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

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Summary

The current and planned size and composition of the Navy, the rate of Navy ship procurement, and the prospective affordability of the Navy's shipbuilding plans have been oversight matters for the congressional defense committees for many years. The Navy's FY2019 budget submission includes proposed increases in shipbuilding rates that are intended as initial steps for increasing the size of the Navy toward a goal of a fleet with 355 ships of certain types and numbers.

The Navy's proposed FY2019 budget requests funding for the procurement of 10 new ships, including two Virginia-class attack submarines, three DDG-51 class Aegis destroyers, one Littoral Combat Ship (LCS), two John Lewis (TAO-205) class oilers, one Expeditionary Sea Base ship (ESB), and one TATS towing, salvage, and rescue ship. The total of 10 new ships is one more than the 9 that the Navy requested in its amended FY2018 budget submission, 3 less than the 13 battle force ships that were funded in the FY2018 DOD appropriations act, and 3 more than the 7 that were projected for FY2019 in the Navy's FY2018 budget submission. The three added ships include one DDG-51 class destroyer, one TAO-205 class oiler, and one ESB.

The Navy's FY2019 five-year (FY2019-FY2023) shipbuilding plan includes 54 new ships, or an average of 10.8 new ships per year. The total of 54 new ships is 12 more than the 42 that were included in the Navy's FY2018 five-year (FY2018-FY2022) shipbuilding plan, and 11 more than the 43 that the Navy says were included in the five-year period FY2019-FY2023 under the Navy's FY2018 budget submission. (The FY2023 column was not visible to Congress in the Navy's FY2018 budget submission.) The 11 ships that have been added to the five-year period FY2019-FY2023, the Navy says, are four DDG-51 class destroyers, three TAO-205 class oilers, two ESBs, one TATS, and one TAGOS ocean surveillance ship.

The Navy's FY2019 30-year (FY2019-FY2048) shipbuilding plan includes 301 new ships, or an average of about 10 per year. The total of 301 ships is 47 more than the 254 that were included in the Navy's FY2017 30-year (FY2017-FY2046) shipbuilding plan. (The Navy did not submit an FY2018 30-year shipbuilding plan.)

The Navy's goal for achieving and maintaining a fleet of 355 ships, released in December 2016, is 47 ships higher than the Navy's previous force-level goal of 308 ships. The force level of 355 ships is a goal to be attained in the future; the actual size of the Navy in recent years has generally been between 270 and 290 ships. Section 1025 of the FY2018 National Defense Authorization Act (H.R. 2810/P.L. 115-91 of December 12, 2017) states in part: "It shall be the policy of the United States to have available, as soon as practicable, not fewer than 355 battle force ships, comprised of the optimal mix of platforms, with funding subject to the availability of appropriations or other funds."

Although the 355-ship force-level goal is 47 ships higher than the previous 308-ship force-level goal, achieving and maintaining the 355-ship fleet within 30 years would require adding more than 47 ships to the Navy's previous (FY2017) 30-year shipbuilding plan, in part because that plan did not include enough ships to fully achieve all elements of the 308-ship force-level goal. CRS estimated in 2017 that 57 to 67 ships would need to be added to the Navy's FY2017 30-year shipbuilding plan to achieve the Navy's 355-ship fleet and maintain it through the end of the 30-year period (i.e., through FY2046), unless the Navy extends the service lives of existing ships beyond currently planned figures and/or reactivates recently retired ships. Similarly, the Congressional Budget Office (CBO) estimated in 2017 that 73 to 77 ships would need to be added to a CBO-created notional version of the Navy's FY2018 30-year (FY2018-FY2047) shipbuilding plan to achieve the Navy's 355-ship fleet and maintain it not only through the end of the 30-year period (i.e., through FY2047), but another 10 years beyond the end of the 30-year

period (i.e., through FY2057), unless the Navy extends the service lives of existing ships beyond currently planned figures and/or reactivates recently retired ships.

Consistent with these CRS and CBO estimates, the Navy projects that the 47 additional ships included in the Navy's FY2019 30-year shipbuilding plan would not be enough the achieve a 355-ship fleet during the 30-year period. The Navy projects that if the FY2019 30-year shipbuilding plan were implemented, the fleet would peak at 342 ships in FY2039 and FY2041, and then drop to 335 ships by the end of the 30-year period. The Navy projects that under the FY2019 30-year shipbuilding plan, a 355-ship fleet would not be attained until the 2050s (and the aircraft carrier force-level goal within the 355-ship goal would not be attained until the 2060s). Consistent with CRS and CBO estimates from 2017, the Navy estimates that adding another 20 to 25 ships to the earlier years of the Navy's FY2019 30-year shipbuilding plan (and thus procuring a total of 321 to 326 ships in the 30-year plan, or 67 to 72 ships more than the 254 included in the FY2017 30-year plan) could accelerate the attainment of a 355-ship fleet to about 2036 or 2037.

At a hearing on April 12, 2018, Navy officials announced that the Navy has decided to extend the service lives of all DDG-51 destroyers to 45 years. Navy officials testified that this action would permit the Navy to achieve a total of 355 ships by the 2030s, although the resulting mix of ships would not match the mix called for in the Navy's 355-ship force-level goal—there would be more than the required number of DDG-51s, and fewer than the required numbers of other types of ships.

CRS estimated in 2017 that procuring the 57 to 67 ships that would need to be added to the Navy's FY2017 30-year shipbuilding plan to achieve the Navy's 355-ship fleet and maintain it through FY2046 (unless the Navy extends the service lives of existing ships beyond currently planned figures and/or reactivates recently retired ships) would notionally cost an average of roughly $4.6 billion to $5.1 billion per year in additional shipbuilding funds over the 30-year period, using today's shipbuilding costs. Similarly, CBO estimated in 2017 that procuring the 73 to 77 ships that would need to be added to the CBO-created notional version of the Navy's FY2018 30-year shipbuilding plan to achieve the Navy's 355-ship fleet and maintain it through FY2057 (unless the Navy extends the service lives of existing ships beyond currently planned figures and/or reactivates recently retired ships) would cost, in constant FY2017 dollars, an average of $5.4 billion per year in additional shipbuilding funds over the 30-year period.

Additional shipbuilding funds are only a fraction of the total costs that would be needed to achieve and maintain the Navy's 355-ship fleet instead of the previously envisaged 308-ship fleet. CBO estimated in 2017 that, adding together both shipbuilding costs and ship operation and support (O&S) costs, the Navy's 355-ship fleet would cost an average of about $11 billion to $23 billion more per year in constant FY2017 dollars than the previously envisaged 308-ship fleet. This figure does not include additional costs for manned aircraft, unmanned systems, and weapons. Depending on total levels of defense spending in coming years, achieving and maintaining a 355-ship fleet could require reducing funding levels for other Department of Defense (DOD) programs.

The U.S. shipbuilding industrial base has some unused capacity to take on increased Navy shipbuilding work, particularly for certain kinds of surface ships, and its capacity could be increased further over time to support higher Navy shipbuilding rates. Navy shipbuilding rates could not be increased steeply across the board overnight—time (and investment) would be needed to hire and train additional workers and increase production facilities at shipyards and supplier firms, particularly for supporting higher rates of submarine production. Over a period of a few to several years, with investment and management attention, Navy shipbuilding could ramp up to higher rates for achieving a 355-ship fleet over a period of 20 to 30 years.

Contents

Introduction 1
Background 2
Navy's 355-Ship Ship Force-Structure Goal 2
Introduction 2
Made U.S. Policy by FY2018 NDAA 2
Part of Navy the Nation Needs (NNN) Vision 4
Apparent Reasons for Increasing Force-Level Goal from 308 Ships 4
Compared to Trump Campaign Organization Goal of 350 Ships 5
Additional Shipbuilding Needed to Achieve and Maintain 355-Ship Fleet 6
Time Needed to Achieve 355-Ship Fleet 7
Cost to Achieve and Maintain 355-Ship Fleet 7
Industrial Base Ability for Taking on Additional Shipbuilding Work 9
Employment Impact of Additional Shipbuilding Work 10
Extending Service Lives of Existing Ships and Reactivating Retired Ships 10
Navy's Five-Year and 30-Year Shipbuilding Plans 12
FY2019 Five-Year (FY2019-FY2023) Shipbuilding Plan 12
FY2019 30-Year (FY2019-FY2048) Shipbuilding Plan 13
Projected Force Levels Under FY2019 30-Year Shipbuilding Plan 14
Issues for Congress 16
Appropriateness of 355-Ship Goal 16
Navy's Proposed Shipbuilding Plan in Relation to 355-Ship Goal 17
Affordability of 30-Year Shipbuilding Plan 18
Overview 18
CBO vs. Navy Estimates of Cost of 30-Year Plan 20
Legislative Activity for FY2019 21
CRS Reports Tracking Legislation on Specific Navy Shipbuilding Programs 21
Summary of Congressional Action on FY2019 Funding Request 21
FY2019 National Defense Authorization Act (H.R. 5515) 23
House 23

Figures

Figure 1. Navy Estimate of Funding Requirements for 30-Year Plan 19

Tables

Table 1. 355-Ship Goal Compared to Previous 308-Ship Goal 3
Table 2. FY2019 Five-Year (FY2019-FY2023) Shipbuilding Plan 12
Table 3. FY2019 30-Year (FY2019-FY2048) Shipbuilding Plan 14
Table 4. Projected Force Levels Resulting from FY2019 30-Year Shipbuilding Plan 15
Table 5. Summary of Congressional Action on FY2019 Funding Request 22

Table B-1. Earlier Navy Force-Structure Goals Dating Back to 2001 33

Table C-1. Ship Procurement Quantities in First 10 Years of 30-Year Shipbuilding Plans 36
Table C-2. Projected Navy Force Sizes in First 10 Years of 30-Year Shipbuilding Plans 38
Table E-1. Comparison of Navy's 355-Ship Goal, 346-Ship Navy Goal from 1993 BUR, and 346-Ship Navy Goal from 2010 QDR Review Panel 44
Table F-1. Fleet Architecture Study by Navy Project Team: Summary of Force Level in 2030 46
Table F-2. Fleet Architecture Study by MITRE Corporation: Summary of Recommendations 49
Table F-3. Fleet Architecture Study by CSBA: Summary of Force-Level Goal 52
Table G-1. Pre-2013 Study Group Proposals for Navy Ship Force Structure 59
Table M-1. Total Number of Ships in Navy Since FY1948 79
Table M-2. Battle Force Ships Procured or Requested, FY1982-FY2018 80

Appendixes

Appendix A. Strategic and Budgetary Context 29
Appendix B. Earlier Navy Force-Structure Goals Dating Back to 2001 33
Appendix C. Comparison of First 10 Years of 30-Year Plans 35
Appendix D. Comparing Past Ship Force Levels to Current or Potential Future Ship Force Levels 40
Appendix E. Independent Panel Assessment of 2010 QDR 42
Appendix F. Fleet Architecture Studies Required by FY2016 NDAA 46
Appendix G. Pre-2013 Proposals by Study Groups for Navy Force Structure 58
Appendix H. Industrial Base Ability for Taking on Additional Shipbuilding Work 61
Appendix I. 2014 Journal Article on Fleet Architecture 70
Appendix J. A Summary of Some Acquisition Lessons Learned for Navy Shipbuilding 73
Appendix K. Some Considerations Relating to Warranties in Shipbuilding and Other Defense Acquisition 74
Appendix L. Some Considerations Relating to Avoiding Procurement Cost Growth vs. Minimizing Procurement Costs 76
Appendix M. Size of the Navy and Navy Shipbuilding Rate 78

Contacts

Author Contact Information 80

Introduction

This report presents background information and issues for Congress concerning the Navy's force structure and shipbuilding plans. The current and planned size and composition of the Navy, the rate of Navy ship procurement, and the prospective affordability of the Navy's shipbuilding plans have been oversight matters for the congressional defense committees for many years.

The Navy's FY2019 budget submission includes proposed increases in shipbuilding rates that are intended as initial steps for increasing the size of the Navy toward a goal of a fleet with 355 ships of certain types and numbers. The Navy's proposed FY2019 budget requests funding for the procurement of 10 new ships, including two Virginia-class attack submarines, three DDG-51 class Aegis destroyers, one Littoral Combat Ship (LCS), two John Lewis (TAO-205) class oilers, one Expeditionary Sea Base ship (ESB), and one TATS towing, salvage, and rescue ship.

The issue for Congress is whether to approve, reject, or modify the Navy's proposed FY2019 shipbuilding program and the Navy's longer-term shipbuilding plans. Decisions that Congress makes on this issue can substantially affect Navy capabilities and funding requirements, and the U.S. shipbuilding industrial base.

Detailed coverage of certain individual Navy shipbuilding programs can be found in the following CRS reports:

- CRS Report R41129, *Navy Columbia (SSBN-826) Class Ballistic Missile Submarine Program: Background and Issues for Congress*, by (name redacted) .
- CRS Report RL32418, *Navy Virginia (SSN-774) Class Attack Submarine Procurement: Background and Issues for Congress*, by (name redacted) .
- CRS Report RS20643, *Navy Ford (CVN-78) Class Aircraft Carrier Program: Background and Issues for Congress*, by (name redacted) .
- CRS Report RL32109, *Navy DDG-51 and DDG-1000 Destroyer Programs: Background and Issues for Congress*, by (name redacted) .
- CRS Report R44972, *Navy Frigate (FFG[X]) Program: Background and Issues for Congress*, by (name redacted) .
- CRS Report RL33741, *Navy Littoral Combat Ship (LCS) Program: Background and Issues for Congress*, by (name redacted) .
- CRS Report R43543, *Navy LPD-17 Flight II (LX[R]) Amphibious Ship Program: Background and Issues for Congress*, by (name redacted) . (This report also covers the issue of funding for the procurement of San Antonio [LPD-17] class amphibious ships.)
- CRS Report R43546, *Navy John Lewis (TAO-205) Class Oiler Shipbuilding Program: Background and Issues for Congress*, by (name redacted) .

For a discussion of the strategic and budgetary context in which U.S. Navy force structure and shipbuilding plans may be considered, see **Appendix A**.

Background

Navy's 355-Ship Ship Force-Structure Goal

Introduction

On December 15, 2016, the Navy released a force-structure goal that calls for achieving and maintaining a fleet of 355 ships of certain types and numbers. The 355-ship goal is the result of a Force Structure Assessment (FSA) conducted by the Navy in 2016. An FSA is an analysis in which the Navy solicits inputs from U.S. regional combatant commanders (CCDRs) regarding the types and amounts of Navy capabilities that CCDRs deem necessary for implementing the Navy's portion of the national military strategy, and then translates those CCDR inputs into required numbers of ships, using current and projected Navy ship types. The analysis takes into account Navy capabilities for both warfighting and day-to-day forward-deployed presence.[1] The Navy conducts an FSA every few years, as circumstances require, to determine its force-structure goal.

The 355-ship force-level goal replaced a 308-ship force-level goal that the Navy released in March 2015. **Table 1** compares the 355-ship force-level goal to the previous 308-ship force-level goal. As can be seen in the table, compared to the 308-ship goal, the 355-ship goal includes 47 additional ships, or about 15% more ships, including 1 aircraft carrier, 18 attack submarines (SSNs), 16 large surface combatants (i.e., cruisers and destroyers), 4 amphibious ships, 3 oilers, 3 ESBs, and 2 command and support ships. The 34 additional SSNs and large surface combatants account for about 72% of the 47 additional ships.

The 355-ship force-level goal is the largest force-level goal that the Navy has released since a 375-ship force-level goal that was in place in 2002-2004. In the years between that 375-ship goal and the 355-ship goal, Navy force-level goals were generally in the low 300s (see **Appendix B**). The force level of 355 ships is a goal to be attained in the future; the actual size of the Navy in recent years has generally been between 270 and 290 ships.

Made U.S. Policy by FY2018 NDAA

Section 1025 of the FY2018 National Defense Authorization Act, or NDAA (H.R. 2810/P.L. 115-91 of December 12, 2017), states the following:

> SEC. 1025. Policy of the United States on minimum number of battle force ships.
>
> (a) Policy.—It shall be the policy of the United States to have available, as soon as practicable, not fewer than 355 battle force ships, comprised of the optimal mix of platforms, with funding subject to the availability of appropriations or other funds.
>
> (b) Battle force ships defined.—In this section, the term "battle force ship" has the meaning given the term in Secretary of the Navy Instruction 5030.8C.

The term *battle force ships* in the above provision refers to the ships that count toward the quoted size of the Navy in public policy discussions about the Navy.[2]

[1] For further discussion, see U.S. Navy, *Executive Summary, 2016 Navy Force Structure Assessment (FSA)*, December 15, 2016, pp. 1-2.

[2] The battle force ships method for counting the number of ships in the Navy was established in 1981 by agreement between the Secretary of the Navy and the Secretary of Defense, and has been modified somewhat over time, in part by Section 1021 of the Carl Levin and Howard P. "Buck" McKeon National Defense Authorization Act for Fiscal Year (continued...)

Table 1. 355-Ship Goal Compared to Previous 308-Ship Goal

Ship type	355-ship goal of December 2016	308-ship goal of March 2015	Difference	Difference (%)	Number of ships that would need to be added to 30-year shipbuilding plan to achieve and maintain 355-ship fleet (unless the Navy extends the service lives of existing ships beyond currently planned figures and/or reactivates recently retired ships)	
					CRS 2017 estimate of addition to Navy *FY17* 30-year *(FY17-FY46)* shipbuilding plan to maintain 355-ship fleet *through end of 30-year period (i.e., through FY2046)*	CBO 2017 estimate of addition to notional *FY18 30-year (FY18-FY47)* shipbuilding plan to maintain 355-ship fleet *10 years beyond end of 30-year period (i.e., through FY2057)*
Ballistic missile submarines (SSBNs)	12	12	0	0	0	0
Attack submarines (SSNs)	66	48	18	37.5	19	16 to 19
Aircraft carriers (CVNs)	12	11	1	9.1	2	4
Large surface combatants (LSCs) (i.e., cruisers and destroyers)	104	88	16	18.2	23	24 to 25
Small surface combatants (i.e., LCSs, frigates, mine warship ships)	52	52	0	0	8	10
Amphibious ships	38	34	4	11.8	0 to 5	7
Combat logistic force (CLF) ships (i.e., resupply ships)	32	29	3	10.3	2 or 3	5
Expeditionary Fast transports (EPFs)	10	10	0	0	0	0
Expeditionary Support Base ships (ESBs)	6	3	3	100	3	3
Command and support ships	23	21	2	9.5	0 to 4	4
TOTAL	**355**	**308**	**47**	**15.3**	**57 to 67**	**73 to 77**
Average additional shipbuilding funds per year needed over 30-year period, compared to amounts needed to implement FY2017 30-year shipbuilding plan					$4.6 billion per year to $5.1 billion per year in additional funds, using today's shipbuilding costs	About $5.4 billion per year in additional funds, in constant FY2017 dollars
Average additional shipbuilding funds + ship operation and support (O&S) costs per year to maintain Navy's 355-ship fleet once it is achieved					not estimated	$11 billion per year to $23 billion per year in FY2017 dollars, not including additional costs for manned aircraft, unmanned systems, and weapons.

Source: Table prepared by CRS based on U.S. Navy data and information provided to CRS by CBO on April 26, 2017. The CRS and CBO estimates shown in the final two columns assume no service life extensions of existing Navy ships and no reactivations of retired Navy ships.

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2015 (H.R. 3979/P.L. 113-291 of December 19, 2014).

Notes: EPFs were previously called Joint High Speed Vessels (JHSVs). ESBs were previously called Afloat Forward Staging Base ships (AFSBs). The figures for additional small surface combatants shown in the final two columns are the net results of adding 12 small surface combatants in the earlier years of the 30-year plan and removing 4 or 2 small surface combatants, respectively, from the later years of the 30-year plan.

Part of Navy the Nation Needs (NNN) Vision

The Navy's 355-ship force-level goal forms part of a Navy vision for its future that the Navy refers to as the Navy the Nation Needs (NNN). The Navy says the NNN vision consists of six pillars—readiness, capability, capacity, manning, networks, and operating concepts.[3] The 355-force-level goal is arguably most closely associated with the capacity pillar. The Navy states the following:

> The Navy's overarching plan in support of the NDS [National Defense Strategy] is referred to as the Navy the Nation Needs (NNN). The six pillars of the NNN are Readiness, Capability, Capacity, Manning, Networks, and Operating Concepts. These six pillars must remain balanced and scalable in order to field the needed credible naval power, guarding against over-investment in one area that might disadvantage another. This disciplined approach ensures force structure growth accounts for commensurate, properly phased investments across all six pillars—a balanced warfighting investment strategy to fund the total ownership cost of the Navy (manning, support, training, infrastructure, etc.)....
>
> [The] Navy will proactively invest above the baseline steady [shipbuilding] profiles [shown in the FY2019 30-year shipbuilding plan] if [the Navy is] also able to remain balanced [in terms of investments] across the [six] NNN pillars.[4]

Apparent Reasons for Increasing Force-Level Goal from 308 Ships

The roughly 15% increase in the 355-ship goal over the previous 308-ship goal can be viewed as a Navy response to, among other things, China's continuing naval modernization effort;[5] resurgent Russian naval activity, particularly in the Mediterranean Sea and the North Atlantic Ocean;[6] and challenges that the Navy has sometimes faced, given the current total number of

[3] Capability is a qualitative term that generally refers to the technological sophistication of weapons and equipment, what missions they can perform, and how well they can perform them. Capacity is a quantitative term that generally refers to having adequate numbers of ships, aircraft, and other things. Networks refers to data links, computers, and software that permit individual ships, aircraft, and shore stations to share information and operate together in an integrated, networked manner.

[4] U.S. Navy, *Report to Congress on the Annual Long-Range Plan for Construction of Naval Vessels for Fiscal Year 2019*, February 2018, p. 4.

[5] For more on China's naval modernization effort, see CRS Report RL33153, *China Naval Modernization: Implications for U.S. Navy Capabilities—Background and Issues for Congress*, by (name redacted) .

[6] See, for example, Dave Majumdar, "Chief of Naval Operations Richardson: US Navy is Focusing on Enemy Submarine Threat," *National Interest*, August 30, 2016; Dmitry Gorenburg, "Black Sea Fleet Projects Power Westward," *Russian Military Reform*, July 20, 2016; Dave Majumdar, "Russia's Submarine Force Is Back: How Worried Should America Be?" *National Interest*, July 5, 2016; Sa, LaGrone, "Admiral Warns: Russian Subs Waging Cold War-Style 'Battle of the Atlantic,'" *USNI News*, June 3, 2016; Jim Sciutto et al., "CNN Visits Nuclear Submarine As Deep-Sea Tensions with Russia Grow," *CNN*, May 5, 2016; Eric Schmitt, "Russia Bolsters Its Submarine Fleet, and Tensions With U.S. Rise," *New York Times*, April 20, 2016; Jim Sciutto, "Top Navy Official: Russian Sub Aggression at Peak Since Cold War," *CNN*, April 15, 2016; Franz-Stefan Gady, "Russian Sub Combat Patrols Nearly Doubled in 2015," *The Diplomat*, March 23, 2016; Karl Soper, "Russia Confirms Higher Level of Submarine Activity," *IHS Jane's 360*, March 23, 2016; Magnus Nordenman, "Russian Subs Are Reheating a Cold War Chokepoint," *Defense One*, March 4, 2016; Richard Lardner, "US Commander Says Tracking Russian Subs Is a Key Challenge," *CNBC*, March 1, 2016; Paul McLeary, "Chinese, Russian Subs Increasingly Worrying the Pentagon," *Foreign Policy*, February 24, 2016; Thomas Gibbons-Neff, "Report: Russian Sub Activity Returns to Cold War Levels," *Washington Post*, February (continued...)

ships in the Navy, in meeting requests from the various regional U.S. combatant commanders for day-to-day in-region presence of forward-deployed Navy ships.[7] To help meet requests for forward-deployed Navy ships, Navy officials in recent years have sometimes extended deployments of ships beyond (sometimes well beyond) the standard length of seven months, leading to concerns about the burden being placed on Navy ship crews, wear and tear on Navy ships, and fleet readiness.[8] Navy officials have testified that fully satisfying requests from regional U.S. military commanders for forward-deployed Navy ships would require a fleet of substantially more than 308 ships. For example, Navy officials testified in March 2014 that fully meeting such requests would require a Navy of 450 ships.[9] In releasing its 355-ship goal on December 15, 2016, the Navy stated that

> Since the last full FSA was conducted in 2012, and updated in 2014, the global security environment changed significantly, with our potential adversaries developing capabilities that challenge our traditional military strengths and erode our technological advantage. Within this new security environment, defense planning guidance directed that the capacity and capability of the Joint Force must be sufficient to defeat one adversary while denying the objectives of a second adversary.[10]

Compared to Trump Campaign Organization Goal of 350 Ships

The figure of 355 ships appears close to an objective of building toward a fleet of 350 ships that was mentioned by the Trump campaign organization during the 2016 presidential election campaign. The 355-ship goal, however, is a product of the Navy's 2016 FSA, and thus reflects the national military strategy that was in place in 2016 (i.e., the Obama Administration's national

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4, 2016; Nicholas de Larrinaga, "Russian Submarine Activity Topping Cold War Levels," *IHS Jane's 360*, February 2, 2016.

