

CRS Report for Congress

Received through the CRS Web

Potential Navy Force Structure and Shipbuilding Plans: Background and Issues for Congress

Updated March 30, 2005

Ronald O'Rourke
Specialist in National Defense
Foreign Affairs, Defense, and Trade Division

Potential Navy Force Structure and Shipbuilding Plans: Background and Issues for Congress

Summary

In February 2005, the Navy testified that the Navy in future years may require a total of 260 to 325 ships, or possibly 243 to 302 ships, depending on how much the Navy uses new technologies and a new ship crewing and deployment method called Sea Swap. In March 2005, the Navy provided a report to Congress showing the notional compositions of 260- and 325-ship fleets in FY2035.

Navy ambiguity regarding required numbers of ships, together with proposed reductions and delays in Navy ship-procurement programs in the FY2006-FY2011 Future Years Defense Plan (FYDP), have caused concern among Members of Congress and others about future Navy capabilities and the shipbuilding industrial base. Ambiguity regarding required numbers of Navy ships may cause business-planning uncertainty for companies that own shipyards, and may make it difficult, if not impossible, for Congress to conduct effective oversight of the Navy budget and ship-procurement programs.

Historical figures for the total number of ships in the Navy are not necessarily a reliable yardstick for assessing the adequacy of today's Navy or a future planned Navy that includes a certain number of ships. Similarly, trends over time in the total number of ships in the Navy are not necessarily a reliable indicator of the direction of change over time in the fleet's ability to perform its stated missions.

Current force-planning issues that Congress may consider in assessing how large a Navy the United States needs include new technologies that may affect U.S. Navy ship capabilities; Navy ship homeporting arrangements and deployment methods; sea-based missile defense; the sea basing concept for conducting expeditionary operations ashore; naval requirements for the global war on terrorism and irregular conflicts; the possible emergence over the next 10 to 25 years of significantly more capable Chinese maritime military forces; DOD's increased emphasis on achieving full jointness in U.S. military operations; and potential tradeoffs between funding Navy requirements and funding competing defense requirements.

In assessing how many shipyards should be regularly involved in Navy shipbuilding in coming years, Congress may consider a number of factors, including shipyard production capacities, the potential shipbuilding rate for a fleet of 260 to 325 ships, the potential need to surge to a higher rate of production, the potential for creating new shipyards or reopening closed ones, shipyard fixed overhead costs, costs associated with split learning curves and government supervision of Navy shipbuilding work, competition in design and construction of Navy ships, regional labor markets, potential shipyard work other than Navy shipbuilding, the geographic base of support for Navy shipbuilding, and the distribution of the economic benefits of shipbuilding around the country. This report will be updated as events warrant.

Contents

Introduction and Issue for Congress	1
Background	2
Ambiguity In Navy Requirements For Numbers Of Ships	2
310-Ship Plan From 2001 QDR	2
Navy 375-Ship Proposal Of 2002-2004	3
2005 Navy Testimony On Fleet Of 260 To 325 Ships	4
Capabilities-Based Planning and Numbers of Ships	7
Independent Studies on Navy Force Structure	8
Implications Of Ambiguity In Navy Force-Structure Plans	8
For the Navy	8
For Congress	9
For Industry	9
Potential Oversight Questions Arising From This Ambiguity	10
Navy FY2006-FY2011 Ship-Procurement Plan	11
Overall Ship Procurement Rate	11
Individual Shipbuilding Programs	12
Issues for Congress	15
Number of Ships in the Navy	15
Capabilities-Based Planning and Numbers of Ships	15
Historical Fleet Numbers As A Yardstick	15
Previous Force Structure Plans As A Yardstick	17
Current Force-Planning Issues	18
Potential Oversight Questions	22
Number of Yards Involved in Navy Shipbuilding	23
Candidate Yards	23
Factors to Consider	23
Potential Oversight Questions	34
Legislative Activity in the 109 th Congress	35
National Naval Force Structure Policy Act (H.R. 375)	35
H.R. 304/S. 145 On Aircraft Carrier Force Levels	35
Legislative Activity in the 108 th Congress	35
FY2004 Defense Authorization Bill (H.R. 1588/P.L. 108-136)	35
FY2005 Defense Authorization Bill (H.R. 4200/P.L. 108-375)	36
Appendix A: Independent Studies On Navy Force Structure	39
CNA Report	39
OFT Report	41
CSBA Report	49
Appendix B: Size of Navy and Navy Shipbuilding Rate	58

List of Tables

Table 1. Navy Ship Force Structure Plans	6
Table 2. Navy FY2006-FY2011 Ship-Procurement Plan	11
Table 3. Annual Shipyard Production Capacities	24
Table 4. Steady-State Ship Procurement Rate for Fleet of 260 to 325 Ships ...	26
Table 5. CNA-Recommended Force and 375-Ship Proposal	40
Table 6. Alternative fleet structures from OFT report	45
Table 7. CSBA-Recommended Force and 375-Ship Proposal	51
Table 8. Battle force ships procured (FY1982-FY2005) or <i>projected</i> (<i>FY2006-FY2011</i>)	58

Potential Navy Force Structure and Shipbuilding Plans: Background and Issues for Congress

Introduction and Issue for Congress

In February 2005, the Navy testified that the Navy in future years may require a total of 260 to 325 ships, or possibly 243 to 302 ships, depending on how much the Navy uses new technologies and a new ship crewing and deployment method called Sea Swap.¹ In March 2005, the Navy provided a report to Congress showing the notional compositions of 260- and 325-ship fleets in FY2035.

Navy ambiguity regarding required numbers of ships, together with proposed reductions and delays in Navy ship-procurement programs in the FY2006-FY2011 Future Years Defense Plan (FYDP), have caused concern among Members of Congress and others about future Navy capabilities and the shipbuilding industrial base.

The issue for Congress is how to respond to Navy ambiguity regarding required numbers of ships and proposed reductions and delays in planned Navy shipbuilding programs. Decisions that Congress makes regarding Navy force structure and shipbuilding programs could significantly affect future U.S. military capabilities, Navy funding requirements, and the Navy shipbuilding industrial base.

The next section of the report discusses the following background questions:

- Why is there ambiguity regarding required numbers of Navy ships?
- How does capabilities-based planning relate to required numbers of Navy ships?
- What independent studies are available concerning required numbers of Navy ships?

¹ Sea Swap is the Navy's term for the concept of deploying Navy ships for extended lengths of time (e.g., 12, 18, or 24 months, rather than the standard six months) and rotating successive crews to the ship, with each crew serving aboard the ship for six months. The concept reduces the number of ships needed to maintain day-to-day forward deployments of Navy ships by reducing the number of times that ships need to transit between their home port and overseas operating areas. For more on Sea Swap and other new approaches for deploying Navy ships, see CRS Report RS21338, *Navy Ship Deployments: New Approaches — Background and Issues for Congress*, by Ronald O'Rourke.

- What are the potential implications for the Navy, Congress, and industry of Navy ambiguity regarding required numbers of ships?
- What potential oversight questions for Congress arise from this ambiguity?
- How does the Navy's newly proposed FY2006-FY2011 ship-procurement plan compare to previous plans?

The section that follows discusses two potential issues for Congress:

- In terms of numbers of ships, how large a Navy does the United States need, and what current force-planning issues may affect these numbers?
- How many shipyards should be regularly involved in Navy shipbuilding?

The final section of the report presents recent legislative activity on these issues.

Background

Ambiguity In Navy Requirements For Numbers Of Ships

Why is there ambiguity regarding required numbers of Navy ships?

310-Ship Plan From 2001 QDR. The last unambiguous ship force structure plan for the Navy that was officially approved and published by the Office of the Secretary of Defense (OSD) appeared in the September 2001 report on the 2001 Quadrennial Defense Review (QDR). This plan, like the one approved in the 1997 QDR, included 12 aircraft carriers, 116 surface combatants, 55 nuclear-powered attack submarines (SSNs),² and 36 amphibious ships organized into 12 amphibious ready groups (ARGs) with a combined capability to lift the assault echelons of 2.5 Marine Expeditionary Brigades (MEBs).³ Although the 2001 QDR report did not mention a total number of ships, this fleet was generally understood to include a total of about 310 battle force ships.⁴ The 2001 QDR report also stated that as DOD's

² The plan approved in the 1997 QDR originally included 50 SSNs but was subsequently amended to include 55 SSNs.

³ U.S. Department of Defense, *Quadrennial Defense Review Report*, Washington, 2001, p. 22.

⁴ Since the beginning of the Reagan Administration, the total number of ships in the Navy has been calculated using the battle force method of counting ships. Battle force ships are ships that are readily deployable and which contribute directly or indirectly to the deployed combat capability of the Navy. Battle force ships include active-duty Navy ships, Naval Reserve Force ships, and ships operated by the Military Sealift Command that meet this (continued...)

“transformation effort matures — and as it produces significantly higher output of military value from each element of the force — DOD will explore additional opportunities to restructure and reorganize the Armed Forces.”⁵

Following the publication of the 2001 QDR report, the Navy took steps which had the effect of calling into question the status of the 310-ship plan. In November 2001, the Navy announced a plan for procuring a new kind of small surface combatant, called the Littoral Combat Ship (LCS), that the Navy had not previously planned to procure, and which was not mentioned in the 2001 QDR report.⁶ And in February 2003, in submitting its proposed FY2004-FY2009 Future Years Defense Plan (FYDP) to Congress, DOD announced that it had initiated studies on undersea warfare requirements and forcible entry options for the U.S. military. These studies could affect, among the other things, the required numbers of SSNs and amphibious ships. The 310-ship plan is now rarely mentioned by Navy and DOD officials.

Navy 375-Ship Proposal Of 2002-2004. Navy leaders in early 2002 began to mention an alternative proposal for a 375-ship Navy that initially included 12 aircraft carriers, 55 SSNs, 4 converted Trident cruise-missile-carrying submarines (SSGNs), 160 surface combatants (including 104 cruisers, destroyers, frigates, and 56 LCSs), 37 amphibious ships, and additional mine warfare and support ships.⁷

Although Navy leaders routinely referred to the 375-ship proposal from about February 2002 through about February 2004, Secretary of Defense Donald Rumsfeld, at a February 5, 2003, hearing before the House Armed Services Committee, explicitly declined to endorse it as an official DOD goal, leaving it a Navy proposal only.

In April 2004, Navy leaders began to back away from the 375-ship proposal, stating that 375 was an approximate figure, that the ships making up the total of 375 were subject to change, and perhaps most important, that the 375-ship figure

⁴ (...continued)

standard. The total number of battle force ships includes not only combat ships but also auxiliary and support ships — such as oilers, ammunition ships, and general stores ships — that transport supplies to deployed Navy ships operating at sea. The total number of battle force ships does not include ships in reduced readiness status that are not readily deployable, ships and craft that are not generally intended for making distant deployments, oceanographic ships operated by the National Oceanic and Atmospheric Administration (NOAA), and DOD sealift and prepositioning ships that transport equipment and supplies (usually for the benefit of the Army or Air Force) from one land mass to another.

⁵ *Quadrennial Defense Review Report*, op. cit., p. 23.

⁶ For more on the LCS program, see CRS Report RS21305, *Navy Littoral Combat Ship (LCS): Background and Issues for Congress*, by Ronald O’Rourke; and CRS Report RL32109, *Navy DD(X) and LCS Ship Acquisition Programs: Oversight Issues and Options for Congress*, by Ronald O’Rourke.

⁷ The composition of the plan was subsequently modified to include 12 aircraft carriers, 52 SSNs, 4 SSGNs, 165 surface combatants (109 cruisers and destroyers and 56 LCSs), 36 amphibious ships, 18 Maritime Prepositioning Force (Future) ships, and additional mine warfare and support ships.

reflected traditional concepts for crewing and deploying Navy ships, rather than new concepts — such as Sea Swap — that could significantly reduce future requirements for Navy ships.

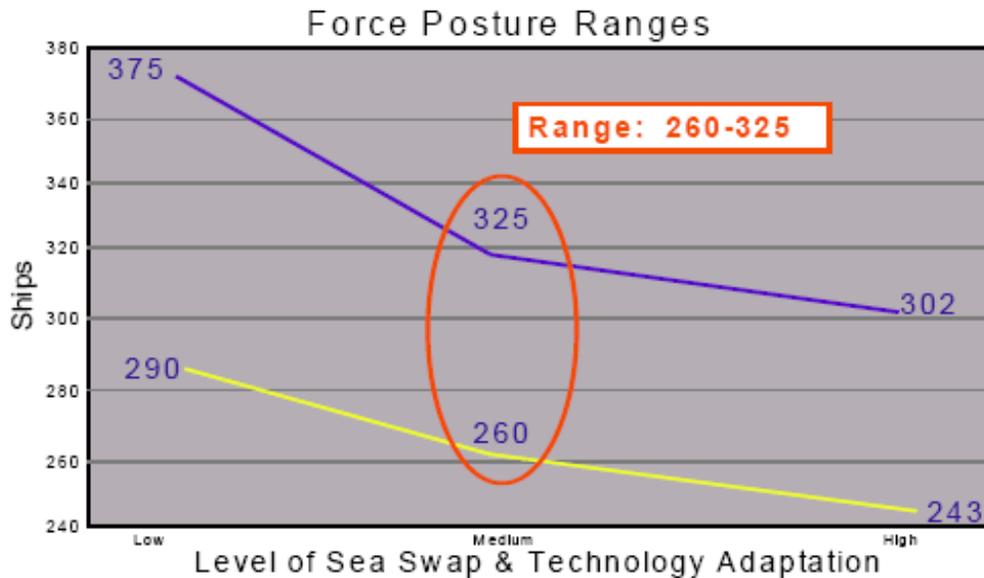
2005 Navy Testimony On Fleet Of 260 To 325 Ships. At a February 10, 2005, hearing before the Senate Armed Services Committee on the proposed FY2006 DOD budget and FY2006-FY2011 FYDP, Admiral Vernon Clark, the Chief of Naval Operations, testified that the Navy in future years may require a total of 260 to 325 ships, or possibly 243 to 302 ships, depending on how much the Navy uses new technologies and Sea Swap. Specifically, Clark stated:

As we evolve advanced concepts for employment of forces, we will also refine analyses and requirements, to include the appropriate number of ships, aircraft, and submarines....

