	2	48	2	47	2	47	2	50	2	52
20	1	44	2	46	1	47	2	47	2	47	2	50	2	52
21	1	43	1	45	2	47	2	47	2	47	2	50	2	52
22	1	41	2	44	1	45	2	46	2	46	2	49	2	51
23	1	40	1	43	2	45	2	46	2	46	2	49	2	51
24	1	38	2	42	1	43	2	45	2	45	2	48	2	50
25	1	36	1	40	2	42	2	44	2	44	2	47	2	49
26	1	33	2	38	1	39	2	42	2	42	2	45	2	47
27	1	31	1	36	2	38	2	41	2	41	2	44	2	46
28	1	29	2	35	1	36	2	40	2	40	2	43	2	45
29	1	28	1	34	2	36	1	40	2	40	2	43	2	45
30	1	28	2	35	1	36	2	41	2	41	2	44	2	46
31	1	28	1	35	2	37	1	42	2	42	2	45	2	47
32	1	29	2	37	1	38	2	44	2	44	2	47	2	49
33	1	30	1	38	2	40	1	46	2	46	2	49	2	51
34	1	31	2	40	1	41	2	48	2	48	2	51	2	53
35	1	32	1	41	2	43	1	49	2	50	2	53	2	55
36	1	33	2	43	1	44	2	51	2	52	2	55	2	57
37	1	33	1	43	2	45	n/a	51	2	53	2	56	2	58
38	1	33	2	44	1	45	n/a	52	2	54	2	57	2	59
39	1	33	1	44	2	46	n/a	52	2	55	2	58	2	60
40	1	33	2	45	1	46	n/a	53	2	56	2	59	2	61
41	1	33	1	45	2	47	n/a	53	2	57	2	60	2	62
42	1	33	2	46	1	47	n/a	54	2	58	2	61	2	63
43	1	33	1	46	2	48	n/a	n/a	2	59	2	62	2	64
44	1	33	2	47	1	48	n/a	n/a	2	60	2	63	2	65
45	1	33	1	47	2	49	n/a	n/a	2	61	2	64	2	66
46	1	33	2	48	1	49	n/a	n/a	2	62	2	65	2	66
47	1	33	1	48	2	50	n/a	n/a	2	63	2	66	2	66
48	1	33	2	49	1	49	n/a	n/a	2	64	2	66	2	66
49	1	33	1	49	2	50	n/a	n/a	2	65	2	66	2	66
50	1	33	2	50	1	49	n/a	n/a	2	66	2	66	2	66

Source: Prepared by CRS using Navy data. n/a = data not available

The projections in **Table D-1** assume a 6-year construction period²⁹ and 33-year service life for SSNs. If service life turns out to be less than 33 years, resulting force levels would be lower than those shown in the table.

Procurement Profiles For Maintaining Forces Of 30 To 70 Boats

Table D-2 presents notional SSN procurement profiles for the 25-year period FY2007-FY2031 for supporting SSN forces of 30, 40, 48, 50, 55, 60, and 70 boats (excluding any SSGNs). None of the profiles calls for procuring more than four boats per year — the maximum annual rate that was achieved for SSNs during the Cold War years of the 1980s, when the Navy was working toward achieving and maintaining a force of 100 SSNs.

For the Navy's reported planned force level of 48 SSNs, **Table D-2** shows three profiles — A, B, and C — that increase the procurement rate to two boats per year in FY2012, FY2009, and FY2007, respectively. As can be seen from these three profiles, starting to procure two boats per year earlier reduces the number of subsequent years in which three boats need to be procured.

²⁹Exceptions to the 6-year construction period include the second boats procured in FY2007 and FY2008, which are assumed to enter service 8 years and 7 years after they are procured, respectively, due to lack of advance procurement funding for the FY2007 boat in FY2005 and FY2006 and for the FY2008 boat in FY2006.

