Navy Force Structure: Alternative Force Structure Studies of 2005—Background for Congress

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Summary

This CRS report summarizes three studies submitted to Congress in 2005 on potential future Navy ship force structures, and is intended as a lasting reference source on these three studies.

Two of the three studies were conducted in response to Section 216 of the conference report (H.Rept. 108-354 of November 7, 2003) on the FY2004 defense authorization act (H.R. 1588/P.L. 108-136 of November 24, 2003). The two studies were conducted by the Center for Naval Analyses (CNA) and the Office of Force Transformation (OFT, which was then a part of the Office of the Secretary of Defense). They were submitted to the congressional defense committees in February 2005. The third study was conducted by the Center for Strategic and Budgetary Assessments (CSBA), an independent defense-policy research organization, on its own initiative. The study was made available to congressional and other audiences in March 2005.

The CNA study presents a fairly traditional approach to naval force planning in which capability requirements for warfighting and for maintaining day-to-day naval forward deployments are calculated and then integrated. The CNA-recommended force parallels fairly closely Navy thinking at the time on the size and composition of the fleet. This is perhaps not surprising, given that much of CNA's analytical work is done at the Navy's request.

The OFT study fundamentally challenges current Navy thinking on the size and composition of the fleet, and presents an essentially clean-sheet proposal for a future Navy that would be radically different from the currently planned fleet. This is perhaps not surprising, given both OFT's institutional role within DOD as a leading promoter of military transformation and the views of retired Navy admiral Arthur Cebrowski—the director of OFT until January 31, 2005—regarding network-centric warfare and distributed force architectures. (OFT was disestablished on October 1, 2006, and its activities were transferred to other DOD offices.)

The CSBA study challenges current Navy thinking on the size and composition of the fleet more dramatically than the CNA report, and less dramatically than the OFT report. Compared to the CNA and OFT reports, the CSBA report contains a more detailed implementation plan and a more detailed discussion of possibilities for restructuring the shipbuilding industrial base.

This CRS report will not be updated.

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Introduction

This CRS report summarizes three studies submitted to Congress in 2005 on potential future Navy ship force structures, and is intended as a lasting reference source on these three studies. The contents of this CRS report previously appeared as an appendix to another CRS report.[1]

Two of the three studies were conducted in response to Section 216 of the conference report (H.Rept. 108-354 of November 7, 2003) on the FY2004 defense authorization act (H.R. 1588/P.L. 108-136 of November 24, 2003), which required the Secretary of Defense to provide for two independently performed studies on potential future fleet platform architectures (i.e., potential force structure plans) for the Navy.[2] The two studies were conducted by the Center for Naval Analyses (CNA) and the Office of Force Transformation (OFT, which was then a part of the Office of the Secretary of Defense), and were submitted to the congressional defense committees in February 2005. OFT was disestablished on October 1, 2006, and its activities were transferred to other DOD offices.

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The Three Studies

Force Structure Recommendations

CNA Report[3]

The CNA report uses essentially the same kinds of ships and naval formations as those planned by the Navy. The report recommends a Navy force structure range of 256 to 380 ships. The low end of the range assumed a greater use of crew rotation and overseas homeporting of Navy ships than the high end. **Table 1** below compares the CNA-recommended force range to the Navy's 375-ship fleet proposal of 2002-2004 and the notional 260- and 325-ship fleets for FY2035 presented in a March 2005 Navy report to Congress.

[1] CRS Report RL32665, *Navy Force Structure and Shipbuilding Plans: Background and Issues for Congress*, by Ronald O'Rourke. This appendix was in turn adapted from part of the prepared statement of Ronald O'Rourke before the Senate Armed Services Committee Subcommittee on Seapower, Hearing on Navy Capabilities and Force Structure, Apr. 12, 2005.

[2] Section 216 was an amended version of a provision (Section 217) in the House-reported version of H.R. 1588. See H.Rept. 108-354, pp. 28-29, 612-613 and H.Rept. 108-106, pp. 255-256.

[3] Delwyn Gilmore, with contributions by Mark Lewellyn et al., *Report to Congress Regarding Naval Force Architecture*, Center for Naval Analyses, CRM D0011303.A2/1Rev, Jan. 2005.

Table 1. CNA-Recommended Force and Other Proposals

Ship type	CNA force range	Navy 375-ship proposal of 2002-2004[a]	Notional Navy fleets for FY2035	
			260 ships	325 ships
Ballistic missile submarines (SSBNs)	14	14	14	14
Cruise missile submarines (SSGNs)	4	4	4	4
Attack submarines (SSNs)	38 to 62	52	37	41
Aircraft carriers	10 to 12	12	10	11
Cruisers and destroyers	66 to 112	109	67	92
Littoral combat ships (LCSs)	40 to 70	56	63	82
Amphibious ships	18 to 30	36	17	24
Maritime Prepositioning Force (Future) ships	19 to 21	18	14	20
Combat logistics (resupply) ships	25 to 33	33	24	26
Other[b]	22	41	10	11
Total battle force ships	**256 to 380**	375	260	325

Source: Table prepared by CRS based on CNA report and March 2005 Navy report.

a. Composition as shown in CNA report as the program of record for 2022.

b. Includes command ships, support ships (such as salvage ships and submarine tenders), dedicated mine warfare ships, and sea basing connector ships.

OFT Report[4]

The OFT report employs eight new ship designs that differ substantially from the designs of most ships currently in the fleet, under construction, or planned for procurement. Among the eight new ship designs were four types of large surface ships that would be built from a common, relatively inexpensive, merchant-like hull design developed in 2004 for the Navy's Maritime Prepositioning Force (Future) analysis of alternatives. These four types of ships, which would all displace 57,000 tons, include:

- **An aircraft carrier** that would embark a notional air wing of 30 Joint Strike Fighters (JSFs), 6 MV-22 Osprey tilt-rotor aircraft, and 15 unmanned air vehicles (UAVs). The total of 36 manned aircraft is about half as many as in today's carrier air wings, and the OFT architecture envisaged substituting two of these new carriers for each of today's carriers. This new carrier would also have support spaces for unmanned underwater vehicles (UUVs), unmanned surface vehicles (USVs), and mission modules for the 1,000-ton surface combatant described below.