In a sensor-rich construct, the numbers of platforms are no longer a meaningful measure of combat capability. And just as the number of people is no longer the primary yardstick by which we measure the strength or productivity of an organization in an age of increasing capital-for-labor substitutions, the number of ships is no longer adequate to gauge the health or combat capability of the Navy. The capabilities posture of the Fleet is what is most important. In fact, your Navy can deliver much more combat power, more quickly now than we could twenty years ago when we had twice as many ships and half again as many people....

Further, I believe that the current low rate of ship construction and the resultant escalation of platform cost will constrain the future size of the Fleet. As I have previously testified, I don't believe that it's all about numbers; numbers have a quality all their own, there's no question about that. But, it is more important that we buy the right kinds of capabilities in the ships that we're procuring in the future, and that we properly posture our force to provide the speed and agility for seizing and retaining the initiative in any fight.

The ultimate requirement for shipbuilding, however, will be shaped by the potential of emerging technologies, the amount of forward basing, and innovative manning concepts such as Sea Swap. Additional variables range from operational availability and force posture to survivability and war plan timelines.



The notional diagram [above] illustrates how manning concepts and anticipated technological adaptation will modify the number of ships required. The [upper and lower] lines represent levels of combat capability and the ships required to achieve that capability. For example, the left side of the diagram shows our current number of ships (290) and the current projection of ships required to fully meet Global War on Terror requirements (375) in the future. The right side of the diagram shows a projection that provides the same combat capability but fully leverages technological advances with maximum use of Sea Swap. It is a range of numbers because the degree of technological adaptation is a variable, as is the degree to which we can implement Sea Swap. The middle portion of the curve [in the ellipse] shows a projected range that assumes a less extensive projection of technological adaptation and use of Sea swap. Although simplified, this diagram shows how the application of transformational new technologies coupled with new manning concepts will enable us to attain the desired future combat capability with a force posture between 260 and 325 ships.⁸

Admiral Clark's testimony did not detail the compositions of these fleets by ship type or make clear whether any of these potential total ship figures have been endorsed by the Secretary of Defense as official DOD force-structure planning goals.

In March 2005, the Navy provided a report to Congress showing the notional compositions of 260- and 325-ship fleets in FY2035.⁹ **Table 1** below compares the 310-ship plan from the 2001 QDR and the Navy's 375-ship proposal of 2002-2004 with the notional 260- and 325-ship fleets from the March 2005 Navy report to Congress.

⁸ Source for quoted text and associated diagram: Statement of Admiral Vernon Clark, USN, Chief of Naval Operations, Before the Senate Armed Services Committee, Feb. 10, 2005, pp. 17-19.

⁹ U.S. Department of the Navy, *An Interim Report to Congress on Annual Long-Range Plan For The Construction Of Naval Vessels For FY2006*. Washington, 2005. 5 pp. The report was delivered to the House and Senate Armed Services Committees on March 23, 2005. Copies of the report were obtained by defense trade publications, and at least one of these publications posted the report on its website.

Table 1. Navy Ship Force Structure Plans

Ship type	310-ship plan from 2001 QDR	Navy 375-ship Navy proposal of 2002-2004 ^a	March 2005 Navy report to Congress	
			260-ship fleet (FY2035)	325-ship fleet (FY2035)
Ballistic missile submarines (SSBNs)	14	14	14	14
Cruise missile submarines (SSGNs)	2 or 4 ^b	4	4	4
Attack submarines (SSNs)	55	55	37	41
Aircraft carriers	12	12	10	11
Cruisers, destroyers, frigates	116	104	67	92
Littoral Combat Ships (LCSs)	0	56	63	82
Amphibious ships	36	37	17	24
Maritime prepositioning ships ^c	0 ^c	0 ^c	14 ^c	20 ^c
Combat logistics (resupply) ships	34	42	24	26
Dedicated mine warfare ships	16	26 ^d	0	0
Other ^e	25	25	10	11
TOTAL battle force ships	310 or 312	375	260	325

Sources: 2001 QDR report and U.S. Navy data.

a Initial composition. Composition was subsequently modified; see the text of this report for discussion.

b The report on the 2001 QDR did not mention a specific figure for SSGNs. The Administration's proposed FY2001 DOD budget requested funding to support the conversion of two available Trident SSBNs into SSGNs, and the retirement of two other Trident SSBNs. Congress, in marking up this request, supported a plan to convert all four available SSBNs into SSGNs.

c Today's 16 Maritime Prepositioning Force (MPF) ships are intended primarily to support Marine Corps operations ashore, rather than Navy combat operations, and thus are not counted as Navy battle force ships. The Navy's planned MPF(Future) ships, however, may be capable of contributing to Navy combat capabilities (for example, by supporting Navy aircraft operations). For this reason, MPF(F) ships are counted here as battle force ships.

d The figure of 26 dedicated mine warfare ships includes 10 ships maintained in a reduced mobilization status called Mobilization Category B. Ships in this status are not readily deployable and thus do not count as battle force ships. The 375-ship proposal thus implied transferring these 10 ships to a higher readiness status.

e Includes command ships, support ships, and sea basing connector ships.

Using the 260-ship fleet as a baseline, the range of 260 to 325 ships equates to a 25% range of variability in the potential total number of ships. For some ship categories — such as SSBNs and SSGNs — there is little or no difference between the 260- and 325-ship fleets. For other categories of ships, there are substantial percentage ranges of variability — 37% for cruisers, destroyers and frigates, 30% for LCSs; 41% for amphibious ships; and 43% for maritime prepositioning ships. For the remaining categories of ships — attack submarines, aircraft carriers, combat logistics ships, and other ships — the ranges of variability are 10% or less. In the

case of aircraft carriers, the one-ship difference under two fleet plans can translate into a substantial difference in Navy funding requirements and shipbuilding work.

When asked why the Navy hasn't expressed its force-level requirements as a single figure, as it has in the past, or as a more tightly focused range, Navy officials have stated that additional analyses need to be performed to tighten the range, that some of the variability is due to the Navy's inability to predict the future with precision, and that the Navy needs to work to refine these figures further to establish a more stable set of requirements for ships.¹⁰

Capabilities-Based Planning and Numbers of Ships

How does capabilities-based planning relate to required numbers of Navy ships?

As suggested in Admiral Clark's above-cited February 2005 testimony, DOD in recent years has altered the basis of its force planning, shifting from threat-based planning to capabilities-based planning. Under threat-based planning, DOD planned its forces based on what would be needed for conflict scenarios that were defined fairly specifically. During the Cold War, for example, DOD planned forces that would be sufficient, in conjunction with allied NATO forces, for fighting a multi-theater conflict with the Soviet Union and its Warsaw Pact allies. Similarly, in the first few years of the post-Cold War era, DOD planned forces that would be sufficient for, among other things, fighting two nearly simultaneous regional conflicts, one in the Persian Gulf region, the other on the Korean peninsula.

Under capabilities-based planning, DOD is now planning for U.S. military forces to have a variety of abilities, so that they will be better able to respond to a wide array of possible conflict scenarios. DOD officials have explained that the shift to capabilities-based planning responds to the difficulty of predicting, in today's security environment, specific future threats and warfighting scenarios.

When asked about required numbers of Navy ships and aircraft, Navy and DoD officials have argued, as Admiral Clark does in the above-cited testimony, that under capabilities-based planning, numbers of ships and aircraft per se are not as important as the total amount of capability represented in the fleet. That may be correct insofar as the policy objective is to have a Navy with a certain desired set of capabilities, and not simply one that happens to include a certain number of ships and aircraft. But that is not the same as saying that a Navy with a desired set of capabilities cannot in turn be described as one having certain numbers of ships and aircraft of certain types.

Although the Navy is currently working to resolve uncertainties concerning the applicability of new technologies the Sea Swap concept, it arguably should become possible at some point to translate a set of desired Navy into desired numbers of ships and aircraft. Those numbers might be expressed as focused ranges rather than

¹⁰ See, for example, Geoff Fein, "Navy Needs To Better Refine Shipbuilding Numbers, Says Sestak," *Defense Daily*, Mar. 30, 2005 and Dave Ahearn, "Adm. Sestak Says Future Shipbuilding Needs Must Be Flexible," *Defense Today*, Mar. 30, 2005.

specific figures, and these focused ranges may change over time as missions, technologies, and crewing concepts change. But to argue indefinitely that desired naval capabilities cannot be translated into desired numbers of ships and aircraft would be to suggest that the Navy cannot measure and understand the capabilities of its own ships and aircraft. In this sense, the shift to capability-based planning does not in itself constitute a rationale for permanently setting aside the question of the planned size and structure of the fleet.

Independent Studies on Navy Force Structure

What independent studies are available concerning required numbers of Navy ships?

Section 216 of the conference report (H.Rept. 108-354 of November 7, 2003) on the FY2004 defense authorization bill (H.R. 1588/P.L. 108-136 of November 24, 2003) 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. The two studies, which were conducted by the Center for Naval Analyses (CNA) and the Office of Force Transformation (OFT, a part of the Office of the Secretary of Defense), were submitted to the congressional defense committees in February 2005.¹¹

A third independent study on potential future fleet platform architectures, which was conducted by the Center for Strategic and Budgetary Assessments (CSBA) on its own initiative, was made available to congressional and other audiences in March 2005.

Appendix A summarizes these three studies.

Implications Of Ambiguity In Navy Force-Structure Plans

What are the potential implications for the Navy, Congress, and industry of Navy ambiguity regarding required numbers of ships?

For the Navy. For the Navy, ambiguity concerning required numbers of Navy ships provides time to resolve uncertainties concerning the applicability of new technologies and the Sea Swap concept to various kinds of Navy ships. Navy (and DOD) officials may also find this ambiguity convenient because it permits them to speak broadly about individual Navy ship-acquisition programs without offering many quantitative details about them — details which they might be held accountable to later, or which, if revealed now, might disappoint Members of Congress or industry officials.

This ambiguity may also, however, make it difficult for Navy officials, in conversations with the Office of the Secretary of Defense (OSD), to defend programs

¹¹ Section 216 is an amended version of a provision (Section 217) in the House-reported version of H.R. 1588. See pages 28-29 and 612-613 of H.Rept. 108-354, and pages 255-256 of the House report (H.Rept. 108-106 of May 16, 2003) on H.R. 1588.

for procuring Navy ships in certain total numbers or at certain annual rates because OSD officials might view alternative total numbers or annual rates as sufficient for maintaining a Navy that falls somewhere within the broad ranges of total numbers of ships that Navy officials have presented in their testimony.

For Congress. Ambiguity concerning required numbers of Navy ships may make it difficult, if not impossible, for Congress to conduct effective oversight by reconciling desired Navy capabilities with planned Navy force structure, and planned Navy force structure with supporting Navy programs and budgets. With the middle element of this oversight chain expressed in only general terms, Congress may find it difficult to understand whether proposed programs and budgets will produce a Navy with DOD's desired capabilities. The defense oversight committees in recent years have criticized the Navy for presenting a confused and changing picture of Navy ship requirements and procurement plans.¹²

For Industry. Ambiguity concerning required numbers of Navy ships may make it easier for industry officials to pour into broad remarks from the Navy or DOD their own hopes and dreams for individual programs. This could lead to excessive industry optimism about those programs. Ambiguity concerning required

¹² For example, the conference report (H.Rept. 107-772 of November 12, 2002) on the FY2003 defense authorization act (P.L. 107-314/H.R. 4546) stated

In many instances, the overall Department of Defense ship acquisition message is confused.... The conferees also believe that the DON shares blame for this confusion because it has been inconsistent in its description of force structure requirements. This situation makes it appear as if the Navy has not fully evaluated the long-term implications of its annual budget requests....

The conferees perceive that DOD lacks a commitment to buy the number and type of ships required to carry out the full range of Navy missions without redundancy. The DON has proposed to buy more ships than the stated requirement in some classes, while not requesting sufficient new hulls in other classes that fall short of the stated requirement. Additionally, the conferees believe that the cost of ships will not be reduced by continually changing the number of ships in acquisition programs or by frequently changing the configuration and capability of those ships, all frequent attributes of recent DON shipbuilding plans. (Pages 449 and 450)

The House Appropriations Committee, in its report (H.Rept. 108-553 of June 18, 2004) on the FY2005 DOD appropriations bill (H.R. 4613), stated:

The Committee remains deeply troubled by the lack of stability in the Navy's shipbuilding program. Often both the current year and out year ship construction profile is dramatically altered with the submission of the next budget request. Programs justified to Congress in terms of mission requirements in one year's budget are removed from the next. This continued shifting of the shipbuilding program promotes confusion and frustration throughout both the public and private sectors. Moreover, the Committee is concerned that this continual shifting of priorities within the Navy's shipbuilding account indicates uncertainty with respect to the validity of requirements and budget requests in support of shipbuilding proposals. (Page 164)

numbers of Navy ships can also cause business-planning uncertainty in areas such as production planning, workforce management, facilities investment, company-sponsored research and development, and potential mergers and acquisitions.¹³

Potential Oversight Questions Arising From This Ambiguity

What potential oversight questions for Congress arise from the current ambiguity regarding required numbers of Navy ships?

Potential oversight questions for Congress that arise from the current ambiguity regarding required numbers of Navy ships include the following:

- For each of the three ranges shown in the Navy’s 2005 testimony — 290 to 275 ships, 260 to 325 ships, and 243 to 302 ships — what factors explain the difference between the low and high end of the range?
- Does the Navy anticipate narrowing the difference between the low and high end of each range? If so, when? If not, why not?
- What is the Navy’s view regarding the prospective affordability of a Navy of 300 or more ships (i.e., as shown in the high ends of the three ranges from the Navy’s 2005 testimony) as opposed to a Navy of roughly 240 to 290 ships (as shown in the low ends of the three ranges)?

¹³ A July 2004 press article, for example, states that

Philip Dur, chief executive officer of Northrop Grumman’s Shipbuilding Systems, argued that the Navy’s concept of “capabilities versus numbers” not only would hurt the service’s operations, but decimate the industry.

If the Navy decides it cannot afford 300 ships, it should come up with a smaller number and set new ship construction plans based on that number, Dur said.

It also would be helpful, he added, if both the Navy and the Coast Guard jointly planned their long-term shipbuilding buys. “I do not know that either service takes the other service’s capabilities into account,” he said. If both services set their shipbuilding goals collectively, “then the shipbuilders can lay out an investment plan, a hiring plan [and] a training plan that was predicated on the assumption that we would competing for an X-number of platforms per year on a going-forward basis,” Dur said....