Table D-2. Notional Procurement Profiles for Various Force Sizes
(Years with 3 or 4 boats shown in bold)

FY	Size of force supported — total number of boats in force																	
	30		40		48						50		55		60		70	
					A (2/year starts FY12)		B (2/year starts FY09)		C (2/year starts FY07)									
07	1	56	1	56	1	56	1	56	2	56	2	56	2	56	2	56	2	56
08	1	57	1	57	1	57	1	57	2	57	2	57	2	57	3	57	3	57
09	1	57	1	57	1	57	2	57	2	57	2	57	2	57	3	57	4	57
10	1	56	1	56	1	56	2	56	2	56	2	56	2	56	4	56	4	56
11	1	57	1	57	1	57	2	57	2	57	2	57	3	57	4	57	4	57
12	1	58	2	58	2	58	2	58	2	58	2	58	3	58	3	58	4	58
13	1	59	2	59	2	59	2	59	2	59	2	59	3	59	3	59	4	59
14	1	55	2	55	3	55	2	55	2	55	2	55	2	55	2	55	4	55
15	1	55	2	55	2	55	2	56	2	58	2	58	2	58	2	60	4	61
16	1	51	2	51	3	51	2	53	2	55	2	55	3	55	3	59	4	60
17	1	49	2	49	3	49	2	52	2	54	2	54	3	55	3	60	4	61
18	1	46	2	47	3	47	3	50	2	52	3	52	3	54	3	59	3	61
19	1	45	2	47	3	47	3	50	2	52	3	52	3	55	3	60	3	63
20	1	44	2	47	3	48	3	50	3	52	3	52	3	55	3	60	4	65
21	1	43	2	47	3	48	3	50	3	52	3	52	3	55	3	60	3	67
22	2	41	2	46	3	48	3	49	3	51	3	51	3	55	3	60	3	68
23	2	40	2	46	2	49	2	49	2	51	2	51	2	56	2	61	2	70
24	1	38	1	45	1	49	1	49	1	50	1	51	1	56	1	61	1	70
25	1	36	1	44	1	49	1	49	1	49	1	51	1	56	1	61	1	70
26	0	33	0	42	0	48	0	48	0	48	0	50	0	55	0	60	0	70
27	0	31	0	41	0	48	0	48	0	48	0	50	0	55	0	60	0	70
28	0	30	0	40	0	48	0	48	0	48	0	50	0	55	0	60	0	70
29	0	30	0	40	0	48	0	48	0	48	0	50	0	55	0	60	0	70
30	0	30	0	40	0	48	0	48	0	48	0	50	0	55	0	60	0	70
31	1	30	1	40	1	48	1	48	1	48	1	50	1	55	1	60	1	70

Source: Prepared by CRS using U.S. Navy data.

The following points arise from the figures in the table and the data underlying the figures:

- **For a 30-boat force.** Supporting a force of 30 boats could involve maintaining an average procurement rate of about 1 boat per year into the 2020s. If all SSNs are operated to the end of their expected 33-year lives, then the force would decline to 30 boats by 2028 and remain there after that. The force could be reduced to 30 boats much sooner by accelerating the retirement of older SSNs.

- **For a 40-boat force.** Supporting a force of 40 boats could involve maintaining an average procurement rate of 2 boats per year from FY2012 to FY2023. If all SSNs are operated to the end of their expected 33-year lives, then the force would decline to 40 boats by 2028 and remain there after that. The force could be reduced to 40 boats much sooner by accelerating the retirement of older SSNs.
- **For a 48-boat force.** Supporting the Navy's reportedly planned force of 48 boats could involve procuring a total of 35 boats during the 16-year period FY2007-FY2022, or an average of about 2.2 boats per year. If all SSNs are operated to the end of their expected 33-year lives, then the force would decline to about 48 boats by 2018 (Profile A) or FY2026 (Profiles B and C) and remain about there after that. As stated earlier, starting to procure two boats per year earlier reduces the number of subsequent years in which three boats need to be procured. The force could be reduced to 48 boats sooner by accelerating the retirement of older SSNs.
- **For a 50-boat force.** Supporting a force of 50 boats could involve procuring a total of 37 boats during the 16-year period FY2007-FY2022, or an average of about 2.3 boats per year. If all SSNs are operated to the end of their expected 33-year lives, then the force would decline to 50 boats by 2026 and remain there after that. The force could be reduced to 50 boats sooner by accelerating the retirement of older SSNs.
- **For a 55-boat force.** Supporting a force of 55 boats could involve procuring a total of 42 boats during the 16-year period FY2007-FY2022, or an average of about 2.6 boats per year.
- **For a 60-boat force.** Achieving and maintaining a force of about 60 boats could involve procuring a total of 47 boats during the 16-year period FY2007-FY2022, or an average of about 2.9 boats per year. The force would reach 60 boats by 2015 and remain about there after that.
- **For a 70-boat force.** Achieving and maintaining a force of about 70 boats could involve procuring a total of 57 boats during the 16-year period FY2007-FY2022, or an average of about 3.6 boats per year. The force would reach 70 boats by 2023 and remain about there after that.