[7] See, for example, Justin Doubleday, "CNO: High Optempo Hindering Seven-Month Deployment Goal," *Inside the Navy*, September 19, 2016; Chris Church, "Analysts: Truman Strike Group Extension Highlights Flaws in Navy's Deployment Goal," *Stars and Stripes*, May 5, 2016; David Larter, "Navy Leader Warns Long Deployments Will Harm the Fleet," *Navy Times*, April 20, 2016; Hope Hodge Seck, "Overtaxed Fleet Needs Shorter Deployments," *Military.com*, March 19, 2016; David Larter, "Carrier Scramble: CENTCOM, PACOM Face Flattop Gaps This Spring Amid Tensions," *Navy Times*, January 7, 2016; Bryan Clark and Jesse Sloman, *Deploying Beyond Their Means, America's Navy and Marine Corps at a Tipping Point*, Center for Strategic and Budgetary Assessments, 2015, 28 pp.; Ryan T. Tewell, "Assessing the U.S. Aircraft Carrier Gap in the Gulf," Washington Institute for Near East Policy, October 5, 2015.

[8] See, for example, Hope Hodge Seck, "CNO: Navy to Hit Seven-Month Deployments by End of Year," *Military.com*, February 12, 2016; Chris Church, "Analysts: Truman Strike Group Extension Highlights Flaws in Navy's Deployment Goal," *Stars and Stripes*, May 5, 2016; David Larter, "Navy Leader Warns Long Deployments Will Harm the Fleet," *Navy Times*, April 20, 2016; Hope Hodge Seck, "Overtaxed Fleet Needs Shorer Deployments," *Military.com*, March 19, 2016; Bryan Clark and Jesse Sloman, *Deploying Beyond Their Means, America's Navy and Marine Corps at a Tipping Point*, Center for Strategic and Budgetary Assessments, 2015, 28 pp.; David Larter, "CNO: Shorter Carrier Cruises A Year Away," *Navy Times*, February 28, 2015; David Larter, "Uneven Burden: Some Ships See Time at Sea Surge; Others Fall Well Below Fleetwide Average," *Navy Times*, June 16, 2014; Richard Sisk, "Struggle Ahead to Reach 8-Month Sea Deployments," *Military.com*, April 8, 2016; David Larter, "Navy Fleet Boss: 9-Month Deployments Unsustainable," *Military Times*, April 8, 2014; Lance M. Bacon, "Fleet's New Deployment Plan To Lock In 8-Month Cruises," *Defense News*, April 6, 2014.

[9] Spoken testimony of Admiral Jonathan Greenert at a March 12, 2014, hearing before the House Armed Services Committee on the Department of the Navy's proposed FY2015 budget, as shown in transcript of hearing.

[10] U.S. Navy, *Executive Summary, 2016 Navy Force Structure Assessment (FSA)*, December 15, 2016, p. 1. See also *United States Navy Accelerated Fleet Plan*, undated, 14 pp., with cover memorandum from the Secretary of the Navy to the Secretary of Defense, February 9, 2017, posted at InsideDefense.com (subscription required) April 6, 2017.

military strategy),[11] while the Trump campaign organization's 350-ship goal appears to have had a different origin.[12] In addition, the 355-ship goal is a fully delineated force-level goal, with specified numbers for various ship types that add up to 355 ships, while the 350-ship figure was a topline number only, without a supporting set of specified numbers for various ship types.[13]

Additional Shipbuilding Needed to Achieve and Maintain 355-Ship Fleet

CRS and CBO Estimates

Although the 355-ship force-level goal includes 47 more ships than the previous 308-ship force-level goal, as shown in the final two columns of **Table 1**, more than 47 ships would need to be

[11] The military strategy that was in place in 2016 is scheduled to be superseded: A January 27, 2017, national security presidential memorandum on rebuilding the U.S. Armed Forces signed by President Trump states the following: "Upon transmission of a new National Security Strategy to Congress, the Secretary [of Defense] shall produce a National Defense Strategy (NDS). The goal of the NDS shall be to give the President and the Secretary maximum strategic flexibility and to determine the force structure necessary to meet requirements." ("Presidential Memorandum on Rebuilding the U.S. Armed Forces," accessed January 31, 2017, at https://www.whitehouse.gov/the-press-office/2017/01/27/presidential-memorandum-rebuilding-us-armed-forces.)

[12] The Trump campaign organization's vision for national defense comprised eight elements, one of which was to "rebuild the U.S. Navy toward a goal of 350 ships, as the bipartisan National Defense Panel has recommended." ("National Defense, Donald J. Trump's Vision," accessed January 19, 2017, at https://www.donaldjtrump.com/policies/national-defense.) The figure of 350 ships appeared to be a rounded-off version of a recommendation for a fleet of up to (and possibly more than) 346 ships that was included in the 2014 report of the National Defense Panel (NDP), a panel that provided an independent review of the Department of Defense's (DOD's) report on its 2014 Quadrennial Defense Review (QDR). (William J. Perry et al., *Ensuring a Strong U.S. Defense for the Future: The National Defense Panel Review of the 2014 Quadrennial Defense Review*, Washington, 2014, p. 3. The statement appears again on page 49.)

Four years before that, a fleet of 346 ships was recommended in the 2010 report of the independent panel that reviewed DOD's report on its 2010 QDR. The 2010 independent panel report further specified that the figure of 346 ships included 11 aircraft carriers, 55 attack submarines (SSNs), and 4 guided missile submarines (SSGNs). (Stephen J. Hadley and William J. Perry, co-chairmen, et al., *The QDR in Perspective: Meeting America's National Security Needs In the 21st Century, The Final Report of the Quadrennial Defense Review Independent Panel*, Washington, 2010, Figure 3-2 on pages 58-59.)

Seventeen years earlier, a fleet of 346 ships was recommended in DOD's 1993 report on its Bottom-Up Review (BUR), a major review of U.S. defense strategy, plans, and programs that was prompted by the end of the Cold War. (Department of Defense, Report on the Bottom-Up Review, October 1993, Figure 7 on page 28. For further discussion of the 1993 BUR, see CRS Report R43838, *A Shift in the International Security Environment: Potential Implications for Defense—Issues for Congress*, by (name redacted) .)

The 2014 NDP report cited above referred explicitly to the BUR in making its recommendation for future fleet size:

> We believe the fleet-size requirement to be somewhere between the 2012 Future Year Defense Program (FYDP) goal of 323 ships and the 346 ships enumerated in the [1993] BUR, depending on the desired "high-low mix [of ships]," and an even larger fleet may be necessary if the risk of conflict in the Western Pacific increases.
>
> (William J. Perry et al., *Ensuring a Strong U.S. Defense for the Future: The National Defense Panel Review of the 2014 Quadrennial Defense Review*, Washington, 2014, p. 3. The statement appears again on page 49. The term *high-low mix* refers to a force structure consisting of some mix of individually more-capable [and more-expensive] units, and individually less-capable [and less-expensive] units.)

As shown in **Table E-1**, a full composition for the 1993 BUR's 346-ship force-level goal was not provided in public testimony. The Navy testified in 1994 that the planned number was adjusted from 346 to 330 to reflect reductions in numbers of tenders and early retirements of some older amphibious ships. The Navy's 1994 testimony provided force-level goals for various ship types that totaled 331 to 341 ships.

[13] The Trump campaign organization did not delineate the composition of its 350-ship fleet.

added to the Navy's previous 30-year shipbuilding plan—the FY2017 30-year (FY2017-FY2046) shipbuilding plan[14]—to achieve and maintain the Navy's 355-ship fleet, unless the Navy extends the service lives of existing ships beyond currently planned figures and/or reactivates recently retired ships. This is because the FY2017 30-year shipbuilding plan did not include enough ships to fully populate all elements of the 308-ship fleet across the entire 30-year period, and because some ships that will retire over the 30-year period that would not need to be replaced to maintain the 308-ship fleet would need to be replaced to maintain the 355-ship fleet. As shown in the final two columns of **Table 1**:

- CRS estimated in 2017 that 57 to 67 ships would need to be added to the Navy's *FY2017 30-year (FY2017-FY2046)* shipbuilding plan to achieve the Navy's 355-ship fleet and maintain it *through the end of the 30-year period (i.e., through FY2046)*, unless the Navy extends the service lives of existing ships beyond currently planned figures and/or reactivates recently retired ships.
- The Congressional Budget Office (CBO) estimated in 2017 that 73 to 77 ships would need to be added to a CBO-created notional version of the Navy's *FY2018 30-year (FY2018-FY2047)* shipbuilding plan[15] to achieve the Navy's 355-ship fleet and maintain it *not only through the end of the 30-year period (i.e., through FY2047), but another 10 years beyond the end of the 30-year period (i.e., through FY2057)*, unless the Navy extends the service lives of existing ships beyond currently planned figures and/or reactivates recently retired ships.[16]

Time Needed to Achieve 355-Ship Fleet

Even with increased shipbuilding rates, achieving certain parts of the 355-ship force-level goal—particularly the 12-ship goal for aircraft carriers and the 66-boat goal for SSNs—could take many years. CBO estimated in 2017 that the earliest the Navy could achieve all elements of the 355-ship fleet would be 2035.[17] Extending the service lives of existing ships and/or reactivating retired ships could accelerate the attainment of certain parts of the 355-ship force structure.[18]

Cost to Achieve and Maintain 355-Ship Fleet

Shipbuilding Costs

Procuring the additional ships needed to achieve and maintain the Navy's 355-ship fleet would require several billion dollars per year in additional shipbuilding funds. As shown in **Table 1**:

- CRS estimated in 2017 that procuring the 57 to 67 ships that would need to be added to the Navy's FY2017 30-year shipbuilding plan to achieve the Navy's

[14] The Navy did not submit an FY2018 30-year shipbuilding plan.

[15] As mentioned in footnote 14, The Navy did not submit an FY2018 30-year shipbuilding plan. CBO, for purposes of conducting its analysis, created a notional version of an FY2018 30-year shipbuilding plan that represented a logical extension of the shipbuilding rates shown in the FY2017 30-year shipbuilding plan.

[16] Information provided by CBO to CRS on April 26, 2017, reflecting information in Congressional Budget Office, *Costs of Building a 355-Ship Navy*, April 2017, 12 pp.

[17] Congressional Budget Office, *Costs of Building a 355-Ship Navy*, April 2017, p. 1.

[18] See also Sydney J. Freedberg Jr., "Trump's 355-Ship Fleet Will Take Til 2050s," *Breaking Defense*, October 26, 2017; Ben Werner, "355-Ship Navy Could Take More Than Three Decades to Build, Acting Navy Under Secretary Says," *USNI News*, October 25, 2017.

355-ship fleet and maintain it through FY2046 (unless the Navy extends the service lives of existing ships beyond currently planned figures and/or reactivates recently retired ships) would notionally cost an average of roughly $4.6 billion to $5.1 billion per year in additional shipbuilding funds over the 30-year period, using today's shipbuilding costs.

- CBO estimated in 2017 that procuring the 73 to 77 ships that would need to be added to the CBO-created notional version of the Navy's FY2018 30-year shipbuilding plan to achieve the Navy's 355-ship fleet and maintain it through FY2057 (unless the Navy extends the service lives of existing ships beyond currently planned figures and/or reactivates recently retired ships) would cost, in constant FY2017 dollars, an average of $5.4 billion per year in additional shipbuilding funds over the 30-year period.[19]

Aircraft Procurement Costs

CBO estimated in 2017 that procuring the additional ship-based aircraft associated with the Navy's 355-ship force-level goal—including an additional carrier air wing for an aircraft carrier, plus additional aircraft (mostly helicopters) for surface combatants and amphibious ships—would require about $15 billion in additional funding for aircraft procurement.[20]

Shipbuilding Plus Operation and Support (O&S) costs

As shown in **Table 1**, the above additional shipbuilding and aircraft procurement funds are only a fraction of the total costs that would be needed to achieve and maintain the Navy's 355-ship fleet instead of the Navy's previously envisaged 308-ship fleet. CBO estimated in 2017 that, adding together both shipbuilding costs and ship operation and support (O&S) costs, the Navy's 355-ship fleet would cost an average of about $11 billion to $23 billion more per year in constant FY2017 dollars than the Navy's previously envisaged 308-ship fleet. This figure does not include additional costs for manned aircraft, unmanned systems, and weapons.[21]

As noted earlier, the 355-ship force-level goal is 47 ships higher than the previous 308-ship force-level goal. CRS estimated in 2017 that a total of roughly 15,000 additional sailors and aviation personnel would be needed at sea to operate those 47 additional ships.[22] The Navy testified in

[19] Information provided by CBO to CRS on April 26, 2017, reflecting information in Congressional Budget Office, *Costs of Building a 355-Ship Navy*, April 2017, 12 pp.

[20] Information provided by CBO to CRS on April 26, 2017, reflecting information in Congressional Budget Office, *Costs of Building a 355-Ship Navy*, April 2017, p. 3. The same figure is mentioned on page 7.

[21] Information provided by CBO to CRS on April 26, 2017, reflecting information in Congressional Budget Office, *Costs of Building a 355-Ship Navy*, April 2017, 12 pp.

[22] The rough estimate of 15,000 additional sailors is based on Navy ship crew sizes as shown in the Navy's online Fact File (http://www.navy.mil/navydata/fact.asp), and includes the following:

-- about 2,376 sailors for 18 additional attack submarines (132 per boat);

-- about 4,500 sailors for 1 additional aircraft carrier (including about 3,000 to operate the ship and about 1,500 to operate its embarked air wing);

-- about 5,264 sailors for 16 additional destroyers (329 per ship);

-- about 1,520 sailors for 4 additional amphibious ships (380 per ship);

-- about 18 sailors for 3 additional combat logistics force ships (6 per ship—these ships have mostly civilian crews);

-- about 750 sailors for 3 additional expeditionary support base ships (ESBs) (about 250 per ship, depending on the mission—these ships also have 34 additional Military Sealift Command

(continued...)

May 2017 that the Navy would need a total of 20,000 to 40,000 more sailors both at sea and ashore to operate and provide shore-based support for a fleet of about 350 ships, depending on the composition of that 350-ship fleet, than the Navy in 2017 had both at sea and ashore for operating and providing shore-based support for the 2017 fleet of about 275 ships.[23]

Industrial Base Ability for Taking on Additional Shipbuilding Work

The U.S. shipbuilding industrial base has some unused capacity to take on increased Navy shipbuilding work, particularly for certain kinds of surface ships, and its capacity could be increased further over time to support higher Navy shipbuilding rates. Navy shipbuilding rates could not be increased steeply across the board overnight—time (and investment) would be needed to hire and train additional workers and increase production facilities at shipyards and supplier firms, particularly for supporting higher rates of submarine production. Depending on their specialties, newly hired workers could be initially less productive per unit of time worked than more experienced workers.

Some parts of the shipbuilding industrial base, such as the submarine construction industrial base, could face more challenges than others in ramping up to the higher production rates required to build the various parts of the 355-ship fleet. Over a period of a few to several years, with investment and management attention, Navy shipbuilding could ramp up to higher rates for achieving a 355-ship fleet over a period of 20 to 30 years. An April 2017 CBO report stated that

> all seven shipyards [currently involved in building the Navy's major ships] would need to increase their workforces and several would need to make improvements to their infrastructure in order to build ships at a faster rate. However, certain sectors face greater obstacles in constructing ships at faster rates than others: Building more submarines to meet the goals of the 2016 force structure assessment would pose the greatest challenge to the shipbuilding industry. Increasing the number of aircraft carriers and surface combatants would pose a small to moderate challenge to builders of those vessels. Finally, building more amphibious ships and combat logistics and support ships would be the least problematic for the shipyards. The workforces across those yards would need to increase by about 40 percent over the next 5 to 10 years. Managing the growth and training of those new workforces while maintaining the current standard of quality and efficiency would represent the most significant industrywide challenge. In addition, industry and Navy sources indicate that as much as $4 billion would need to be invested in the physical infrastructure of the shipyards to achieve the higher production rates required under the [notional] 15-year and 20-year [buildup scenarios examined by CBO]. Less investment would be needed for the [notional] 25-year or 30-year [buildup scenarios examined by CBO].[24]

For additional background information on the ability of the industrial base to take on the additional shipbuilding work associated with achieving and maintaining the Navy's 355-ship force-level goal, see **Appendix H**.

(...continued)

personnel); and

-- additional sailors for the 2 additional command and support ships.

The figures above exclude any additional sailors that might be needed ashore in support roles.

[23] See, for example, Hope Hodge Seck, "Navy Needs Up to 40,000 More Sailors to Staff 350-Ship Fleet," *Military.com*, May 19, 2017.

[24] Congressional Budget Office, *Costs of Building a 355-Ship Navy*, April 2017, pp. 9-10.

Employment Impact of Additional Shipbuilding Work

Depending on the number of additional ships per year that might be added to the Navy's shipbuilding effort, building the additional ships that would be needed to achieve and maintain the 355-ship fleet could create thousands of additional manufacturing and other jobs at shipyards, associated supplier firms, and elsewhere in the U.S. economy. A 2015 Maritime Administration (MARAD) report states,

> Considering the indirect and induced impacts, each direct job in the shipbuilding and repairing industry is associated with another 2.6 jobs in other parts of the US economy; each dollar of direct labor income and GDP in the shipbuilding and repairing industry is associated with another $1.74 in labor income and $2.49 in GDP, respectively, in other parts of the US economy.[25]

A March 2017 press report states, "Based on a 2015 economic impact study, the Shipbuilders Council of America [a trade association for U.S. shipbuilders and associated supplier firms] believes that a 355-ship Navy could add more than 50,000 jobs nationwide."[26] The 2015 economic impact study referred to in that quote might be the 2015 MARAD study discussed in the previous paragraph. An estimate of more than 50,000 additional jobs nationwide might be viewed as a higher-end estimate; other estimates might be lower. A June 14, 2017, press report states the following: "The shipbuilding industry will need to add between 18,000 and 25,000 jobs to build to a 350-ship Navy, according to Matthew Paxton, president of the Shipbuilders Council of America, a trade association representing the shipbuilding industrial base. Including indirect jobs like suppliers, the ramp-up may require a boost of 50,000 workers."[27]

Extending Service Lives of Existing Ships and Reactivating Retired Ships

As one possible option for increasing the size of the Navy beyond or more quickly than what could be accomplished solely through increased rates of construction of new ships, Navy officials stated in 2017 that they explored options for increasing the service lives of certain existing surface ships (particularly DDG-51 class destroyers) and attack submarines (SSNs).

As a second possible option for increasing the size of the Navy—particularly in the nearer term, before increased rates of construction of new ships could produce significant results—Navy officials stated in 2017 that they explored options for reactivating recently retired conventional surface ships, particularly several Oliver Hazard Perry (FFG-7) class frigates. The technical feasibility and potential cost effectiveness of these reactivation options was not clear.[28]

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[25] Maritime Administration (MARAD), *The Economic Importance of the U.S. Shipbuilding and Repairing Industry*, November 2015, pp. E-3, E-4, For another perspective on the issue of the impact of shipbuilding on the broader economy, see Edward G. Keating et al., *The Economic Consequences of Investing in Shipbuilding, Case Studies in the United States and Sweden*, RAND Corporation, Santa Monica, CA, 2015 (Report RR-1036), 69 pp.

[26] Yasmin Tadjdeh, "Navy Shipbuilders Prepared for Proposed Fleet Buildup," *National Defense*, March 2017. Similarly, another press report states the following: "The Navy envisioned by Trump could create more than 50,000 jobs, the Shipbuilders Council of America, a trade group representing U.S. shipbuilders, repairers and suppliers, told Reuters." (Mike Stone, "Missing from Trump's Grand Navy Plan: Skilled Workers to Build the Fleet," *Reuters*, March 17, 2017.)

[27] Jaqueline Klimas, "Growing Shipbuilding Workforce Seen As Major Challenge for Trump's Navy Buildup," *Politico*, June 14, 2017.

[28] For a discussion of some past ship reactivations, see Steven Wills, "Of Mothballs and Modernizations," *Real Clear Defense*, June 16, 2017.

In its FY2019 budget submission, the Navy is proposing surface life extensions for six Ticonderoga (CG-47) class Aegis cruisers, four mine countermeasures (MCM) ships, and one Los Angeles (SSN-688) class SSN (which the Navy says would be the first of potentially five Los Angeles-class attack submarines to receive a service life extension).[29] The Navy is not proposing to extend the surface lives of any DDG-51s or reactivate any FFG-7 class frigates.[30]

At an April 12, 2018, hearing on the Navy's 355-ship force-level goal before the Seapower and Projection Forces subcommittee of the House Armed Services Committee, Navy officials announced that the Navy has decided to extend the service lives of all DDG-51 destroyers to 45 years. Navy officials testified that this action would permit the Navy to achieve a total of 355 ships by the 2030s, although the resulting mix of ships would not match the mix called for in the Navy's 355-ship force-level goal—there would be more than the required number of DDG-51s, and fewer than the required numbers of other types of ships. When asked by the subcommittee chairman, Representative Rob Wittman, about the Navy's plans for modernizing its older DDG-51s, Vice Admiral William Merz, Deputy Chief of Naval Operations for Warfare Systems, replied in part

> Yes, sir, Mr. Chairman. And thanks for that question, because it really does tee up a little bit larger conversation on how we're approaching the DDG-51 class.
>
> So as promised, and as stated in the shipbuilding plan, you know, we saw a path to accelerate this 355 achievement as quickly to the 2030s. And recently, NAVSEA [the Naval Sea Systems Command—the Navy's command for ship procurement and modernization] completed the analysis of that class, so we will, in fact, be extending the entire class out to 45 years.

A bit later in his exchange with Wittman, Merz stated the following:

> So how does this affect the [achievement of the] 355-ship number? It does—as we stated in the shipbuilding plan—the [total of] 355 [ships] will now be arriving in the mid-'30s [2030s]. And that's only with the DDG[-51] extensions. That does not include [the impact of] candidate options for [procuring] three [rather than two] SSNs per year or any other service life extensions in and around the time period.
>
> Typically the individual hull life extensions will only help you smooth the [ship retirement] ramp. They don't really affect the overall number [of ships] in the end on when you achieve it. But a class-wide extension does, and that's what you're seeing.
>
> So with the extension of that [DDG-51] class, with the modernization efforts with that class, we don't get the correct mix [of ships] in the 2030s, but it's not a bad mix. If you have to have an [sic: some] extra ships, destroyers are good ones to have. And then we'll work with Congress on how we manage that [ship] inventory, because we don't want them [ships with extended service lives] to come at the expense of the new construction [ships], especially the overall driver of [achieving] the correct mix, which is the SSN [force-level goal of 66 boats]. So we'll have to manage that very, very quickly.
>
> And right now, under the current plan, that's [i.e., achieving the 66-boat SSN force-level goal is] still [projected to be] at the 2048 timeline, but like I said, we have done—that [projected 2048 attainment date] does not include [the procurement of] any extra [attack] submarines [in] any particular years. And of course, the CVN plan [i.e., the goal for

[29] U.S. Navy, *Report to Congress on the Annual Long-Range Plan for Construction of Naval Vessels for Fiscal Year 2019*, February 2018, p. 5.