If the Department of Defense can frame a requirement for ships and defend it, the industry would make the necessary adjustments to either scale down or ramp up, Dur told reporters during a recent tour of the company’s shipyards in Louisiana and Mississippi.

(Roxana Tiron, “Lack of Specificity in Navy Shipbuilding Plans Irks the Industry,” *National Defense*, July 2004.)

Navy FY2006-FY2011 Ship-Procurement Plan

What are the Navy's plans for procuring ships under the proposed FY2006 budget and FY2006-FY2011 FYDP?

Table 2 below shows the Navy's FY2006-FY2011 ship-procurement plan.

Table 2. Navy FY2006-FY2011 Ship-Procurement Plan
(Ships fully funded in FY2005 shown for reference)

	FY05	FY06	FY07	FY08	FY09	FY10	FY11	Total FY06- FY11
CVN-21				1				1
SSN-774	1	1	1	1	1	1	1	6
DDG-51	3							0
DD(X)			1	1	1	1	1	5
CG(X)							1	1
LCS	1	1	2	3	5	5	5	21
LPD-17	1	1	1					2
LHA(R)			1			1		2
TAKE	2	1	1	1				3
TAOE(X)					1	1	2	4
MPF(F)					1	1	2	4
MPF(A)								0
TOTAL	8	4	7	7	9	10	12	49
TOTAL less LCSs	7	3	5	4	4	5	7	28

Source: Department of the Navy, *Highlights of the Department of the Navy FY 2006 Budget*, Chart 14 (p. 5-1).

The following discusses this ship-procurement plan in terms of overall ship-procurement rate and individual ship-procurement programs.

Overall Ship Procurement Rate. The FY2006-FY2011 plan would procure a total of 49 ships, or an average of about 8.2 ships per year. Assuming an average Navy ship life of 30 to 35 years, an average procurement rate of about 8.2 ships per year would, over the long run, maintain a fleet of 245 to 286 ships.

The relatively small Littoral Combat Ships (LCSs) shown in the table are to be built by yards other than the six yards that have built the Navy's major warships in recent years.¹⁴ Excluding LCSs so as to focus on larger ships that would likely be built by these six yards, the total number of larger ships to be 28, or an average of about 4.7 ships per year. Assuming an average Navy ship life of 30 to 35 years, an average procurement rate of about larger 4.7 ships per year other than LCSs, if maintained over the long run, would maintain a fleet that included 140 to 163 ships other than LCSs.

Individual Shipbuilding Programs.

CVN-21 Aircraft Carrier Program. Compared to the FY2005-FY2009 ship-procurement plan submitted to Congress in February 2004, the FY2006-FY2011 plan would defer the procurement of the next aircraft carrier, called CVN-21, by a year, to FY2008. This may have been due to need to finance the procurement in FY2007 of other ships, including the lead DD(X) destroyer and the LHA(R) amphibious assault ship. The FY2006-FY2011 plan would also defer the procurement of the carrier after CVN-21 from FY2011 to some future fiscal year.¹⁵

SSN-774 Attack Submarine Program. The FY2006-FY2011 plan would maintain the procurement rate for Virginia (SSN-774) class attack submarines at one per year through FY2011. The FY2005-FY2009 plan had called for increasing Virginia-class procurement to two per year starting in FY2009.¹⁶

DDG-51 Destroyer Program. The FY2006-FY2011 plan leaves unchanged the previous procurement profile for the Arleigh Burke (DDG-51) class Aegis destroyer program. This profile calls for the three DDG-51s procured in FY2005 to be the last ships in the program.

DD(X) Destroyer Program. The FY2006-FY2011 plan would reduce procurement of DD(X) destroyers to one ship per year for the period FY2007-FY2011. The FY2005-FY2009 plan had called for procuring a total of eight ships through FY2009 — one in FY2005, two in FY2007, another two in FY2008, and three in FY2009.

A comparison of the FY2006-FY2011 plan to the FY2005-FY2009 plan suggests at first that the FY2006-FY2011 plan has deferred the procurement of the

¹⁴ These six yards include Bath Iron Works (BIW) of Bath, ME, the Electric Boat Division of Groton, CT, and Quonset Point, RI, and National Steel and Shipbuilding Company (NASSCO) of San Diego, CA, all of which are owned by General Dynamics Corporation; and Avondale Shipyards near New Orleans, LA, Ingalls Shipbuilding of Pascagoula, MS, and Newport News Shipbuilding of Newport News, VA, all of which are owned by Northrop Grumman Corporation.

¹⁵ For more on the CVN-21 program, see CRS Report RS20643, *Navy CVN-21 Aircraft Carrier Program: Background and Issues for Congress*, by Ronald O'Rourke.

¹⁶ For more on the SSN-774 program, see CRS Report RL32418, *Navy Attack Submarine Force-Level Goal and Procurement Rate: Background and Issues for Congress*, by Ronald O'Rourke.

lead DD(X) destroyer by two years, to FY2007. The actual effect of the FY2006-FY2011 plan on the schedule for building this ship, however, may be less dramatic. The Navy's FY2005-FY2009 plan proposed funding the construction of the lead DD(X) in the Navy's research and development account through a stream of annual funding increments stretching out to FY2011 — an approach commonly known as incremental funding. Under this proposed scheme, the Navy had some flexibility to choose which year to record as the nominal year of procurement for the lead DD(X). The Navy chose FY2005, the year of the first scheduled increment, even though the amount of funding requested for the FY2005 increment equated to only about 8% of the ship's total cost, leaving the remaining 92% of the ship's cost to be provided in future years.

Congress, in acting on the Navy's proposed FY2005 budget, approved the Navy's FY2005 funding request for the lead DD(X) but directed that the ship be procured the traditional way, through the Navy's shipbuilding account (known formally as the Shipbuilding and Conversion, Navy, or SCN, account), and that it be funded the traditional way, in accordance with the full funding policy, which requires that items acquired through the procurement title of the DOD appropriation act be fully funded in the year they are procured.¹⁷ Consistent with this direction, the FY2005 funding increment was designated as advance procurement (AP) funding for a lead DD(X) to be procured in some future fiscal year.

Abiding by this direction required the Navy to alter its funding profile for the lead DD(X) to one that fully funds the ship in a particular year. The FY2006-FY2011 plan suggests that the Navy, after examining its options, selected FY2007 as the year in which the ship would be fully funded. It is not clear, however, whether the actual schedule for building the lead ship will be significantly affected by this change in funding profile and nominal year of procurement. Consequently, although the nominal year of procurement for the lead DD(X) appears to have been deferred two years, this may overstate the actual amount of change in the schedule for the lead ship.

The FY2006-FY2011 Navy plan, however, defers the procurement of the second DD(X) by a year, to FY2008, and reduces to five the total number of DD(X)s to be procured through FY2011.

Under previous plans, the Navy envisioned stopping DD(X) procurement at about the time that it started CG(X) procurement. If the lead CG(X) is procured in FY2011, as shown in the FY2006-FY2011 plan, and there is a gap year in FY2012 between the procurement of the lead CG(X) and follow-on CG(X)s starting in FY2013, then a final DD(X)s might be procured in FY2012. If so, then the total procurement quantity for the DD(X) program would be six ships.¹⁸

¹⁷ For more on the full funding policy, see CRS Report RL31404, *Defense Procurement: Full Funding Policy — Background, Issues, and Options for Congress*, by Ronald O'Rourke and Stephen Daggett.

¹⁸ For more on the DD(X) program, see CRS Report RS21059, *Navy DD(X) Destroyer Program: Background and Issues for Congress*, by Ronald O'Rourke; and CRS Report (continued...)

CG(X) Cruiser Program. The FY2006-FY2011 plan would accelerate the procurement of the first CG(X) cruiser to FY2011. The long-range shipbuilding plan that the Navy submitted to Congress in 2003 showed the first CG(X) cruiser being procured in FY2018.¹⁹

Littoral Combat Ship (LCS) Program. The FY2006-FY2011 plan would defer procurement of the third LCS by a year, to FY2007. This is consistent with Congress' direction, in acting on the Navy's FY2005 budget request, to fully fund a lead LCS in FY2005 but require a gap year between the procurement of a lead LCS and any follow-on LCSs built to that same design. The Navy plans to procure two lead LCSs to different designs developed by two competing industry teams. Under the FY2006-FY2011 plan, the single ship now planned for FY2006 would presumably be the second lead LCS, and the two LCSs now planned for FY2007 would presumably be follow-on ships built to the same design as the lead LCS procured in FY2005. The FY2006-FY2011 plan would also reduce the number of LCSs procured in FY2009 from six ships to five. This can be viewed as consistent with the Navy's longer-range projection for the LCS program, which has envisioned a sustaining procurement rate of five ships per year through the end of the program, as shown by the figures for FY2010 and FY2011.²⁰

LPD-17 Amphibious Ship Program. The FY2006-FY2011 plan would end procurement of San Antonio (LPD-17) class amphibious ships after procuring the ninth ship in the class in FY2007. Previous plans had generally called for building a total of 12 LPD-17s.²¹

LHA(R) Amphibious Ship Program. Compared to the FY2005-FY2009 plan, the FY2006-FY2011 plan would accelerate the procurement of LHA(R), an amphibious assault ship, by one year, to FY2007. The FY2004-FY2009 shipbuilding plan that the Navy submitted to Congress in February 2003 showed LHA(R) in FY2007. Accelerating procurement of LHA(R) to FY2007 can thus be viewed as restoring the year of procurement shown in the plan submitted to Congress in 2003.²²

¹⁸ (...continued)

RL32109, *Navy DD(X) and LCS Ship Acquisition Programs: Oversight Issues and Options for Congress*, by Ronald O'Rourke.

¹⁹ For more on the CG(X) program, see CRS Report RL32109, *Navy DD(X) and LCS Ship Acquisition Programs: Oversight Issues and Options for Congress*, by Ronald O'Rourke.

²⁰ For more on the LCS program, see CRS Report RS21305, *Navy Littoral Combat Ship (LCS): Background and Issues for Congress*, by Ronald O'Rourke; and CRS Report RL32109, *Navy DD(X) and LCS Ship Acquisition Programs: Oversight Issues and Options for Congress*, by Ronald O'Rourke.

²¹ For more on the LPD-17 program, see CRS Report RL32513, *Navy-Marine Corps Amphibious and Maritime Prepositioning Ship Programs: Background and Oversight Issues for Congress*, by Ronald O'Rourke.

²² For more on the LHA(R) program, see CRS Report RL32513, *Navy-Marine Corps Amphibious and Maritime Prepositioning Ship Programs: Background and Oversight Issues for Congress*, by Ronald O'Rourke.

TAKE Auxiliary Cargo Ship Program. Compared to the FY2005-FY2009 plan, the FY2006-FY2011 plan would effectively defer one of the two Lewis and Clark (TAKE-1) class auxiliary cargo ships previously planned for FY2006 to FY2008.

TAOE(X) Replenishment Ship Program. The FY2005-FY2009 plan called for procuring the first two TAOE(X) ships in FY2009. The FY2006-FY2011 plan reduces the FY2009 procurement to one ship.

MPF(F) Maritime Prepositioning Ship (Future) Program. Compared to the FY2005-FY2009 plan, the FY2006-FY2011 plan would defer procurement of the first Maritime Prepositioning Force (Future) ship by two years, to FY2009.²³

MPF(A) Maritime Prepositioning Ship (Aviation) Program. Previous Navy plans distinguished between the basic MPF(F) ship and an aviation variant called MPF(A). The FY2006-FY2011 plan would either cancel the MPF(A) effort or end the distinction by folding the MPF(A) back into the MPF(F) program.

Issues for Congress

Number of Ships in the Navy

In terms of numbers of ships, how large a Navy does the United States need, and what current force-planning issues may affect these numbers?

Capabilities-Based Planning and Numbers of Ships. As a result of the shift to capabilities-based planning, Navy and DOD officials are seeking to acquire a Navy with a certain set of desired capabilities, rather than a Navy that happens to have a certain number of ships and aircraft. As discussed in the Background section, however, once the Navy and DOD identify a desired set of capabilities for the Navy, it should become possible at some point to translate those desired capabilities into a force structure plan for a Navy that includes numbers of ships and aircraft, although those numbers might be expressed as ranges rather than discrete figures. In this sense, even under capabilities-based planning, it is legitimate to ask Navy and DOD officials how large a Navy they are planning in terms of numbers of ships.

Historical Fleet Numbers As A Yardstick. Historical figures for the total number of ships in the Navy are not necessarily a reliable yardstick for assessing the adequacy of today's Navy or a future planned Navy that includes a certain number of ships, particularly if the historical figures are more than a few years old, because the missions to be performed by the Navy, the mix of ships that make up the Navy, and the technologies that are available to Navy ships for performing missions all change over time. Due to changes in these variables, the historical number of ships in the fleet is at best a partial guide, and at worst a potentially misleading guide, to

²³ For more on the MPF(F) program, see CRS Report RL32513, op. cit.

whether today's Navy is adequate, or a future Navy that includes a certain number of ships would be adequate, for performing its required missions.

The Navy, for example, reached a late-Cold War peak of 568 battle force ships at the end of FY1987,²⁴ and as of February 16, 2005 had declined to a total of 290 battle force ships. The FY1987 fleet, however, was intended to meet a set of mission requirements that focused on countering Soviet naval forces at sea during a potential multi-theater NATO-Warsaw Pact conflict, while the October 2004 fleet is intended to meet a considerably different set of mission requirements centered on influencing events ashore by countering both land- and sea-based military forces of potential regional threats other than Russia, including non-state terrorist organizations. In addition, the Navy of FY1987 differed substantially from the October 2004 fleet in areas such as profusion of precision-guided air-delivered weapons, numbers of Tomahawk-capable ships, and sophistication of C4ISR systems.²⁵

Fifteen or so years from now, Navy missions may have shifted again, to include, as a possible example, a greater emphasis on being able to counter Chinese maritime military capabilities. In addition, the capabilities of Navy ships will likely have changed further by that time due to developments such as more comprehensive implementation of networking technology and increased use of ship-based unmanned vehicles.