Attack Submarine Service Lives

As mentioned earlier, SSNs have expected service lives of 33 years. The notional procurement profiles outlined above reflect this figure. As also mentioned earlier, however, the current high operational tempo for the SSN force could reduce the service lives of SSNs to something less than 33 years by accelerating the rate at which reactor core life is used up. If the service lives of existing SSNs turn out to be less than 33 years due to either higher-than-planned rates of reactor core use or general wear and tear on the ships, then the procurement rates needed to maintain SSN forces of various sizes may need to be greater than shown in the notional profiles outlined above.

Conversely, if the service lives of SSNs can be increased to something greater than 33 years, then procurement rates needed to maintain SSN forces of various sizes could possibly be lower than

shown in the notional profiles outlined above. If, for example, the service lives of Navy SSNs can be extended to 40 years, then an annual procurement rate of 1 or 1.5 boats per year would, over the long run, be sufficient to maintain a force of 40 to 60 boats, rather than 33 boats.

The feasibility and potential cost of extending the service lives of the Navy's SSNs is not clear. The Navy a few years ago increased the expected service lives of its SSBNs (including the four being converted into SSGNs) from 30 years to 42 years, with the new 42-year life to consist of two 20-year operating periods with a two-year refueling in between. The typical mission profile of an SSBN, however, may be less stressful on the boat than is the typical mission profile of an SSN. Compared to SSBN operations, SSN operations can involve submerging and surfacing more frequently (placing more frequent cyclic stress on the submarine's pressure hull) and more frequent high-speed runs (which can lead to higher rates of wear and tear on propulsion machinery).

Unlike earlier Navy SSNs, which were built with reactor cores intended to last about 15 years, Seawolf- and Virginia-class boats have cores that are intended to last the 33-year expected life of the ship. Extending the lives of Seawolf- or Virginia-class boats to 40 years, if feasible, could thus involve changing their life-cycle maintenance plans to include a refueling at about age 33 or earlier.

Appendix E. Cruiser-Destroyer Procurement Rates And Resulting Force Levels³⁰

Planned Cruiser-Destroyer Procurement

Table E-1 shows planned procurement of cruisers and destroyers in the Navy's 30-year shipbuilding plan.

Table E-1. Projected Procurement Of Surface Combatants, FY2007-FY2036

FY	DD(X)	CG(X) ^b	DDG(X) ^c
07	2 ^a		
08	0 ^a		
09	1		
10	1		
11	1	1	
12	1		
13	1	1	
14		1	
15		2	
16		1	
17		1	
18		2	
19		2	
20		2	
21		2	
22		2	
23		1	1
24			2
25			2
26			2
27			2
28			2
29			2
30			2
31			2
32			2
33			2
34			2
35			2
36			2

Source: U.S. Department of the Navy, *Draft Report to Congress on Annual Long-Range Plan for Construction of Naval Vessels for FY 2007*. Table 3 on page 7.

a Each of the two DD(X)s to be procured in FY2007 is to be split-funded (i.e., incrementally funded) across

³⁰This appendix is adapted from a portion of CRS Report 32109, *Navy DD(X), CG(X), and LCS Ship Acquisition Programs: Oversight Issues and Options for Congress*, by Ronald O'Rourke.

FY2007 and FY2008.

b The total of 18 rather than 19 CG(X)s in the table is as shown in the draft Navy report.

c The DDG(X), not to be confused with the DD(X), is the Navy's projected long-term notional replacement for today's DDG-51s.

Steady-State Procurement Rate vs. Projected Rate

As shown in **Table E-1**, the Navy's 30-year shipbuilding plan shows a total of 7 DD(X)s and 18 (rather than 19) CG(X)s being procured from FY2007 through FY2023. The draft report also shows the DDG(X) — the Navy's notional long-term replacement for the DDG-51s — starting procurement with a lead ship in FY2023 and two ships per year from FY2024 through FY2036, the final year covered in the report.