[4] U.S. Department of Defense, Office of the Secretary of Defense, *Alternative Fleet Architecture Design* (Report for the Congressional Defense Committees, Office of Force Transformation). The OFT report was also published in slightly modified form as Stuart E. Johnson and Arthur K. Cebrowski, *Alternative Fleet Architecture Design*. Washington, National Defense University, 2005. 96 pp. (Defense & Technology Paper 19, Center for Technology and National Security, National Defense University, August 2005)

- **A missile-and-rocket ship** that would be equipped with 360 vertical launch system (VLS) missile tubes and 4 trainable rocket launchers. Additional spaces on this ship could be used to support UUVs, USVs, and mission modules for the 1,000-ton surface combatant. Alternatively, these spaces could be used to provide limited stowage and working space for the 100-ton surface combatant described below, and mission modules for these 100-ton ships.
- **An amphibious assault ship** that would embark a notional air wing of either 30 CH-46 equivalents or 6 JSFs, 18 MV-22s, and 3 gyrocopter heavy-lift helicopters. It would also have spaces for Marine Corps equipment, unmanned vehicles, and mission modules for the 1,000-ton surface combatant.
- **A "mother ship" for small combatants** that would contain stowage and support spaces for the 100-ton surface combatant described below.

The four other new-design ships in the OFT architecture are:

- **A 13,500-ton aircraft carrier** based on a conceptual surface effect ship (SES)/catamaran hull design developed in 2001 by a team at the Naval Postgraduate School. This ship would embark a notional air wing of 8 JSFs, 2 MV-22s, and 8 UAVs. The total of 10 manned aircraft is roughly one-eighth as many as in today's carrier air wings, and the OFT architecture envisages substituting eight of these new carriers for each of today's carriers. This new ship would have a maximum speed of 50 to 60 knots.
- **A 1,000-ton surface combatant** with a maximum speed of 40 to 50 knots and standard interfaces for accepting various modular mission packages. These ships would self-deploy to the theater and would be supported in theater by one or more of the 57,000-ton ships described above.
- **A 100-ton surface combatant** with a maximum speed of 60 knots and standard interfaces for accepting various modular mission packages. These ships would be transported to the theater by the 57,000-ton mother ship and would be supported in theater by that ship and possibly also the 57,000-ton missile-and-rocket ship.
- **A non-nuclear-powered submarine** equipped with an air-independent propulsion (AIP) system. These AIP submarines would be lower-cost supplements to the Navy's nuclear-powered submarines (SSNs) and would be transported from home port to the theater of operations by transport ships. The OFT architecture envisaged substituting four of these submarines for the SSN in each carrier strike group.[5]

The 1,000- and 100-ton surface combatants would be built as relatively inexpensive sea frames, like the Littoral Combat Ship (LCS).

[5] The report states that "Alternatives to the SSNs in formations were diesel Air Independent Propulsion (AIP) submarines and unmanned undersea vehicles (UUVs). The AIP submarines were substituted for Virginia class SSNs on a cost basis of roughly four to one. These submarines could be nuclear-powered if they are designed and built based upon a competitive, cost suppressing business model." (Page 60) The strategy of transporting the AIP submarines to the theater using transport ships is not mentioned in the report but was explained at a February 18, 2005 meeting between CRS and analysts who contributed to the OFT report.

The OFT report combines these eight types of ships, plus the Navy's currently planned TAOE-class resupply ship, into a fleet that would include a much larger total number of ships than planned by the Navy, about the same number of carrier-based aircraft as planned by the Navy, and large numbers of unmanned systems. The OFT report presents three alternative versions of this fleet, which the report called Alternatives A, B, and C. The report calculates that each of these alternatives would be equal in cost to the equivalent parts of the Navy's 375-ship proposal. Each of these alternative force structures, like the equivalent parts of the Navy's 375-ship proposal, would be organized into 12 carrier strike groups (CSGs), 12 expeditionary strike groups (ESGs), and 9 surface strike groups (SSGs). The three alternative force structures are shown in **Table 2** below.

Table 2. Alternative Fleet Structures from OFT Report

	Alternative		
Ship type	**A**	**B**	**C**
57,000-ton aircraft carrier	24	***24***	***0***
57,000-ton missile-and-rocket ship	33	33	33
57,000-ton amphibious assault ship	24	24	24
57,000-ton mother ship	***0***	***24***	24
13,500-ton aircraft carrier	0	***0***	***96***
1,000-ton surface combatant	***417***	***0***	0
100-ton surface combatant	***0***	***609***	609
AIP submarine	48	48	48
TAOE-class resupply ship	12	12	12
Subtotal 1,000- and 100-ton ships	*417*	*609*	*609*
Subtotal other ships	*141*	*165*	*237*
Total ships[a]	**558**[a]	**774**[a]	**846**[a]

Source: Table prepared by CRS based on figures in OFT report.

a. The totals shown in early copies of the OFT report are 36 ships lower in each case due to an error in those copies in calculating the numbers of ships in the 12 carrier strike groups.

The totals shown in the table do not include SSNs, cruise missile submarines (SSGNs), and ballistic missile submarines (SSBNs) operating independently of the 12 CSGs, 12 ESGs, and 9 SSGs. The totals also do not include combat logistics ships other than the TAOEs (e.g., oilers, ammunition ships, and general stores ships) and fleet support ships. The Navy's 375-ship proposal, by comparison, included all these kinds of ships.

As also can be seen from the table, the difference between Alternatives A and B is that the former uses 1,000-ton surface combatants while the latter uses 100-ton surface combatants that are transported into the theater by mother ships, and the difference between Alternatives B and C is that the former uses 57,000-ton aircraft carriers while the latter substituted 13,500-ton carriers.

CSBA Report[6]

The CSBA report uses many of the same ship designs currently planned by the Navy, but also proposes some new ship designs. The CSBA report also proposed ship formations that in some cases are different than those planned by the Navy. **Table 3** below compares the CSBA-recommended force structure to CNA's recommended force range, the Navy's 375-ship fleet proposal of 2002-2004, and the notional 260- and 325-ship fleets for FY2035 presented in the Navy's March 2005 report to Congress.