[30] See, for example, Sam, LaGrone, "SECNAV Memo: Navy Won't Reactivate Perry Frigates for SOUTHCOM Mission; Will Send Ships to Fight Drug War in 2018," *USNI News*, December 11, 2017.

achieving a 12-carrier force] also is one of the lengthier ones [i.e., projected force-level goal attainment timelines].[31]

Navy's Five-Year and 30-Year Shipbuilding Plans

FY2019 Five-Year (FY2019-FY2023) Shipbuilding Plan

Table 2 shows the Navy's FY2019 five-year (FY2019-FY2023) shipbuilding plan. The table also shows, for reference purposes, the ships requested for procurement in the Navy's amended FY2018 budget submission, and the ships funded for procurement in the enacted FY2018 DOD appropriations act (Division C of H.R. 1625/P.L. 115-141 of March 23, 2018).[32]

Table 2. FY2019 Five-Year (FY2019-FY2023) Shipbuilding Plan

FY2018 shown for reference

	FY18 (req.)	*FY18 (enacted)*	FY19 (req.)	FY20	FY21	FY22	FY23	FY19-FY23 Total
Columbia (SSBN-826) class ballistic missile submarine					1			1
Gerald R. Ford (CVN-78) class aircraft carrier	*1*	*1*					1	1
Virginia (SSN-774) class attack submarine	*2*	*2*	2	2	2	2	2	10
Arleigh Burke (DDG-51) class destroyer	2	*2*	3	2	3	3	3	14
FFG(X) frigate				1	1	2	2	6
Littoral Combat Ship (LCS)	*2*	*3*	1					1
LHA(R) amphibious assault ship								0
LX(R) amphibious ship		*1*		1		1	1	3
John Lewis (TAO-205) class oiler	*1*	*1*	2	1	2	1	2	8
Towing, salvage, and rescue ship (TATS)	*1*	*1*	1	2	1	1	1	6
TAGOS(X) ocean surveillance ship						1	1	2
Expeditionary Fast Transport (EPF) ship		*1*						0
Expeditionary Support Base (ESB) ship		*1*	1	1				2
TOTAL	***9***	***13***	**10**	**10**	**10**	**11**	**13**	**54**

Source: Table prepared by CRS based on FY2019 Navy budget submission and P.L. 115-141.

Note: Ships shown are battle force ships—i.e., ships that count against 355-ship goal; FY2018 requested figures shown for reference. In addition to the battle force ships shown in the FY18 (enacted) column, Congress funded the procurement of an additional TAGS oceanographic survey ship. This ship is not a battle force ship.

As shown in the table, the Navy's proposed FY2019 budget requests funding for the procurement of 10 new ships, including two Virginia-class attack submarines, three DDG-51 class Aegis destroyers, one Littoral Combat Ship (LCS), two John Lewis (TAO-205) class oilers, one Expeditionary Sea Base ship (ESB), and one TATS towing, salvage, and rescue ship. The total of 10 new ships is

- one more than the nine that the Navy requested in its amended FY2018 budget submission;

[31] Source: CQ transcript of hearing.

[32] The Navy's original FY2018 budget request, submitted on May 23, 2017, requested the procurement of eight new ships, including one LCS. On May 24, 2017, the Navy amended its budget submission to include a request for two LCSs rather than one, and thus a total of nine new ships rather than eight.

- three less than the 13 battle force ships that were funded in the FY2018 DOD appropriations act (Division C of H.R. 1625/P.L. 115-141 of March 23, 2018);[33] and
- three more than the seven that were projected for FY2019 in the Navy's FY2018 budget submission. The three added ships include one DDG-51 class destroyer, one TAO-205 class oiler, and one ESB.

As also shown in the table, the Navy's FY2019 five-year (FY2019-FY2023) shipbuilding plan includes 54 new ships, or an average of 10.8 new ships per year. The total of 54 new ships is 12 more (an average of 2.4 more per year) than the 42 that were included in the Navy's FY2018 five-year (FY2018-FY2022) shipbuilding plan, and 11 more (an average of 2.2 more per year) than the 43 that the Navy says were included in the five-year period FY2019-FY2023 under the Navy's FY2018 budget submission. (The FY2023 column was not visible to Congress in the Navy's FY2018 budget submission.) The 11 ships that have been added to the five-year period FY2019-FY2023, the Navy says, are four DDG-51 class destroyers (the third ship in FY2019, FY2021, FY2022, and FY2023), three TAO-205 class oilers (the second ship in FY2019, FY2021, and FY2023), the two ESBs, one TATS (the second ship in FY2020), and one TAGOS ocean surveillance ship (the one in FY2023).

FY2019 30-Year (FY2019-FY2048) Shipbuilding Plan

Table 3 shows the Navy's FY2019-FY2048 30-year shipbuilding plan. In devising a 30-year shipbuilding plan to move the Navy toward its ship force-structure goal, key assumptions and planning factors include but are not limited to ship construction times and service lives, estimated ship procurement costs, projected shipbuilding funding levels, and industrial-base considerations.

As shown in **Table 3**, the Navy's FY2019 30-year (FY2019-FY2048) shipbuilding plan includes 301 new ships, or an average of about 10 per year. The total of 301 ships is 47 more than the 254 that were included in the Navy's FY2017 30-year (FY2017-FY2046) shipbuilding plan. (The Navy did not submit an FY2018 30-year shipbuilding plan.)

[33] P.L. 115-141 also funded the procurement of a 14th ship—a TAGS oceanographic research ship. This ship, however, is not a battle force ship (i.e., a ship that counts toward the quoted size of the Navy and the Navy's 355-ship force-level goal).

Table 3. FY2019 30-Year (FY2019-FY2048) Shipbuilding Plan

FY	CVNs	LSCs	SSCs	SSNs	LPSs	SSBNs	AWSs	CLFs	Supt	Total
19		3	1	2				2	2	**10**
20		2	1	2			1	1	3	**10**
21		3	1	2		1		2	1	**10**
22		3	2	2			1	1	2	**11**
23	1	3	2	2			1	2	2	**13**
24		2	2	2		1	2	1	1	**11**
25		3	2	2			1	1	2	**11**
26		2	2	2		1	1	1	2	**11**
27		3	2	2		1	2	1	1	**12**
28	1	2	2	2		1	1	1	1	**11**
29		3	2	2		1	1	1	1	**11**
30		2	2	2		1	1	1	2	**11**
31		3	2	2		1	2	1	2	**13**
32	1	2	2	2		1	1	1	2	**12**
33		3	2	2		1	1	1	2	**12**
34		2	2	2		1	1		2	**10**
35		3	2	2		1			1	**9**
36	1	2	2	2	1					**8**
37		3	2	2						**7**
38		2	2	2			1			**7**
39		3	2	2	1					**8**
40	1	2	2	2			1			**8**
41		3	2	2			1			**8**
42		2	2	2	1		1			**8**
43		3	2	2				1		**8**
44	1	2	2	2			1			**8**
45		3	2	2	1		2	2		**12**
46		2	2	2			1	2		**9**
47		3	2	2			1	2		**10**
48	1	2	2	2	1		2	2		**12**
Total	7	76	57	60	5	12	28	27	29	**301**

Source: Table prepared by CRS based on Navy's FY2019 30-year (FY2019-FY2048) shipbuilding plan.

Key: FY = Fiscal Year; **CVNs** = aircraft carriers; **LSCs** = surface combatants (i.e., cruisers and destroyers); **SSCs** = small surface combatants (i.e., Littoral Combat Ships [LCSs] and frigates [FFG(X)s]); **SSNs** = attack submarines; **LPSs** = large payload submarines; **SSBNs** = ballistic missile submarines; **AWSs** = amphibious warfare ships; **CLFs** = combat logistics force (i.e., resupply) ships; **Supt** = support ships.

Projected Force Levels Under FY2019 30-Year Shipbuilding Plan

Table 4 shows the Navy's projection of ship force levels for FY2019-FY2048 that would result from implementing the FY2019 30-year (FY2019-FY2048) 30-year shipbuilding plan shown in **Table 3**.

Table 4. Projected Force Levels Resulting from FY2019 30-Year Shipbuilding Plan

	CVNs	LSCs	SSCs	SSNs	SSGN/LPSs	SSBNs	AWSs	CLFs	Supt	Total
355-ship goal	**12**	**104**	**52**	**66**	**0**	**12**	**38**	**32**	**39**	**355**
FY19	11	92	31	52	4	14	33	29	33	**299**
FY20	11	95	34	53	4	14	33	29	35	**308**
FY21	11	98	37	52	4	14	34	30	34	**314**
FY22	12	99	35	52	4	14	34	31	37	**318**
FY23	12	101	39	51	4	14	35	31	39	**326**
FY24	12	104	32	48	4	14	36	32	39	**321**
FY25	11	103	32	46	4	14	36	32	40	**318**
FY26	11	101	33	45	2	14	37	32	40	**315**
FY27	11	101	35	44	1	13	36	32	41	**314**
FY28	11	100	37	42		13	37	32	41	**313**
FY29	11	99	39	44		12	37	32	41	**315**
FY30	11	97	41	45		11	37	31	41	**314**
FY31	11	93	43	47		11	37	32	40	**314**
FY32	11	92	45	49		11	37	32	41	**317**
FY33	11	91	46	50		11	39	32	41	**321**
FY34	11	90	48	52		11	37	32	41	**322**
FY35	11	88	51	54		11	35	32	42	**324**
FY36	11	89	54	56		11	36	32	42	**331**
FY37	11	90	55	58		10	36	32	42	**334**
FY38	11	93	56	58		10	36	32	40	**336**
FY39	11	95	58	59		10	38	32	39	**342**
FY40	10	96	59	59		10	37	32	38	**341**
FY41	11	96	58	59		11	37	32	38	**342**
FY42	10	95	57	61		12	36	32	38	**341**
FY43	10	94	54	61	1	12	36	32	38	**338**
FY44	10	93	52	62	1	12	36	32	38	**336**
FY45	11	92	51	63	1	12	36	32	38	**336**
FY46	10	91	50	64	2	12	37	32	38	**336**
FY47	10	91	51	65	2	12	35	32	38	**336**
FY48	9	92	49	66	2	12	35	32	38	**335**

Source: Table prepared by CRS based on Navy's FY2019 30-year (FY2019-FY2048) shipbuilding plan.

Note: Figures for support ships include five JHSVs transferred from the Army to the Navy and operated by the Navy primarily for the performance of Army missions.
Key: FY = Fiscal Year; **CVNs** = aircraft carriers; **LSCs** = surface combatants (i.e., cruisers and destroyers); **SSCs** = small surface combatants (i.e., frigates, Littoral Combat Ships [LCSs], and mine warfare ships); **SSNs** = attack submarines; **SSGNs/LPSs** = cruise missile submarines/large payload submarines; **SSBNs** = ballistic missile submarines; **AWSs** = amphibious warfare ships; **CLFs** = combat logistics force (i.e., resupply) ships; **Supt** = support ships.

Consistent with CRS and CBO estimates from 2017 shown in **Table 1**, the Navy projects that the 47 additional ships included in the Navy's FY2019 30-year shipbuilding plan would not be enough the achieve a 355-ship fleet during the 30-year period. As shown in **Table 4**, the Navy projects that if the FY2019 30-year shipbuilding plan were implemented, the fleet would peak at 342 ships in FY2039 and FY2041, and then drop to 335 ships by the end of the 30-year period. The Navy projects that under the FY2019 30-year shipbuilding plan, a 355-ship fleet would not

be attained until the 2050s (and the aircraft carrier force-level goal within the 355-ship goal would not be attained until the 2060s).

Also consistent with CRS and CBO estimates from 2017, the Navy estimates that adding another 20 to 25 ships to the earlier years of the Navy's FY2019 30-year shipbuilding plan (and thus procuring a total of 321 to 326 ships in the 30-year plan, or 67 to 72 ships more than the 254 included in the FY2017 30-year plan) could accelerate the attainment of a 355-ship fleet to about 2036 or 2037.[34]

The Navy's report on its FY2019 30-year shipbuilding plan includes notional options for inserting numerous ships into various years of the 30-year shipbuilding program,[35] including (CRS estimates) up to 52 or so ships that could be added early enough in the 30-year plan to be in service by about 2037. These 52 or so ships include up to three SSNs, up to six large surface combatants (i.e., cruisers and destroyers), up to 14 or so small surface combatants, up to 12 or so amphibious ships, up to 12 or so combat logistics force (CLF) ships, and up to five command and support ships.[36] Adding 20 to 25 of these 52 or so ships early enough in the 30-year shipbuilding plan could produce a 355-ship fleet by about 2037, although not necessarily one matching the Navy's desired composition for a 355-ship fleet.

As discussed earlier (see "Extending Service Lives of Existing Ships and Reactivating Retired Ships"), at an April 12, 2018, hearing on the Navy's 355-ship force-level goal before the Seapower and Projection Forces subcommittee of the House Armed Services Committee, Navy officials announced that the Navy has decided to extend the service lives of all DDG-51 destroyers to 45 years. Navy officials testified that this action would permit the Navy to achieve a total of 355 ships by the 2030s, although the resulting mix of ships would not match the mix called for in the Navy's 355-ship force-level goal—there would be more than the required number of DDG-51s, and fewer than the required numbers of other types of ships.

Issues for Congress

The overall issue for Congress is whether to approve, reject, or modify the Navy's proposed FY2019 shipbuilding program and the Navy's longer-term shipbuilding plans. Regarding the Navy's proposed FY2019 shipbuilding program, one issue that Congress may consider is whether the Navy has accurately priced the shipbuilding work it is proposing to do in FY2019. The sections below explore additional issues that can bear on whether to approve, reject, or modify the Navy's proposed FY2019 shipbuilding program and the Navy's longer-term shipbuilding plans.

Appropriateness of 355-Ship Goal

One potential oversight issue for Congress concerns the appropriateness of the Navy's 355-ship force-level objective. Potential oversight questions include the following:

[34] U.S. Navy, *Report to Congress on the Annual Long-Range Plan for Construction of Naval Vessels for Fiscal Year 2019*, February 2018, Figure A3-6 (page 15).

[35] U.S. Navy, *Report to Congress on the Annual Long-Range Plan for Construction of Naval Vessels for Fiscal Year 2019*, February 2018, Figure A3-5 (page 14).

[36] This CRS estimate is based on U.S. Navy, *Report to Congress on the Annual Long-Range Plan for Construction of Naval Vessels for Fiscal Year 2019*, February 2018, Figure A3-5 (page 14) and notional delivery times for various types of ships procured through the early 2030s.

- Is the 355-ship goal appropriate and affordable in terms of planned fleet size and composition, given current and projected strategic and budgetary circumstances as discussed in **Appendix A**? Would it provide an appropriate and affordable amount of capacity and capability for responding to Chinese naval modernization and resurgent Russian naval activity, and for meeting requests from U.S. regional combatant commanders for day-to-day forward deployments of Navy ships?
- As noted earlier, the 355-ship goal is the result of a Force Structure Assessment (FSA) conducted by the Navy in 2016, and thus reflects the national military strategy that was in place in 2016 (i.e., the Obama Administration's national military strategy). Is the 355-ship goal appropriate for implementing the Trump Administration's National Security Strategy (NSS), released in December 2017, and National Defense Strategy (NDS), released in January 2018?[37] In light of the release of the Trump Administration's NSS and NDS, should the Navy update the 2016 FSA or conduct a new FSA?

At a March 6, 2018, hearing before the Seapower and Projection Forces subcommittee of the House Armed Services Committee regarding that subcommittee's portion of the Department of the Navy's proposed FY2019 budget, Representative Gallagher asked the Navy witnesses whether, in light of the Trump Administration's NSS and NDS, the Navy intended to undertake a new FSA. In reply, Vice Admiral William Merz, the Deputy Chief of Naval Operations for Warfare systems stated "[w]e intend to do another FSA with the new national defense strategy." Merz added that

> We have done multiple studies on the architecture of the Navy and the size of the Navy. Every single one of them says we have to grow. And we have to grow with these fundamental types of ships. So we don't expect much of that to change with the next FSA.
>
> There may be some changes on the margin, there may be another number that we're shooting for, but it's going to be bigger than we are today. So we have to move out and we have to move out aggressively as we—as we go forward....
>
> This will probably be done sometime over the next year as soon as we can. We are eager to get this new FSA completed, but the undeniable fact is we still need to get bigger....[38]

Navy's Proposed Shipbuilding Plan in Relation to 355-Ship Goal

Another potential oversight question for Congress concerns the relationship of the Navy's proposed shipbuilding plan to the 355-ship force-level goal. Potential oversight questions for Congress include the following:

[37] For more on the NSS and NDS, see CRS Insight IN10842, *The 2017 National Security Strategy: Issues for Congress*, by (name redacted) .

[38] Source: Transcript of hearing as compiled by CQ.com. The quoted remarks were in a back-and-forth exchange between Representative Gallagher and Vice Admiral Merz. The remarks as quoted here omit short interjections by Gallagher as he was tracking Merz's remarks. In addition to asking about the possibility of a new FSA in general, Gallagher asked about whether a new FSA might reconsider the force-level goal for small surface combatants. In reply to this part of Gallagher's question, Merz stated the following: "The small surface combatants in particular which is the area of concern for your shipyard, you know, I mean there was a lethality aspect of that that brought us to the mix between frigates and—and LCS that we are definitely going to revisit on the next FSA based on the key elements of the national defense strategy."

- Do the Navy's FY2019 five-year and 30-year shipbuilding plans include an appropriate number of ships in relation to the Navy's 355-ship force-level goal? Should policymakers aim to achieve the Navy's 355-ship goal in the 2050s (and the aircraft carrier portion of that goal in the 2060s), as proposed by the Navy, or by a date that is sooner or later than that?
- How does the projected date for attaining the 355-ship fleet relate to the current and projected strategic and budgetary circumstances as discussed in **Appendix A**, including the issues of responding to Chinese naval modernization and resurgent Russian naval activity, and providing forces for meeting requests from U.S. regional combatant commanders for day-to-day forward deployments of Navy ships?
- If policymakers decide to achieve the 355-ship goal sooner than the 2050s (and the aircraft carrier portion of that goal sooner than the 2060s), how many ships of what types should be added in which specific years to the Navy's five-year and 30-year shipbuilding plans?
- In a situation of finite defense spending, what impact might adding ships to the shipbuilding plan (and operating and supporting those additional ships once they enter service) have on funding available for other Navy or DOD programs? If adding ships to the shipbuilding plan requires reducing funding for other Navy or DOD programs, what would be the resulting net impact on Navy and DOD capabilities?

Affordability of 30-Year Shipbuilding Plan

Overview

Another oversight issue for Congress concerns the prospective affordability of the Navy's 30-year shipbuilding plan. This issue has been a matter of oversight focus for several years, and particularly since the enactment in 2011 of the Budget Control Act, or BCA (S. 365/P.L. 112-25 of August 2, 2011). Observers have been particularly concerned about the plan's prospective affordability during the decade or so from the mid-2020s through the mid-2030s, when the plan calls for procuring Columbia-class ballistic missile submarines as well as replacements for large numbers of retiring attack submarines, cruisers, and destroyers.[39]

As discussed in the CRS report on the Columbia-class program,[40] the Navy since 2013 has identified the Columbia-class program as its top program priority, meaning that it is the Navy's intention to fully fund this program, if necessary at the expense of other Navy programs, including other Navy shipbuilding programs. This has led to concerns that in a situation of finite Navy shipbuilding budgets, funding requirements for the Columbia-class program could crowd

[39] As discussed in CRS testimony in 2011, a key function of the 30-year shipbuilding plan is to alert policymakers well ahead of time to periods of potentially higher funding requirements for Navy shipbuilding. (See Statement of Ronald O'Rourke, Specialist in Naval Affairs, Congressional Research Service, before the House Armed Services Committee, Subcommittee on Oversight and Investigations, hearing on the Department of Defense's 30-Year Aviation and Shipbuilding Plans, June 1, 2011, 8 pp.) The Navy's 30-year plans in recent years have spotlighted for policymakers the substantial increase in Navy shipbuilding funding that would be required to implement the 30-year plan during the decade or so from the mid-2020s through the mid-2030s.

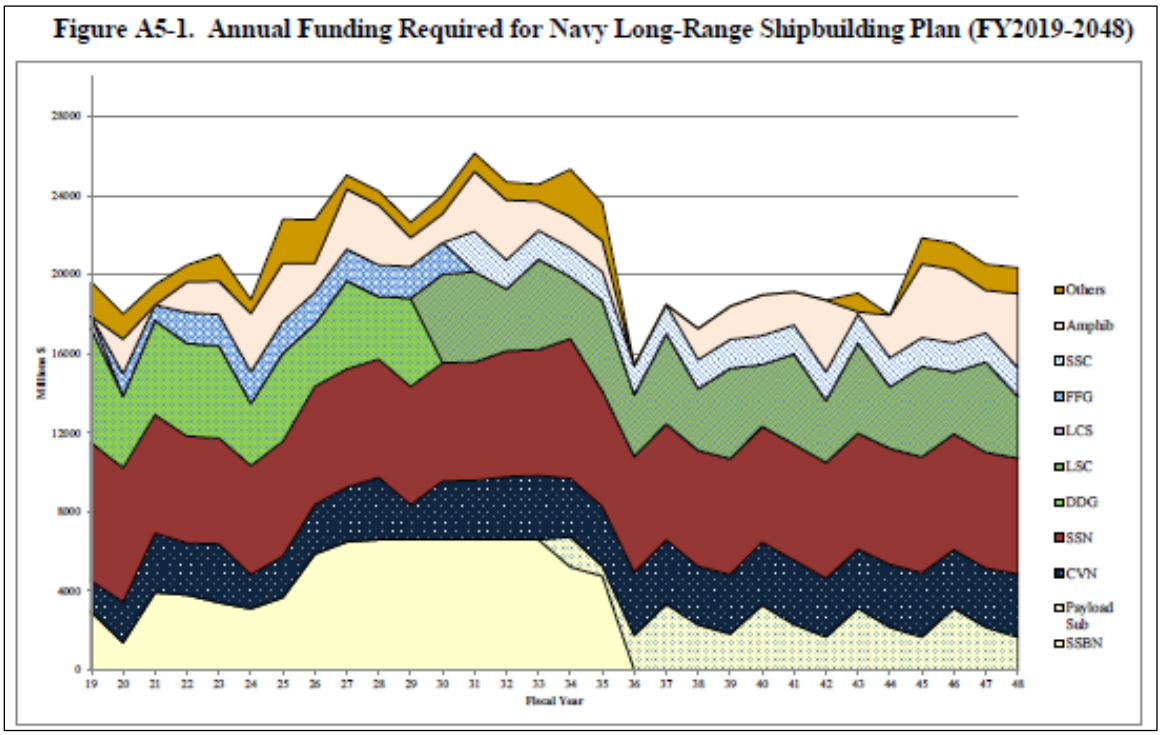
[40] CRS Report R41129, *Navy Columbia (SSBN-826) Class Ballistic Missile Submarine Program: Background and Issues for Congress*, by (name redacted) .

out funding for procuring other type of Navy ships. These concerns led to the creation by Congress of the National Sea-Based Deterrence Fund (NSBDF), a fund in the DOD budget that is intended in part to encourage policymakers to identify funding for the Columbia-class program from sources across the entire DOD budget rather than from inside the Navy's budget alone.[41]

Figure 1 shows the Navy's estimate of the annual amounts of funding that would be needed to implement the Navy's FY2019 30-year shipbuilding plan. The figure shows that during the period from the mid-2020s through the mid-2030s, the Navy estimates that implementing the FY2019 30-year shipbuilding plan would require roughly $24 billion per year in shipbuilding funds.

Figure 1. Navy Estimate of Funding Requirements for 30-Year Plan

Constant FY2018 dollars, in millions



Source: U.S. Navy, *Report to Congress on the Annual Long-Range Plan for Construction of Naval Vessels for Fiscal Year 2019*, February 2018, Figure A5-1 (page 19).