The 568-ship fleet of FY1987 may or may not have been capable of performing its stated missions; the 290-ship fleet of February 2005 may or may not be capable of performing its stated missions; and a fleet 15 or so years from now with a certain number of ships may or may not be capable of performing its stated missions. Given changes over time in mission requirements, ship mixes, and technologies, however, these three issues are to a substantial degree independent of one another.

For similar reasons, trends over time in the total number of ships in the Navy are not necessarily a reliable indicator of the direction of change in the fleet's ability to perform its stated missions. An increasing number of ships in the fleet might not

²⁴ Some publications, such as those of the American Shipbuilding Association, state that the Navy reached a peak of 594 ships at the end of FY1987. This figure, however, is the total number of active ships in the fleet, which is not the same as the total number of battle force ships. In recent years, the total number of active ships has been larger than the total number of battle force ships. For example, the Naval Historical Center states that as of November 16, 2001, the Navy included a total of 337 active ships, while the Navy states that as of November 19, 2001, the Navy included a total of 317 battle force ships. Although the total number of battle force ships as of October 6, 2004, was 290, the total number of active ships as of this date was likely more than 300. Comparing the total number of active ships in one year to the total number of battle force ships in another year is thus an apple-to-oranges comparison that in this case overstates the decline since FY1987 in the number of ships in the Navy. As a general rule to avoid potential statistical distortions, comparisons of the number of ships in the Navy over time should use, whenever possible, a single counting method.

²⁵ C4ISR stands for command and control, communications, computers, intelligence, surveillance, and reconnaissance.

necessarily mean that the fleet's ability to perform its stated missions is increasing, because the fleet's mission requirements might be increasing more rapidly than ship numbers and average ship capability. Similarly, a decreasing number of ships in the fleet might not necessarily mean that the fleet's ability to perform stated missions is decreasing, because the fleet's mission requirements might be declining more rapidly than numbers of ships, or because average ship capability and the percentage of time that ships are in deployed locations might be increasing quickly enough to more than offset reductions in total ship numbers.

Previous Force Structure Plans As A Yardstick. Previous Navy force structure plans might provide some insight into the potential adequacy of a proposed new force-structure plan, but changes over time in mission requirements, technologies available to ships for performing missions, and other force-planning factors suggest that some caution should be applied in using past force structure plans for this purpose. The Reagan-era plan for a 600-ship Navy was designed for a Cold War set of missions focusing on countering Soviet naval forces at sea, which is not an appropriate basis for planning the Navy today, while more recent Navy force-structure plans, including the Navy's 375-ship proposal of 2002-2004, do not appear to reflect potential changes now being discussed by Navy officials, such as additional forward homeporting of ships, widespread application of the Sea Swap concept, and implementation of the new sea basing concept for conducting expeditionary operations ashore.²⁶

²⁶ Recent Navy force structure plans include the Reagan-era 600-ship plan of the 1980s, the Base Force fleet of more than 400 ships planned during the final two years of the George H. W. Bush Administration, the 346-ship fleet from the Clinton Administration's 1993 Bottom-Up Review (or BUR, sometimes also called Base Force II), the 310-ship fleets of the Clinton Administration's 1997 QDR and the George W. Bush Administration's 2001 QDR, and the Navy's 375-ship proposal. The table below summarizes some key features of these plans.

Features of Recent Navy Force Structure Plans

Plan	600-ship	Base Force	1993 BUR	1997 QDR	2001 QDR	375-ship proposal (2002-2004)
TOTAL ships	~600	~450/416 ^a	346	~305/310 ^b	~310	375
Attack submarines	100	80/~55 ^c	45-55	50/55 ^d	55 ^e	55 ^e
Aircraft carriers	15 ^f	12	11+1 ^g	11+1 ^g	12	12
Surface combatants	242/228 ^h	~150	~124	116	116	160 ⁱ
Amphibious ships	~75 ^j	51 ^k	36 ^k	36 ^k	36 ^k	37

Source: Prepared by CRS based on DOD and U.S. Navy data.

a Commonly referred to as 450-ship plan, but called for decreasing to 416 ships by end of FY1999.

b Original total of about 305 ships was increased to about 310 due to increase in number of attack submarines to 55 from 50.

c Plan originally included 80 attack submarines, but this was later reduced to about 55.

d Plan originally included 50 attack submarines but this was later increased to 55.

e Plus 2 or 4 additional converted Trident cruise missile submarines (SSGNs) for the 2001 QDR plan

(continued...)

Current Force-Planning Issues. Current force-planning issues that Congress may consider in assessing how large a Navy the United States needs include the following:

- new technologies that may affect U.S. Navy ship capabilities;
- additional forward homeporting and the Sea Swap concept;
- sea-based missile defense;
- the sea basing concept for conducting expeditionary operations ashore;
- naval requirements for the global war on terrorism and for irregular conflicts such as insurgencies;
- naval requirements to address the possible emergence over the next 10 to 25 years of significantly more capable Chinese maritime military forces;
- DOD's increased emphasis on achieving full jointness in U.S. military plans and operations; and
- potential tradeoffs between funding Navy requirements and funding competing defense requirements.

Each of these is discussed briefly below.

New Technologies. New technologies that will likely affect the capabilities of Navy ships in coming years, and consequently the number of ships that may be needed to perform a given set of missions, include improved radars and other sensors (including miniaturized sensors), improved computers and networking systems, unmanned vehicles, reduced-size, precision-guided, air-delivered weapons, rail guns, directed-energy weapons, and integrated electric drive propulsion technology, to name just a few. Although the effect of improving technology historically has often been to increase the capability of individual Navy ships and thereby permit a reduction in the number of Navy ships needed to perform a stated set of missions, some analysts believe that networking technology and reduced-sized sensors may argue in favor of a more distributed force structure that includes a larger number of smaller ships such as the LCS.

Forward Homeporting and Sea Swap. Other things held equal, homeporting additional Navy ships in forward locations such as Guam and Hawaii, and applying the Sea Swap concept to a significant portion of the fleet, could reduce, perhaps substantially, the total number of Navy ships needed to maintain a certain number of Navy ships in overseas operating areas on a day-to-day basis.

²⁶ (...continued)

and 4 additional SSGNs for the 375-ship proposal.

f Plus one additional aircraft carrier in the service life extension program (SLEP).

g 11 active carriers plus 1 operational reserve carrier.

h Plan originally included 242 surface combatants but this was later reduced to 228.

i Figure includes 56 LCSs. Other plans shown include no LCSs.

j Number needed to lift assault echelons of 1 Marine Expeditionary Force (MEF) plus 1 Marine Expeditionary Brigade (MEB).

k Number needed to lift assault echelons of 2.5 MEBs. Note how number needed to meet this goal changed from Base Force plan to the BUR plan — a result of new, larger amphibious ship designs.

Navy officials, for example, have stated that in terms of resulting operating days in the Pacific, a Guam-homeported attack submarine is the equivalent of an average of about 2.3 attack submarines homeported in the Third Fleet (i.e., in San Diego or Pearl Harbor).²⁷ The Congressional Budget Office, in a March 2002 report on the attack submarine force, stated that the ratio might be higher, with a Guam-homeported attack submarine equivalent in operating days to about three attack submarines homeported elsewhere.²⁸

Recent experiments with the Sea Swap concept on surface combatants sent on long deployments to the Indian Ocean/Persian Gulf region suggest that the concept, if widely applied, might reduce the total number of surface combatants needed to maintain a certain number in forward-deployed locations by 20% or more.²⁹ The Navy reportedly is considering increasing the number of attack submarines homeported at Guam and transferring one of its continental-U.S.-homeported aircraft carriers to either Hawaii or Guam.

A key planning consideration is the potential difference between the number of Navy ships required for maintaining day-to-day forward deployments and the number required for fighting conflicts. Forward homeporting and Sea Swap affect primarily the former rather than the latter. As a consequence, for some types of ships, additional forward homeporting and use of Sea Swap might reduce the number needed for maintaining day-to-day forward deployments below the number needed for fighting conflicts. In such cases, fully implementing the force-level economies suggested by forward homeporting and Sea Swap could leave the Navy with inadequate forces for fighting conflicts.

Sea-based Missile Defense. The Navy would likely play a role in any U.S. missile defense system, but the nature of that role is not yet well defined, because the United States Strategic Command (Stratcom) and the Missile Defense Agency (MDA) are only in the early stages of defining its preferred eventual overall missile-defense architecture.

²⁷ In a “memorandum for interested members of Congress” on the homeporting of attack submarines in Guam dated Jan. 22, 2001, the Navy stated: “Three attack submarines homeported in Guam will provide a total of 300 days (on average) of operations and engagement per year. Those submarines would provide 130 days of operations and engagement per year if they were homeported in [the] Third Fleet [i.e., Eastern Atlantic] and deployed to [the] Seventh Fleet [i.e., Western Pacific] in accordance with current guidelines,” 300 divided by 130 is about 2.3. The text of the memo was reprinted in the Feb. 12, 2001, issue of *Inside the Navy* under the headline, “Text: Navy Memo on Subs in Guam,” For the accompanying news story, see Christian Bohmfalk, “Basing Attack Subs On Guam Expected To Increase Fleet’s Presence,” *Inside the Navy*, Feb. 12, 2001. For additional discussion, see CRS Report RL32418, *Navy Attack Submarine Force-Level Goal and Procurement Rate: Background and Issues for Congress*, by Ronald O’Rourke, pp. 30-33.

²⁸ Congressional Budget Office, *Increasing the Mission Capability of the Attack Submarine Force*, Mar. 2002, p. 11.

²⁹ For additional discussion, see CRS Report RS21338, *Navy Ship Deployments: New Approaches — Background and Issues for Congress*, by Ronald O’Rourke. pp. 4-5.

Navy ships could contribute to a U.S. missile defense system by acting as platforms for both radars and interceptor missiles. Sea-based radars could be placed on surface combatants or on non-combatant platforms such as auxiliary ships or floating structures resembling offshore oil platforms. Several U.S. Navy surface combatants have recently been designated to operate on a rotational basis in the Sea of Japan as forward radar platforms for detecting potential ballistic missile launches from North Korea. Sea-based interceptor missiles could be based on either submarines, surface combatants, or noncombatant platforms. Submarines might be particularly suitable as boost-phase interceptor platforms, while noncombatant platforms might be particularly suitable as midcourse radar or interceptor platforms. Surface combatants might be suitable as either.

Eventual decisions on the overall missile defense architecture consequently could affect Navy requirements for submarines, surface combatants, and auxiliary ships. A new Navy force structure plan that errs badly in anticipating the Navy's eventual role in the overall missile defense architecture could leave the country with a surplus or shortfall of ships in one or more of these categories. A shortfall could create a tension between performing sea-based missile defense and performing other Navy missions, while a surplus would suggest that the funds used to build some ships might have been better used for other purposes. If Stratcom and MDA can take steps to better define the Navy's role in the overall missile-defense architecture, this could reduce the potential for the next Navy force structure plan to result in such a surplus or shortfall.

Sea Basing Concept. Implementing the sea basing concept would affect requirements for numbers and types of amphibious ships and MPF(F) ships. It might also affect requirements for surface combatants such as the DD(X) and the LCS. Exactly how implementing sea basing would affect these requirements, however, is not yet clear because the number of sea basing squadrons, and their composition, is still being examined.

Global War on Terrorism and Irregular Warfare. The potential effects of the global war on terrorism and irregular conflicts such as insurgencies on requirements for U.S. ground forces have received much attention in recent months. The potential effects of these factors on requirements for U.S. naval forces, in contrast, has received less attention. In terms of ships, possible effects on requirements for U.S. naval forces include an increased emphasis on one or more of the following:

- ships (such as attack submarines, surface combatants, or aircraft carriers) that can conduct offshore surveillance of suspected terrorists and irregular military forces using either built-in sensors or embarked unmanned vehicles;
- ships (such as surface combatants, and perhaps particularly smaller and less heavily armed combatants like the LCS) for conducting

coastal patrol and intercept operations, including countering small boats and craft and countering pirate-like operations;³⁰

- ships (such as attack submarines) for covertly inserting and recovering Navy special operations forces, known as SEALs;³¹
- ships (such as amphibious ships) for supporting smaller-scale Marine Corps operations ashore; and
- ships (such as aircraft carriers or large-deck amphibious assault ships) that can launch strike-fighters armed with smaller-scale precision guided weapons.

Chinese Maritime Military Forces. Some analysts are concerned that DOD in coming years may structure U.S. forces, including the Navy, too closely around near-term requirements associated with the global war on terrorism, irregular conflicts, and conflicts against countries like Iraq and Afghanistan, and not enough around requirements associated with countering significantly more capable Chinese military forces, including maritime forces, that might emerge over the next 10 to 25 years.

Views among analysts differ concerning the possible scale or composition of China's military modernization efforts. Most, however, appear to agree that a growing Chinese economy would be able to finance a significant military modernization effort, should Chinese leaders decide to embark upon one, and that improved naval forces capable of operating in blue waters (i.e., waters further away from China's coast) could be a significant component of such an effort.³²

Structuring the U.S. Navy primarily to match the near-term requirements mentioned above could lead to a fleet that is strongly oriented toward operating in near-shore areas, attacking land targets, and countering land-based military forces. Preserving an ability to counter significantly more capable Chinese maritime military forces in the future could involve preserving different kinds of capabilities (or the foundations in technology and operational experience for building up such capabilities), particularly open-ocean antisubmarine warfare, air-to-air combat, defense against large-scale antiship cruise missile attacks, defense against sophisticated electronic warfare techniques and cyberwar attacks, and capabilities for attacking larger enemy ships at sea.

Jointness. DOD's increased emphasis on achieving increased jointness (i.e., coordination and integration of the military services) in U.S. military plans and operations could lead to reassessments of requirements for Navy capabilities that

³⁰ Coast Guard cutters may also be well suited for such operations.

³¹ SEAL stands for Sea, Air, and Land.

³² For more on China's current and potential future military capabilities, and Chinese strategic thinking, see U.S. Department of Defense, *Annual Report on The Military Power of The People's Republic of China*, Washington, 2004. (FY2004 Report To Congress on PRC Military Power, Pursuant to the FY2000 National Defense Authorization Act) 54 pp.

were originally determined in a less-joint setting. Areas where U.S. Navy capabilities overlap with the those of the Air Force or Army, and where total U.S. capabilities across the services exceed DOD requirements, might be viewed as candidates for such reassessments, while capabilities that are unique to the Navy might be viewed as less suitable for such reassessments. An example of a broad area shared by the Navy, Air Force, and Army is tactical aviation, while an example of an area that is usually regarded as unique to the Navy is antisubmarine warfare.