Table 3. CSBA-Recommended Force and Other Proposals

Ship type	CSBA force	CNA force range	Navy 375-ship proposal of 2002-2004[a]	Notional Navy fleets for FY2035	
				260 ships	325 ships
Ballistic missile submarines (SSBNs)	12[b]	14	14	14	14
Cruise missile submarines (SSGNs)	6[b]	4	4	4	4
Attack submarines (SSNs)	54[c]	38 to 62	52	37	41
Large-deck aircraft carriers (CVNs)	10	10 to 12	12	10	11
Medium aircraft carriers (CVEs)	4	0	0	0	0
Afloat forward staging base (AFSB)	1	0	0	0	0
Cruisers and destroyers	84 or 86	66 to 112	109	67	92
Littoral combat ships (LCSs)	84	40 to 70	56	63	82
Amphibious ships	32[d]	18 to 30	36	17	24
Maritime Prepositioning Force ships	16[e]	19 to 21[e]	18[e]	14[e]	20[e]
Combat logistics (resupply) ships	36[f]	25 to 33	33	24	26
Other[g]	34[h]	22	41	10	11
Total battle force ships	**373 or 375[i]**	**256 to 380**	**375**	**260**	**325**

Source: Table prepared by CRS based on CSBA report, CNA report, and March 2005 Navy report.

a. Composition as shown in CNA report as the program of record for 2022.

b. Alternatively, 10 SSBNs and 8 SSGNs.

c. Includes one special-mission submarine. Total number drops slightly over next 12 years.

d. Includes eight LHDs and 24 LPD-17s.

e. In the CSBA force, these are existing MPF ships; in the other fleets, they are MPF(Future) ships.

f. Includes eight TAOEs, 11 TAKEs, and 17 TAOs.

g. Includes command ships, and support ships (such as salvage ships and submarine tenders), dedicated mine warfare ships, and sea basing connector ships.

h. Includes, among other ships, 2 TAVBs and 8 TLKAs associated with the amphibious and MPF ships.

[6] Robert O. Work, *Winning the Race: A Naval Fleet Platform Architecture for Enduring Maritime Supremacy*, Center for Strategic and Budgetary Assessments (CSBA), 2005.

i. In addition to these ships, the CSBA report notes that U.S. maritime forces would include 35 DOD prepositioning and surge sealift ships used primarily by the Army and Air Force, and 91 large, medium, and fast-response (i.e., small) cutters planned for procurement under the Coast Guard Deepwater acquisition program.

The CSBA report makes numerous specific recommendations for ship force structure and ship acquisition, including the following:

Aircraft Carriers

When the George H.W. Bush (CVN-77) enters service in 2008 or 2009:

- Retire the two remaining conventional carriers—the Kitty Hawk CV-63) and the Kennedy (CV-67).
- Convert the Enterprise (CVN-65) into an afloat forward staging base (AFSB) with a mixed active/reserve/civilian crew, to be used in peacetime for aviation testing and in crises for embarking special operations forces, Army or Marine Corps forces, or joint air wings.
- Begin replacing the 10 Nimitz (CVN-68) class carriers on a one-for-one basis with CVN-21-class carriers procured once every five years using incremental funding.
- Redesignate the LHA(R) as a medium sized carrier (CVE) and procure one every three years starting in FY2007 using incremental funding.[7]

Submarines

- Maintain Virginia-class SSN procurement at one per year for the next several years, producing an eventual total of perhaps 20 Virginia-class boats.
- Begin immediately to design a new "undersea superiority system" with a procurement cost 50% to 67% that of the Virginia-class design, with the goal of achieving a procurement rate of two or three of these boats per year no later than FY2019.
- Study options for extending the service lives of the three Seawolf SSNs and the 31 final Los Angeles-class SSNs to mitigate the projected drop in SSN force levels during the 2020s.
- Reduce the SSBN force from 14 ships to 12 ships and convert an additional two SSBNs into SSGNs, for a total of six SSGNs.
- Study the option of reducing the SSBN force further, to 10 ships, which would permit another two SSBNs to be converted into SSGNs, for a total of eight SSGNs.[8]

[7] CSBA report, slides 154-158.

[8] CSBA report, slides 276, 284, 289, 297, 299.

Destroyers and Cruisers

- Procure a single DDG-1000 in FY2007, using research and development funding, as the first of three surface combatant technology demonstrators.
- Start a design competition for a next generation, modular surface combatant or family of combatants, with capabilities equal to or greater than the DDG-1000/CG(X), but with a substantially lower procurement cost.
- Build two additional surface combatant technology demonstrators to compete against the DDG-1000 design.
- Use the results of this competition to inform the design of a new surface combatant, called SCX, with a procurement cost perhaps one-third to one-half that of the DDG-1000.
- Begin procuring this new design in FY2015 as a replacement for the DDG-1000/CG(X) program.
- Consider modifying the LPD-17 design into a low-cost naval surface fire support ship carrying the Advanced Gun System (AGS) that was to be carried by the DDG-1000.
- Consider procuring two additional DDG-51s to help support the surface combatant industrial base in the near-term.[9]

Littoral Combat Ships and Coast Guard Deepwater Cutters

- Procure six LCSs per year for a total of 84 LCSs—42 of the Lockheed design, and 42 of the General Dynamics design.
- Organize these 84 ships into 42 divisions, each consisting of one Lockheed ship and one General Dynamics ship, so that each division can benefit from the complementary strengths of the two designs.
- Ensure that mission packages for the LCS and mission packages for the Coast Guard's large and medium Deepwater cutters are as mutually compatible as possible.
- Include the Coast Guard's Deepwater cutters when counting ships that contribute to the country's total fleet battle network.
- Begin a research and development and experimentation program aimed at building several competing stealth surface combatant technology demonstrators for operations in contested or denied-access waters.[10]

[9] CSBA report, slides 246, 249, and 251-253. Slide 249 states that possibilities for a reduced-cost alternative to the DDG-1000 include a surface combatant based on the LPD-17 design, a semi-submersible ship built to commercial standards (like a ship called the "Stryker" that was proposed several years ago), and a large or medium "carrier of large objects," perhaps built to relaxed commercial standards.

[10] CSBA report, slides 275, 277, and 283.