Assuming a 35-year average life for cruisers and destroyers, maintaining a force of 88 cruisers and destroyers over the long run would require steady-state procurement rate — that is, a long-run (35-year) average procurement rate — of about 2.5 ships per year. The profile shown in **Table E-1** procures a total of 26 ships — 7 DD(X)s, 18 CG(X)s, and 1 DDG(X) — in the 17-year period FY2007-FY2023. This equates to an average of about 1.5 ships per year, or about 60% of the steady-state procurement rate of 2.5 ships per year. If this plan is executed, then maintaining a total of 88 cruisers and destroyers over the long run would require procuring another 62 ships in the following 18 years (FY2024-FY2041) of the 35-year replacement period, or an average of about 3.4 ships per year.

If, due to affordability considerations, no more than one DD(X) or CG(X) were procured in any given year, then a total of 18 ships — 17 DD(X)s and CG(X)s and 1 DDG(X) — would be procured during the 17-year period FY2007-FY2023. If this were to happen, then maintaining a total of 88 cruisers and destroyers over the long run would require procuring another 70 ships in the remaining 18 years (FY2024-FY2041) of the 35-year replacement period, or an average of about 3.9 ships per year.

As mentioned above, the Navy's draft 30-year plan shows a steady rate of 2 DDG(X)s per year starting in FY2024, rather than 3.4 or 3.9 ships per year.

Potential Force-Level Consequences

As shown in **Table E-2**, the combination of a DD(X)/CG(X) program that procures an average of 1 or 1.5 ships per year and a DDG(X) program that procures 2 ships per year will, over the long run, result in a cruiser-destroyer force that eventually falls and remains below Navy's 88-ship goal.

If 25 DD(X)s and CG(X)s (7 of the former, 18 of the latter) are procured during the 17-year period FY2007-FY2023 and DDG(X) procurement reaches 2 per year in FY2024 and remains there indefinitely, the cruiser-destroyer force will reach 88 ships in 2016, peak at 95 ships in 2021, fall below 88 ships in 2027, reach a minimum of 62 ships (about 30% below the 88-ship goal) in FY2044-FY2046, and recover somewhat to a steady-state level of 70 ships — the steady-state level eventually maintained by procuring 2 ships per year, and about 20% below the 88-ship goal — after 2050.

If 17 DD(X)s and CG(X)s are procured during the 17-year period FY2007-FY2023 and

DDG(X) procurement reaches 2 per year in FY2024 and remains there indefinitely, the cruiser-destroyer force will reach 88 ships in 2016, peak at 92 ships in 2020-2021, fall below 88 ships in 2025, reach a minimum of 54 ships (about 39% below the 88-ship goal) in FY2044-FY2046, and recover somewhat to a steady-state level of 70 ships after 2050.

Table E-2. Number of Cruisers and Destroyers, 2007-2050

(Depending on total number of DD(X)s/CG(X)s procured FY2007-FY2023, with DDG(X)s procured at 2 per year from FY2024 onward)

With 25 DD(X)s and CG(X)s procured FY07-FY23 (Draft Navy 30-year plan)				With 17 DD(X)s and CG(X)s procured FY07-FY23 (Procurement limited to 1 DD(X) or CG(X) year)			
2007	75	2029	83	2007	75	2029	75
2008	77	2030	79	2008	77	2030	71
2009	80	2031	76	2009	80	2031	68
2010	82	2032	75	2010	82	2032	67
2011	84	2033	73	2011	84	2033	65
2012	84	2034	72	2012	84	2034	64
2013	86	2035	72	2013	86	2035	64
2014	86	2036	70	2014	86	2036	62
2015	87	2037	69	2015	87	2037	61
2016	88	2038	68	2016	88	2038	60
2017	90	2039	66	2017	89	2039	58
2018	91	2040	64	2018	90	2040	56
2019	93	2041	63	2019	91	2041	55
2020	94	2042	63	2020	92	2042	55
2021	95	2043	63	2021	92	2043	55
2022	93	2044	62	2022	90	2044	54
2023	92	2045	62	2023	89	2045	54
2024	90	2046	62	2024	86	2046	54
2025	91	2047	64	2025	86	2047	56
2026	88	2048	64	2026	82	2048	56
2027	86	2049	66	2027	79	2049	58
2028	85	2050	67	2028	77	2050	59

Source: Prepared by CRS using Navy data.