Competing Defense Priorities. A final issue to consider are the funding needs of other defense programs. In a situation of finite defense resources, funding certain Navy requirements may require not funding certain other defense priorities. If so, then the issue could become how to allocate finite resources so as to limit operational risk over the various missions involving both Navy and non-Navy mission requirements.

Potential Oversight Questions. Potential oversight questions for Congress regarding the planned size of the Navy and its relationship to ship procurement plans and budgets include the following:

- **Desired Navy capabilities.** Have DOD and the Navy defined the set of capabilities the Navy should have? If not, when do DOD and the Navy anticipate completing this task? Should Congress establish a deadline for completing it? If DOD and the Navy have completed the task, have they defined this set of capabilities accurately, taking into account factors like those discussed in the previous section?
- **Translating desired capabilities into planned force structure.** Have DOD and the Navy translated desired Navy capabilities into new Navy force-structure goals? If not, when do DOD and the Navy anticipate completing this task? Should Congress establish a deadline for DOD and the Navy to complete this task and issue a new Navy force structure plan? To the extent that DOD and the Navy have translated desired Navy capabilities into Navy force structure goals, have they done so accurately, taking into account factors like those discussed in the previous section?
- **Procurement plan.** If DOD and the Navy have accurately translated desired capabilities into force-structure goals, would implementing the associated Navy procurement plan achieve a fleet with such a force structure in a timely manner?
- **Budget plan.** If the procurement plan would achieve the desired force structure in a timely manner, have DOD and the Navy programmed the correct amount of funding to implement this procurement plan? If the Navy's procurement plan is fully funded, what other defense priorities might not be fully funded, and what are the resulting potential operational risks?

Number of Yards Involved in Navy Shipbuilding

How many shipyards should be regularly involved in Navy shipbuilding?

Questions about the Navy shipbuilding industrial base, including the number of yards that should be regularly involved in Navy shipbuilding, have been debated in Congress for many years, and particularly since the early 1990s, when the rate of Navy ship procurement dropped to a relatively low level as a consequence of the end of the Cold War and the dissolution of the Soviet Union. This section reviews the question of the number of yards that might be regularly involved in Navy shipbuilding using the Navy's 260- and 325-ship fleets.

Candidate Yards. Candidate shipyards for building Navy ships in coming years include the six yards that have built the Navy's major warships in recent years and three additional yards that are competing to build LCSs. The six yards that have built the Navy's major warships in recent years are:

- General Dynamics(GD)/Bath Iron Works (BIW) of Bath, ME;
- GD/Electric Boat (EB) of Groton, CT, and Quonset Point, RI;
- GD/National Steel and Shipbuilding Company (NASSCO) of San Diego, CA;
- Northrop Grumman (NG)/Avondale Shipyards, located near New Orleans, LA;
- NG/Ingalls Shipbuilding of Pascagoula, MS;³³ and
- NG/Newport News Shipbuilding (NGNN) or Newport News, VA.

The three yards competing to build LCSs are:

- Austal USA of Mobile, AL, which is the production shipyard on the LCS industry team led by General Dynamics;³⁴
- Bollinger Shipyards of Louisiana and Texas, which is one of two production shipyards on the LCS industry team led by Lockheed Martin,³⁵ and
- Marinette Marine of Marinette, WI, which is the other production shipyard on the Lockheed-led LCS industry team.

Factors to Consider. In assessing how many shipyards should be regularly involved in Navy shipbuilding in coming years, Congress may consider a number of

³³ The Avondale and Ingalls yards, together with a fabrication facility at Gulfport, MS, form Northrop Grumman Ship Systems (NGSS) division.

³⁴ Austal USA was created in 1999 as a joint venture between Austal Limited of Henderson, Western Australia and Bender Shipbuilding & Repair Company of Mobile, AL. The Lockheed LCS team also includes GD/BIW as prime contractor, to provide program management and planning, to provide technical management, and to serve as "LCS system production lead,"

³⁵ Bollinger operates about 15 shipyards and ship-related facilities in Louisiana and Texas, of which three, located in Lockport, LA, Gretna, LA, and Amelia, LA, are for building new ships.

factors, including factors relating to shipyard capacity, factors relating to cost and acquisition strategy, and factors relating to other issues.

Capacity-Related Factors.

Yard Capacities. **Table 3** below, taken from a 1996 CRS report,³⁶ shows the maximum annual production capacities of the first group of six yards, measured in the principal kinds of ships that they were building for the Navy in 1996, which are broadly similar to the kinds of ships they are building for the Navy today. As can be seen in the table, most of the yards in 1996 could build 3 to 5 ships per year of the kinds they were producing at that time, while Ingalls could build more.³⁷ The maximum capacities of the yards today would be roughly similar, and in some cases perhaps a bit higher due to yard modernization efforts since 1996 that have increased throughput capacities.

Table 3. Annual Shipyard Production Capacities

Yard	Maximum capacity: Number of ships completed per year
GD/BIW	3.5 Arleigh Burke (DDG-51) class destroyers
GD/EB	3 nuclear-powered attack submarines (SSNs) ^a
GD/NASSCO	4 or 5 Supply (AOE-6) class underway replenishment ships or 5 or 6 Watson (TAKR-310) class sealift ships ^b
NG/Avondale	4 Harpers Ferry (LSD-49) class amphibious ships
NG/Ingalls	11 DDG-51 class destroyers <i>or</i> 8 DDG-51 class destroyers + 1 Wasp (LHD-1) class amphibious ship
NGNN	4 SSNs ^c + 1 nuclear-powered aircraft carrier (CVN)

Source: CRS Report 96-785 F, *Navy Major Shipbuilding Programs and Shipbuilders: Issues and Options for Congress*, op. cit. Table 2 on page 28. GD = General Dynamics, NG = Northrop Grumman.

a Capacity of EB's Land-Level Submarine Construction Facility (LLSCF). Additional submarines could be built in EB's older inclined building ways.

b These ships are also known as Large, Medium-Speed Ro/Ro (Roll-on/Roll-off) ships (LMSRs).

c Capacity of NGNN's Modular Outfitting Facility (MOF). Additional submarines could be built in NGNN's graving docks.

³⁶ CRS Report 96-785 F, *Navy Major Shipbuilding Programs and Shipbuilders: Issues and Options for Congress*, by Ronald O'Rourke. (Archived; available from the author at 202-707-7610.) **Table 2** on page 28; see also text on p. 27.

³⁷ As noted in the 1996 CRS report, caution should be exercised in using the figures in this table to judge the comparative capacities of the yards, because these figures do not adjust for the differing sizes and levels of complexity of the various types of ships listed. A shipyard that is listed as being able to build a given number of large, complex ships may have more capacity than a yard that is listed as being able to build a larger number of smaller or less complex ships.

The annual rates in this table add up to roughly 30 ships per year. Adding in the capacities of one or more of the three yards now competing to build LCSs would increase this figure. As noted in the 1996 CRS report, achieving and sustaining the rates shown in **Table 3** could require at least some of the yards to curtail or eliminate other forms of work, such as overhaul and repair of Navy and commercial ships and construction of commercial ships. It could also result in levels of employment at the yards that could strain the managerial and supervisory capacities of the yards.³⁸

Potential Shipbuilding Rate for Fleet of 250 to 330 Ships. As shown in **Table 4** on the next page, the steady-state procurement rate for a Navy of 260 to 325 ships could be roughly 8 to 10 ships per year, including LCSs, and roughly 6 to 9 ships per year other than LCSs.³⁹

³⁸ These maximum rates also do not take into account possible capacity limitations in critical supporting supplier industries that could prevent these high rates from being achieved. Limits on supporting supplier industries, however, may be independent of the number of shipyards involved in the building effort. If supplier industries, for example, could only support a combined production rate of 10 ships per year, that limit might apply regardless of whether those 10 ships were being built by 6 yards or some other number of yards.

³⁹ The steady state replacement rate for an item is equal to the force-level goal divided by the service life. For example, a force-level goal of 70 cruisers, destroyer, and frigates divided by a service life of 35 years for such ships equals a steady state procurement rate of 2 such ships per year.

Table 4. Steady-State Ship Procurement Rate for Fleet of 260 to 325 Ships
(average annual procurement rates)

Ship type	Expected service life (years)	Notional fleets			
		260 ships		325 ships	
		Number	Steady-state rate	Number	Steady-state rate
SSBNs	42	14	0.33	14	0.33
SSGNs	42	4	0.10	4	0.10
SSNs	33	37	1.12	41	1.24
Aircraft carriers	50	10	0.20	11	0.22
Cruisers, destroyers	35	67	1.91	92	2.63
LCSs	25	63	2.52	82	3.28
Amphibious	35	17	0.49	24	0.69
MPF(F)s	35	14	0.40	20	0.57
CLF^a	35	24	0.69	26	0.74
Dedicated MIW^b	25	0	0.00	0	0.00
Other^c	35	10	0.29	11	0.31
TOTAL		260	8.05	325	10.11
TOTAL other than LCSs			5.53		6.83

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 Dedicated mine warfare ships.

c Includes command ships, support ships, and sea basing connector ships.

The planned ship service lives shown in this table 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.

To compensate for the relatively low rate of Navy ship procurement since the early 1990s (see Appendix B), maintaining a fleet of about 260 to 325 ships, including 30 to 45 LCSs, will require an average procurement rate in coming years somewhat higher than the steady-state rate. Assuming an average 35-year life for Navy ships, the required rate might be about 9 to 12 ships per year including LCSs,

and about 6 to 8 ships per year other than LCSs.⁴⁰ If average ship life is assumed to be closer to 30 years, which some observers believe is a more realistic figure, then the required shipbuilding rate might be closer to about 11 to 15 ships per year including LCSs, and about 7 to 10 ships per year other than LCSs.⁴¹

Even if the maximum production capacities shown in **Table 3** are discounted significantly to avoid a risk of straining the yards' managerial and supervisory abilities and to allow for the yards to do things other than build new Navy ships, it would appear that the nine candidate yards collectively have more than enough capacity to build the ships associated with maintaining a fleet of about 250 to 330 ships, including 30 to 45 LCSs. If, for example, each yard involved in Navy shipbuilding builds an average of two Navy ships per year, then of the total of nine candidate yards, five to six might be sufficient to build 9 to 12 ships per year, including LCSs, while of the first group of six yards, three or four might be sufficient to build a total of 6 to 8 ships per year other than LCSs. An average rate of two ships per year for each yard is between one-third and two-thirds of most of the maximum annual rates shown in **Table 3**, and is similar to rates executed at times in the 1980s, during the final years of the Cold War.

Potential Need to Surge to Higher-Rate Production. Advocates of keeping a larger number of shipyards involved in Navy shipbuilding could argue that in light of the difficulties of predicting future potential threats to U.S. interests, and the possibility that China may choose to build a significant maritime military capability over the next 10 to 25 years, it is possible that the Navy and DOD might decide years from now that the United States needs to build a Navy substantially larger than one of about 260 to 325 ships, in which case there may be a sudden need for building substantially more than 9 to 12 ships per year. Keeping a larger number of yards involved in Navy shipbuilding, they could argue, would make it easier to shift to higher-rate production in a timely manner without straining yard capabilities.

Advocates of keeping a smaller number of yards involved in Navy shipbuilding could argue that in light of the capacity figures shown in **Table 3**, even a smaller number of yards could still have enough excess capacity to shift to a higher rate of production in a timely manner without straining yard capabilities.

⁴⁰ The decline in the rate of Navy ship procurement to relatively low levels began about FY1993. During the 13-year period FY1993-FY2005, a total of 72 battle force ships (including 1 LCS) were procured, or an average of about 5.5 ships per year. Subtracting these 72 ships from a total fleet of 260 to 325 ships would leave a total of 188 to 253 ships to be procured during the remaining 22 years of a 35-year procurement period for replacing the entire fleet. Procuring these 188 to 253 ships over a 22-year period would require an average procurement rate of about 8.6 to 11.5 ships per year. A total of 126 to 172 ships other than LCSs (197 to 243 ships other than LCSs required minus 71 ships other than LCSs procured during FY1993-FY2005) would need to be procured over these 22 years, or an average of 5.7 to 7.8 ships other than LCSs per year.

⁴¹ Extending the analysis in the previous footnote, a total of 188 to 253 ships of all kinds divided by the 17 remaining years in a 30-year procurement period equates to an average rate of about 11.1 to 14.9 ships per year, while a total of 126 to 172 ships other than LCSs divided by 17 years equates to an average rate of about 7.4 to 10.1 ships other than LCSs per year.

Potential For Creating New Yards or Reopening Closed Yards.

Depending on other forms of work available to various shipyards (see discussion below), a decision to keep a smaller number of yards involved in Navy shipbuilding could lead to the end of shipbuilding activities at, or the complete closure of, yards that are not involved in Navy shipbuilding. As a result of this possibility, a potential additional factor to consider is the potential for creating new shipyards or reopening closed ones to respond a need at some point in the future for additional shipbuilding capacity. Factors to consider in assessing this potential include availability of suitable waterfront property, regulatory issues, cost and time for facilities, and cost and time for the workforce:

- **Waterfront property.** If a shipyard is closed but the property is not sold off and developed for other uses (such as conversion into waterside residential units), then it might remain available for eventual reuse as a shipyard. Part of the former government-operated U.S. naval shipyard in Philadelphia, for example, has been converted by the Kvaerner Corporation into a new facility for building commercial ships. If, however, a closed yard's waterfront property is sold off and developed for other uses, it may be difficult to find other suitable waterfront property to establish a new yard, at least in the same immediate area.
- **Regulatory issues.** Since shipyards are major industrial facilities, gaining regulatory approval for establishing a shipyard on a parcel of waterfront property may involve a number of regulatory issues. A special set of regulatory issues would apply in the case of a proposal to establish or reopen a shipyard capable of building nuclear-powered ships. Although the Navy maintains extremely high safety standards in its program for building, operating, and maintaining its nuclear-powered ships, the challenges involved gaining regulatory approval (and local popular support) for establishing a shipyard that would work with radioactive fuel as part of the process for building nuclear-powered ships are viewed as potentially significant, particularly if the area in which the shipyard is to be located has not hosted such a facility previously or for some number of years. The potential challenges associated with creating a new nuclear-capable shipyard, or reopening and recertifying a closed one, are a reason why some observers have argued that particular caution should be applied when considering actions that may have the effect of leading to the closure of either of General Dynamics/Electric Boat or Northrop Grumman/Newport News, which are the only two yards that have built nuclear-powered ships in recent years.⁴²

⁴² In theory, nuclear-powered warships could be built at one or more of the country's four government-operated naval shipyards, which are located at Portsmouth, NH/Kittery, ME, Norfolk, VA, Bremerton, WA, and Pearl Harbor, HI. Government-operated naval shipyards, however, have not built new ships for the Navy since the 1970s (they have been used since (continued...))