Amphibious Ships

- Complete LHD-8 to create a force of eight LHDs.
- Rather than stopping procurement of LPD-17s after the ninth ship in FY2007, as now planned by the Navy, increase the LPD-17 procurement rate to two ships per year and use multiyear procurement (MYP) to procure a total of 24 LPD-17s.
- Retire the 12 existing LSD-41/49 class ships, leaving a 32-ship amphibious fleet consisting of eight LHDs and 24 LPD-17s.
- Form eight "distributed expeditionary strike bases"—each of which would include one LHD, three LPD-17s, one Aegis cruiser, three Aegis destroyers, two LCSs, and one SSGN.[11]

MPF and Other Ships

- Retain the three existing MPF squadrons over the near- to mid-term.
- Reconfigure two of the squadrons for irregular warfare.
- Use the third squadron as a swing asset to either reinforce the two irregular-warfare squadrons or to provide lift for assault follow-on echelon amphibious landing forces.
- Develop high-speed intra-theater and ship-to-shore surface connectors.
- Design an attack cargo ship (TAKA) to help support sustained joint operations ashore, with a target unit procurement cost of $500 million or less, and begin procuring this ship in FY2014.
- Replace the two existing hospital ships, the four existing command ships, and existing support tenders with new ships based on the LPD-17 design.
- Initiate a joint experimental program for future sea-basing platforms and technologies.[12]

The CSBA report raises several questions about the Navy's emerging sea basing concept for conducting expeditionary operations ashore. The report states:

> The work done thus far on sea basing is intriguing, but neither the concept nor the supporting technologies appear sufficiently mature to justify any near-term decisions such as canceling LPD-17 [procurement] in favor of MPF(F) ships, or removing the well deck from the big deck amphibious assault platforms, both of which would severely curtail the [fleet's] ability to launch surface assaults over the longer term.
>
> Given these large uncertainties, no major moves toward the sea basing vision should be made without further exploring the sea basing concept itself, and experimenting with different numbers and types of sea base platforms, connectors, and capabilities.[13]

[11] CSBA report, slides 227 and 236.

[12] CSBA report, slides 228-232, and 307.

[13] CSBA report, slide 212.

Observations

Observations about the CNA, OFT, and CSBA reports can be made on several points, including the following:

- organizations and authors;
- analytical approach;
- use of prospective ship-procurement funding levels as a force-planning consideration;
- fleet size and structure;
- whether the recommended force qualifies as an alternative fleet architecture;
- fleet capability;
- transition risks; and
- implications for the industrial base.

Each of these is discussed below.

Organizations and Authors

CNA Report

CNA is a federally funded research and development center (FFRDC) that does much of its analytical at the Navy's request. The CNA report's discussion of how crew rotation may alter force-level requirements for maintaining day-to-day forward deployments is somewhat detailed and may have been adapted from other work that CNA has done on the topic for the Navy.

OFT Report

The OFT report was prepared under the direction of retired Navy admiral Arthur Cebrowski, who was the director of OFT from October 29, 2001 until January 31, 2005 and the President of the Naval War College (NWC) from July 24, 1998 to August 22, 2001. During his time at NWC and OFT, Cebrowski was a leading proponent of network-centric warfare and distributed force architectures.

CSBA Report

The CSBA report was prepared by Robert Work, CSBA's analyst for maritime issues. CSBA describes itself as "an independent, policy research institute established to promote innovative thinking about defense planning and investment strategies for the 21st century. CSBA's analytic-based research makes clear the inextricable link between defense strategies and budgets in fostering a more effective and efficient defense, and the need to transform the US military in light of an emerging military revolution."[14] CSBA's Executive Director is Dr. Andrew F.

[14] See CSBA's website http://www.csbaonline.org.

Krepinevich, Jr., whose previous experience includes work in DOD's Office of Net Assessment, the office directed by Andrew Marshall. Krepinevich is generally considered a major writer on defense transformation.

Analytical Approach

CNA Report

The CNA report grounds its analysis in traditional DOD force-planning considerations and campaign modeling. The report cites past DOD force-planning studies that reflect similar approaches. The implicit argument in the CNA report is that its findings have weight in part because they reflect a well-established and systematic approach to the problem.

OFT Report

In contrast to the CNA report, the OFT report "calls into question the viability of the longstanding logic of naval force building."[15] The OFT report grounds its analysis in four major force-design principles that the report identifies as responsive to future strategic challenges and technological opportunities.[16] The report then seeks to design a fleet that it is consistent with these principles, and assesses that fleet using a new set of metrics that the report believes to be consistent with these principles. The implicit argument in the OFT report is that its findings have weight in part because they reflect major force-design principles that respond to future strategic challenges and technological opportunities.

CSBA Report

The CSBA report employs an extensive historical analysis of the missions and structure of the U.S. Navy and other navies. The report argues that the structure of the U.S. Navy has shifted over time in response to changes in technology and U.S. security challenges, and that U.S. military forces have entered a new security era (which the report calls the "Joint Expeditionary Era") during which the U.S. Navy will need to do three things.[17] To do these three things, the report argues, the Navy should be structured to include four different force elements.[18] The report constructs these four force elements and then combines them to arrive at an overall recommended Navy force structure. The implicit argument in the CSBA report is that its findings have weight in part because they reflect insights about future missions and force requirements gained through careful historical analysis of the missions and structure of the U.S. Navy and other navies.

[15] OFT report, p. 1.

[16] The principles are complexity, smaller ships and improved payload fraction, network-centric warfare, and modularity.

[17] These three things are: (1) contribute to the global war on terrorism (GWOT); (2) prepare for possible nuclear-armed regional competitors; and (3) hedge against the possibility of a disruptive maritime competition with China.

[18] These four force elements are: (1) a sea-based power-projection and regional deterrence force; (2) a global patrol, GWOT, and homeland defense force; (3) a force for prevailing over enemy anti-access/area-denial forces; and (4) a strategic deterrence and dissuasion force.

Prospective Ship-Procurement Funding Levels as Consideration

CNA Report

The CNA report aimed at designing a cost-effective fleet. It also mentions cost estimates relating to the option of homeporting additional attack submarines at Guam.[19] Prospective ship-procurement funding levels, however, are not prominently featured in the CNA report as a force-planning consideration.

OFT Report

Prospective ship-procurement funding levels are a significant force-planning consideration in the OFT report. The report argues that an important metric for assessing a proposed fleet architecture is the ease or difficulty with which it can be scaled up or down to adapt to changes in ship-procurement funding levels.

The OFT report contains a fairly detailed discussion of the Navy's budget situation that calls into question, on several grounds, the Navy's prospective ability to afford its 375-ship proposal. The report concludes that funding for Navy ship-procurement in future years may fall as much as 40% short of what would be needed to achieve the Navy's 375-ship fleet proposal. If the shortfall is 40%, the report estimates, the Navy could maintain a force of 270 to 315 ships, which is comparable in number to today's force of 282 ships, except that the future force would include a substantial number of relatively inexpensive LCSs. If proportionate reductions are applied to the OFT fleets shown in **Table 2**, Alternative A would include 402 to 469 ships, Alternative B would include 557 to 650 ships, and Alternative C would include 609 to 711 ships. Again, these totals would not include certain kinds of ships (independently operating SSNs, etc.) that are included in the total of 270 to 315 ships associated with the Navy's currently planned architecture.