As noted earlier, the FY2019 30-year shipbuilding plan does not include enough ships to achieve a 355-ship fleet inside the plan's 30-year period—under the 30-year plan, a 355-ship fleet would not be achieved until the 2050s (and the aircraft-carrier portion of the 355-ship goal would not be achieved until the 2060s). As also noted earlier, adding 20 to 25 additional ships to the earlier years of the plan would accelerate the attainment of a 355-ship fleet to 2036 or 2037. Adding those 20 to 25 ships, however, would increase annual funding requirements for the earlier years of the 30-year plan to levels even higher than those shown in **Figure 1**.

As discussed earlier (see "Extending Service Lives of Existing Ships and Reactivating Retired Ships"), at an April 12, 2018, hearing on the Navy's 355-ship force-level goal before the

[41] For additional discussion of the NSBDF, see CRS Report R41129, *Navy Columbia (SSBN-826) Class Ballistic Missile Submarine Program: Background and Issues for Congress*, by (name redacted) .

Seapower and Projection Forces subcommittee of the House Armed Services Committee, Navy officials announced that the Navy has decided to extend the service lives of all DDG-51 destroyers to 45 years. Navy officials testified that this action would permit the Navy to achieve a total of 355 ships by the 2030s, although the resulting mix of ships would not match the mix called for in the Navy's 355-ship force-level goal—there would be more than the required number of DDG-51s, and fewer than the required numbers of other types of ships.

CBO vs. Navy Estimates of Cost of 30-Year Plan

If one or more Navy ship designs turn out to be more expensive to build than the Navy estimates, then the projected funding levels shown in **Figure 1** will not be sufficient to procure all the ships shown in the 30-year shipbuilding plan. Ship designs that can be viewed as posing a risk of being more expensive to build than the Navy estimates include Gerald R. Ford (CVN-78) class aircraft carriers, Columbia-class ballistic missile submarines, Virginia-class attack submarines equipped with the Virginia Payload Module (VPM), Flight III versions of the DDG-51 destroyer, FFG(X) frigates, LX(R) amphibious ships, and John Lewis (TAO-205) class oilers.

The statute that requires the Navy to submit a 30-year shipbuilding plan each year (10 U.S.C. 231) also requires CBO to submit its own analysis of the potential cost of the 30-year plan (10 U.S.C. 231[d]). CBO is currently preparing its estimate of the cost of the Navy's FY2019 30-year shipbuilding plan. CBO analyses of past Navy 30-year shipbuilding plans have generally estimated the cost of implementing those plans to be higher than what the Navy estimated.

For example, CBO's estimate of the cost of the Navy's FY2017 30-year (FY2017-FY2046) shipbuilding plan was about 11.1% higher than the Navy's estimated cost for that plan. More specifically, CBO estimated that the cost of the first 10 years of the FY2017 30-year plan would be about 2.0% higher than the Navy's estimate for those 10 years; that the cost of the middle 10 years of the plan would be about 5.9% higher than the Navy's estimate; and that the cost of the final 10 years of the plan would be about 14.6% higher than the Navy's estimate.

The growing divergence between CBO's estimate and the Navy's estimate as one moves from the first 10 years of the plan to the final 10 years of the plan is due in part to a technical difference between CBO and the Navy regarding the treatment of inflation. This difference compounds over time, making it increasingly important as a factor in the difference between CBO's estimates and the Navy's estimates the further one goes into the 30-year period. In other words, other things held equal, this factor tends to push the CBO and Navy estimates further apart as one proceeds from the earlier years of the plan to the later years of the plan.

The Columbia-class program has accounted for some of the difference between the CBO estimate and the Navy estimate, but it has not been the largest source of difference—a future large surface combatant that the Navy shows in the later years of the 30-year plan has accounted for a larger share of the difference between the CBO and Navy estimates, in part because there is a relatively large number of these future large surface combatants in the plan, and because those ships occur in the latter years of the plan, where the effects of the technical difference between CBO and the Navy regarding the treatment of inflation show more strongly.

Legislative Activity for FY2019

CRS Reports Tracking Legislation on Specific Navy Shipbuilding Programs

Detailed coverage of legislative activity on certain Navy shipbuilding programs (including funding levels, legislative provisions, and report language) can be found in the following CRS reports:

- CRS Report R41129, *Navy Columbia (SSBN-826) Class Ballistic Missile Submarine Program: Background and Issues for Congress*, by (name redacted) .
- CRS Report RL32418, *Navy Virginia (SSN-774) Class Attack Submarine Procurement: Background and Issues for Congress*, by (name redacted) .
- CRS Report RS20643, *Navy Ford (CVN-78) Class Aircraft Carrier Program: Background and Issues for Congress*, by (name redacted) .
- CRS Report RL32109, *Navy DDG-51 and DDG-1000 Destroyer Programs: Background and Issues for Congress*, by (name redacted) .
- CRS Report R44972, *Navy Frigate (FFG[X]) Program: Background and Issues for Congress*, by (name redacted) .
- CRS Report RL33741, *Navy Littoral Combat Ship (LCS) Program: Background and Issues for Congress*, by (name redacted) .
- CRS Report R43543, *Navy LPD-17 Flight II (LX[R]) Amphibious Ship Program: Background and Issues for Congress*, by (name redacted) . (This report also covers the issue of funding for the procurement of San Antonio [LPD-17] class amphibious ships.)
- CRS Report R43546, *Navy John Lewis (TAO-205) Class Oiler Shipbuilding Program: Background and Issues for Congress*, by (name redacted) .

Legislative activity on individual Navy shipbuilding programs that are not covered in detail in the above reports is covered below.

Summary of Congressional Action on FY2019 Funding Request

The Navy's proposed FY2019 budget requests the procurement of 10 new ships:

- 2 Virginia-class attack submarines;
- 3 DDG-51 class Aegis destroyers;
- 1 Littoral Combat Ship (LCS);
- 2 John Lewis (TAO-205) class oilers;
- 1 Expeditionary Sea Base ship (ESB); and
- 1 TATS towing, salvage, and rescue ship.

The Navy's proposed FY2018 shipbuilding budget also requests funding for ships that have been procured in prior fiscal years, and ships that are to be procured in future fiscal years, as well as funding for activities other than the building of new Navy ships.

Table 5 summarizes congressional action on the Navy's FY2019 funding request for Navy shipbuilding. The table shows the amounts requested and congressional changes to those

requested amounts. A blank cell in a filled-in column showing congressional changes to requested amounts indicates no change from the requested amount.

Table 5. Summary of Congressional Action on FY2019 Funding Request

(Millions of dollars, rounded to nearest tenth; totals may not add due to rounding)

			Congressional changes to requested amounts					
			Authorization			Appropriation		
Line number	Program	Request	HASC	SASC	Conf.	HAC	SAC	Conf.
Shipbuilding and Conversion, Navy (SCN) appropriation account								
001	Ohio replacement AP	3,005.3	+82.7					
002	CVN-78	1,598.2	-49.1					
003	CVN-78 AP	0						
004	Virginia class	4,373.4	+938.0					
005	Virginia class AP	2,796.4						
006	CVN refueling overhaul	0						
007	CVN refueling overhaul AP	449.6						
008	DDG-1000	271.1						
009	DDG-51	5,253.3	-312.0					
010	DDG-51 AP	391.9						
011	LCS	646.2	+950.0					
012	LPD-17 Flight II	0						
012A	LPD-17 Flight II AP	0	+150.0					
013	ESB	650.0	-20.0					
014	LHA(R)	0						
015	EPF	0						
016	TAO-205	977.1	-20.0					
017	TAO-205 AP	75.0						
018	TATS	80.5	-5.0					
019	Moored Training Ship (MTS)	0						
020	LCU 1700	41.5						
021	Outfitting	634.0	-45.0					
022	Ship-to-Shore Connector	325.4	+182.5					
023	Service Craft	72.1						
024	LCAC SLEP	23.3						
025	Coast Guard icebreakers	0						
026	Coast Guard icebreakers AP	0						
027	YP Craft maint./ROH/SLEP	0						
028	Completion of PY shipbldg.	207.1						
029	Adjustment to match CR	0						
TOTAL		**21,871.4**	**23,723.5**					

Source: Table prepared by CRS based on Navy FY2019 budget submission, committee reports, and explanatory statements on the FY2019 National Defense Authorization Act and FY2019 DOD Appropriations Act.

Notes: Millions of dollars, rounded to nearest tenth. A blank cell indicates no change to requested amount. Totals may not add due to rounding. **AP** is advance procurement funding; **HASC** is House Armed Services Committee; **SASC** is Senate Armed Services Committee; **HAC** is House Appropriations Committee; **SAC** is Senate Appropriations Committee; **Conf.** is conference report.

FY2019 National Defense Authorization Act (H.R. 5515)

House

The House Armed Services Committee, in its report (H.Rept. 115-676 of May 15, 2018) on H.R. 5515, recommended the funding levels shown in the HASC column of **Table 5**.

The HASC report recommends authorizing the procurement of the aircraft carrier CVN-81 in FY2019. The report also recommends funding three LCSs in FY2019—an increase of two over the one LCS requested by the Navy for FY2019. As a result, the HASC report authorizes the procurement of 13 new ships in FY2019—three more than the 10 requested by the Navy for FY2019.

Section 121 of H.R. 5515 as reported by the committee states:

> SEC. 121. Increase in number of operational aircraft carriers of the Navy.
>
> (a) Findings.—Congress finds the following:
>
> (1) The aircraft carrier can fulfill the Navy's core missions of forward presence, sea control, ensuring safe sea lanes, and power projection as well as providing flexibility and versatility to execute a wide range of additional missions.
>
> (2) Forward airpower is integral to the security and joint forces operations of the United States. Carriers play a central role in delivering forward airpower from sovereign territory of the United States in both permissive and nonpermissive environments.
>
> (3) Aircraft carriers provide our Nation the ability to rapidly and decisively respond to national threats, as well as conducting worldwide, on-station diplomacy and providing deterrence against threats to the United States allies, partners, and friends.
>
> (4) Since the end of the cold war, aircraft carrier deployments have increased while the aircraft carrier force structure has declined.
>
> (5) Considering the increased array of complex threats across the globe, the Navy aircraft carrier is operating at maximum capacity, increasing deployment lengths and decreasing maintenance periods in order to meet operational requirements.
>
> (6) To meet global peacetime and wartime requirements, the Navy has indicated a requirement to maintain two aircraft carriers deployed overseas and have three additional aircraft carriers capable of deploying within 90 days. However, the Navy has indicated that the existing aircraft carrier force structure cannot support these military requirements.
>
> (7) Despite the requirement to maintain an aircraft carrier strike group in both the United States Central Command and the United States Pacific Command, the Navy has been unable to generate sufficient capacity to support combatant commanders and has developed significant carrier gaps in these critical areas.
>
> (8) Because of the continuing use of a diminished aircraft carrier force structure, extensive maintenance availabilities result which typically exceed program costs and increase time in shipyards. These expansive maintenance availabilities exacerbate existing carrier gaps.
>
> (9) Developing an alternative design to the Ford-class aircraft carrier is not cost beneficial. A smaller design is projected to incur significant design and engineering cost while significantly reducing magazine size, carrier air wing size, sortie rate, and on-station effectiveness, among other vital factors, as compared to the Ford-class. Furthermore, a new design will delay the introduction of future aircraft carriers,

exacerbating existing carrier gaps and threatening the national security of the United States.

(10) The 2016 Navy Force Structure Assessment states "A minimum of 12 aircraft carriers are required to meet the increased warfighting response requirements of the Defense Planning Guidance Defeat/Deny force sizing direction.".

(b) Sense of congress.—It is the sense of Congress that—

(1) the United States should expedite delivery of 12 aircraft carriers; and

(2) an aircraft carrier should be authorized every three years.

(c) Increase in number of operational aircraft carriers of the navy.—

(1) INCREASE.—Section 5062(b) of title 10, United States Code, is amended by striking "11 operational aircraft carriers" and inserting "12 operational aircraft carriers".

(2) EFFECTIVE DATE.—The amendment made by paragraph (1) shall take effect on September 30, 2022.

Section 122 of H.R. 5515 as reported by the committee states:

SEC. 122. Procurement authority for Ford class aircraft carrier program.

(a) Contract authority.—

(1) PROCUREMENT AUTHORIZED.—The Secretary of the Navy may enter into one or more contracts, beginning with the fiscal year 2019 program year, for the procurement of one Ford class aircraft carrier to be designated CVN–81.

(2) PROCUREMENT IN CONJUNCTION WITH CVN–80.—The aircraft carrier authorized to be procured under subsection (a) may be procured as an addition to the contract covering the Ford class aircraft carrier designated CVN–80 that is authorized to be constructed under section 121 of the John Warner National Defense Authorization Act for Fiscal Year 2007 (Public Law 109–364; 120 Stat. 2104).

(b) Use of incremental funding.—With respect to a contract entered into under subsection (a), the Secretary of the Navy may use incremental funding to make payments under the contract.

(c) Liability.—A contract entered into under subsection (a) shall provide that the total liability to the Government for termination of the contract entered into shall be limited to the total amount of funding obligated at the time of termination.

(d) Condition for out-year contract payments.—A contract entered into under subsection (a) shall provide that any obligation of the United States to make a payment under the contract for a fiscal year is subject to the availability of appropriations for that purpose for such fiscal year.

Section 124 of H.R. 5515 as reported by the committee states:

SEC. 124. Multiyear procurement authority for amphibious vessels.

(a) Authority for multiyear procurement.—Subject to section 2306b of title 10, United States Code, the Secretary of the Navy may enter into one or more multiyear contracts for the procurement of not more than five amphibious vessels.

(b) Limitation.—The Secretary of the Navy may not modify a contract entered into under subsection (a) if the modification would increase the target price of an amphibious vessel by more than 10 percent above the target price specified in the original contract awarded for the amphibious vessel under subsection (a).

(c) Authority for advance procurement.—The Secretary of the Navy may enter into one or more contracts for advance procurement associated with the amphibious vessels for which authorization to enter into a multiyear procurement contract is provided under subsection (a) and for equipment or subsystems associated with the amphibious vessels, including procurement of—

(1) long lead time material; or

(2) material or equipment in economic order quantities when cost savings are achievable.

(d) Condition for out-year contract payments.—A contract entered into under subsection (a) shall provide that any obligation of the United States to make a payment under the contract for a fiscal year after fiscal year 2019 is subject to the availability of appropriations or funds for that purpose for such later fiscal year.

(e) Limitation on termination liability.—A contract for the construction of amphibious vessels entered into under subsection (a) shall include a clause that limits the liability of the United States to the contractor for any termination of the contract. The maximum liability of the United States under the clause shall be the amount appropriated for the amphibious vessels covered by the contract regardless of the amount obligated under the contract.

(f) Amphibious vessel defined.—The term "amphibious vessel" means a San Antonio class amphibious transport dock ship with a Flight II configuration.

Section 842 of H.R. 5515 as reported by the committee states:

SEC. 842. Report on domestic sourcing of specific components for all Naval vessels.

Not later than March 1, 2019, the Secretary of the Navy shall submit to the congressional defense committees a report that provides a market survey and cost assessment associated with limiting competition to domestic sources for—

(1) naval vessel components listed in section 2534(a)(3) of title 10, United States Code;

(2) expanding such list to include all ships authorized using funds available for Shipbuilding and Conversion, Navy and Other Procurement, Navy; and

(3) expanding such list to include waterjet marine propulsion systems, azimuth thrusters, and bow thrusters for all ships authorized using funds available for Shipbuilding and Conversion, Navy and Other Procurement, Navy.

Section 1021 of H.R. 5515 as reported by the committee states:

SEC. 1021. Inclusion of operation and sustainment costs in annual naval vessel construction plans.

Section 231(b)(2) of title 10, United States Code, is amended by adding at the end the following new subparagraph:

"(F) The estimated operations and sustainment costs required to support the vessels delivered under the naval vessel construction plan.".

Section 1022 of H.R. 5515 as reported by the committee states:

SEC. 1022. Purchase of vessels using funds in National Defense Sealift Fund.

(a) In general.—Section 2218(f)(3) of title 10, United States Code, is amended—

(1) in subparagraph (C)—

(A) by striking "two" and inserting "ten"; and

(B) by striking "ships" and inserting "vessels";

(2) by redesignating subparagraph (E) as subparagraph (F); and

(3) by inserting after subparagraph (D) the following new subparagraph (E):

"(E) The Secretary may not use the authority under this paragraph to procure more than two foreign constructed vessels unless the Secretary submits to Congress, by not later than the second week of February of the fiscal year during which the Secretary plans to use such authority, a certification that—

"(i) the Secretary has initiated an acquisition strategy for the construction in United States shipyards of not less than ten new sealift vessels purchased with funds in the National Defense Sealift Fund; and

"(ii) of such new sealift vessels, the lead ship is anticipated to be delivered by not later than 2026.".

(b) Limitation on use of funds.—Of the amounts authorized to be appropriated or otherwise made available by this Act for fiscal year 2019 for the Military Sealift Command, the Secretary of the Navy may not obligate or expend more than 75 percent until the Secretary submits to the congressional defense committees certification that the Navy has—

(1) entered into a contract for the procurement of two used National Defense Reserve Fleet vessels in accordance with section 2218(f)(3)(C) of title 10, United States Code; and

(2) completed the capability development document for the common hull multi-mission platform.

Section 1023 of H.R. 5515 as reported by the committee states:

SEC. 1023. Purchase of vessels built in foreign shipyards with funds in National Defense Sealift Fund.

Section 2218(f)(3) of title 10, United States Code, as amended by section 1022, is further amended—

(1) in subparagraph (F), as redesignated by such section 1022—

(A) by striking "30 days after" and inserting "30 days before";

(B) in clause (i), by inserting "proposed" before "date";

(C) in clause (ii), by striking "was" and inserting "would be"; and

(D) by adding at the end the following new clause:

"(viii) A detailed account of the criteria used to make the determination under subparagraph (B)."; and

(2) by inserting after subparagraph (F), as so redesignated, the following new subparagraph:

"(G) The Secretary may not finalize or execute the final purchase of any vessel using the authority under this paragraph until 30 days after the date on which a report under subparagraph (E) is submitted with respect to such purchase.".

Section 1024(c) as reported by the committee states:

SEC. 1024. Technical corrections and clarifications to chapter 633 of title 10, United States Code, and other provisions of law regarding naval vessels.

...

(c) Other provisions of law.—

(1) REPEAL OF METERING OF NAVY PIERS TO ACCURATELY MEASURE ENERGY CONSUMPTION.—Section 2828 of the National Defense Authorization Act for Fiscal Year 2012 (Public Law 112–81; 125 Stat. 1694; 10 U.S.C. 7291 note) is repealed.

(2) MODIFICATION OF ADVANCE PROCUREMENT FUNDING.—Section 124 of the National Defense Authorization Act for Fiscal Year 2010 (Public Law 111–84; 123 Stat. 2214; 10 U.S.C. 7291 note) is amended—

(A) by striking subsection (a); and

(B) by redesignating subsections (b) and (c) as subsections (a) and (b), respectively.

(3) REPEAL OF POLICY RELATING TO MAJOR COMBATANT VESSELS OF THE STRIKE FORCES OF THE UNITED STATES NAVY.—Section 1012 of the National Defense Authorization Act for Fiscal Year 2008 (Public Law 110–181; 122 Stat. 303; 10 U.S.C. 7291 note) is repealed.

(4) REPEAL OF ALTERNATIVE TECHNOLOGIES FOR FUTURE SURFACE COMBATANTS.—Section 128 of the John Warner National Defense Authorization Act for Fiscal Year 2007 (Public Law 109–364; 120 Stat. 2109; 10 U.S.C. 7291 note) is repealed.

(5) REPEAL OF OBSOLETE PROVISION ON VESSEL SCRAPPING PILOT PROGRAM.—Section 8124 of the Department of Defense Appropriations Act, 1999 (Public Law 105–262; 112 Stat. 2333; 10 U.S.C. 7291 note) is repealed.

(6) REPEAL OF PROVISION ON CONSIDERATION OF VESSEL LOCATION FOR AWARD OF LAYBERTH CONTRACTS FOR SEALIFT VESSELS.—Section 375 of the National Defense Authorization Act for Fiscal Year 1993 (Public Law 102–484; 106 Stat. 2385; 10 U.S.C. 7291 note) is repealed.

(7) REPEAL OF PROVISION ON REVITALIZATION OF UNITED STATES SHIPBUILDING INDUSTRY.—Section 1031 of the National Defense Authorization Act for Fiscal Year 1993 (Public Law 102–484; 106 Stat. 2489; 10 U.S.C. 7291 note) is repealed.

(8) REPEAL OF FAST SEALIFT PROGRAM.—

(A) PROCUREMENT OF SHIPS.—Section 1021 of the National Defense Authorization Act for Fiscal Year 1993 (Public Law 102–484; 106 Stat. 2485; 10 U.S.C. 7291 note) is repealed.

(B) ESTABLISHMENT OF PROGRAM.—Section 1424 of the National Defense Authorization Act for Fiscal Year 1991 (Public Law 101–510; 104 Stat. 1683; 10 U.S.C. 7291 note) is repealed.

(9) REPEAL OF REQUIREMENTS RELATING TO DEPOT-LEVEL MAINTENANCE OF SHIPS.—Section 1614 of the National Defense Authorization Act for Fiscal Years 1990 and 1991 (Public Law 101–189; 103 Stat. 1601; 10 U.S.C. 7291 note) is amended by striking subsections (a) and (b).

(10) REPEAL OF OBSOLETE REQUIREMENT FOR REPORTS ON EFFECTS OF NAVAL SHIPBUILDING PLANS ON MARITIME INDUSTRIES.—Section 1227 of the National Defense Authorization Act for Fiscal Year 1989 (Public Law 100–456; 102 Stat. 2055; 10 U.S.C. 7291 note) is repealed.

(11) REPEAL OF SIX-HUNDRED-SHIP GOAL FOR NAVY; SENSE OF CONGRESS.—Section 791 of the Department of Defense Appropriations Act, 1982 (Public Law 97–114; 95 Stat. 1593; 10 U.S.C. 7291 note) is repealed.

(12) REPEAL OF PROHIBITION ON USE OF PUBLIC AND PRIVATE SHIPYARDS FOR CONVERSION, OVERHAUL, OR REPAIR WORK UNDER CERTAIN PROGRAMS.—Section 811 of the Department of Defense Appropriations Act, 1979 (Public Law 95–485; 92 Stat. 1624; 10 U.S.C. 7291 note) is repealed.

(13) REPEAL OF OBSOLETE REQUIREMENT TO SUBMIT A FIVE-YEAR NAVAL SHIP NEW CONSTRUCTION AND CONVERSION PROGRAM.—Section 808 of the Department of Defense Authorization Act, 1976 (Public Law 94–106; 89 Stat. 539; 10 U.S.C. 7291 note) is repealed.

Section 1025 of H.R. 5515 as reported by the committee states:

SEC. 1025. Retention of Navy hospital ship capability.

(a) Retention of ships.—The Secretary of the Navy shall retain two T-AH 19 Mercy-class hospital ships at a readiness level that provides for the activation and deployment of each such ship within a period that does not exceed 5 days.

(b) Waiver authority.—The Secretary of the Navy may waive the requirement under subsection (a) if the Secretary submits to the congressional defense committees certification in writing that the Secretary has—

(1) for any T-AH 19 Mercy-class hospital ship to be retired or transferred, identified a replacement capability to meet the combatant commander afloat medical capability for medical and surgical care that is being met by the ship to be retired or transferred; and

(2) achieved the initial operational capability of the replacement capability described in paragraph (1).

Section 1666 of H.R. 5515 as reported by the committee states:

SEC. 1666. Requirements for ballistic missile defense capable ships.

(a) Force structure assessment.—The Secretary of the Navy, in consultation with the Director of the Missile Defense Agency, shall include in the first force structure assessment conducted following the date of the enactment of this Act the following:

(1) An assessment of the requirements for ballistic missile defense capable ships.

(2) The force structure requirements associated with advanced ballistic missile defense capabilities.

(b) Force structure assessment defined.—The term “force structure assessment” has the meaning given the term in Chief of Naval Operations Instruction 3050.27.

Appendix A. Strategic and Budgetary Context

This appendix presents some brief comments on elements of the strategic and budgetary context in which U.S. Navy force structure and shipbuilding plans may be considered.