- **Cost and time for facilities.** Building the facilities for a new shipyard capable of building larger ships for the Navy could easily involve an investment of several hundred million dollars, or possibly more than a billion dollars, and a number of years of construction time. Reopening a closed shipyard could cost less and require less time, if some portion of the yard's old facilities were left in place and preserved.
- **Cost and time for workforce.** Hiring and training the workforce of a yard capable of building large and complex Navy ships, and putting together a team of capable managers and supervisors for such a facility, could take considerable time and resources if skilled production workers and experienced managers and supervisors were not readily available from other yards. Some observers believe that establishing a skilled workforce can be the most time-consuming component of an effort to create or reopen a shipyard.

Factors Related to Cost and Acquisition Strategy.

Shipyard Fixed Overhead Costs. Other things held equal, keeping a higher number of yards involved in building Navy ships could increase the total cost of Navy ships by increasing the amount of shipyard fixed overhead costs included in that cost.⁴³ A 1996 CRS report estimated that a smaller shipyard capable of building major Navy ships (i.e., one whose facilities are adjusted to support a total employment of a few thousand people) might have fixed costs ranging from a few to several tens of millions of dollars per year, while a larger shipyard capable of building major Navy ships (i.e., one whose facilities are adjusted to support a total employment ranging from several thousand people to more than 10,000 people) might have fixed costs ranging from several tens of millions of dollars per year to more than \$100 million per year.⁴⁴ Given inflation since 1996, those figures might be higher today.

⁴² (...continued)

that time only to overhaul, repair, and modernize Navy ships), so considerable investment would be needed to improve their facilities so as to support new-construction work.

⁴³ As explained in a 1996 CRS report, a manufacturing facility's fixed overhead costs are those that are relatively insensitive (i.e., do not change very much in response) to changes in the level of production, particularly over the shorter run. Some fixed costs would continue to be incurred even if the level of production at the facility falls to zero. A manufacturing facility's other main type of costs are its variable costs, which are those incurred in proportion to the level of production. Variable costs include expenses for labor and materials. A firm's fixed costs are spread over — that is, charged to and thereby incorporated into the cost of — the various work projects that make up the total workload underway at the facility. (CRS Report 96-785 F, *Navy Major Shipbuilding Programs and Shipbuilders: Issues and Options for Congress*, by Ronald O'Rourke, pp.83-84. Archived; available from the author.)

⁴⁴ CRS Report 96-785 F, *Navy Major Shipbuilding Programs and Shipbuilders: Issues and Options for Congress*, op. cit., p. 84.

On this basis, keeping a higher rather than lower number of yards involved in building Navy ships might increase the fixed overhead costs associated with building these ships by perhaps a few hundred million, or possibly several hundred million, dollars a year. Given current and projected procurement costs for Navy ships, building a total of 9 to 12 ships per year including LCSs could cost an average of more (perhaps much more) than \$10 billion per year, in which case a figure of a few or possibly several hundred million dollars in additional fixed overhead costs would increase the collective cost of those ships by a few or possibly several percent. The decision to produce Virginia-class submarines jointly between two yards rather than at a single yard, for example, may have increased the cost of these submarines by somewhere between about \$70 million and about \$200 million per boat, which equates to about 3% to 9% of the cost of each boat. Some (but not all) of this additional cost is due to the additional fixed overhead costs of maintaining the combined equivalent of more than one complete submarine production line between the two yards.⁴⁵

Advocates of keeping a smaller number of yards involved in Navy shipbuilding could argue that a sum of a few or possibly several hundred million dollars per year in additional shipyard fixed overhead costs is significant in an absolute sense and that being good stewards of taxpayer dollars requires reducing Navy ship construction costs wherever possible, including the area of shipyard fixed overhead costs. Advocates of keeping a larger number of yards involved in Navy shipbuilding could argue that, as a percentage of the total cost of the ships being built, this sum is not very significant and is worth the benefits of keeping more yards involved.

Cost Associated With Split Learning Curves. Other things held equal, if keeping a higher number of shipyards involved in Navy shipbuilding results in producing a given class of ship at two yards rather than at one yard, the resulting “splitting of the learning curve” between the two yards might increase the cost of producing that class of ship by roughly 1% to 4%.⁴⁶ Navy officials, for example, estimated that the 2002 agreement between the Navy, Northrop Grumman, and General Dynamics to consolidate production of the 12 planned LPD-17 amphibious ships at Northrop’s Avondale and Ingalls shipyards rather than divide the class on two-for-one basis between the Northrop yards and GD/BIW, respectively, would

⁴⁵ For a discussion, see CRS Report RL32418, *Navy Attack Submarine Force-Level Goal and Procurement Rate: Background and Issues for Congress*, by Ronald O’Rourke, pp. 48-50.

⁴⁶ The concept of the production learning curve refers to the reduction in labor hours needed to produce each item in a series as the workers at the facility learn (i.e., become more familiar with and experienced in building) the design. If an item is produced at two facilities rather than one, the workforce at each facility must travel down the learning curve, increasing average labor costs for the combined lot of items being built at both facilities. Given typical learning curves (i.e., rates of learning) for Navy ships and potential production runs ranging from a few ships to perhaps about 20 ships, splitting a learning curve for a class of Navy ships can increase shipyard labor costs for building the class by perhaps 3% to 13%. If shipyard labor costs account for roughly 20% to 40% of the total construction cost of a Navy ship, then this would equate to an increase in the total construction cost of the ship of 0.6% to 4.2%. For a discussion, see CRS Report 96-785 F, *Navy Major Shipbuilding Programs and Shipbuilders: Issues and Options for Congress*, op. cit., pp. 95-101.

reduce construction costs for the program by at least \$437 million dollars.⁴⁷ This would equate to a savings of roughly 3% for a class of 12 LPD-17s costing an average of \$1.2 billion each. Much of this savings was due to avoiding a split learning curve for the class. Keeping a higher number of yards involved in Navy shipbuilding, however, might not necessarily result in any instances of splitting the learning curve, in which case there would be no additional cost due to this factor.

As with the issue of shipyard fixed overhead costs, advocates of keeping a smaller number of yards involved in Navy shipbuilding could argue that the potential additional costs resulting from split learning curves are significant in an absolute sense, while advocates of keeping a larger number of yards involved in Navy shipbuilding could argue that even if this results in additional instances of split learning curves, the resulting additional costs would not be very significant as a percentage of the total cost of the ships being built and are worth the benefits of keeping more yards involved.

Cost of Government Supervision. Other things held equal, keeping a higher number of shipyards involved in Navy shipbuilding may result in higher costs to the Navy for supervising the work done at those yards. Additional personnel-related costs for supervising a larger number of sites might total millions of dollars a year.

Competition in Ship Design. Advocates of keeping a larger number of yards involved in Navy shipbuilding could argue that doing so would increase the likelihood of having two yards with recent experience in designing a given kind of ship, thus improving the government's ability to use competition in the design stage of ship acquisition programs to spur design innovation and achieve the best possible design. Recent experience in building a given category of ship, they could argue, could be particularly important in strengthening a yard's understanding of design producibility (i.e., designing a ship so that it can not only perform its missions well, but also be produced in the shipyard easily and at lower cost).

Advocates of keeping a smaller number of yards involved in Navy shipbuilding could argue that doing so could involve having individual yards building multiple types of ships, in which case the Navy might be no less likely to have at least two yards with recent experience in designing and building a given type of ship. Yards involved in building multiple types of ships, they could argue, might be better able to transfer design innovations from one type of ship to another and take maximum advantage of the potential for exploiting commonality in systems and components across ship types so as to reduce cost.

Competition in (or Benchmarking of) Ship Construction. Competition in the awarding of contracts for building follow-on ships in Navy shipbuilding programs (i.e. the ships that follow the lead ship in each class) was a common feature in Navy shipbuilding programs in the 1980s but became less common in the 1990s and is rare

⁴⁷ Kerry Gildea, "Navy Evaluating Option For Building Added LPD-17 Earlier Than Planned," *Defense Daily*, Apr. 4, 2003. The Navy earlier estimated that the savings would be at least \$400 million. See David Rogers, "Pentagon's Revised Budget Nears Agreement In House And Senate," *Wall Street Journal*, Oct. 9, 2002.

today, primarily because of the decrease in Navy shipbuilding rates since the end of the Cold War. Some policymakers believe that competition in the awarding of contracts for building follow-on ships can be advantageous for the government in terms of constraining production costs, maintaining adherence to delivery schedules, and maintaining high production quality standards. Results in constraining costs can offset the additional costs (such as additional shipyard fixed overhead costs) of keeping a larger number of yards involved in building Navy ships.

Advocates of keeping a larger number of yards involved in Navy shipbuilding could argue that doing so increases the chances of having two yards with recent experience in building various kinds of Navy ships, thus preserving a potential for resuming effective competition in the awarding of contracts for building these ships, should shipbuilding rates in the future increase to levels that can support a resumption of competition. Even if procurement rates do not increase enough to support a resumption of competition, they could argue, keeping at least two yards involved in building a given kind of ship permits the government to use one yard's performance in that program to benchmark the performance of the other yard involved in that program. In August 2004, for example, the Navy criticized Newport News' performance in its portion of the Virginia-class submarine program, noting that cost growth on Electric Boat's portion of the program was much smaller.⁴⁸

Advocates of keeping a smaller number of yards involved in Navy shipbuilding could argue that it is unlikely that shipbuilding rates will rise in coming years to levels that would permit the government to resume meaningful competition in the awarding of contracts to build follow-on ships, but that having a smaller number of yards that each build multiple kinds of ships could in any event preserve at least two yards with recent experience in building various kinds of ships, preserving a potential for resuming competition or for using one yard's performance on a program to benchmark another yard's performance. In instances where a certain kind of ship is being built by only one yard, they could argue, the performance of other yards in building other kinds of ships could still be used to indirectly benchmark the performance of the first yard using performance measures that are common to multiple types of Navy shipbuilding efforts.

Labor Markets. Advocates of keeping a larger number of yards involved in Navy shipbuilding could argue that this would increase the number of local or regional labor markets from which shipyard workers could be recruited and trained, increasing the likelihood that yards could hire and train high-quality workers and making it potentially easier to rapidly increase the number of workers involved in Navy shipbuilding, should a sudden increase in required shipbuilding rates call for such an expansion.

⁴⁸ See Christopher J. Castelli, "Virginia-Class Program Delivers Lead Sub, But Cost Concerns Lom," *Inside the Navy*, Oct. 18, 2004; Christopher J. Castelli, "Young Suggests Changing Work Distribution For Submarine Program," *Inside the Navy*, Oct. 4, 2004; Tony Capaccio, "General Dynamics, Northrop Review Of Sub Work Sought," *Bloomberg.com*, Sept. 29, 2004; Bloomberg News. "Northrop's Submarine Work Draws Criticism From Navy," *Baltimore Sun*, Sept. 16, 2004; Tony Capaccio, "Northrop Sub Work Has Cost Growth, Delays, Navy Says," *Bloomberg News*, Sept. 15, 2004.

Advocates of keeping a smaller number of yards involved in Navy shipbuilding could argue that a sufficient number of labor markets would still be involved to support the hiring and training of new workers, and that attracting new workers when needed will not be difficult because jobs building Navy ships are relatively well-paying manufacturing jobs that are highly sought after due to recent declines in the number of such jobs available in certain other sectors of the economy.

Potential Work Other Than Navy Shipbuilding. Building ships for the Navy is the primary business for most of the nine candidate yards. Other forms of work, however, contribute to the workloads and revenues of these yards and can thus become a consideration in discussions of which yards should be involved in Navy shipbuilding programs. These other forms of work traditionally have included repairing and modernizing Navy ships and building and repairing commercial ships.

An additional form of work that has not been available to a significant degree in past years, but which is currently available, is construction of new Coast Guard cutters under the Coast Guard's Deepwater program (a major program for replacing the Coast Guard's aging cutters and aircraft). Accelerating the procurement of these cutters from more distant years into the near term, and expanding the total number of cutters to be procured under the program, could provide a significant amount of support over the next several years to the Navy shipbuilding industrial base, particularly for the shipyards that have been involved in building surface combatants (Northrop Grumman/Ingalls and General Dynamics/BIW). As discussed in other CRS reports, accelerating and expanding procurement of cutters under the Deepwater program could reduce their unit procurement costs by improving production economies of scale, more quickly reduce operation and maintenance costs associated with keeping older Coast Guard cutters in service, and more quickly improve the Coast Guard's abilities to fully perform all of its post-9/11 missions.⁴⁹

Factors Relating to Other Issues.

Geographic Base of Support for Navy Shipbuilding. Advocates of keeping a larger number of yards involved in Navy shipbuilding could argue that doing so increases the number of locations around the country where Navy ships are built, thus broadening the geographic base of support for Navy shipbuilding, which can be important when supporters of Navy shipbuilding compete against supporters of other DOD procurement programs, such as aircraft programs, for scarce DOD procurement dollars.

Supporters of keeping a small number of yards involved in Navy shipbuilding could argue that doing so could reduce shipbuilding costs and thereby make Navy shipbuilding more cost-competitive against other areas of DOD procurement for scarce DOD procurement dollars. They could also argue that the firms that own most of these yards — General Dynamics and Northrop Grumman — will defend these

⁴⁹ For a discussion, see CRS Report RL32109, *Navy DD(X) and LCS Ship Acquisition Programs: Oversight Issues and Options for Congress*, by Ronald O'Rourke, pp. 78-81. See also CRS Report RS21019, *Coast Guard Deepwater Program: Background and Issues for Congress*, by Ronald O'Rourke.

programs adequately in the competition for DOD procurement dollars so long as the Navy ensures that the firms' rates of return on investment for Navy shipbuilding are comparable to their rates of return for their other lines of defense work.