CSBA Report

As with the OFT report, prospective ship-procurement funding levels are a significant force-planning consideration in the CSBA report. The CSBA report estimates that in future years, the Navy may have an average of about $10 billion per year in ship-acquisition funding. The report then aims at designing a force whose ships could be acquired for this average annual amount of funding.

[19] CNA Report, p. 36.

Fleet Size and Structure

CNA Report

The 380-ship fleet at the high end of the CNA range is similar in size and composition to the Navy's 375-ship fleet proposal. The 256-ship fleet at the low end of the CNA range is similar in size and composition to the Navy's 260-ship fleet for FY2035, except that the 260-ship fleet has more LCSs and fewer ships in the "other ships" category.[20]

OFT Report

The OFT-recommended fleet would have a much larger total number of ships than the Navy's planned fleet. The OFT fleet would also feature a much larger share of small combatants. Of the ships shown in **Table 2**, the small combatants account for about 75% in Alternative A, about 79% in Alternative B, and about 72% in Alternative C. (Adding into the mix SSNs and other kinds of ships not shown in **Table 2** would reduce these percentages somewhat.) In the Navy's notional 260- and 325-ship fleets, by contrast, LCSs account for about 25% of the total number of ships.

The OFT architecture is similar in certain ways to a fleet architecture proposed by the Naval Surface Warfare Center (NSWC) between 1989 and 1992 and sometimes referred to as the Carrier of Large Objects (CLO) proposal. The NSWC architecture, like the OFT architecture, employed a common hull design for a large ship that could be built in several variants for various missions, including aviation, missile launching and fire support, amphibious warfare, logistics support, and mother-ship support of small, fast, surface combatants. The small, fast surface combatants in the NSWC architecture were called scout fighters and were in the same general size range as the 100- and 1,000-ton surface combatants in the OFT architecture.[21]

CSBA Report

The CSBA force would have about the same total number of ships as the Navy's 375-ship fleet proposal. CSBA's subtotals for some ship categories are similar to subtotals in one or more of the other fleet proposals shown in **Table 1**. Significant differences between the CSBA proposal and the other fleet proposals shown in **Table 3** include:

[20] Additional points of comparison: The CNA range of 256 to 380 ships overlaps with potential ranges of 290 to 375 ships, 260 to 325 ships, and 243 to 302 ships presented in the Navy's February 2005 testimony to Congress. The mid-point of the CNA-recommended range (318 ships) is similar in terms of total numbers of ships to the 310-ship fleet from the 2001 Quadrennial Defense Review (QDR). Unlike the 2001 QDR fleet, however, the CNA-recommended force includes several dozen Littoral Combat Ships (LCSs) and smaller numbers of other kinds of ships.

[21] For more on this proposed fleet architecture, see Norman Polmar, "Carrying Large Objects," *U.S. Naval Institute Proceedings*, December 1990, pp. 121-122; Michael L. Bosworth *et al*, "Multimission Ship Design for an Alternative Fleet Concept," *Naval Engineers Journal*, May 1991, pp. 91-106; Michael L. Bosworth, "Fleet Versatility by Distributed Aviation," *U.S. Naval Institute Proceedings*, Jan. 1992, pp. 99-102; and Victor A. Meyer, "Naval Surface Warfighting Vision 2030," *Naval Engineers Journal*, May 1992, pp. 74-88. See also "USN's '2030' Plan For Future Fleet," *Sea Power*, Apr. 1992, pp. 79, 82; Edward J. Walsh, "'Alternative Battle Force' Stresses Commonality, Capability," *Sea Power*, Feb. 1991, pp. 33-35; Robert Holzer, "Navy Floats Revolutionary Ship Design for Future Fleet," *Defense News*, May 14, 1990, pp. 4, 52; and Anne Rumsey, "Navy Plans Ship Look-A-Likes," *Defense Week*, Mar. 13, 1989, p. 3.

- the four medium-sized aircraft carriers (CVEs);
- the conversion of a carrier into an afloat forward staging base;
- the composition of the cruiser-destroyer force (which would include SCXs rather than DDG-1000s and CG(X)s);
- the composition of the amphibious fleet (which would have additional LPD-17s in lieu of today's LSD-41/49s); and
- the composition of the maritime prepositioning force (which would continue to include, for a time at least, today's MPF ships rather than the Navy's planned MPF(F) ships).

Does it Qualify as an Alternative Force Architecture

CNA Report

As mentioned earlier, the CNA report uses essentially the same kinds of ships and naval formations as those planned by the Navy. If an alternative fleet platform architecture is defined as one that uses ship types or naval formations that differ in some significant way from those currently used or planned, then the CNA-recommended force arguably would not qualify as an alternative fleet platform architecture.

OFT Report

Since the OFT report proposes building ships that are substantially different from those currently planned, and combines them ships into formations which, although similar in name to currently planned formations (i.e., CSGs, ESGs, and SSGs), might be viewed by some observers as substantially different in composition from the currently planned versions of these formations, the OFT-recommended force arguably would qualify as an alternative fleet platform architecture.

CSBA Report

Since the CSBA report proposes building ships that in some cases are different from those currently planned, and combines these ships into formations that in some cases are different in composition from those currently planned, the CSBA-recommended force arguably would qualify as an alternative fleet platform architecture, though less dramatically so than the OFT-recommended force.

New Ship Designs

CNA Report

The CNA report does not propose any ship designs other than those already planned by the Navy.

OFT Report

The 57,000-ton aircraft carrier in the OFT report would be roughly the same size as the United Kingdom's new aircraft carrier design, and somewhat larger than the U.S. Navy's 40,000-ton LHA/LHD-type amphibious assault ships. Compared to the U.S. Navy's aircraft carriers, which displace 81,000 to 102,000 tons, this ship could be considered a medium-size carrier.

The 57,000-ton missile-and-rocket ship in the OFT report could be considered similar in some respects to the Navy/DARPA arsenal ship concept of 1996-1997, which would have been a large, relatively simple surface ship equipped with about 500 VLS tubes.[22]

The 13,500-ton aircraft carrier in the OFT report would be slightly larger than Thailand's aircraft carrier, which was commissioned in 1997, and somewhat smaller than Spain's aircraft carrier, which was based on a U.S. design and was commissioned in 1988. Due to its SES/catamaran hull design, this 13,500-ton ship would be much faster than the Thai and Spanish carriers (or any other aircraft carrier now in operation), and might have a larger flight deck. This ship could be considered a small, high-speed aircraft carrier.