Shift in International Security Environment

World events have led some observers, starting in late 2013, to conclude that the international security environment has undergone a shift over the past several years from the familiar post-Cold War era of the past 20-25 years, also sometimes known as the unipolar moment (with the United States as the unipolar power), to a new and different strategic situation that features, among other things, renewed great power competition with China and Russia, and challenges to elements of the U.S.-led international order that has operated since World War II. This situation is discussed further in another CRS report.[42]

World Geography and U.S. Grand Strategy

Discussion of the above-mentioned shift in the international security environment has led to a renewed emphasis in discussions of U.S. security and foreign policy on grand strategy and geopolitics.[43] From a U.S. perspective on grand strategy and geopolitics, it can be noted that most of the world's people, resources, and economic activity are located not in the Western Hemisphere, but in the other hemisphere, particularly Eurasia. In response to this basic feature of world geography, U.S. policymakers for the past several decades have chosen to pursue, as a key element of U.S. national strategy, a goal of preventing the emergence of a regional hegemon in one part of Eurasia or another, on the grounds that such a hegemon could represent a concentration of power strong enough to threaten core U.S. interests by, for example, denying the United States access to some of the other hemisphere's resources and economic activity. Although U.S. policymakers have not often stated this key national strategic goal explicitly in public, U.S. military (and diplomatic) operations in recent decades—both wartime operations and day-to-day operations—can be viewed as having been carried out in no small part in support of this key goal.

[42] CRS Report R43838, *A Shift in the International Security Environment: Potential Implications for Defense—Issues for Congress*, by (name redacted) .

[43] The term *grand strategy* generally refers in foreign policy discussions to a country's overall approach for securing its interests and making its way in the world, using all the national instruments at its disposal, including diplomatic, informational, military, and economic tools (sometimes abbreviated in U.S. government parlance as DIME). A country's role in the world can be viewed as a visible expression of its grand strategy. For the United States, grand strategy can be viewed as a design or blueprint at a global or interregional level, as opposed to U.S. approaches for individual regions, countries, or issues.

The term *geopolitics* is often used as a synonym for international politics or for strategy relating to international politics. More specifically, it refers to the influence of basic geographic features on international relations, and to the analysis of international relations from a perspective that places a strong emphasis on the influence of such geographic features. Basic geographic features involved in geopolitical analysis include things such as the relative sizes and locations of countries or land masses; the locations of key resources such as oil or water; geographic barriers such as oceans, deserts, and mountain ranges; and key transportation links such as roads, railways, and waterways.

For additional discussion, see CRS Report R44891, *U.S. Role in the World: Background and Issues for Congress*, by (name redacted) and (name redacted) .

U.S. Grand Strategy and U.S. Naval Forces

As noted above, in response to basic world geography, U.S. policymakers for the past several decades have chosen to pursue, as a key element of U.S. national strategy, a goal of preventing the emergence of a regional hegemon in one part of Eurasia or another. The traditional U.S. goal of preventing the emergence of a regional hegemon in one part of Eurasia or another has been a major reason why the U.S. military is structured with force elements that enable it to cross broad expanses of ocean and air space and then conduct sustained, large-scale military operations upon arrival. Force elements associated with this goal include, among other things, an Air Force with significant numbers of long-range bombers, long-range surveillance aircraft, long-range airlift aircraft, and aerial refueling tankers, and a Navy with significant numbers of aircraft carriers, nuclear-powered attack submarines, large surface combatants, large amphibious ships, and underway replenishment ships.[44]

The United States is the only country in the world that has designed its military to cross broad expanses of ocean and air space and then conduct sustained, large-scale military operations upon arrival. The other countries in the Western Hemisphere do not design their forces to do this because they cannot afford to, and because the United States has been, in effect, doing it for them. Countries in the other hemisphere do not design their forces to do this for the very basic reason that they are already in the other hemisphere, and consequently instead spend their defense money on forces that are tailored largely for influencing events in their own local region.

The fact that the United States has designed its military to do something that other countries do not design their forces to do—cross broad expanses of ocean and air space and then conduct sustained, large-scale military operations upon arrival—can be important to keep in mind when comparing the U.S. military to the militaries of other nations. For example, in observing that the U.S. Navy has 11 aircraft carriers while other countries have no more than one or two, it can be noted other countries do not need a significant number of aircraft carriers because, unlike the United States, they are not designing their forces to cross broad expanses of ocean and air space and then conduct sustained, large-scale military operations upon arrival.

As another example, it is sometimes noted, in assessing the adequacy of U.S. naval forces, that U.S. naval forces are equal in tonnage to the next dozen or more navies combined, and that most of those next dozen or more navies are the navies of U.S. allies. Those other fleets, however, are mostly of Eurasian countries, which do not design their forces to cross to the other side of the world and then conduct sustained, large-scale military operations upon arrival. The fact that the U.S. Navy is much bigger than allied navies does not necessarily prove that U.S. naval forces are either sufficient or excessive; it simply reflects the differing and generally more limited needs that U.S. allies have for naval forces. (It might also reflect an underinvestment by some of those allies to meet even their more limited naval needs.)

Countries have differing needs for naval and other military forces. The United States, as a country located in the Western Hemisphere that has adopted a goal of preventing the emergence of a regional hegemon in one part of Eurasia or another, has defined a need for naval and other military forces that is quite different from the needs of allies that are located in Eurasia. The sufficiency of U.S. naval and other military forces consequently is best assessed not through comparison to the militaries of other countries, but against U.S. strategic goals.

[44] For additional discussion, see CRS In Focus IF10485, *Defense Primer: Geography, Strategy, and U.S. Force Design*, by (name redacted) .

More generally, from a geopolitical perspective, it can be noted that that U.S. naval forces, while not inexpensive, give the United States the ability to convert the world's oceans—a global commons that covers more than two-thirds of the planet's surface—into a medium of maneuver and operations for projecting U.S. power ashore and otherwise defending U.S. interests around the world. The ability to use the world's oceans in this manner—and to deny other countries the use of the world's oceans for taking actions against U.S. interests—constitutes an immense asymmetric advantage for the United States. This point would be less important if less of the world were covered by water, or if the oceans were carved into territorial blocks, like the land. Most of the world, however, is covered by water, and most of those waters are international waters, where naval forces can operate freely. The point, consequently, is not that U.S. naval forces are intrinsically special or privileged—it is that they have a certain value simply as a consequence of the physical and legal organization of the planet.

Uncertainty Regarding Future U.S. Role in the World

The overall U.S. role in the world since the end of World War II in 1945 (i.e., over the past 70 years) is generally described as one of global leadership and significant engagement in international affairs. A key aim of that role has been to promote and defend the open international order that the United States, with the support of its allies, created in the years after World War II. In addition to promoting and defending the open international order, the overall U.S. role is generally described as having been one of promoting freedom, democracy, and human rights, while criticizing and resisting authoritarianism where possible, and opposing the emergence of regional hegemons in Eurasia or a spheres-of-influence world.

Certain statements and actions from the Trump Administration have led to uncertainty about the Administration's intentions regarding the U.S. role in the world. Based on those statements and actions, some observers have speculated that the Trump Administration may want to change the U.S. role in one or more ways. A change in the overall U.S. role could have profound implications for DOD strategy, budgets, plans, and programs, including the planned size and structure of the Navy.[45]

Declining U.S. Technological and Qualitative Edge

DOD officials have expressed concern that the technological and qualitative edge that U.S. military forces have had relative to the military forces of other countries is being narrowed by improving military capabilities in other countries. China's improving military capabilities are a primary contributor to that concern.[46] Russia's rejuvenated military capabilities are an additional contributor. DOD in recent years has taken a number of actions to arrest and reverse the decline in the U.S. technological and qualitative edge.[47]

[45] For additional discussion, see CRS Report R44891, *U.S. Role in the World: Background and Issues for Congress*, by (name redacted) and (name redacted) .

[46] For more on China's naval modernization effort, see CRS Report RL33153, *China Naval Modernization: Implications for U.S. Navy Capabilities—Background and Issues for Congress*, by (name redacted) .

[47] For more on these initiatives, see CRS Report R43838, *A Shift in the International Security Environment: Potential Implications for Defense—Issues for Congress*, by (name redacted) .

Challenge to U.S. Sea Control and U.S. Position in Western Pacific

Observers of Chinese and U.S. military forces view China's improving naval capabilities as posing a potential challenge in the Western Pacific to the U.S. Navy's ability to achieve and maintain control of blue-water ocean areas in wartime—the first such challenge the U.S. Navy has faced since the end of the Cold War.[48] More broadly, these observers view China's naval capabilities as a key element of an emerging broader Chinese military challenge to the long-standing status of the United States as the leading military power in the Western Pacific.

Longer Ship Deployments

U.S. Navy officials have testified that fully meeting requests from U.S. regional combatant commanders (CCDRs) for forward-deployed U.S. naval forces would require a Navy much larger than today's fleet. For example, Navy officials testified in March 2014 that a Navy of 450 ships would be required to fully meet CCDR requests for forward-deployed Navy forces.[49] CCDR requests for forward-deployed U.S. Navy forces are adjudicated by DOD through a process called the Global Force Management Allocation Plan. The process essentially makes choices about how best to apportion a finite number forward-deployed U.S. Navy ships among competing CCDR requests for those ships. Even with this process, the Navy has lengthened the deployments of some ships in an attempt to meet policymaker demands for forward-deployed U.S. Navy ships. Although Navy officials are aiming to limit ship deployments to seven months, Navy ships in recent years have frequently been deployed for periods of eight months or more.

Limits on Defense Spending in Budget Control Act of 2011 as Amended

Limits on the "base" portion of the U.S. defense budget established by Budget Control Act of 2011, or BCA (S. 365/P.L. 112-25 of August 2, 2011), as amended, combined with some of the considerations above, have led to discussions among observers about how to balance competing demands for finite U.S. defense funds, and about whether programs for responding to China's military modernization effort can be adequately funded while also adequately funding other defense-spending priorities, such as initiatives for responding to Russia's actions in Ukraine and elsewhere in Europe and U.S. operations for countering the Islamic State organization in the Middle East.[50]

[48] The term "blue-water ocean areas" is used here to mean waters that are away from shore, as opposed to near-shore (i.e., littoral) waters. Iran is viewed as posing a challenge to the U.S. Navy's ability to quickly achieve and maintain sea control in littoral waters in and near the Strait of Hormuz. For additional discussion, see CRS Report R42335, *Iran's Threat to the Strait of Hormuz*, coordinated by (name redacted) and (name redacted) .

[49] Spoken testimony of Admiral Jonathan Greenert at a March 12, 2014, hearing before the House Armed Services Committee on the Department of the Navy's proposed FY2015 budget, as shown in transcript of hearing.

[50] See, for example, Statement of Admiral Jonathan Greenert, U.S. navy, Chief of Naval Operations, Before the Senate Armed Services Committee on the Impact of Sequestration on National Defense, January 28, 2015, particularly page 4 and Table 1, entitled "Mission Impacts to a Sequestered Navy."

Appendix B. Earlier Navy Force-Structure Goals Dating Back to 2001

The table below shows earlier Navy force-structure goals dating back to 2001. The 308-ship force-level goal of March 2015, shown in the first column of the table, is the goal that was replaced by the 355-ship force-level goal released in December 2016.

Table B-1. Earlier Navy Force-Structure Goals Dating Back to 2001

Ship type	308-ship goal of March 2015	306-ship goal of January 2013	~310-316 ship goal of March 2012	Revised 313-ship goal of September 2011	Changes to February 2006 313-ship goal announced through mid-2011	February 2006 Navy goal for 313-ship fleet	Early-2005 Navy goal for fleet of 260-325 ships		2002-2004 Navy goal for 375-ship Navy[a]	2001 QDR goal for 310-ship Navy
							260-ships	325-ships		
Ballistic missile submarines (SSBNs)	12[b]	12[b]	12-14[b]	12[b]	12[b]	14	14	14	14	14
Cruise missile submarines (SSGNs)	0[c]	0[c]	0-4[c]	4[c]	0[c]	4	4	4	4	2 or 4[d]
Attack submarines (SSNs)	48	48	~48	48	48	48	37	41	55	55
Aircraft carriers	11[e]	11[e]	11[e]	11[e]	11[e]	11[f]	10	11	12	12
Cruisers and destroyers	88	88	~90	94	94[g]	88	67	92	104	116
Frigates	0	0	0	0	0	0	0	0	0	
Littoral Combat Ships (LCSs)	52	52	~55	55	55	55	63	82	56	0
Amphibious ships	34	33	~32	33	33[h]	31	17	24	37	36
MPF(F) ships[i]	0[j]	0[j]	0[j]	0[j]	0[j]	12[i]	14[i]	20[i]	0[i]	0[i]
Combat logistics (resupply) ships	29	29	~29	30	30	30	24	26	42	34
Dedicated mine warfare ships	0	0	0	0	0	0	0	0	26[k]	16
Joint High Speed Vessels (JHSVs)	10[l]	10[l]	10[l]	10[l]	21[l]	3	0	0	0	0
Other[m]	24	23	~23	16	24[n]	17	10	11	25	25
Total battle force ships	**308**	**306**	**~310-316**	**313**	**328**	**313**	**260**	**325**	**375**	**310 or 312**

Sources: Table prepared by CRS based on U.S. Navy data.

Notes: QDR is Quadrennial Defense Review. The "~" symbol means approximately.

a. Initial composition. Composition was subsequently modified.

b. The Navy plans to replace the 14 current Ohio-class SSBNs with a new class of 12 next-generation SSBNs. For further discussion, see CRS Report R41129, *Navy Columbia (SSBN-826) Class Ballistic Missile Submarine Program: Background and Issues for Congress*, by (name redacted) .

c. Although the Navy plans to continue operating its four SSGNs until they reach retirement age in the late 2020s, the Navy does not plan to replace these ships when they retire. This situation can be expressed in a table like this one with either a 4 or a 0.

d. 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.

e. With congressional approval, the goal has been temporarily be reduced to 10 carriers for the period between the retirement of the carrier *Enterprise* (CVN-65) in December 2012 and entry into service of the carrier *Gerald R. Ford* (CVN-78), currently scheduled for September 2015.

f. For a time, the Navy characterized the goal as 11 carriers in the nearer term, and eventually 12 carriers.

g. The 94-ship goal was announced by the Navy in an April 2011 report to Congress on naval force structure and missile defense.

h. The Navy acknowledged that meeting a requirement for being able to lift the assault echelons of 2.0 Marine Expeditionary Brigades (MEBs) would require a minimum of 33 amphibious ships rather than the 31 ships shown in the February 2006 plan. For further discussion, see CRS Report RL34476, *Navy LPD-17 Amphibious Ship Procurement: Background, Issues, and Options for Congress*, by (name redacted) .

i. Today's 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 planned MPF (Future) ships, however, would have contributed to Navy combat capabilities (for example, by supporting Navy aircraft operations). For this reason, the ships in the planned MPF(F) squadron were counted by the Navy as battle force ships. The planned MPF(F) squadron was subsequently restructured into a different set of initiatives for enhancing the existing MPF squadrons; the Navy no longer plans to acquire an MPF(F) squadron.

j. The Navy no longer plans to acquire an MPF(F) squadron. The Navy, however, has procured or plans to procure some of the ships that were previously planned for the squadron—specifically, TAKE-1 class cargo ships, and Mobile Landing Platform (MLP)/Afloat Forward Staging Base (AFSB) ships. These ships are included in the total shown for "Other" ships. AFSBs are now called Expeditionary Support Base ships (ESBs).

k. The figure of 26 dedicated mine warfare ships included 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.

l. Totals shown include 5 ships transferred from the Army to the Navy and operated by the Navy primarily for the performance of Army missions.

m. This category includes, among other things, command ships and support ships.

n. The increase in this category from 17 ships under the February 2006 313-ship goal to 24 ships under the apparent 328-ship goal included the addition of one TAGOS ocean surveillance ship and the transfer into this category of six ships—three modified TAKE-1 class cargo ships, and three Mobile Landing Platform (MLP) ships—that were previously intended for the planned (but now canceled) MPF(F) squadron.

Appendix C. Comparison of First 10 Years of 30-Year Plans

Table C-1 and **Table C-2** below show the first 10 years of planned annual ship procurement quantities and projected Navy force sizes in Navy 30-year shipbuilding plans dating back to the first such plan, which was submitted in 2000 in conjunction with the FY2001 budget. By reading vertically down each column, one can see how the ship procurement quantity or Navy force size projected for a given fiscal year changed as that year drew closer to becoming the current budget year.

Table C-1. Ship Procurement Quantities in First 10 Years of 30-Year Shipbuilding Plans

(Years shown are fiscal years)

FY of 30-year plan (year submitted)	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
FY01 (2000)	8	8	8	8	7	5	6	6	6	7																			
FY02 (2001)		6	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a																		
FY03 (2002)			5	5	7	7	11	n/a	n/a	n/a	n/a	n/a																	
FY04 (2003)				7	8	7	7	9	14	15	13	14	15																
FY05 (2004)					9	6	8	9	17	14	15	14	16	15															
FY06 (2005)						4	7	7	9	10	12	n/a	n/a	n/a	n/a														
FY07 (2006)							7	7	11	12	14	13	12	11	11	10													
FY08 (2007)								7	11	12	13	12	12	10	12	11	6												
FY09 (2008)									7	8	8	12	12	13	13	12	12	13											
FY10 (2009)										8	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a										
FY11 (2010)											9	8	12	9	12	9	12	9	13	9									
FY12 (2011)												10	13	11	12	9	12	10	12	8	9								
FY13 (2012)													10	7	8	9	7	11	8	12	9	12							
FY14 (2013)														8	8	7	9	9	10	10	10	11	14						
FY15 (2014)															7	8	11	10	8	11	8	11	11	13					
FY16 (2015)																9	10	10	9	10	9	11	13	12	10				
FY17 (2016)																	7	8	7	8	8	10	11	11	9	7			
FY18 (2017)																		9	7	8	8	10	n/a	n/a	n/a	n/a	n/a		
FY19 (2018)																			10	10	10	11	13	11	11	11	12	11	11

Source: Navy 30-year shipbuilding plans supplemented by annual Navy budget submissions (including 5-year shipbuilding plans) for fiscal years shown. **n/a** means not available—see notes below.

Notes: The FY2001 30-year plan submitted in 2000 was submitted under a one-time-only legislative provision, Section 1013 of the FY2000 National Defense Authorization Act (S. 1059/P.L. 106-65 of October 5, 1999). No provision required DOD to submit a 30-year shipbuilding plan in 2001 or 2002, when Congress considered DOD's proposed FY2002 and FY2003 DOD budgets. (In addition, no FYDP was submitted in 2001, the first year of the George W. Bush Administration.) Section 1022 of the FY2003 Bob Stump National Defense Authorization Act (H.R. 4546/P.L. 107-314 of December 2, 2002) created a requirement to submit a 30-year shipbuilding plan each year, in conjunction with each year's defense budget. This provision was codified at 10 U.S.C. 231. The first 30-year plan submitted under this provision was the one submitted in 2003, in conjunction with the proposed FY2004 DOD budget. For the next several years, 30-year shipbuilding plans were submitted each year, in conjunction with each year's proposed DOD budget. An exception occurred in 2009, the first year of the Obama Administration, when DOD submitted a proposed budget for FY2010 with no accompanying FYDP or 30-year Navy shipbuilding plan. Section 1023 of the FY2011 Ike Skelton National Defense Authorization Act (H.R. 6523/P.L. 111-383 of January 7, 2011) amended 10 U.S.C. 231 to require DOD to submit a 30-year shipbuilding plan once every four years, in the same year that DOD was required to submit a Quadrennial Defense Review (QDR). Consistent with Section 1023, DOD did not submit a new 30-year shipbuilding plan at the time that it submitted the proposed FY2012 DOD budget. At the request of the House Armed Services Committee, the Navy submitted the FY2012 30-year (FY2012-FY2041) shipbuilding plan in late-May 2011, in the form of tables without a narrative discussion. Section 1011 of the FY2012 National Defense Authorization Act (H.R. 1540/P.L. 112-81 of December 31, 2011) amended 10 U.S.C. 231 to reinstate the requirement to submit a 30-year shipbuilding plan each year, in conjunction with each year's defense budget. Subsequent to P.L. 112-81, submission of 30-year plans each year resumed. Another exception occurred in 2017, the first year of the Trump Administration, when DOD submitted a proposed budget for FY2018 with no accompanying 30-year Navy shipbuilding plan.

Table C-2. Projected Navy Force Sizes in First 10 Years of 30-Year Shipbuilding Plans

(Years shown are fiscal years)

FY of 30-year plan (year sub-mitted)	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
FY01 (2000)	316	315	313	313	313	311	311	304	305	305																		
FY02 (2001)		316	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a																	
FY03 (2002)			314	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a																
FY04 (2003)				292	292	291	296	301	305	308	313	317	321															
FY05 (2004)					290	290	298	303	308	307	314	320	328	326														
FY06 (2005)						289	293	297	301	301	306	n/a	n/a	305	n/a													
FY07 (2006)							285	294	299	301	306	315	317	315	314	317												
FY08 (2007)								286	289	293	302	310	311	307	311	314	322											
FY09 (2008)									286	287	289	290	293	287	288	291	301	309										
FY10 (2009)										287	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a									
FY11 (2010)											284	287	287	285	285	292	298	305	311	315								
FY12 (2011)												290	287	286	286	297	301	311	316	322	324							
FY13 (2012)													285	279	276	284	285	292	300	295	296	298						
FY14 (2013)														282	270	280	283	291	300	295	296	297	297					
FY15 (2014)															274	280	286	295	301	304	304	306	311	313				
FY16 (2015)																282	284	294	300	304	306	309	310	315	317			
FY17 (2016)																	287	295	300	306	308	310	309	311	313	309		
FY18 (2017)																		n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
FY19 (2018)																			299	308	314	318	326	321	318	315	314	313

Source: Navy 30-year shipbuilding plans supplemented by annual Navy budget submissions (including 5-year shipbuilding plans) for fiscal years shown. **n/a** means not available—see notes below.

Notes: The FY2001 30-year plan submitted in 2000 was submitted under a one-time-only legislative provision, Section 1013 of the FY2000 National Defense Authorization Act (S. 1059/P.L. 106-65 of October 5, 1999). No provision required DOD to submit a 30-year shipbuilding plan in 2001 or 2002, when Congress considered DOD's proposed FY2002 and FY2003 DOD budgets. (In addition, no FYDP was submitted in 2001, the first year of the George W. Bush Administration.) Section 1022 of the FY2003 Bob Stump National Defense Authorization Act (H.R. 4546/P.L. 107-314 of December 2, 2002) created a requirement to submit a 30-year shipbuilding plan each year, in conjunction with each year's defense budget. This provision was codified at 10 U.S.C. 231. The first 30-year plan submitted under this provision was the one submitted in 2003, in conjunction with the proposed FY2004 DOD budget. For the next several years, 30-year shipbuilding plans were submitted each year, in conjunction with each year's proposed DOD budget. An exception occurred in 2009, the first year of the Obama Administration, when DOD submitted a proposed budget for FY2010 with no accompanying FYDP or 30-year Navy shipbuilding plan. Section 1023 of the FY2011 Ike Skelton National Defense Authorization Act (H.R. 6523/P.L. 111-383 of January 7, 2011) amended 10 U.S.C. 231 to require DOD to submit a 30-year shipbuilding plan once every four years, in the same year that DOD was required to submit a Quadrennial Defense Review (QDR). Consistent with Section 1023, DOD did not submit a new 30-year shipbuilding plan at the time that it submitted the proposed FY2012 DOD budget. At the request of the House Armed Services Committee, the Navy submitted the FY2012 30-year (FY2012-FY2041) shipbuilding plan in late-May 2011, in the form of tables without a narrative discussion. Section 1011 of the FY2012 National Defense Authorization Act (H.R. 1540/P.L. 112-81 of December 31, 2011) amended 10 U.S.C. 231 to reinstate the requirement to submit a 30-year shipbuilding plan each year, in conjunction with each year's defense budget. Subsequent to P.L. 112-81, submission of 30-year plans each year resumed. Another exception occurred in 2017, the first year of the Trump Administration, when DOD submitted a proposed budget for FY2018 with no accompanying 30-year Navy shipbuilding plan.