Distribution of Economic Benefits of Navy Shipbuilding. Advocates of keeping a larger number of yards involved in Navy shipbuilding could argue that the economic benefits of Navy shipbuilding (particularly in terms of providing relatively well paying manufacturing jobs) should be distributed to as large a number of areas around the country as possible, since Navy shipbuilding is financed with money collected from taxpayers around the country. Supporters of keeping a smaller number of yards involved in Navy shipbuilding could argue that DOD procurement programs often benefit some areas of the country more than others, and that being good stewards of the taxpayers' money means building ships at the lowest possible cost, even if that means building them in a smaller number of locations.

Potential Oversight Questions. Potential oversight questions for Congress regarding the number of shipyards that should be regularly involved in Navy shipbuilding in coming years include the following:

- What are the positions of the Navy, DOD, and the Administration regarding the number of shipyards that should be regularly involved in Navy shipbuilding in coming years? What are the Navy's, DOD's, and the Administration's views regarding the relative advantages and disadvantages of keeping a larger or smaller number of yards involved?
- Are the Navy, DOD, and the Administration committed to keeping all six of the yards that have built the Navy's major ships in recent years involved in Navy shipbuilding?
- If so, what steps is the Administration prepared to take to ensure this result? What are the positions of the Navy, DOD, and the Administration regarding the possibility of accelerating and expanding the procurement of larger cutters under the Coast Guard Deepwater program as a means of providing additional work for the shipbuilding industrial base over the next several years?
- If the Navy, DOD, and the Administration are not committed to keeping all six of the yards that have built the Navy's major ships in recent years involved in Navy shipbuilding, which yard or yards does the Administration believe are most likely to not remain involved in Navy shipbuilding?
- Is the current plan to build LCSs at yards other than six yards that have built the Navy's major ships in recent years motivated in part by a desire by the Navy, DOD, or the Administration to encourage one or more of the six yards that have built the Navy's major ships in recent years to withdraw from Navy shipbuilding?

Recent statements from Navy officials suggest that the Navy's position is that the industrial base must adjust to the needs of the Navy, not the other way around, and that it is up to industry officials to determine, through their own decisions as business leaders, what the future structure of the industry should be. Statements from Navy officials also suggest that the Navy is not necessarily wedded to maintaining a particular number of shipyards.⁵⁰

Legislative Activity in the 109th Congress

National Naval Force Structure Policy Act (H.R. 375)

This identical bills would establish it as “the policy of the United States to rebuild as soon as possible the size of the fleet of the United States Navy to no fewer than 375 vessels in active service, to include 15 aircraft carrier battle groups and 15 amphibious ready groups....” This 375-ship fleet would differ in structure from the Navy's 375-ship proposal of 2002-2004, which included 12 carriers and about 12 amphibious ready groups. Similar legislation was introduced in the 108th Congress (H.R. 375/S. 902).

H.R. 304/S. 145 On Aircraft Carrier Force Levels

These identical bills would amend Section 5062 of title 10 of the U.S. Code to state that “The naval combat forces of the Navy shall include not less than 12 operational aircraft carriers. For the purposes of this subsection, an operational aircraft carrier includes an aircraft carrier that is temporarily unavailable for worldwide deployment due to routine or scheduled maintenance or repair.”

Legislative Activity in the 108th Congress

FY2004 Defense Authorization Bill (H.R. 1588/P.L. 108-136)

Section 216 of the conference report (H.Rept. 108-354 of November 7, 2003) on the FY2004 defense authorization bill (H.R. 1588/P.L. 108-136 of November 24, 2003) requires 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. The two studies, which are being conducted by the Center for Naval Analyses (CNA) and the Office of Force Transformation (or OFT, a part of the Office of the Secretary of Defense), are to be submitted to the congressional defense

⁵⁰ Dave Ahearn, “England, Admirals Say Industry Decides If, Where Shipyards Close,” *Defense Today*, Jan. 14, 2005; Amy Klumper, “Navy Officials Suggest Cuts Will Reshape Shipbuilders,” *GovExec.com Daily Briefing*, Jan. 13, 2005; Richard C. Barnard, “England Charts A Careful Course Through Political Fire,” *Sea Power*, Nov. 2004.

committees by January 15, 2005. (See pages 28-29 and 612-613 of H.Rept. 108-354.)⁵¹

FY2005 Defense Authorization Bill (H.R 4200/P.L. 108-375)

Section 1014 of the conference report (H.Rept. 108-767 of October 8, 2004) on H.R. 4200/P.L. 108-375 of October 28, 2004) states:

SEC. 1014. INDEPENDENT STUDY TO ASSESS COST EFFECTIVENESS OF THE NAVY SHIP CONSTRUCTION PROGRAM.

(a) **STUDY.** — The Secretary of Defense shall provide for a study of the cost effectiveness of the ship construction program of the Navy. The study shall be conducted by a group of industrial experts independent of the Department of Defense. The study shall examine both —

(1) a variety of approaches by which the Navy ship construction program could be made more efficient in the near term; and

(2) a variety of approaches by which, with a nationally integrated effort over the next decade, the United States shipbuilding industry might enhance its health and viability.

(b) **NEAR-TERM IMPROVEMENTS IN EFFICIENCY.** — With respect to the examination under subsection (a)(1) of approaches by which the Navy ship construction program could be made more efficient in the near term, the Secretary shall provide for the persons conducting the study to —

(1) determine the potential cost savings on an annual basis, with an estimate of return on investment, from implementation of each approach examined; and

(2) establish priorities for potential implementation of the approaches examined.

(c) **UNITED STATES SHIPBUILDING INFRASTRUCTURE MODERNIZATION PLAN.** — With respect to the examination under subsection (a)(2) of approaches by which the United States shipbuilding industry might enhance its health and viability through a nationally integrated effort over the next decade, the Secretary shall provide for the persons conducting the study to —

(1) propose a plan incorporating a variety of approaches that would modernize the United States shipbuilding infrastructure within the next decade, resulting in a healthier and more viable shipbuilding industrial base;

(2) establish priorities for potential implementation of the approaches examined; and

(3) estimate the resources required to implement each of the approaches examined.

(d) **REPORT.** — Not later than October 1, 2005, the Secretary of Defense shall submit a report to the congressional defense committees providing the results of the study under subsection (a). The report shall include the matters specified in subsections (b) and (c).

⁵¹ Section 216 is an amended version of a provision (Section 217) in the House-reported version of H.R. 1588. See pages 255-256 of the House report (H.Rept. 108-106 of May 16, 2003) on H.R. 1588.

In discussing this provision, the conference report stated:

The House bill contained a provision (sec. 1012) that would require the Secretary of Defense to have a study conducted by an entity independent of the Department of Defense on the cost-effectiveness of the ship construction program of the Navy. The study would examine various approaches for how the Navy ship construction program could be made more cost-effective in the near-term, and how the United States shipbuilding industry might be made globally competitive through a nationally integrated effort over the next decade.

The Senate amendment contained no similar provision.

The Senate recedes with an amendment that would require the Secretary of Defense to provide for a group of industrial experts to assess priorities for potential implementation of the various approaches in the near-term study, with an assessment of the return on investment. It would also require an assessment of priorities for potential implementation of the various approaches for the nationally, integrated effort, with the objective being to create a healthier and more viable U.S. shipbuilding industrial base.

The conferees believe the group chosen for this study should be five to ten industrial experts who represent an array of industrial sectors, not just the shipbuilding industry. Many sectors of the U.S. industrial base have had to retool processes and equipment to become more competitive. Since the rate of shipbuilding is much lower, competitiveness has not provided the same incentive for this sector. The conferees are aware of and support the work of the National Shipbuilding Research Program-Advanced Shipbuilding Enterprise (NSRP — ASE), including its lean shipbuilding initiative. The conferees would expect the group of industrial experts chosen for this study to become familiar with this work, and to consider the potential for using the NSRP — ASE to implement some of the various approaches. (Pages 755-756)

In its discussion of a proposed ballistic missile defense interceptor called the kinetic energy interceptor (KEI), which could be both ground- and sea-based, the conference report stated:

The conferees remain convinced that the KEI could be an important aspect of the overall ballistic missile defense architecture, potentially contributing intercept capabilities in boost, midcourse, and terminal phases of the threat missile flight. The conferees are concerned, however, with the lack of progress in defining basing modes. The conferees note that:

(1) Recent justifications for the KEI ground-based variant suggest that it might serve as the basis for midcourse intercept capability in Europe. At the same time, however, the budget request included \$35.0 million for additional ground-based interceptors (GBI) for the ground-based midcourse defense element that could be deployed in Europe; and

(2) Consideration of sea-based concepts of operations and platforms do not appear to be progressing.

The conferees direct the Director of the Missile Defense Agency to provide a report to the congressional defense committees by February 1, 2005 that

includes planned ground- and sea-basing modes for KEI (including specific sea-based platforms) and the concept of operations for each basing mode; how KEI will enhance ballistic missile defense system capabilities; the role KEI may play in European missile defense and how that role relates to the fielding of additional GBIs ground-based interceptors); and a comparison of anticipated sea-based KEI capabilities with other sea-based missile defense options. (Pages 579-580)

Appendix A: Independent Studies On Navy Force Structure

Section 216 of the conference report (H.Rept. 108-354 of November 7, 2003) on the FY2004 defense authorization bill (H.R. 1588/P.L. 108-136 of November 24, 2003) 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. The two studies, which were conducted by the Center for Naval Analyses (CNA) and the Office of Force Transformation (OFT, a part of the Office of the Secretary of Defense), were submitted to the congressional defense committees in February 2005.⁵²

A third independent study on potential future fleet platform architectures, which was conducted by the Center for Strategic and Budgetary Assessments (CSBA) on its own initiative, was made available to congressional and other audiences in March 2005.

This appendix summarizes these three studies.⁵³

CNA Report⁵⁴

The CNA report 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 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.

The report recommends a Navy force structure of 256 to 380 ships. The difference between the low and high ends of the CNA range is that the low end assumes a greater use of crew rotation and overseas homeporting of Navy ships.

Table 5 below compares the CNA-recommended force range to the 375-ship fleet proposal mentioned by Navy officials from early 2002 through early 2004.

⁵² Section 216 is an amended version of a provision (Section 217) in the House-reported version of H.R. 1588. See pages 28-29 and 612-613 of H.Rept. 108-354, and pages 255-256 of the House report (H.Rept. 108-106 of May 16, 2003) on H.R. 1588.

⁵³ This appendix essentially reprints a Mar. 18, 2005 memorandum to the office of Representative Roscoe Bartlett, and is incorporated here with the permission of that office.

⁵⁴ Delwyn Gilmore, with contributions by Mark Lewellyn *et al*, *Report to Congress Regarding Naval Force Architecture*. Alexandria (VA), Center for Naval Analyses, 2005. (CRM D0011303.A2/1Rev, Jan. 2005) 60 pp.

Table 5. CNA-Recommended Force and 375-Ship Proposal

Ship type	CNA-recommended force	Navy 375-ship proposal ^a
Ballistic missile submarines (SSBNs)	14	14
Cruise missile submarines (SSGNs)	4	4
Attack submarines (SSNs)	38 to 62	52
Aircraft carriers	10 to 12	12
Cruisers and destroyers	66 to 112	109
Littoral combat ships (LCSs)	40 to 70	56
Amphibious ships	18 to 30	36
Maritime Prepositioning Force (Future) ships	19 to 21	18
Combat logistics (resupply) ships	25 to 33	33
Other ^b	22	41
Total battle force ships	256 to 380	375

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

a Composition as shown in CNA report as the program of record for the year 2022. A somewhat different composition is shown earlier in this report.

b Includes command ships, support ships (such as salvage ships and submarine tenders), dedicated mine warfare ships, and high-speed sealift ships.

As can be seen in the table, 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 a more-or-less scaled-down version of the 380-ship fleet. The 256-ship fleet's reduced numbers for aircraft carriers, amphibious ships, and attack submarines are similar to figures reported in the defense trade press since early 2004 about possible reductions in planned numbers of those kinds of ships. The 256-ship fleet also includes reduced numbers for ships such as larger surface combatants and combat logistics (resupply) ships.

The CNA range of 256 to 380 ships overlaps with ranges of 290 to 375 ships, 260 to 325 ships, and 243 to 302 ships presented in the Navy's February testimony to Congress.⁵⁵ An additional comparison is that 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

⁵⁵ See Statement of Admiral Vernon Clark, USN, Chief of Naval Operations, Before the House Armed Services Committee, Feb. 17, 2005, pp. 19-20 and Statement of Admiral Vernon Clark, USN, Chief of Naval Operations, Before the Senate Armed Services Committee, Feb. 10, 2005, pp. 18-19.

2001 QDR fleet, however, the CNA-recommended force includes several dozen Littoral Combat Ships (LCSs) and smaller numbers of other kinds of ships.

The CNA-recommended fleet platform architecture uses essentially the same kinds of ships as those currently in the fleet, under construction, or planned for procurement. It also uses essentially the same kinds of naval formations as those in use today or 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.

In summary, the CNA-recommended force parallels fairly closely current Navy thinking 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.

OFT Report⁵⁶

The OFT report differs significantly (some might say diametrically) from the CNA report. The OFT report "calls into question the viability of the longstanding logic of naval force building"⁵⁷ and presents an essentially clean-sheet proposal for a future Navy that would be radically different from the currently planned fleet.

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. The report is generally consistent with Cebrowski's ideas on network-centric warfare and distributed force architectures, which he has developed and articulated since his tenure as President of the Naval War College (from July 24, 1998 to August 22, 2001).

The OFT-recommended fleet would include large numbers of manned ships (about three-quarters of them small, fast surface combatants), about the same number of carrier-based manned aircraft as in the Navy's planned fleet, and large numbers of unmanned systems.

The OFT architecture 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 are 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

⁵⁶ U.S. Department of Defense, Office of the Secretary of Defense, *Alternative Fleet Architecture Design*. Washington, 2005. (Report for the Congressional Defense Committees, Office of Force Transformation). 101 pp.