The 1,000- and 100-ton surface combatants in the OFT report could be viewed as similar to, but smaller than, the 2,500- to 3,000-ton Littoral Combat Ship (LCS). Compared to the LCS, they would be closer in size to the Streetfighter concept (a precursor to the LCS that was proposed by retired admiral Cebrowski during his time at the Naval War College).

The AIP submarine in the OFT report could be similar to AIP submarines currently being developed and acquired by a some foreign navies.

CSBA Report

The proposal in the CSBA report for an afloat forward staging base (AFSB) is similar to other proposals for AFSBs that have been reported in recent years, though other proposals have suggested using commercial ships or military sealift ships rather than converted aircraft carriers as the basis for the AFSB.[23]

The CVE in the CSBA report, like the 57,000-ton carrier in the OFT report, can be viewed as a medium-sized carrier. With a full load displacement of perhaps about 40,000 tons, the CVE would be somewhat smaller than the 57,000-ton carrier and consequently might embark a smaller air wing. The CVE, however, would be based on the LHA(R) amphibious ship design rather than a merchant-like hull, and consequently could incorporate more survivability features than the 57,000-ton carrier.

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[22] For more on the arsenal ship, see CRS Report 97-455, *Navy/DARPA Arsenal Ship Program: Issues and Options for Congress*, by Ronald O'Rourke; and CRS Report 97-1044, *Navy/DARPA Maritime Fire Support Demonstrator (Arsenal Ship) Program: Issues Arising From Its Termination*, by Ronald O'Rourke. Both reports are out of print and are available directly from the author.

[23] See, for example, Stephen M. Carmel, "A Commercial Approach to Sea Basing—Afloat Forward Staging Bases," *U.S. Naval Institute Proceedings*, Jan. 2004, pp. 78-79; Christopher J. Castelli, "Budget Anticipates Developing MPF(F) Aviation Variant From LMSR," *Inside the Navy*, Jan. 19, 2004; Christopher J. Castelli, "Brewer Proposes Commercial Ship To Test Seabasing Technologies," *Inside the Navy*, Jan. 27, 2003; Christopher J. Castelli, "In POM-04, Navy Cancels JCC(X), Plans To Substitute MPF(F) Variant," *Inside the Navy*, Sept. 2, 2002; Christopher J. Castelli, "Navy May Develop New Support Ships, Pursue Sealift Experimentation," *Inside the Navy*, May 27, 2002.

Fleet Capability

CNA Report

The CNA report uses essentially the same kinds of ships and formations as planned by the Navy, and recommends generally the same numbers of ships as a function of force-planning variables such as use of crew rotation. As a consequence, the CNA-recommended force range would be roughly similar in overall capability to the Navy's planned architecture.

OFT Report

The OFT architecture differs so significantly from the Navy's planned architecture that assessing its capability relative to the Navy's planned architecture is not easy. As a general matter, the OFT report stresses overall fleet survivability more than individual-ship survivability, and argues that fleet effectiveness can be enhanced by presenting the enemy with a complex task of having to detect, track, and target large numbers of enemy ships. The OFT report argues that in addition to warfighting capability, a fleet can be judged in terms of its capability for adapting to changes in strategic demands and funding levels.[24]

Readers who agree with most or all of these propositions might conclude that the OFT-recommended architecture would be more capable than the Navy's planned architecture. Readers who disagree with most or all of these propositions might conclude that the OFT-recommended architecture would be less capable than the Navy's planned architecture. Readers who agree with some of these propositions but not others (or who agree with these propositions up to a certain point, but less fervently than OFT), might conclude that the OFT-recommended architecture might be roughly equal in total capability to the Navy's planned architecture.

In addressing the question of fleet capability, the OFT report states:

> Alternative fleet formations consisting of small fast and relatively inexpensive craft combining knowledge and attaining flexibility through networking appear superior to the programmed fleet for non-traditional warfare in a variety of settings. This is due to

[24] The OFT report argues that its recommended fleet architecture would:

- "provide a quantum leap ahead in capabilities against a spectrum of enemies ranging from large, highly developed competitors to small but determined asymmetric adversaries" (page 6) and be adaptable, in a dynamic and less-predictable security environment, to changing strategic or operational challenges;
- be capable of both participating in joint expeditionary operations and maintaining "the strategic advantage the Navy has developed in the global commons," avoiding a need to choose between optimizing the fleet for "performance against asymmetric challenges at the expense of its ability to confront a potential adversary capable of traditional high intensity conflict," such as China; (pages 1 and 2)
- pose significant challenges to adversaries seeking to counter U.S. naval forces due to the "large numbers of combat entities that the enemy must deal with; a great variety of platforms with which the enemy must contend; speed; different combinations of forces; distribution of forces across large areas; and [adversary] uncertainty as to the mission and capabilities of a given platform;" (page i)
- permit more constant experimentation with new operational concepts, and thereby achieve higher rates of learning about how to evolve the fleet over time; and
- recognize potential future constraints on Navy budgets and make the Navy more smoothly scalable to various potential future resource levels by shifting from a fleet composed of limited numbers of relatively expensive ships to one composed of larger numbers of less expensive ships.

> increasing the complexity the enemy faces and increasing U.S. fleet options that in turn reduce enemy options. The speed and complexity of the alternative fleets can provide them with the capability to complicate and possibly defeat the attempts of non-traditional adversaries to elude surveillance. The enemy could have difficulty determining what to expect and how to defeat them all. The superior speed and more numerous participants than in the programmed fleet provide a stronger intelligence base and more numerous platforms from which to conduct strikes and interceptions. This appears to be true even if the smaller craft are *individually* somewhat less capable and less able to sustain a hit than the larger ships in the programmed fleet.
>
> If these circumstances are not achieved, and the enemy can continue to elude and deceive, the [Navy's] programmed fleet often is as good as the [OFT] alternatives, sometimes even better. It is not necessarily better in cases in which individual ship survivability dominates, a perhaps counterintuitive result until we realize that *fleet* survivability not *individual ship* survivability is what dominates.
>
> An area in which programmed fleets might have an advantage would be when the long loiter time or deep reach of CTOL [conventional takeoff and landing] aircraft on programmed big-deck CVNs [nuclear-powered aircraft carriers] is needed. That said, there need be no great sacrifice. With airborne tanking, the VSTOL [very short takeoff and landing] aircraft in the alternatives could meet the deep strike and long loiter demands. Also, as mentioned earlier, a combination of advances in EMALS [electromagnetic aircraft launch system] and modifications to the JSF will make it possible to launch the JSF with only a marginal range-payload capability penalty. Moreover, trends in technology are providing *unmanned* aircraft greater capability, including greater loiter time and sensor capability.[25]