Appendix D. Comparing Past Ship Force Levels to Current or Potential Future Ship Force Levels

In assessing the appropriateness of the current or potential future number of ships in the Navy, observers sometimes compare that number to historical figures for total Navy fleet size. Historical figures for total fleet size, however, can be a problematic yardstick for assessing the appropriateness of the current or potential future number of ships in the Navy, 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; and
- the number of ships in the fleet in an earlier year might itself have been inappropriate (i.e., not enough or more than enough) for meeting the Navy's mission requirements in that year.

Regarding the first bullet point above, the Navy, for example, reached a late-Cold War peak of 568 battle force ships at the end of FY1987,[51] and as of March 27, 2018, included a total of 282 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 multitheater NATO-Warsaw Pact conflict, while the March 2018 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 China, Russia, North Korea, and Iran, as well as nonstate terrorist organizations. In addition, the Navy of FY1987 differed substantially from the March 2018 fleet in areas such as profusion of precision-guided air-delivered weapons, numbers of Tomahawk-capable ships, and the sophistication of C4ISR systems and networking capabilities.[52]

In coming years, Navy missions may shift again, and the capabilities of Navy ships will likely have changed further by that time due to developments such as more comprehensive implementation of networking technology, increased use of ship-based unmanned vehicles, and the potential fielding of new types of weapons such as lasers or electromagnetic rail guns.

The 568-ship fleet of FY1987 may or may not have been capable of performing its stated missions; the 282-ship fleet of March 2018 may or may not be capable of performing its stated missions; and a fleet 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.

[51] Some publications have stated 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. The battle force ships figure is the number used in government discussions of the size of the Navy. In recent years, the total number of active ships has been larger than the total number of battle force ships. For example, the Naval History and Heritage Command (formerly 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. Comparing the total number of active ships in one year to the total number of battle force ships in another year is thus an apples-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.

[52] C4ISR stands for command and control, communications, computers, intelligence, surveillance, and reconnaissance.

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 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.

Regarding the second of the two bullet points above, it can be noted that comparisons of the size of the fleet today with the size of the fleet in earlier years rarely appear to consider whether the fleet was appropriately sized in those earlier years (and therefore potentially suitable as a yardstick of comparison), even though it is quite possible that the fleet in those earlier years might not have been appropriately sized, and even though there might have been differences of opinion among observers at that time regarding that question. Just as it might not be prudent for observers years from now to tacitly assume that the 275-ship Navy of September 2016 was appropriately sized for meeting the mission requirements of 2016, even though there were differences of opinion among observers on that question (as reflected, for example, in **Table G-1**), simply because a figure of 275 ships appears in the historical records for 2016, so, too, might it not be prudent for observers today to tacitly assume that the number of ships of the Navy in an earlier year was appropriate for meeting the Navy's mission requirements that year, even though there might have been differences of opinion among observers at that time regarding that question, simply because the size of the Navy in that year appears in a table like **Table M-1**.

Previous Navy force structure plans, such as those shown in **Table B-1**, 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, as well as the possibility that earlier force-structure plans might not have been appropriate for meeting the mission demands of their times, suggest that some caution should be applied in using past force structure plans for this purpose, particularly if those past force structure plans are more than a few years old. The Reagan-era goal for a 600-ship Navy, for example, 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, and there was considerable debate during those years as to the appropriateness of the 600-ship goal.[53]

[53] Navy force structure plans that predate those shown in **Table B-1** include the Reagan-era 600-ship goal 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), and the 310-ship fleet of the Clinton Administration's 1997 QDR. 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
Total ships	~600	~450/416[a]	346	~305/310[b]
Attack submarines	100	80/~55[c]	45-55	50/55[d]
Aircraft carriers	15[e]	12	11+1[f]	11+1[f]
Surface combatants	242/228[g]	~150	~124	116
Amphibious ships	~75[h]	51[i]	41[i]	36[i]

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

(continued...)

Appendix E. Independent Panel Assessment of 2010 QDR

The law that once required DOD to perform Quadrennial Defense Reviews (QDRs) once every four years (previously codified at 10 U.S.C. 118) stated that the results of each QDR were to be assessed by an independent panel.[54] The report of the independent panel that assessed the 2010 QDR was released on July 29, 2010. The independent panel's report recommended a Navy of 346 ships, including 11 aircraft carriers and 55 attack submarines.[55] The report stated the following, among other things:

- "The QDR should reflect current commitments, but it must also plan effectively for potential threats that could arise over the next 20 years.… we believe the 2010 QDR did not accord sufficient priority to the need to counter anti-access challenges, strengthen homeland defense (including our defense against cyber threats), and conduct post-conflict stabilization missions." (Page 54)
- "In this remarkable period of change, global security will still depend upon an American presence capable of unimpeded access to all international areas of the Pacific region. In an environment of 'anti-access strategies,' and assertions to create unique 'economic and security zones of influence,' America's rightful and historic presence will be critical. To preserve our interests, the United States will need to retain the ability to transit freely the areas of the Western Pacific for security and economic reasons. Our allies also depend on us to be fully present in the Asia-Pacific as a promoter of stability and to ensure the free flow of commerce. A robust U.S. force structure, largely rooted in maritime strategy but including other necessary capabilities, will be essential." (Page 51)
- "The United States will need agile forces capable of operating against the full range of potential contingencies. However, the need to deal with irregular and hybrid threats will tend to drive the size and shape of ground forces for years to come, whereas the need to continue to be fully present in Asia and the Pacific and other areas of interest will do the same for naval and air forces." (Page 55)

(...continued)

a. Commonly referred to as 450-ship goal, 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 one additional aircraft carrier in the service life extension program (SLEP).
f. Eleven active carriers plus one operational reserve carrier.
g. Plan originally included 242 surface combatants but this was later reduced to 228.
h. Number needed to lift assault echelons of one Marine Expeditionary Force (MEF) plus one Marine Expeditionary Brigade (MEB).
i. Number needed to lift assault echelons of 2.5 MEBs. Changing numbers needed to meet this goal reflect in part changes in the design and capabilities of amphibious ships.

[54] Section 1072(a)(1) of the Carl Levin and Howard P. "Buck" McKeon National Defense Authorization Act for FY2015 (H.R. 3979/P.L. 113-291 of December 19, 2014) amended 10 U.S.C. 118 generally, substituting provisions relating to a once-every-four-years defense strategy review for provisions that had related to a QDR.

[55] Stephen J. Hadley and William J. Perry, co-chairmen, et al., *The QDR in Perspective: Meeting America's National Security Needs In the 21st Century, The Final Report of the Quadrennial Defense Review Independent Panel*, Washington, 2010, Figure 3-2 on page 58.

- "The force structure in the Asia-Pacific needs to be increased. In order to preserve U.S. interests, the United States will need to retain the ability to transit freely the areas of the Western Pacific for security and economic reasons. The United States must be fully present in the Asia-Pacific region to protect American lives and territory, ensure the free flow of commerce, maintain stability, and defend our allies in the region. A robust U.S. force structure, one that is largely rooted in maritime strategy and includes other necessary capabilities, will be essential." (Page 66)
- "Force structure must be strengthened in a number of areas to address the need to counter anti-access challenges, strengthen homeland defense (including defense against cyber threats), and conduct post-conflict stabilization missions: First, as a Pacific power, the U.S. presence in Asia has underwritten the regional stability that has enabled India and China to emerge as rising economic powers. The United States should plan on continuing that role for the indefinite future. The Panel remains concerned that the QDR force structure may not be sufficient to assure others that the United States can meet its treaty commitments in the face of China's increased military capabilities. Therefore, we recommend an increased priority on defeating anti-access and area-denial threats. This will involve acquiring new capabilities, and, as Secretary Gates has urged, developing innovative concepts for their use. Specifically, we believe the United States must fully fund the modernization of its surface fleet. We also believe the United States must be able to deny an adversary sanctuary by providing persistent surveillance, tracking, and rapid engagement with high-volume precision strike. That is why the Panel supports an increase in investment in long-range strike systems and their associated sensors. In addition, U.S. forces must develop and demonstrate the ability to operate in an information-denied environment." (Pages 59-60)
- "To compete effectively, the U.S. military must continue to develop new conceptual approaches to dealing with operational challenges, like the Capstone Concept for Joint Operations (CCJO). The Navy and Air Force's effort to develop an Air-Sea Battle concept is one example of an approach to deal with the growing anti-access challenge. It will be necessary to invest in modernized capabilities to make this happen. The Chief of Naval Operations and Chief of Staff of the Air Force deserve support in this effort, and the Panel recommends the other military services be brought into the concept when appropriate." (Page 51; a similar passage appears on page 67)

In recommending a Navy of 346 ships, the independent panel's report cited the 1993 Bottom-Up Review (BUR) of U.S. defense plans and policies. **Table E-1** compares the Navy's 355-ship goal of December 2016 to the 346-ship Navy recommended in the 1993 BUR (as detailed partly in subsequent Navy testimony and publications) and the ship force levels recommended in the independent panel report.

Table E-1. Comparison of Navy's 355-Ship Goal, 346-Ship Navy Goal from 1993 BUR, and 346-Ship Navy Goal from 2010 QDR Review Panel

Ship Type	Navy's 355-ship goal of December 2016	346-ship fleet from Bottom-Up Review (BUR) (1993)	2010 QDR Independent Review Panel (July 2010)
SSBNs	12	18 (SSBN force was later reduced to 14 as a result of the 1994 Nuclear Posture Review)	14
SSGNs	0	0 (SSGN program did not yet exist)	4
SSNs	66	45 to 55 (55 in FY99, with a long-term goal of about 45)	55
Aircraft carriers	12	11 active + 1 operational/reserve	11 active
Surface combatants	156	124 (114 active + 10 frigates in Naval Reserve Force; a total of 110-116 active ships was also cited)	n/a
Large surface combatants (i.e., cruisers and destroyers	*104*	*n/a*	*n/a*
Small surface combatants (i.e., LCSs and frigates)	*52*	*10 frigates in Naval Reserve Force*	*n/a*
Amphibious ships	38 (34 operational ships needed to lift 2.0 MEBs)	41 (Enough to lift 2.5 MEBs)	n/a
Dedicated mine warfare ships	0 (to be replaced by LCSs)	26 (LCS program did not exist)	n/a
CLF ships	32	43	n/a
Support ships	39	22	n/a
TOTAL ships	**355**	**346** **(numbers above, however, add to 331-341, not 346)**[a]	**346**

Sources: Table prepared by CRS. ***Sources for 1993 Bottom-Up Review:*** Department of Defense, *Report on the Bottom-Up Review*, October 1993, Figure 7 on page 28; Department of the Navy, *Highlights of the FY 1995 Department of the Navy Budget*, February 1994, p. 1; Department of the Navy, *Force 2001, A Program Guide to the U.S. Navy*, 1994 edition, p. 15; Statement of VADM T. Joseph Lopez, U.S. Navy, Deputy Chief of Naval Operations (Resources, Warfare Requirements & Assessments), Testimony to the Military Forces and Personnel Subcommittee of the House Armed Services Committee, March 22, 1994, pp. 2-5. ***Source for independent panel report:*** Stephen J. Hadley and William J. Perry, co-chairmen, et al., *The QDR in Perspective: Meeting*

America's National Security Needs In the 21st Century, The Final Report of the Quadrennial Defense Review Independent Panel, Washington, 2010, Figure 3-2 on pages 58-59.

Notes: n/a is not addressed in the report. **SSBN** is nuclear-powered ballistic missile submarine; **SSGN** is nuclear-powered cruise missile and special operations forces submarine; **SSN** is nuclear-powered attack submarine; **LCS** is Littoral Combat Ship; **MPF(F)** is Maritime Prepositioning Force (Future) ship; **CLF** is combat logistics force (i.e., resupply) ship; **MEB** is Marine Expeditionary Brigade.

a. The Navy testified in 1994 that the planned number was adjusted from 346 to 330 to reflect reductions in numbers of tenders and early retirements of some older amphibious ships.

In a letter dated August 11, 2010, Secretary of Defense Robert Gates provided his comments on the independent panel's report. The letter stated the following in part:

> I completely agree with the Panel that a strong navy is essential; however, I disagree with the Panel's recommendation that DoD should establish the 1993 Bottom Up Review's (BUR's) fleet of 346 ships as the objective target. That number was a simple projection of the then-planned size of [the] Navy in FY 1999, not a reflection of 21st century, steady-state requirements. The fleet described in the 2010 QDR report, with its overall target of 313 to 321 ships, has roughly the same number of aircraft carriers, nuclear-powered attack submarines, surface combatants, mine warfare vessels, and amphibious ships as the larger BUR fleet. The main difference between the two fleets is in the numbers of combat logistics, mobile logistics, and support ships. Although it is true that the 2010 fleet includes fewer of these ships, they are all now more efficiently manned and operated by the Military Sealift Command and meet all of DoD's requirements….
>
> I agree with the Panel's general conclusion that DoD ought to enhance its overall posture and capabilities in the Asia-Pacific region. As I outlined in my speech at the Naval War College in April 2009, "to carry out the missions we may face in the future… we will need numbers, speed, and the ability to operate in shallow waters." So as the Air-Sea battle concept development reaches maturation, and as DoD's review of global defense posture continues, I will be looking for ways to meet plausible security threats while emphasizing sustained forward presence – particularly in the Pacific.[56]

[56] Letter dated August 11, 2010, from Secretary of Defense Robert Gates to the chairmen of the House and Senate Armed Services and Appropriations Committees, pp. 3 and 4. The ellipsis in the second paragraph appears in the letter.

Appendix F. Fleet Architecture Studies Required by FY2016 NDAA

This appendix summarizes the results of the three fleet architecture studies required by Section 1067 of the FY2016 National Defense Authorization Act (S. 1356/P.L. 114-92 of November 25, 2015).

Navy Project Team Study

Section 1067 of P.L. 114-92 required one of the three fleet architecture studies to be done by the Department of the Navy, with participants from the Office of Net Assessment within the Office of the Secretary of Defense (OSD) and the Naval Surface Warfare Center Dahlgren Division.[57] The resulting Navy project team was led by the Deputy Director of the Assessment Division (N81) within the office of the Chief of Naval Operations, and also included participants from the Office of Net Assessment, the Naval Surface Warfare Center Dahlgren Division, the Naval Postgraduate School, the Naval War College, the Center for Naval Analyses (CNA), and other Navy staff. The alternative fleet architecture proposed by the Navy project team represents the view of the team members, as opposed to the official position of the Navy as a whole, which is reflected in the 355-ship force-level goal and the associated 30-year shipbuilding plan.

Table F-1 compares the composition of the Navy in 2030 under the Navy's 30-year shipbuilding plan to the composition of the Navy in 2030 under the Navy project team's proposed alternative fleet architecture.

Table F-1. Fleet Architecture Study by Navy Project Team: Summary of Force Level in 2030

(Navy force structure in 2030: current Navy plan vs. Navy project team's alternative)

Ship Type	Current Navy Plan	Navy Project Team Alternative
Manned ships		
Ballistic missile submarines (SSBNs)	***11***	***12***
Attack submarines (SSNs)	***42***	***53***
SSN-21 (Seawolf) class	2	2
SSN-774 (Virginia) class	29	28
SSN-774 (Virginia) class with Virginia Payload Module (VPM)	11	23
Aircraft carriers	***11***	***14***
Large-deck carriers (CVNs)	11	11
Medium-sized aircraft carriers (CVLs)	0	3
Large surface combatants	***95***	***91***

[57] Navy Project Team, *Report to Congress, Alternative Future Fleet Platform Architecture Study*, October 27, 2016, 25 pp.

Ship Type	Current Navy Plan	Navy Project Team Alternative
CG-47 class cruisers	11	0
DDG-1000 class destroyers	3	3
DDG-51 class destroyers	81	83
DDGH destroyers	0	5
Small surface combatants	***40***	***48***
Littoral Combat Ships (LCSs)	29	28
Frigates (including frigate-variant LCSs)	11	20
Amphibious ships	***37***	***35***
LHA/LHD-class large-deck amphibious assault ships	11	10
LPD-17 class amphibious ships	12	12
LSD-41/49 class amphibious ships	9	9
LX(R) class amphibious ships	5	4
Combat Logistics Force (CLF) ships	***30***	***30***
TAOE-type replenishment ships	2	2
TAKE-type dry cargo ships	12	12
TAO-type oilers	16	16
Expeditionary fast transport ships (EPFs and HSTs)	***13***	***10***
Command and support ships	***18***	***16***
Navy fleet tugs/salvage ships	8	0
Commercial fleet tugs/salvage ships	0	8
Submarine tender (AS)	2	1
TAGOS-type ocean surveillance ships	6	7
LCC-type command ships	2	0
Maritime prepositioning ships	***7***	***12***
MPS-assigned TAKE-type dry cargo ships	2	2
Expeditionary Transfer Dock ships (T-ESDs)	2	2
Expeditionary Sea Base ships (T-ESBs)	3	5
CHAMP (Common Hull Auxiliary Multi-mission Platform)	0	3
SUBTOTAL Manned Ships	***304***	***321***
Large unmanned vehicles	***10***	***136***
Large unmanned underwater vehicles (UUVs)	10	48
Large unmanned surface vehicles (USVs)	0	88
TOTAL manned ships and large unmanned vehicles	**314**	**457**

Source: Table prepared by CRS based on Navy Project Team, *Report to Congress, Alternative Future Fleet Platform Architecture Study*, October 27, 2016, 25 pp.

The Navy project team study stated the following:

> The Navy Project Team postulated that the U.S. will continue to provide strong and sustained leadership for a rules-based international order that promotes global security and prosperity through the 2030s. To support this leadership role, the Navy Project Team identified the key missions for the U.S. Navy:
>
> - protecting the homeland
>
> - building security globally
>
> - establishing sea control
>
> - projecting power
>
> - winning decisively
>
> To accomplish these missions, the Navy Project Team derived a 'Distributed Fleet' architecture designed to provide strong and sustained forward presence to influence and shape geopolitical events, respond to crises, reassure allies and partners, and deter potential aggressors. The Distributed Fleet was further conceived to deliver decisive combat power, as part of a joint force, to defeat U.S. adversaries if deterrence failed.
>
> As envisioned by the Navy Project Team, the Distributed Fleet would encompass a widely dispersed, expansively networked set of air, surface, and sub-surface platforms capable of delivering both kinetic and non-kinetic effects and supported by survivable logistics. Navy systems would be part of an assured, agile information-sharing environment that would present opportunities to engage enemy platforms before they could attack. The Distributed Fleet would focus on fleet-wide coordination and action. That approach would enable a greater reliance on strikes delivered from combat nodes beyond the strike group, which in turn would allow the carrier air wing to focus more on surveillance, targeting, and electronic attack.
>
> The Distributed Fleet would employ three mutually-supporting concepts of operations (CONOPS):
>
> • Distributed Fleet Lethality
>
> • Electromagnetic Maneuver Warfare
>
> • Distributed, Agile Logistics
>
> The Distributed Fleet would consist of 457 ships – 321 manned and 136 large unmanned vehicles – and 1,220 sea-based Navy aircraft, supported by requisite enabling capabilities and improved readiness and sustainability.[58]

MITRE Corporation Study

Section 1067 of P.L. 114-92 required one of the three fleet architecture studies to be done by a federally funded research and development center (FFRDC). The MITRE Corporation was chosen to do the study.[59] **Table F-2**, which reprints (with minor clarifications) a table from the MITRE study, summarizes that study's recommendations.

[58] Navy Project Team, *Report to Congress, Alternative Future Fleet Platform Architecture Study*, October 27, 2016, pp. 3-4.

[59] MITRE Corporation, *Navy Future Fleet Platform Architecture Study*, July 1, 2016, 70 pp.

Table F-2. Fleet Architecture Study by MITRE Corporation: Summary of Recommendations

(Summary of recommendations for 15-year [FY2016-FY2030] shipbuilding plan)

Recommendation	Increase Effectiveness	Reduce Cost	Increase Capacity
1. Immediately cancel Littoral Combat Ship (LCS) production.		X	
2. Procure an additional DDG-51 [Aegis destroyer] per year, using funds available from LCS termination, until a new frigate for Integrated Air Missile Defense (IAMD) is under construction.	X		
3. Augment existing CG-47s and DDG-51s [Aegis cruisers and destroyers] with a magazine ship to increase weapon capacity and provide a long-range strike capability to the surface force.	X		X
4. Fix the naval aviation [carrier-based strike-fighter] shortfall by deferring or reducing the F-35C [carrier-capable Joint Strike Fighter] procurement [and instead procure] additional F/A-18 E/Fs [Super Hornet strike fighters].			X
5. Develop an aerial [i.e., airborne] layer for Integrated Air Missile Defense (IAMD) that is integrated with the corresponding IAMD platforms [i.e., ships] in the surface force.	X		
6. Delay the Ford [CVN-78 class] class CVN procurement to align with the number of CVWs [carrier air wings].		X	
7. Modify the Ford [CVN-78] design or develop a conventional[ly powered aircraft carrier] alternative to reduce [unit procurement] cost to less than $11 billion.		X	
8. Continue America [LHA-6] class amphibious assault ship procurement but consider a small carrier option, with catapults for fixed-wing flight operations, as a potential alternative in the late 2020s.	X		
9. Do not procure any more San Antonio [LPD-17] class LPDs beyond what is planned.		X	
10. Consider some near-term alternatives to the current plans for the [planned] LXR class of [amphibious] ships to support disaggregated expeditionary operations.		X	X
11. Continue to build two Virginia class SSNs per year, each [equipped] with VPMs [Virginia Payload Modules] after [FY]2019.	X		X
12. License and produce diesel [-electric] submarines as [a] lower-cost platform to augment the SSN force.		X	X

Source: MITRE Corporation, *Navy Future Fleet Platform Architecture Study*, July 1, 2016, Table 2 on page 4.

Notes: The magazine ship mentioned in recommendation 3 is described in on page 31 of the MITRE report as follows: "The Navy should build low-cost magazine ships to act as "wingmen" for large surface combatants. To keep the costs low, these ships would be based on either a commercial or civilian manned fleet oiler (T-AO) hull that can keep up with the surface combatant. The future T-AO (T-AO 205) is projected to cost roughly $0.5 billion, and using the same basic hull should keep the magazine ship within the same price range, with some additional cost for increased speed to operate with CSG [carrier strike group]."

The MITRE Corporation study stated the following:

> **Findings**
>
> **The future international security environment continues to be complex and uncertain.** The current Department of Defense (DoD) planning, programming and budgeting process is being redirected by the national security challenges posed by China, Russia, North Korea, Iran, and the Islamic State.
>
> **The U.S. and its allies have maintained a decisive technological advantage for more than 40 years, but this advantage is rapidly disappearing as the guided missile age reaches full maturity.** Missile speeds, elusiveness, and precision – for example – all continue to increase. Coastal defense missile batteries can cover a radius of 700 or 800 miles today, compared to 70 or 80 miles just a few years ago. Supersonic anti-ship missiles that currently travel at Mach 2 will be supplanted by hypersonic missiles that will travel at speeds well in excess of Mach 5. As the costs of these weapons become increasingly inexpensive, they will continue to proliferate and adversary inventories will continue to increase.
>
> **Advances in sensor technology, including new passive and active methods, and its commercialization enable detection and targeting at extreme ranges.** Weapons with extended ranges are not fully effective unless an adversary can also identify targets at these ranges. In the past, nations spent enormous resources to build sensing capabilities that are commercially available today. For example, BlackSky plans to launch a sixty satellite constellation by 2019 that will provide in excess of 40 re-visits per day in the equatorial region. The Navy should continue to invest in capabilities to prevent adversary targeting, but cannot rely on ships remaining hidden for extended periods in a 2030 environment.
>
> **The Navy's current force structure is essentially a scaled down version of the balanced force that exited World War II.** This forces [sic] consists of attack submarines; aircraft carriers; large and small surface combatants; amphibious ships; and combat logistics. The only fundamentally new platform since World War II is the ballistic missile submarine, which is part of the nuclear triad.
>
> **Force structure decisions based on the post-Cold War peace dividend do not reflect the current national security environment.** In 2014, OPNAV N81 [Office of the Chief of Naval Operations Assessment Division] completed a force structure assessment to determine 2030 fleet warfighting requirements. After reviewing the original 2012 N81 analyses and the 2014 update, MITRE assessed the force structure needed to defeat one and deter another near-peer adversary in a revised scenario, which is more representative of the current world situation.... While this force structure level is not recommended, it does imply that the current Navy force structure and capabilities would not be sufficient to meet the DSG given the current world situation....
>
> **[The] Navy's budget is insufficient to fund required force levels.** The Navy's budget is insufficient to develop, procure, operate, and sustain all the forces need to meet the revised defeat/hold scenario force structure. In addition, budget instability forces the Navy to make acquisition decisions that undermine affordability initiatives. By the end of 2016, the national debt will be $20 trillion dollars—more than triple what it was on 11 September 2011—and for the last four years, the Navy has been operating under reduced top-lines and significant shortfalls. There will likely continue to be increasing pressure on the procurement accounts, which in turn threatens the near-term health of the defense industrial base.
>
> **Recommendations**
>
> Table 2 [in the MITRE study—reprinted above as **Table F-2**] contains a list of recommended modifications to the Navy's 30-Year shipbuilding plan. The analysis of a

revised defeat / tailored hold scenario... suggests a shortfall of 110 ships by FY30 with the current 30-year shipbuilding program. Building 110 additional ships is unrealistic, so MITRE makes recommendations across the full scope of the Future Fleet Architecture to improve its overall effectiveness. However, the only means achieving both effectiveness and capacity, within the constraints of affordability, is to build a mix of exquisite (i.e., high), capable (i.e., moderate), and expendable (i.e., low) platforms.