⁵⁷ *Ibid.*, p. 1

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 envisages 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. In displacement terms, this ship would be roughly the same size as a new aircraft carrier design that the United Kingdom plans to procure, 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.

- **A missile-and-rocket ship** that would be quipped with 360 vertical launch system (VLS) missile tubes and four 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. This ship 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.⁵⁸
- **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

⁵⁸ For more on the arsenal ship, see CRS Report 97-455 F, *Navy/DARPA Arsenal Ship Program: Issues and Options for Congress*, by Ronald O'Rourke. 133 pp.; and CRS Report 97-1044 F, *Navy/DARPA Maritime Fire Support Demonstrator (Arsenal Ship) Program: Issues Arising From Its Termination*, by Ronald O'Rourke. 6 pp. Both reports are out of print and are available directly from the author.

carriers for each of today's carriers. This new ship would have a maximum speed of 50 to 60 knots. In displacement terms, the ship 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.

- **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. This design could be viewed as similar to, but smaller than, the 2,500- to 3,000-ton Littoral Combat Ship (LCS). Compared to the LCS, it 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.
- **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. Compared to the LCS, this ship, like the 1,000-ton surface combatant, would be closer in size to the Streetfighter concept.
- **A non-nuclear-powered submarine** equipped with an air-independent propulsion (AIP) system.⁵⁹ 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 envisages substituting four of these submarines for the SSN in each carrier strike group.⁶⁰

⁵⁹ An AIP system such as a fuel-cell or closed-cycle diesel engine extends the stationary or low-speed submerged endurance of a non-nuclear-powered submarine. A conventional diesel-electric submarine has a stationary or low-speed submerged endurance of a few days, while an AIP-equipped submarine may have a stationary or low-speed submerged endurance of up to two or three weeks. An AIP system does not significantly increase the high-speed submerged endurance of a non-nuclear-powered submarine. A non-nuclear-powered submarine, whether equipped with a conventional diesel-electric propulsion system or an AIP system, has a high-speed submerged endurance of perhaps 1 to 3 hours, a performance limited by the electrical storage capacity of the boat's batteries, which are exhausted quickly at high speed.

⁶⁰ The report states that "Alternatives to the SSNs in formations were diesel Air Independent Propulsion (AIP) submarines and unmanned undersea vehicles (UUVs). The AIP (continued...)"

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

The OFT architecture is similar in certain ways to a fleet architecture proposed by the Naval Surface Warfare Center (NSWC) between 1989 and 1992. 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.⁶¹

The OFT report combines the eight above-described types of ships, plus the Navy's currently planned TAOE-class resupply ship, into three alternative force structures (Alternatives A, B, and C) that the report calculates would be equal in cost to the equivalent parts of the Navy's proposed 375-ship fleet. The report states that each of these alternative force structures, like the equivalent parts of the Navy's proposed 375-ship fleet, 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 6** on the next page.

⁶⁰ (...continued)

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 Feb. 18, 2005 meeting between CRS and analysts who contributed to the OFT report.

⁶¹ For more on this proposed fleet architecture, see Norman Polmar, "Carrying Large Objects," *U.S. Naval Institute Proceedings*, December 1990: 121-122; Michael L. Bosworth *et al*, "Multimission Ship Design for an Alternative Fleet Concept," *Naval Engineers Journal*, May 1991: 91-106; Michael L. Bosworth, "Fleet Versatility by Distributed Aviation," *U.S. Naval Institute Proceedings*, Jan. 1992: 99-102; and Victor A. Meyer, "Naval Surface Warfighting Vision 2030," *Naval Engineers Journal*, May 1992: 74-88. See also "USN's '2030' Plan For Future Fleet," *Sea Power*, Apr. 1992: 79, 82; Edward J. Walsh, "'Alternative Battle Force' Stresses Commonality, Capability," *Sea Power*, Feb. 1991: 33-35; Robert Holzer, "Navy Floats Revolutionary Ship Design for Future Fleet," *Defense News*, May 14, 1990: 4, 52; and Anne Rumsey, "Navy Plans Ship Look-A-Likes," *Defense Week*, Mar. 13, 1989: 3.

Table 6. Alternative fleet structures from OFT report

Ship type	Alternative		
	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
<i>Subtotal 1,000- and 100-ton ships</i>	<i>417</i>	<i>609</i>	<i>609</i>
<i>Subtotal other ships</i>	<i>141</i>	<i>165</i>	<i>237</i>
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 earlier 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, includes all these kinds of ships.

As can be seen from the shaded cells in 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 substitutes 13,500-ton carriers.

As can also be seen in the table, all three fleets are dominated numerically by the small surface combatants. These ships account for about 75% of the ships in Alternative A, about 79% of the ships in Alternative B, and about 72% of the ships

in Alternative C. In the Navy's currently planned architecture, by contrast, the LCS might account for roughly 15% to 20% of the total number of ships.

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 290 ships, except that the future force would include a substantial number of relatively inexpensive LCSs. If proportionate reductions are applied to the force structures shown in **Table 6**, 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.

In terms of how the OFT architecture would compare in capability with the currently planned architecture, the 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 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 programmed fleet often is as good as the 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.⁶²

At other points, 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”⁶³ 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;⁶⁴
- 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;”⁶⁵
- 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;
- 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;
- 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;

⁶² *Alternative Fleet Architecture Design*, op. cit., pp. 75-76. Italics as in the original.

⁶³ *Ibid.*, p. 6.

⁶⁴ *Ibid.*, p. 1 and 2.

⁶⁵ *Ibid.*, p. 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.

The OFT report does not include a detailed plan for transitioning from today's fleet architecture to its proposed architecture,⁶⁶ but such a plan could be developed as a follow-on analysis.

The 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

⁶⁶ 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)

system that is beset by laws and regulations that frustrate, even pervert, market forces.⁶⁷

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."⁶⁸

The OFT report proposes building ships that are substantially different from those currently in the fleet, under construction, or planned for procurement, and combines these 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. 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 OFT-recommended force arguably would qualify as an alternative fleet platform architecture.

In summary, the OFT report fundamentally challenges current Navy thinking on the size and composition of the fleet. This is perhaps not surprising, given both OFT's institutional role within DOD as a leading promoter of military transformation and Cebrowski's views on network-centric warfare and distributed force architectures.

CSBA Report⁶⁹

The CSBA report can be viewed as falling somewhere in between the CNA and OFT reports in terms of how far its recommendations depart from current Navy plans. The CSBA report:

- challenges current Navy thinking on Navy force planning more than the CNA report, but less than the OFT report;
- uses many of the same kinds of ships now planned by the Navy (like the CNA report) but also recommends or suggests some new kinds of ship designs (like the OFT report); and
- recommends a ship force structure that differs from current Navy plans more than CNA's force structure, but less than OFT's force structure.

⁶⁷ Ibid., p. 76.

⁶⁸ Ibid., p. 80.

⁶⁹ Robert O. Work, *Winning the Race: A Naval Fleet Platform Architecture for Enduring Maritime Supremacy*. (Washington, Center for Strategic and Budgetary Assessments: 2005).

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.⁷⁰

CSBA's Executive Director is Dr. Andrew F. 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.

The CSBA report aims at designing a distributed, adaptable, and scalable integrated naval battle network whose ships could be acquired for a total of about \$10 billion per year in ship-acquisition funding, defined in the report as the sum of the Shipbuilding and Conversion, Navy (SCN) appropriation account and ship-construction funding in the National Defense Sealift Fund (NDSF). Another stated goal of the CSBA report is to provide a practical transition road map for shifting from today's fleet structure to CSBA's recommended fleet structure.

The CSBA report analyzes at length the historical missions and structure of the U.S. Navy and other navies and uses this analysis to support its discussion of how to structure the U.S. fleet for the future. 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:

- contribute to the global war on terrorism (GWOT);
- prepare for possible nuclear-armed regional competitors; and
- hedge against the possibility of a disruptive maritime competition with China.

To do these three things, the report argues, the Navy should be structured to include the following:

- a sea-based power-projection and regional deterrence force;
- a global patrol, GWOT, and homeland defense force;
- a force for prevailing over enemy anti-access/area-denial forces; and
- a strategic deterrence and dissuasion force.

⁷⁰ Source: CSBA's website [<http://www.csbaonline.org>].

The report constructs these four force elements and then combines them to arrive at an overall recommended Navy force structure. **Table 7** below shows this force structure and compares it to the Navy's 375-ship proposal as outlined in the CNA report.

Table 7. CSBA-Recommended Force and 375-Ship Proposal

Ship type	CSBA-recommended force	Navy 375-ship proposal ^a
Ballistic missile submarines (SSBNs)	12 ^b	14
Cruise missile submarines (SSGNs)	6 ^b	4
Attack submarines (SSNs)	54 ^c	52
Large-deck aircraft carriers (CVNs)	10	12
Medium aircraft carriers (CVEs)	4	0
Afloat forward staging base (AFSB)	1	0
Cruisers and destroyers	84 or 86	109
Littoral combat ships (LCSs)	84	56
Amphibious ships	32 ^d	36
Maritime Prepositioning Force ships	16 ^e	18 ^e
Combat logistics (resupply) ships	36 ^f	33
Other ^g	34 ^h	41
Total battle force ships	373 or 375ⁱ	375

Source for CSBA force structure: Table prepared by CRS based on figures in CSBA report.

a Composition as shown in CNA report as the program of record for the year 2022. A somewhat different composition is shown earlier in this report.

b Alternatively, 10 SSBNs and 8 SSGNs.

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

d Includes 8 LHDs and 24 LPD-17s.

e In the CSBA force, these are existing MPF ships; in the Navy's 375-ship proposal, they are MPF(Future) ships.

f Includes 8 TAOEs, 11 TAKEs, and 17 TAOs.

g Includes command ships and support ships (such as salvage ships and submarine tenders), and (for CNA) dedicated mine warfare ships, and high-speed sealift ships.

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

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 currently 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, do the following:
 - 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.⁷¹

- **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.⁷²

- **Destroyers and cruisers.**
 - Procure a single DD(X) 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 DD(X)/CG(X), but with a substantially lower procurement cost.
 - Build two additional surface combatant technology demonstrators to compete against the DD(X) design.

⁷¹ CSBA briefing, slides 154-158.

⁷² Ibid., slides 276, 284, 289, 297, 299.

- 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 DD(X).
 - Begin procuring this new design in FY2015 as a replacement for the DD(X)/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 DD(X).
 - Consider procuring two additional DDG-51s to help support the surface combatant industrial base in the near-term.⁷³
- **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.⁷⁴
 - **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 composed 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.⁷⁵
 - **MPF and other ships.**
 - Retain the three existing MPF squadrons over the near- to mid-term.

⁷³ Ibid., slides 246, 249, and 251-253. Slide 249 states that possibilities for a reduced-cost alternative to the DD(X) 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.

⁷⁴ Ibid., slides 275, 277, and 283.

⁷⁵ Ibid., slides 227 and 236.

- 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.⁷⁶

The 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.⁷⁷

Regarding the industrial base, 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.”⁷⁸ 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.”⁷⁹

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

⁷⁶ Ibid., slides 228-232, and 307.

⁷⁷ Ibid., slide 212.

⁷⁸ Ibid., slide 314.

⁷⁹ Ibid., slide 315.

- 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.⁸⁰

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

- maintain production of aircraft carriers at Newport News,
- consolidate production of large surface combatants and amphibious ships at Ingalls, and
- consolidate submarine building at Electric Boat (EB), or with a new, single submarine production company.⁸¹

The report states that the second of these possibilities is guided by the building sequence of LPD-17s and SCXs recommended in the report, Ingalls’ ability to build a wider variety of ships than BIW, Ingalls’ surge capacity, and the availability of space for expanding Ingalls if needed.⁸²

⁸⁰ Ibid., 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.
- 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.

⁸¹ Ibid., slides 317-318.

⁸² Ibid., slide 318.

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, EB's past experience in building SSBNs and SSNs, EB's surge capacity, and the fact that building submarines at EB would maintain two shipyards (EB and Newport News) capable of designing and building nuclear-powered combatants of some kind.⁸³

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.⁸⁴

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 [National Steel and Shipbuilding Company], Avondale, and Tier II yards may help to keep the costs of these ships down.

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 LCS, and the Northrop Grumman National Security Cutter, Medium [i.e., the medium-sized Deepwater cutter] gives the DoN [an] 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 [Bath Iron Works] and Ingalls "hot" until the SCX is designed....

⁸³ Ibid., slide 318. See also slide 298.

⁸⁴ Ibid., slides 318-319.

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.⁸⁵

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

In summary, the CSBA report 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.

⁸⁵ Ibid., slide 319.

Appendix B: Size of Navy and Navy Shipbuilding Rate

The total number of battle force ships in the Navy reached a late-Cold War peak of 568 at the end of FY1987 and began declining thereafter.⁸⁶ The Navy fell below 300 battle force ships in August 2003 and included 288 battle force ships as of March 30, 2005. The FY2006-FY2011 FYDP calls for reducing the Navy to 285 battle force ships by the end of FY2005 before building back to 289 battle force ships by the end of FY2006, 293 by the end of FY2007, 297 by the end of FY2008, 302 by the end of FY2009 and FY2010, and 305 by the end of FY2011.

Table 8 below shows past (FY1982-FY2005) and projected (FY2006-FY2011) rates of Navy ship procurement.

Table 8. Battle force ships procured (FY1982-FY2005) or projected (FY2006-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	4	7	7	9	10	12

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).

⁸⁶ Some publications, such as those of the American Shipbuilding Association, state that the Navy reached a peak of 594 ships at the end of FY1987. This figure, however, is the total number of active ships in the fleet, which is not the same as the total number of battle force ships. In recent years, the total number of active ships has been larger than the total number of battle force ships. For example, the Naval Historical Center states that as of November 16, 2001, the Navy included a total of 337 active ships, while the Navy states that as of November 19, 2001, the Navy included a total of 317 battle force ships. Although the total number of battle force ships as of February 16, 2005 was 290, the total number of active ships as of this date was likely more than 300. Comparing the total number of active ships in one year to the total number of battle force ships in another year is thus an apple-to-oranges comparison that in this case overstates the decline since FY1987 in the number of ships in the Navy. As a general rule to avoid potential statistical distortions, comparisons of the number of ships in the Navy over time should use, whenever possible, a single counting method.