CSBA Report

The CSBA report argues that its architecture would provide a total capability equal to that of the Navy's planned architecture, but at a lower total cost, because the CSBA architecture would:

- employ new ship designs, such the new undersea superiority system and the SCX, that, because of their newer technologies, would cost less than, but be equal in capability to, current designs such as the Virginia-class SSN and DDG-1000 destroyer; and
- make more use of the LPD-17 hull design, whose basic design costs have already been paid, and which can be produced efficiently in large numbers and adapted economically to meet various mission requirements.

It is plausible that using newer technologies would permit new, reduced-cost, ship designs to be more capable than such designs would have been in the past. Whether the increases in capability would always be enough to permit these ships to be equal in capability to more expensive current designs is less clear. The Navy may be able to achieve this with a new SSN design, because several new submarine technologies have emerged since the Virginia-class design was developed in the 1990s, but achieving this with a new large surface combatant design could be more challenging, because the DDG-1000 design was developed within the last few years and few new surface combatant technologies may have emerged since that time. If one or more of the reduced-cost designs turn out to be less capable than current designs, then the CSBA architecture would not generate as much total capability as the report projects.

[25] OFT report, pp. 75-76. Italics as in the original.

The CSBA report also argues that its architecture would produce a force with a mix of capabilities that would better fit future strategic demands. To achieve this, the report recommends, among other things, reducing currently planned near-term procurement of new destroyers and MPF(F) ships, increasing currently planned procurement of new amphibious ships, and a changing the currently planned investment mix for aircraft carriers.

Readers who agree with CSBA's description of future strategic demands, and who agree that CSBA's recommended investment changes respond to those demands, might conclude that the CSBA-recommended architecture would be better optimized than the Navy's planned architecture to meet future needs. Readers who disagree with one or both of these propositions might conclude that the Navy's planned architecture might be better optimized, or that neither architecture offers clear advantages in this regard.

Implementation Risks

CNA Report

Implementation risks associated with the force recommended in the CNA report include developing and designing the various types of ships included in the plan—including in particular the DDG-1000 destroyer, which is to incorporate a number of new technologies—and the issue of whether Navy funding levels in coming years would be adequate to build and maintain the recommended fleet.

OFT Report

The OFT report does not include a detailed plan for transitioning from today's fleet architecture to its proposed architecture,[26] but such a plan could be developed as a follow-on analysis. The plan could involve replacing existing ship designs and associated formations as they retire with OFT's recommended new ship designs and associated formations. Implementation risks associated with the force recommended in the OFT report include developing and designing the eight new types of ships included in the plan, including the four types of large ships based on the 57,000-ton commercial-like hull, the 13,500-ton SES/catamaran aircraft carrier (since it would be much larger than other SES/catamaran ships), the AIP submarine (since the AIP technology is

[26] On the topic of transitioning to the proposed fleet architecture, the report states:

> Implementation of the alternative fleet architecture should start now and should target option generation, short construction time, and technology insertion. The alternative further provides an opportunity to reinvigorate the shipbuilding industrial base. The many smaller ships, manned and unmanned, in the alternative fleet architecture could be built in more shipyards and would be relevant to overseas markets. The potential longevity of the existing fleet will sustain existing shipyards as they move into building smaller ships more rapidly in this broader market and more competitive environment. The shipyards would develop a competence, broad relevance, and operate in an environment driven by market imperatives instead of a framework of laws that frustrates market forces.
>
> As the new ships enter service and the fleet has the opportunity to experiment with new operational concepts (expanded network-centric warfare in particular) existing ships can be retired sooner to capture operations savings. At this point, the sooner the existing fleet is retired, the sooner the benefits of the alternative fleet architecture design will accrue. (Page 3)

Additional general discussion of implementation is found on pp. 76-77 of the report.

relatively new and a non-nuclear-powered submarine has not been designed and built for the U.S. Navy since the 1950s), and the 1,000- and 100-ton surface combatants (since new technologies are needed to achieve the increased payload fraction that these ships are to have). The OFT-recommended force could pose implementation risks due to the new kinds of naval formations that would be used, which could require development of new doctrine, concepts of operations, and tactics.

CSBA Report

A stated goal of the CSBA report is to provide a detailed, practical transition road map for shifting from today's fleet structure to the report's recommended fleet structure. The many specific recommendations made in the report could be viewed as forming such a road map. Implementation risks associated with the force recommended in the CSBA report include developing and designing the reduced-cost SSN and the reduced-cost SCX surface combatant, particularly since these two new ship designs are to be equal in capability to the more expensive designs they would replace.

Implications for Industrial Base

CNA Report

Since the CNA report uses essentially the same kinds of ships and naval formations as those in use today or planned by the Navy, and recommends similar numbers of ships, the industrial-base implications of the CNA-recommended force would appear to be similar to those of the Navy's current plans.

OFT Report

The OFT report seeks to reduce unit shipbuilding costs, and thereby permit an increase in total ship numbers, by shifting the fleet away from complex, highly integrated ship designs that are inherently expensive to build and toward less-complex merchant-like hulls and small sea frames that are inherently less expensive to build. Similarly, the OFT report seeks to increase shipbuilding options for the Navy by shifting the fleet away from complex, highly integrated ship designs that can be built only by a limited number of U.S. shipyards and toward less-complex merchant-like hulls and small sea frames that can be built by a broader array of shipyards. The OFT report also aims to make it easier and less expensive to modernize ships over their long lives, and thereby take better advantage of rapid developments in technology, by shifting from highly integrated ship designs to merchant-like hulls and sea frames.