The tradeoffs embedded within these recommendations are: 1) additional large surface combatants (LSCs) at the expense of small surface combatants (SSCs); 2) more attack submarines (SS); and 3) introduce lower cost ship concepts to pay for increased SS production. The total estimated shipbuilding cost for this battle force is about $257 billion through FY30, which translates into an average shipbuilding budget of $17.1 billion per year (not including support ships). Given the average Navy shipbuilding budget of $16.9 billion between 2016 and 2025 (including support ships), the proposed shipbuilding plan is reasonable. It delivers 20 additional ships and a more capable force by 2030 within the existing shipbuilding budget, potentially with some moderate increases....

Critical Enablers

There are a number of additional factors, other than ships, that contribute to the overall effectiveness of the force:

- **Aircraft procurement.** The recommendation to defer or reduce the F-35C [carrier-capable Joint Strike Fighter] procurement for additional F/A-18 E/Fs [Super Hornets]... impacts the aircraft procurement line in the Navy budget, but has implications for the shipbuilding line.

- **Weapons procurement.** Three capabilities in this report require procuring four new weapon systems, in addition to more of what the Navy already has in the inventory. The development of these new weapons and procuring them in numbers sufficient to matter in 2030 impacts the weapons procurement budget.

- **Integrated Kinetic Effects.** A strategy is needed to defeat large raids of anti-ship cruise and ballistic missiles with a combination of long-range, mid-range, and point defense capabilities—from both surface combatants and aircraft—as well as more long-range offensive strike options. Implicit within this strategy is the ability to: 1) place naval forces in positions that are useful, 2) coordinate the employment of different weapons and platforms to mitigate the raid or achieve the desired effect, and 3) optimize the use of the force (e.g., appropriate target-weapon pairing). This implies: assured command and control (C2) functions for planning and coordination across the force, tactical data links to support cooperative engagement, and fusing data from both tactical and national sensors to detect, track, and identify targets.

- **Integrated Non-Kinetic Effects.** The ability to control a ship's signature, create false targets, seduce adversary weapons away from ships, etc. are all key capabilities to create uncertainty within an adversary's kill chain and reduce their effectiveness. While this study mainly focuses on a range of kinetic capabilities and effects required by the fleet, non-kinetic effects are also needed to increase the survivability of the force. The ability to reduce adversary re-visit rates over the naval force or getting them to commit to the wrong area correspondingly reduces the number and, potentially, the size of raids the naval force must overcome. Also, no defense is perfect, so it is critical to have non-kinetic effects to defeat whatever missiles or platforms leak through the Integrated Air and Missile defense (IAMD) of the naval force. Similarly, cyber effects are a critical aspect of future wars and are described in the classified annex to this report.

 Undersea Enablers. "Networked undersea forces will act as a key to unlock the door for decisive force to enter the fight and seize and maintain the initiative."[60] To achieve this end, the capability to connect submarines, autonomous unmanned vehicles, distributed sensor networks, undersea cables, and a variety of other systems is a critical enabler for not only building and sharing a comprehensive understanding of the undersea environment, but maintaining a comparative advantage in the undersea domain. Similarly, the global proliferation of stealthy submarines with advanced capabilities and the growing threat that these undersea forces pose necessitates that the Navy must sustain and recapitalize its fixed, mobile, and deployable acoustic arrays that provide vital tactical cueing to anti-submarine warfare (ASW) forces.

CSBA Study

Section 1067 of P.L. 114-92 required one of the three fleet architecture studies to be done by "an independent, non-governmental institute which is described in section 501(c)(3) of the Internal Revenue Code of 1986, and exempt from tax under section 501(a) of such Code, and has recognized credentials and expertise in national security and military affairs." The Center for Strategic and Budgetary Assessments (CSBA) was chosen to do the study.[61]

Table F-3 compares the composition of the Navy's 355-ship force-level goal with the force structure recommended in the CSBA study.

Table F-3. Fleet Architecture Study by CSBA: Summary of Force-Level Goal

(Compared to Navy's 355-Ship Force-level Goal)

	Navy 355-ship force-level goal	CSBA-proposed force structure
Manned Ships		
Ballistic missile submarines (SSBNs)	***12***	***12***
Attack submarines (SSNs)	***66***	***66***
Aircraft carriers	***12***	***22***
Large-deck carriers (CVNs)	12	12
Medium-sized carriers (CVLs) *(note LHA-LHD figures below)*	0	10
Large surface combatants	***104***	***74***
CG-47 class cruisers	22	0
DDG-1000 class destroyers	3	3
DDG-51 class destroyers	79	71
Small surface combatants	***52***	***71 or 113***
Littoral Combat Ships (LCSs)	28	0
Frigates	24	71

[60] The MITRE study includes a footnote at this point indicating the following source for this quote: VADM John Richardson, "Preparing for Today's Undersea Warfare," *U.S. Naval Institute Proceedings*, June 2012.

[61] Bryan Clark, et al., *Restoring American Seapower: A New Fleet Architecture for the United States Navy*, Center for Strategic and Budgetary Assessments, 2017, 138 pp.

	Navy 355-ship force-level goal	CSBA-proposed force structure
Patrol vessel *(not included in total below of battle force ships)*	0	42
Amphibious ships	***38***	***29***
LHA-LHD-type large-deck amphibious assault ships *(note CVL figures above)*	12	0
LPD-type amphibious ships	13	29
LSD-LX(R)-type amphibious ships	13	
Combat Logistics Force (CLF) ships	***32***	***31***
TAOs (oilers)	20	0
TAOEs (large oilers)	0	26
TAKE-type dry cargo ships	12	4
Large dry stores transport ships with VLS (vertical launch system)	0	1
Expeditionary fast transport ships (EPFs and HSTs)	***10***	***0***
Unmanned vehicle support ships	***0***	***14***
Command and support ships	***19***	***14***
LCCs (command ships)	2	3
ASs (submarine tenders)	2	5
TAGOS (ocean surveillance ships)	7	5
ATSs (fleet towing, salvage, and rescue ships)	8	6
Maritime Prepositioning Ships	***10***	***2***
MPS-assigned TAKE-type dry cargo ships	2	0
Expeditionary Transfer Dock ships (T-ESDs)	2	0
Expeditionary Sea Base ships (T-ESBs)	6	2
TOTAL, manned ships (battle force ships)	***355***	***340***
TOTAL, manned ships (battle force ships + patrol vessels)	***355***	***382***
Unmanned Vehicles (not specified in Navy's 355-ship goal)		
XLUSVs (extra-large unmanned surface vehicles)	not specified	40
XLUUVs (extra-large unmanned underwater vehicles)	not specified	40
MQ-4 Triton UAV detachments (3 aircraft each)	not specified	14
Unmanned vehicle squadrons	not specified	6
Manned aircraft (not specified in Navy's 355-ship goal)		
P-8 detachments (3 aircraft each)	not specified	44

Source: Bryan Clark et al., *Restoring American Seapower: A New Fleet Architecture for the United States Navy*, Center for Strategic and Budgetary Assessments, 2017, p. viii.

Note: Under the Navy's 355-ship goal, the 22 CG-47 class cruisers are to be eventually replaced by DDGs and a future large surface combatant.

The CSBA study stated the following:

> **A New Strategic Approach**
>
> Since the Berlin Wall fell, naval force structure requirements reflected an expectation that America's main military challenges would come from regional powers such as Iraq, North Korea, Iran, and terrorist groups. Until now, these adversaries lacked the ability to defeat a U.S. ally rapidly or prevent American forces from coming to the ally's defense. Naval force structure investments, therefore, focused on efficiently maintaining a visible presence in important regions, rather than on what would be needed to fight a peer competitor. Even if forces on or near the scene were unable to stop an act of aggression, in-theater naval and other forces could enable the mobilization of a U.S. and allied response to reverse the adversary's gains, as in the 1991 Gulf War, or overthrow the adversary's regime, as in the wars in Kosovo, Afghanistan, or Iraq.
>
> Potential great power adversaries such as China and Russia are improving their capabilities and making it less likely that the mere presence of U.S. forces will deter them. Most significantly, their long-range air defense and strike systems could prevent the United States and its allies from mobilizing a conventional response in an adjacent theater as was done in the lead-up to the wars in Kosovo, Afghanistan, and Iraq. Instead of responding to aggression after the fact, to deter increasingly revisionist great powers U.S. forces will need the capabilities and operational concepts to deny them the objectives of their aggression or to punish them until the aggression stops.
>
> This "deny-and-punish" approach to conventional deterrence is how the United States and its allies countered the Soviet threat during the Cold War, and it has significant implications for fleet architecture. This strategic approach will increase America's reliance on forward-postured forces—particularly naval forces—that could rapidly interdict aggression and conduct attacks on targets the enemy values to compel the aggression to stop. Naval units at sea are less subject to host nation restrictions than air and ground forces and give the United States the ability to act unilaterally, reducing opportunities for an aggressor to pressure neighboring countries into limiting an American response. Navies can also lend themselves to more proportional, tailored responses since each ship is an independent, self-sustaining unit able to deploy in smaller force packages than ground or air forces that require large-footprint shore-based support and force protection.
>
> **New Operating Concepts**
>
> The return of great power competition suggests dramatic changes to how U.S. naval forces will have to operate by the 2030s. The new operating concepts proposed by this study are designed to conduct the range of missions likely required of naval forces and address the ability of great power competitors to contest areas around their territory. The central objective of these concepts is enabling U.S. naval forces to conduct offensive operations against enemy forces engaging in aggression in contested areas and attack targets of value to punish the enemy until aggression stops....
>
> Each of these concepts assumes a highly contested communications environment that will demand an increased reliance on short-range low probability of intercept/low probability of detection (LPI/LPD) communications and individual commanders leading operations without higher headquarters guidance.
>
> These concepts also employ more unmanned systems to a larger degree than the current force for surveillance, targeting, countering enemy sensors, and delivering weapons. They do not, however, replace manned platforms with unmanned systems to a significant extent. Communications constraints in contested areas will limit the ability of naval forces to command and control unmanned systems over a wide area. Manned platforms will be needed to manage unmanned vehicles and systems and provide the accountability to employ weapons. Moreover, the need for naval forces to focus on deterrence will

reduce their ability to use unmanned systems for forward operations, since unmanned vehicles may not have the same deterrent effect as a manned platform and could be more easily neutralized or tampered with by an adversary.

Changing the Deployed Fleet

Changes are needed in the Navy's deployed forces to enable them to deter great power aggression using the new operational concepts described above. Given the short timelines in which aggression could occur and escalate against U.S. allies in East Asia, the Middle East, and Europe, the size and composition of deployed naval forces may make the difference between an adversary being deterred or perceiving an opportunity to act.

To address the challenges posed by Russia and China, the Navy will need to focus on sustaining an effective posture for conventional deterrence rather than an efficient presence to meet near-term operational needs. The posture should address the most significant shortfalls of today's presence: the fact that the current approach does not necessarily position the right capabilities in the right places at the right time to counter great power aggression, and it does not provide the time or ability for the fleet to maintain its material condition, become proficient, and adapt to dynamic and capable adversaries.

This study proposes dividing the deployed fleet into two main groups: "Deterrence Forces" that are organized into discrete regions rather than Combatant Commander (CCDR) areas of responsibility (AOR), and a "Maneuver Force" that is assigned broadly to the Indo–Asia–Pacific theater and composed of the carrier strike groups (CSG) deployed today in the Central and Pacific CCDR AORs. Separating the deployed fleet into these two main groups enables Deterrence Forces to be tailored to their region and improves their ability to prepare and adapt to adversary advancements. And because Deterrence Forces will remain in their region, the Maneuver Force is able to respond to tensions and conflict in any part of the Indo–Asia–Pacific theater, including the Middle East, without leaving an opening for opportunistic aggression by an adversary seeking to exploit a shift in U.S. focus to the area of conflict.

Operationally, separating the deployed fleet into Deterrence Forces and the Maneuver Force enables commanders to align elements of the fleet with the appropriate mission. Deterrence Forces would consist of surface combatants, submarines, and amphibious ships that can provide prompt, high-capacity fires to deter an adversary seeking a rapid fait accompli, such as China or Russia. The Maneuver Force would consist of a Multi-Carrier Task Group designed to deliver sustained combat power at moderate levels over an indefinite period in relief of Deterrence Forces.

A Revised Naval Posture

The size and composition of deployed naval forces, their deployment locations, and their overseas basing create an overall naval posture. In contrast to today's emphasis on the number of ships present in a CCDR AOR, posture connotes an overall capability to conduct and sustain combat operations. In a period of great power competition, posture—not presence—will need to be the focus of a future fleet architecture.

The Deterrence Force posture in each region is designed to sustain the ability to promptly deny adversaries their likely objectives and attack targets the enemy would value. The characteristics of Deterrence Forces are focused on great powers such as China and Russia, but they address strategically located regional powers such as Iran or North Korea. Perhaps more importantly, Deterrence Force naval posture includes the attributes needed to reassure allies and partners of U.S. resolve and capability to defend their interests. In peacetime, Deterrence Forces would conduct day-to-day operations such as maritime security and disaster response, particularly with the maritime forces of allies and partners, but these missions do not drive the composition of Deterrence Forces....

The new fleet architecture includes two types of forward basing in each region. *Forward-based* forces are homeported in the region, such as Forward Deployed Naval Forces (FDNF) in Japan or Spain today, with their crews and dependents living in the region near the homeport. *Forward-stationed* forces use rotational crews from the continental United States (CONUS) to operate platforms that remain forward for several crew rotations, similar to how Littoral Combat Ships (LCS) or guided missile submarines (SSGN) are crewed today.

Deployed forces will also include the Maneuver Force, consisting of two CSGs and the Maritime Prepositioning Force deployed in the Indo–Asia–Pacific region. The Maneuver Force will conduct exercises and experimentation and respond to heightened tension and aggression throughout the theater.

New Force Packages, Platforms, and Unmanned Systems

Executing the operating concepts above in highly contested environments as part of the Deterrence and Maneuver Forces will require new naval force packages as well as some new platforms and payloads....

The deployed posture proposed by this fleet architecture incorporates force packages appropriate to the operations needed in each region to deny and punish aggression or conduct likely steady-state operations.

Changes to Readiness and Training Cycles

The number of each type of unit needed in the overall fleet architecture results from the number deployed at any given time and the rotational readiness cycle that prepares them for deployment. For example, a unit that deploys for 6 months of each 2-year cycle will need at least four units to maintain one continuously deployed.

U.S. naval forces currently operate in rotational cycles consisting of deployments, maintenance, training, and certification for the next deployment. Different platform types use different rotational cycles based on their maintenance requirements and complexity of training. Rotational cycles also differ between those based in CONUS and those based overseas. The proposed fleet architecture proposes changes to these readiness cycles to improve the ability of fleet units to learn, experiment, adapt, and provide more time for maintenance of platforms and systems between deployments....

Compared to the Deterrence Force, the Maneuver Force will need to be prepared for a wider range of possible operational environments, more potential adversaries, a larger number of alliance relationships, and a higher likelihood of being faced with high-intensity sustained combat. Therefore, it would employ a lower OPTEMPO readiness cycle like today's CONUS-based forces to provide more time to prepare for deployment compared to the Deterrence Forces....

Implementing the Proposed Fleet Architecture

The proposed architecture will likely cost about 10–20 percent more to build, operate, and sustain than the Navy's planned [308-ship] fleet. The shipbuilding industrial base could reach the objective number for each ship type of the proposed fleet architecture in the 2030s, but the Navy will need to modify its shipbuilding plans to achieve the size and composition of the proposed fleet architecture.

The alternative shipbuilding plan that delivers the proposed fleet architecture will cost an average of $23.2 billion per year, 18 percent more than the $19.7 billion annual cost of the draft 30-year shipbuilding plan associated with the President's Budget for FY 2017 (PB17). If the Navy expands the Combat Logistics Force (CLF) fleet to meet the wartime demands of the proposed fleet architecture, the average annual cost rises to $23.6 billion, 20 percent greater than the PB17 plan. The operations and maintenance (O&M) costs

associated with the proposed fleet architecture plan will cost an average of $16.5 billion per year, 14 percent more than the $14.6 billion associated with the PB17 budget....

Conclusion...

To be deterred in the 2030s, aggressors must be presented with the possibility that their goals will be denied or that the immediate costs to pursue them will be prohibitively high. The architecture proposed by this report would achieve that effect with more powerful day-to-day Deterrence Forces tailored by region. Bolstering that immediate deterrent would be the Maneuver Force, which in peacetime would hone its skills in multi-carrier, cross-domain, high-end warfare. These two forces would be comprised of some of the same elements, but packaged and supported differently.

This proposed fleet architecture emphasizes effectiveness over efficiency. Built on new operating concepts the Navy is already pursuing and incorporating a new approach to conventional deterrence, the new architecture offers the prospect of protecting and sustaining America's security and prosperity, as well as that of our friends and allies around the world, in the decades ahead. Deterring great power war demands the readiness to contest and win it—and a fleet that supports this approach.[62]

[62] Bryan Clark, et al., *Restoring American Seapower: A New Fleet Architecture for the United States Navy*, Center for Strategic and Budgetary Assessments, 2017, pp. i-x.

Appendix G. Pre-2013 Proposals by Study Groups for Navy Force Structure

Table G-1 shows examples of proposals for Navy force structure made in recent years by various study groups, all of which were published prior to late 2013, when observers began to conclude that the international security environment has undergone a shift from the familiar post-Cold War era of the past 20-25 years, also sometimes known as the unipolar moment (with the United States as the unipolar power), to a new and different strategic situation that features, among other things, renewed great power competition with China and Russia and challenges to elements of the U.S.-led international order that has operated since World War II. For reference purposes, **Table G-1** also shows the Navy's 355-ship goal of December 2016.

Table G-1. Pre-2013 Study Group Proposals for Navy Ship Force Structure

Ship type	Navy's 308-ship goal of December 2016	Project on Defense Alternatives (PDA) (November 2012)	Heritage Foundation (April 2011)	Cato Institute (September 2010)[a]	Independent Panel Assessment of 2010 QDR (July 2010)	Sustainable Defense Task Force (June 2010)	Center for a New American Security (CNAS) (November 2008)	Center for Strategic and Budgetary Assessments (CSBA) (2008)[b]
Submarines								
SSBN	12	7	14[c]	6	14	7	14	12
SSGN	0	6-7	4	0	4	4	0	2
SSN	66	42	55	40	55	37	40	41
Aircraft carriers								
CVN	12	9	11	8	11	9	8	11
CVE	0	0	0	0	0	0	0	4
Surface combatants								
Cruiser	104	72-74	88	22	n/a	85	18	14
Destroyer				65	n/a		56	73
Frigate		2-7[j]	28[d]	14	n/a	0	0	9[e]
LCS	52	12[j]		4	n/a	25	48	55
SSC		[j]	0	0	n/a	0	40	0[f]
Amphibious and Maritime Prepositioning Force (Future) (MPF[F]) ships								
Amphibious ships	38	≥23	37	23	n/a	27	36	33
MPF(F) ships	0	n/a	0	0	n/a	n/a	0	3[g]
LSD station ships	0	0	0	0	0	0	0	7[h]
Other: Mine warfare (MIW) ships; Combat Logistics Force (CLF) ships (i.e., at-sea resupply ships), and support ships								
MIW	0	14[j]	14	11	0	0	0	0
CLF ships	32	n/a	33	21	n/a	36	40	31
Support ships	39	n/a	25	27	n/a			31
TOTAL battle force ships	**355**	**230**	**309**	**241**	**346**	**230**	**300**	**326[i]**

Sources: Table prepared by CRS based on the following sources: **For Heritage Foundation**: *A Strong National Defense[:] The Armed Forces America Needs and What They Will Cost*, Heritage Foundation, April 5, 2011, pp. 25-26. **For Cato Institute**: Benjamin H. Friedman and Christopher Preble, *Budgetary Savings from Military Restraint*, Washington, Cato Institute, September 23, 2010 (Policy Analysis No. 667), pp. 6, 8-10, and additional information provided by Cato Institute to CRS by email on September 22, 2010. **For Independent Panel Assessment**: Stephen J. Hadley and William J. Perry, co-chairmen, et al., *The QDR in Perspective: Meeting America's National Security Needs In the 21st Century, The Final Report of the Quadrennial Defense Review Independent Panel*, Washington, 2010, Figure 3-2 on pages 58-59. **For Sustainable Defense Task Force**: *Debt, Deficits, and Defense, A Way Forward[:] Report of the Sustainable Defense Task Force*, June 11, 2010, pp. 19-20. **For CNAS**: Frank Hoffman, *From Preponderance to Partnership: American Maritime Power in the 21st Century.* Washington, Center for a New American Security, November 2008. p. 19 (Table 2). **For CSBA**: Robert O. Work, *The US Navy[:] Charting a Course for Tomorrow's Fleet.* Washington, Center for Strategic and Budgetary Assessments, 2008. p. 81 (Figure 5). **For PDA**: Carl Conetta, Reasonable Defense, Project on Defense Alternatives, November 14, 2012, 31 pp.

Notes: n/a is not addressed in the report. **SSBN** is nuclear-powered ballistic missile submarine; **SSGN** is nuclear-powered cruise missile and special operations forces submarine; **SSN** is nuclear-powered attack submarine; **CVN** is large nuclear-powered aircraft carrier; **CVE** is medium-sized aircraft carrier; **LCS** is Littoral Combat Ship; **SSC** (an acronym created by CRS for this table) is small surface combatant of 1,000+ tons displacement—a ship similar to late-1990s Streetfighter concept; **MPF(F)** is Maritime Prepositioning Force (Future) ship; **LSD** is LSD-41/49 class amphibious ship operating as a station ship for a formation like a Global Fleet Station (GFS); **MIW** is mine warfare ship; **CLF** is combat logistics force (i.e., resupply) ship.

a. Figures shown are for the year 2020; for subsequent years, reductions from these figures would be considered.

b. Figures shown are for the year 2028.

c. The report calls for a force of 280 SLBMs, which appears to equate to a force of 14 SSBNs, each with 20 SLBM tubes.

d. The report calls for a force of 28 small surface combatants, and appears to use the term small surface combatants the same way that the Navy does in the 30-year shipbuilding plan—as a way of collectively referring to frigates and LCSs. The small surface combatants (SSCs) called for in the November 2008 CNAS report are separate from and smaller than the LCS.

e. Maritime Security Frigates.

f. Plan includes 28 patrol craft (PCs) of a few hundred tons displacement each, as well as 29 boat detachments and seven riverine squadrons.

g. Plan shows three Mobile Landing Platform (MLP) ships that the Navy currently plans for the MPF(F) squadron, plus 16 existing current-generation maritime prepositioning force (MPF) ships and 17 existing prepositioning ships for Army and other service/agency equipment. Plan also shows 67 other DOD sealift ships.

h. T-LSDs, meaning LSDs operated by the Military Sealift Command (MSC) with a partly civilian crew.

i. The CSBA report shows a total of 488 units by including 162 additional force units that do not count toward the 308-ship goal under the battle force ships counting method that has been used since the early 1980s for public policy discussions of the size of the Navy. These 162 additional force units include 16 existing current-generation maritime prepositioning force (MPF) ships and 17 existing prepositioning ships for Army and other service/agency equipment, 67 other DOD sealift ships, 28 PCs, 29 boat detachments, and certain other small-scale units. The CSBA report proposes a new counting method for naval/maritime forces that includes units such as these in the total count.

j. The report "prescribes ending procurement of the LCS with the 12 already purchased. The *Reasonable Defense* model foresees a future cohort of 28 to 33 small surface combatants, including a mix of the 12 LCS that have already been procured, 14 Mine Counter Measure (MCM) ships already in the fleet, and small frigates or ocean-going corvettes. As the MCM ships age and leave the fleet, the LCS should assume their role. The would leave a post-MCM requirement for 16 to 21 additional small surface combatants. For this, the Navy needs a simpler, less expensive alternative to the LCS."