As a consequence of these objectives, the OFT report poses a significant potential business challenge to the six shipyards that have built the Navy's major warships in recent years. The report's discussion on implementing its proposed architecture states in part:

> The shipbuilding industrial base would also need to start to retool to build different types of ships more rapidly. Smaller shipyards, which presently do little or no work for the Navy could compete to build the smaller ships, thereby broadening the capabilities base of ship design and construction available to the Navy. The change to smaller, lower unit cost ships would also open up overseas markets. With more shipyards able to build the ships and potential for a broader overall market, the U.S. shipbuilding industry would have the chance

> to expand its competence, innovation and relevance. Taken together this would sharpen the industry's ability to compete and provide alternatives to a ship procurement system that is beset by laws and regulations that frustrate, even pervert, market forces.[27]

The report's concluding section lists five "dangers" that "risk the Navy's 'losing the way.'" One of these, the report states, is "Shielding the shipbuilding industrial base from global competition," which the report states "guarantees high cost, limited innovation, and long cycle times for building ships."[28]

CSBA Report

The CSBA report similarly raised significant potential issues for the six shipyards that have built the Navy's major warships in recent years. The report states that "Rationalizing the defense industrial base is... a critical part of DoN's [the Department of the Navy's] maritime competition strategy, and should be the subject of immediate consideration and deliberation by the Congress, DoD, and the DoN."[29] The report states:

> Numerous studies have indicated that the six Tier I yards [i.e., the six yards that have built the Navy's major warships in recent years] have "exorbitant excess capacities," which contribute to the rising costs of [Navy] warships, primarily because of high industrial overhead costs. These capacities are the result of "cabotage laws and fluctuating national security acquisition policies that force shipbuilders of combatants to retain capacities to address required surges in coming years." This last point is especially important: the DoN contributes greatly to the problem of "exorbitant capacities" by its consistent tendency to portray overly optimistic ramp ups in ship production in budget "out years."[30]

The report recommends the following as part of its overall transition strategy:

- Minimize production costs for more expensive warships (defined in the report as ships costing more than $1.4 billion each) by consolidating production of each kind of such ship in a single shipyard, pursuing learning curve efficiencies, and requesting use of multiyear procurement (MYP) whenever possible.
- Minimize production costs for warships and auxiliaries costing less than $1.4 billion each by emphasizing competition, shifting production to smaller "Tier II" yards, using large production runs, and enforcing ruthless cost control.[31]

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[27] OFT report, p. 76.

[28] OFT report, p. 80.

[29] CSBA report, slide 314.

[30] CSBA report, slide 315.

[31] CSBA report, slide 316. Other steps recommended as part of the report's overall transition strategy (see slides 124 and 125) include the following:

- Plan to a fiscally prudent steady-state shipbuilding budget of $10 billion per year.
- Maximize current capabilities and minimize nonrecurring engineering costs for new platforms by maintaining and pursuing hulls in service, in production or near production that can meet near- to mid-term GWOT requirements and that are capable of operating in defended-access scenarios against nuclear-armed regional adversaries.
- Identify and retain or build large numbers of common hulls that have a large amount of internal reconfigurable volume, or that can carry a variety of modular payloads, or that can be easily modified or adapted over time to new missions.

(continued...)

The report states that "the strategy developed in this report suggests that [Navy] planners might wish to:"

- maintain production of aircraft carriers at NGNN,
- consolidate production of large surface combatants and amphibious ships at NG/Ingalls, and
- consolidate submarine building GD/EB, or with a new, single submarine production company.[32]

The report states that the second of these possibilities is guided by the building sequence of LPD-17s and SCXs recommended in the report, NG/Ingalls' ability to build a wider variety of ships than GD/BIW, NG/Ingalls' surge capacity, and the availability of space for expanding NG/Ingalls if needed.[33]

The report states that the third of these possibilities is guided by the low probability that procurement of Virginia-class submarines will increase to two per year, the cost savings associated with consolidating submarine production at one yard, GD/EB's past experience in building SSBNs and SSNs, GD/EB's surge capacity, and the fact that building submarines at GD/EB would maintain two shipyards (GD/EB and NGNN) capable of designing and building nuclear-powered combatants of some kind.[34]

The report acknowledges that yard consolidation would reduce the possibilities for using competition in shipbuilding in the near term and increase risks associated with an attack on the shipbuilding infrastructure, but notes that DOD consolidated construction of nuclear-powered carriers in a single yard years ago, and argues that competition might be possible in the longer run if future aircraft-carrying ships, the SCX, and the new undersea superiority system could be built in Tier II yards.[35]

The report states:

> Given their current small yearly build numbers, consolidating construction of aircraft carriers, surface combatants, and submarines in one yard [for each type] makes sense. However, the same logic does not hold true for auxiliaries and smaller combatants. These ships can normally be built at a variety of Tier I and Tier II yards; competition can thus be maintained in a reasonable and cost-effective way. For example, competing auxiliaries and sea lift and maneuver sea base ships between NASSCO, Avondale, and Tier II yards may help to keep the costs of these ships down.

(...continued)

- Pursue increased integration of Navy and Marine warfighting capabilities and emphasize common systems to increase operational effectiveness and reduce operation and support (O&S) costs.
- Focus research and development efforts on meeting future disruptive maritime challenges, particularly anti-access/area-denial networks composed of long-range systems and possibly weapons of mass destruction.

[32] CSBA report, slides 317-318.

[33] CSBA report, slide 318.

[34] CSBA report, slide 318. See also slide 298.

[35] CSBA report, slides 318-319.

> Building multiple classes of a single ship [type] is another prudent way to enforce costs, since the DoN can divert production of any ship class that exceeds its cost target to another company/class that does not. Simultaneously building both the [Lockheed] and [General Dynamics] versions of [the] LCS, and the Northrop Grumman National Security Cutter, Medium [i.e., the medium-sized Deepwater cutter] gives the DoN enduring capability to shift production to whatever ship stays within its cost target....
>
> Of course, Congress and the DoN may elect to retain industrial capacity, and to pay the additional "insurance premium" associated with having excess shipbuilding capacity. For example: Congress and the DoN might wish to retain two submarine yards until the [undersea superiority system] design is clear, and wait to rationalize the submarine building base after potential [undersea superiority system] yearly production rates are clear....
>
> In a similar vein, Congress and the DoN might wish to retain two surface combatant yards until the design of the SCX is clear, and wait to rationalize the surface combatant building base after potential SCX yearly production rates are clear. In this regard, Congress could consider authorizing a modest additional number of [Aegis destroyers] to keep both BIW and Ingalls "hot" until the SCX is designed....
>
> The key point is that the US shipbuilding infrastructure must be rationally sized for expected future austere shipbuilding budgets, and whatever fiscally prudent [Navy] transition plan is finally developed by DoN planners.[36]

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[36] CSBA report, slide 319.