Appendix H. Industrial Base Ability for Taking on Additional Shipbuilding Work

This appendix presents additional background information on the ability of the industrial base to take on the additional shipbuilding work associated with achieving and maintaining the Navy's 355-ship force-level goal.

A January 13, 2017, press report states the following:

> The Navy's production lines are hot and the work to prepare them for the possibility of building out a much larger fleet would be manageable, the service's head of acquisition said Thursday.
>
> From a logistics perspective, building the fleet from its current 274 ships to 355, as recommended in the Navy's newest force structure assessment in December, would be straightforward, Assistant Secretary of the Navy for Research, Development and Acquisition Sean Stackley told reporters at the Surface Navy Association's annual symposium.
>
> "By virtue of maintaining these hot production lines, frankly, over the last eight years, our facilities are in pretty good shape," Stackley said. "In fact, if you talked to industry, they would say we're underutilizing the facilities that we have."
>
> The areas where the Navy would likely have to adjust "tooling" to answer demand for a larger fleet would likely be in Virginia-class attack submarines and large surface combatants, the DDG-51 guided missile destroyers — two ship classes likely to surge if the Navy gets funding to build to 355 ships, he said.
>
> "Industry's going to have to go out and procure special tooling associated with going from current production rates to a higher rate, but I would say that's easily done," he said.
>
> Another key, Stackley said, is maintaining skilled workers — both the builders in the yards and the critical supply-chain vendors who provide major equipment needed for ship construction. And, he suggested, it would help to avoid budget cuts and other events that would force workforce layoffs.
>
> "We're already prepared to ramp up," he said. "In certain cases, that means not laying off the skilled workforce we want to retain."[63]

A January 17, 2017, press report states the following:

> Building stable designs with active production lines is central to the Navy's plan to grow to 355 ships. "if you look at the 355-ship number, and you study the ship classes (desired), the big surge is in attack submarines and large surface combatants, which today are DDG-51 (destroyers)," the Assistant Secretary of the Navy, Sean Stackley, told reporters at last week's Surface Navy Association conference. Those programs have proven themselves reliable performers both at sea and in the shipyards.
>
> From today's fleet of 274 ships, "we're on an irreversible path to 308 by 2021. Those ships are already in construction," said Stackley. "To go from there to 355, virtually all those ships are currently in production, with some exceptions: Ohio Replacement, (we) just got done the Milestone B there (to move from R&D into detailed design); and then

[63] Hope Hodge Seck, "Navy Acquisition Chief: Surge to 355 Ships 'Easily Done,'" *DoD Buzz*, January 13, 2017.

> upgrades to existing platforms. So we have hot production lines that will take us to that 355-ship Navy."[64]

A January 24, 2017, press report states the following:

> Navy officials say a recently determined plan to increase its fleet size by adding more new submarines, carriers and destroyers is "executable" and that early conceptual work toward this end is already underway....
>
> Although various benchmarks will need to be reached in order for this new plan to come to fruition, such as Congressional budget allocations, Navy officials do tell Scout Warrior that the service is already working—at least in concept—on plans to vastly enlarge the fleet. Findings from this study are expected to inform an upcoming 2018 Navy Shipbuilding Plan, service officials said.[65]

A January 12, 2017, press report states the following:

> Brian Cuccias, president of Ingalls Shipbuilding [a shipyard owned by Huntington Ingalls Industries (HII) that builds Navy destroyers and amphibious ships as well as Coast Guard cutters], said Ingalls, which is currently building 10 ships for four Navy and Coast Guard programs at its 800-acre facility in Pascagoula, Miss., could build more because it is using only 70 to 75 percent of its capacity.[66]

A March 2017 press report states the following:

> As the Navy calls for a larger fleet, shipbuilders are looking toward new contracts and ramping up their yards to full capacity....
>
> The Navy is confident that U.S. shipbuilders will be able to meet an increased demand, said Ray Mabus, then-secretary of the Navy, during a speech at the Surface Navy Association's annual conference in Arlington, Virginia.
>
> They have the capacity to "get there because of the ships we are building today," Mabus said. "I don't think we could have seven years ago."
>
> Shipbuilders around the United States have "hot" production lines and are manufacturing vessels on multi-year or block buy contracts, he added. The yards have made investments in infrastructure and in the training of their workers.
>
> "We now have the basis ... [to] get to that much larger fleet," he said....
>
> Shipbuilders have said they are prepared for more work.
>
> At Ingalls Shipbuilding—a subsidiary of Huntington Ingalls Industries—10 ships are under construction at its Pascagoula, Mississippi, yard, but it is under capacity, said Brian Cuccias, the company's president.
>
> The shipbuilder is currently constructing five guided-missile destroyers, the latest San Antonio-class amphibious transport dock ship, and two national security cutters for the Coast Guard.
>
> "Ingalls is a very successful production line right now, but it has the ability to actually produce a lot more in the future," he said during a briefing with reporters in January.

[64] Sydney J. Freedberg Jr., "Build More Ships, But Not New Designs: CNO Richardson To McCain," *Breaking Defense*, January 17, 2017.

[65] Kris Osborn, "Navy: Larger 355-Ship Fleet—'Executable,'" *Scout Warrior*, January 24, 2017.

[66] Marc Selinger, "Navy Needs More Aircraft to Match Ship Increase, Secretary [of the Navy] Says," *Defense Daily*, January 12, 2017. See also Lee Hudson, "Ingalls Operating at About 75 Percent Capacity, Provided Info to Trump Team," *Inside the Navy*, January 16, 2017.

> The company's facility is currently operating at 75 percent capacity, he noted....
>
> Austal USA—the builder of the Independence-variant of the littoral combat ship and the expeditionary fast transport vessel—is also ready to increase its capacity should the Navy require it, said Craig Perciavalle, the company's president.
>
> The latest discussions are "certainly something that a shipbuilder wants to hear," he said. "We do have the capability of increasing throughput if the need and demand were to arise, and then we also have the ability with the present workforce and facility to meet a different mix that could arise as well."
>
> Austal could build fewer expeditionary fast transport vessels and more littoral combat ships, or vice versa, he added.
>
> "The key thing for us is to keep the manufacturing lines hot and really leverage the momentum that we've gained on both of the programs," he said.
>
> The company—which has a 164-acre yard in Mobile, Alabama—is focused on the extension of the LCS and expeditionary fast transport ship program, but Perciavalle noted that it could look into manufacturing other types of vessels.
>
> "We do have excess capacity to even build smaller vessels … if that opportunity were to arise and we're pursuing that," he said.
>
> Bryan Clark, a naval analyst at the Center for Strategic and Budgetary Assessments, a Washington, D.C.-based think tank, said shipbuilders are on average running between 70 and 80 percent capacity. While they may be ready to meet an increased demand for ships, it would take time to ramp up their workforces.
>
> However, the bigger challenge is the supplier industrial base, he said.
>
> "Shipyards may be able to build ships but the supplier base that builds the pumps … and the radars and the radios and all those other things, they don't necessarily have that ability to ramp up," he said. "You would need to put some money into building up their capacity."
>
> That has to happen now, he added.
>
> Rear Adm. William Gallinis, program manager for program executive office ships, said what the Navy must be "mindful of is probably our vendor base that support the shipyards."
>
> Smaller companies that supply power electronics and switchboards could be challenged, he said.
>
> "Do we need to re-sequence some of the funding to provide some of the facility improvements for some of the vendors that may be challenged? My sense is that the industrial base will size to the demand signal. We just need to be mindful of how we transition to that increased demand signal," he said.
>
> The acquisition workforce may also see an increased amount of stress, Gallinis noted. "It takes a fair amount of experience and training to get a good contracting officer to the point to be [able to] manage contracts or procure contracts."
>
> "But I don't see anything that is insurmountable," he added.[67]

At a May 24, 2017, hearing before the Seapower subcommittee of the Senate Armed Services Committee on the industrial-base aspects of the Navy's 355-ship goal, John P. Casey, executive

[67] Yasmin Tadjdeh, "Navy Shipbuilders Prepared for Proposed Fleet Buildup," *National Defense*, March 2017.

vice president–marine systems, General Dynamics Corporation (one of the country's two principal builders of Navy ships) stated the following:

> It is our belief that the Nation's shipbuilding industrial base can scale-up hot production lines for existing ships and mobilize additional resources to accomplish the significant challenge of achieving the 355-ship Navy as quickly as possible....
>
> Supporting a plan to achieve a 355-ship Navy will be the most challenging for the nuclear submarine enterprise. Much of the shipyard and industrial base capacity was eliminated following the steep drop-off in submarine production that occurred with the cancellation of the Seawolf Program in 1992. The entire submarine industrial base at all levels of the supply chain will likely need to recapitalize some portion of its facilities, workforce, and supply chain just to support the current plan to build the Columbia Class SSBN program, while concurrently building Virginia Class SSNs. Additional SSN procurement will require industry to expand its plans and associated investment beyond the level today....
>
> Shipyard labor resources include the skilled trades needed to fabricate, build and outfit major modules, perform assembly, test and launch of submarines, and associated support organizations that include planning, material procurement, inspection, quality assurance, and ship certification. Since there is no commercial equivalency for Naval nuclear submarine shipbuilding, these trade resources cannot be easily acquired in large numbers from other industries. Rather, these shipyard resources must be acquired and developed over time to ensure the unique knowledge and know-how associated with nuclear submarine shipbuilding is passed on to the next generation of shipbuilders. The mechanisms of knowledge transfer require sufficient lead time to create the proficient, skilled craftsmen in each key trade including welding, electrical, machining, shipfitting, pipe welding, painting, and carpentry, which are among the largest trades that would need to grow to support increased demand. These trades will need to be hired in the numbers required to support the increased workload. Both shipyards have scalable processes in place to acquire, train, and develop the skilled workforce they need to build nuclear ships. These processes and associated training facilities need to be expanded to support the increased demand. As with the shipyards, the same limiting factors associated with facilities, workforce, and supply chain also limit the submarine unique first tier suppliers and sub-tiers in the industrial base for which there is no commercial equivalency....
>
> The supply base is the third resource that will need to be expanded to meet the increased demand over the next 20 years. During the OHIO, 688 and SEAWOLF construction programs, there were over 17,000 suppliers supporting submarine construction programs. That resource base was "rationalized" during submarine low rate production over the last 20 years. The current submarine industrial base reflects about 5,000 suppliers, of which about 3,000 are currently active (i.e., orders placed within the last 5 years), 80% of which are single or sole source (based on $). It will take roughly 20 years to build the 12 Columbia Class submarines that starts construction in FY21. The shipyards are expanding strategic sourcing of appropriate non-core products (e.g., decks, tanks, etc.) in order to focus on core work at each shipyard facility (e.g., module outfitting and assembly). Strategic sourcing will move demand into the supply base where capacity may exist or where it can be developed more easily. This approach could offer the potential for cost savings by competition or shifting work to lower cost work centers throughout the country. Each shipyard has a process to assess their current supply base capacity and capability and to determine where it would be most advantageous to perform work in the supply base....
>
> Achieving the increased rate of production and reducing the cost of submarines will require the Shipbuilders to rely on the supply base for more non-core products such as structural fabrication, sheet metal, machining, electrical, and standard parts. The supply base must be made ready to execute work with submarine-specific requirements at a rate and volume that they are not currently prepared to perform. Preparing the supply base to

execute increased demand requires early non-recurring funding to support cross-program construction readiness and EOQ funding to procure material in a manner that does not hold up existing ship construction schedules should problems arise in supplier qualification programs. This requires longer lead times (estimates of three years to create a new qualified, critical supplier) than the current funding profile supports....

We need to rely on market principles to allow suppliers, the shipyards and GFE material providers to sort through the complicated demand equation across the multiple ship programs. Supplier development funding previously mentioned would support non-recurring efforts which are needed to place increased orders for material in multiple market spaces. Examples would include valves, build-to-print fabrication work, commodities, specialty material, engineering components, etc. We are engaging our marine industry associations to help foster innovative approaches that could reduce costs and gain efficiency for this increased volume....

Supporting the 355-ship Navy will require Industry to add capability and capacity across the entire Navy Shipbuilding value chain. Industry will need to make investment decisions for additional capital spend starting now in order to meet a step change in demand that would begin in FY19 or FY20. For the submarine enterprise, the step change was already envisioned and investment plans that embraced a growth trajectory were already being formulated. Increasing demand by adding additional submarines will require scaling facility and workforce development plans to operate at a higher rate of production. The nuclear shipyards would also look to increase material procurement proportionally to the increased demand. In some cases, the shipyard facilities may be constrained with existing capacity and may look to source additional work in the supply base where capacity exists or where there are competitive business advantages to be realized. Creating additional capacity in the supply base will require non-recurring investment in supplier qualification, facilities, capital equipment and workforce training and development.

Industry is more likely to increase investment in new capability and capacity if there is certainty that the Navy will proceed with a stable shipbuilding plan. Positive signals of commitment from the Government must go beyond a published 30-year Navy Shipbuilding Plan and line items in the Future Years Defense Plan (FYDP) and should include:

● Multi-year contracting for Block procurement which provides stability in the industrial base and encourages investment in facilities and workforce development

● Funding for supplier development to support training, qualification, and facilitization efforts – Electric Boat and Newport News have recommended to the Navy funding of $400M over a 3-year period starting in 2018 to support supplier development for the Submarine Industrial Base as part of an Integrated Enterprise Plan Extended Enterprise initiative

● Acceleration of Advance Procurement and/or Economic Order Quantities (EOQ) procurement from FY19 to FY18 for Virginia Block V

● Government incentives for construction readiness and facilities / special tooling for shipyard and supplier facilities, which help cash flow capital investment ahead of construction contract awards

● Procurement of additional production back-up (PBU) material to help ensure a ready supply of material to mitigate construction schedule risk....

So far, this testimony has focused on the Submarine Industrial Base, but the General Dynamics Marine Systems portfolio also includes surface ship construction. Unlike Electric Boat, Bath Iron Works and NASSCO are able to support increased demand without a significant increase in resources.....

> Bath Iron Works is well positioned to support the Administration's announced goal of increasing the size of the Navy fleet to 355 ships. For BIW that would mean increasing the total current procurement rate of two DDG 51s per year to as many as four DDGs per year, allocated equally between BIW and HII. This is the same rate that the surface combatant industrial base sustained over the first decade of full rate production of the DDG 51 Class (1989-1999)....
>
> No significant capital investment in new facilities is required to accommodate delivering two DDGs per year. However, additional funding will be required to train future shipbuilders and maintain equipment. Current hiring and training processes support the projected need, and have proven to be successful in the recent past. BIW has invested significantly in its training programs since 2014 with the restart of the DDG 51 program and given these investments and the current market in Maine, there is little concern of meeting the increase in resources required under the projected plans.
>
> A predictable and sustainable Navy workload is essential to justify expanding hiring/training programs. BIW would need the Navy's commitment that the Navy's plan will not change before it would proceed with additional hiring and training to support increased production.
>
> BIW's supply chain is prepared to support a procurement rate increase of up to four DDG 51s per year for the DDG 51 Program. BIW has long-term purchasing agreements in place for all major equipment and material for the DDG 51 Program. These agreements provide for material lead time and pricing, and are not constrained by the number of ships ordered in a year. BIW confirmed with all of its critical suppliers that they can support this increased procurement rate....
>
> The Navy's Force Structure Assessment calls for three additional ESBs. Additionally, NASSCO has been asked by the Navy and the Congressional Budget Office (CBO) to evaluate its ability to increase the production rate of T-AOs to two ships per year. NASSCO has the capacity to build three more ESBs at a rate of one ship per year while building two T-AOs per year. The most cost effective funding profile requires funding ESB 6 in FY18 and the following ships in subsequent fiscal years to avoid increased cost resulting from a break in the production line. The most cost effective funding profile to enable a production rate of two T-AO ships per year requires funding an additional long lead time equipment set beginning in FY19 and an additional ship each year beginning in FY20.
>
> NASSCO must now reduce its employment levels due to completion of a series of commercial programs which resulted in the delivery of six ships in 2016. The proposed increase in Navy shipbuilding stabilizes NASSCO's workload and workforce to levels that were readily demonstrated over the last several years.
>
> Some moderate investment in the NASSCO shipyard will be needed to reach this level of production. The recent CBO report on the costs of building a 355-ship Navy accurately summarized NASSCO's ability to reach the above production rate stating, "building more … combat logistics and support ships would be the least problematic for the shipyards."[68]

At the same hearing, Brian Cuccias, president, Ingalls Shipbuilding, Huntington Ingalls Industries (the country's other principal builder of Navy ships) stated the following:

[68] John P. Casey, Executive Vice President – Marine Systems, General Dynamics Corporation, Testimony before the Senate Armed Services Committee, Subcommittee on Seapower, 115th Congress, Supporting the 355-Ship Navy with Focus on Submarine Industrial Base, Washington, DC, May 24, 2017, pp. 3-18. See also Marjorie Censer, "BWX Technologies Weighs When To Ready for Additional Submarines," *Inside the Navy*, May 29, 2017.

Qualifying to be a supplier is a difficult process. Depending on the commodity, it may take up to 36 months. That is a big burden on some of these small businesses. This is why creating sufficient volume and exercising early contractual authorization and advance procurement funding is necessary to grow the supplier base, and not just for traditional long-lead time components; that effort needs to expand to critical components and commodities that today are controlling the build rate of submarines and carriers alike. Many of our suppliers are small businesses and can only make decisions to invest in people, plant and tooling when they are awarded a purchase order. We need to consider how we can make commitments to suppliers early enough to ensure material readiness and availability when construction schedules demand it.

With questions about the industry's ability to support an increase in shipbuilding, both Newport News and Ingalls have undertaken an extensive inventory of our suppliers and assessed their ability to ramp up their capacity. We have engaged many of our key suppliers to assess their ability to respond to an increase in production.

The fortunes of related industries also impact our suppliers, and an increase in demand from the oil and gas industry may stretch our supply base. Although some low to moderate risk remains, I am convinced that our suppliers will be able to meet the forecasted Navy demand....

I strongly believe that the fastest results can come from leveraging successful platforms on current hot production lines. We commend the Navy's decision in 2014 to use the existing LPD 17 hull form for the LX(R), which will replace the LSD-class amphibious dock landing ships scheduled to retire in the coming years. However, we also recommend that the concept of commonality be taken even further to best optimize efficiency, affordability and capability. Specifically, rather than continuing with a new design for LX(R) within the "walls" of the LPD hull, we can leverage our hot production line and supply chain and offer the Navy a variant of the existing LPD design that satisfies the aggressive cost targets of the LX(R) program while delivering more capability and survivability to the fleet at a significantly faster pace than the current program. As much as 10-15 percent material savings can be realized across the LX(R) program by purchasing respective blocks of at least five ships each under a multi-year procurement (MYP) approach. In the aggregate, continuing production with LPD 30 in FY18, coupled with successive MYP contracts for the balance of ships, may yield savings greater than $1 billion across an 11-ship LX(R) program. Additionally, we can deliver five LX(R)s to the Navy and Marine Corps in the same timeframe that the current plan would deliver two, helping to reduce the shortfall in amphibious warships against the stated force requirement of 38 ships.

Multi-ship procurements, whether a formal MYP or a block-buy, are a proven way to reduce the price of ships. The Navy took advantage of these tools on both Virginia-class submarines and Arleigh Burke-class destroyers. In addition to the LX(R) program mentioned above, expanding multi-ship procurements to other ship classes makes sense....

The most efficient approach to lower the cost of the Ford class and meet the goal of an increased CVN fleet size is also to employ a multi-ship procurement strategy and construct these ships at three-year intervals. This approach would maximize the material procurement savings benefit through economic order quantities procurement and provide labor efficiencies to enable rapid acquisition of a 12-ship CVN fleet. This three-ship approach would save at least $1.5 billion, not including additional savings that could be achieved from government-furnished equipment. As part of its Integrated Enterprise Plan,

> we commend the Navy's efforts to explore the prospect of material economic order quantity purchasing across carrier and submarine programs.[69]

At the same hearing, Matthew O. Paxton, president, Shipbuilders Council of America (SCA)—a trade association representing shipbuilders, suppliers, and associated firms—stated the following:

> To increase the Navy's Fleet to 355 ships, a substantial and sustained investment is required in both procurement and readiness. However, let me be clear: building and sustaining the larger required Fleet is achievable and our industry stands ready to help achieve that important national security objective.
>
> To meet the demand for increased vessel construction while sustaining the vessels we currently have will require U.S. shipyards to expand their work forces and improve their infrastructure in varying degrees depending on ship type and ship mix – a requirement our Nation's shipyards are eager to meet. But first, in order to build these ships in as timely and affordable manner as possible, stable and robust funding is necessary to sustain those industrial capabilities which support Navy shipbuilding and ship maintenance and modernization....
>
> Beyond providing for the building of a 355-ship Navy, there must also be provision to fund the "tail," the maintenance of the current and new ships entering the fleet. Target fleet size cannot be reached if existing ships are not maintained to their full service lives, while building those new ships. Maintenance has been deferred in the last few years because of across-the-board budget cuts....
>
> The domestic shipyard industry certainly has the capability and know-how to build and maintain a 355-ship Navy. The Maritime Administration determined in a recent study on the Economic Benefits of the U.S. Shipyard Industry that there are nearly 110,000 skilled men and women in the Nation's private shipyards building, repairing and maintaining America's military and commercial fleets.1 The report found the U.S. shipbuilding industry supports nearly 400,000 jobs across the country and generates $25.1 billion in income and $37.3 billion worth of goods and services each year. In fact, the MARAD report found that the shipyard industry creates direct and induced employment in every State and Congressional District and each job in the private shipbuilding and repairing industry supports another 2.6 jobs nationally.
>
> This data confirms the significant economic impact of this manufacturing sector, but also that the skilled workforce and industrial base exists domestically to build these ships. Long-term, there needs to be a workforce expansion and some shipyards will need to reconfigure or expand production lines. This can and will be done as required to meet the need if adequate, stable budgets and procurement plans are established and sustained for the long-term. Funding predictability and sustainability will allow industry to invest in facilities and more effectively grow its skilled workforce. The development of that critical workforce will take time and a concerted effort in a partnership between industry and the federal government.
>
> U.S. shipyards pride themselves on implementing state of the art training and apprenticeship programs to develop skilled men and women that can cut, weld, and bend steel and aluminum and who can design, build and maintain the best Navy in the world. However, the shipbuilding industry, like so many other manufacturing sectors, faces an aging workforce. Attracting and retaining the next generation shipyard worker for an industry career is critical. Working together with the Navy, and local and state resources, our association is committed to building a robust training and development pipeline for skilled shipyard workers. In addition to repealing sequestration and stabilizing funding

[69] Statement of Brian Cuccias, President, Ingalls Shipbuilding, Huntington Ingalls Industries, Subcommittee on Seapower, Senate Armed Services Committee, May 24, 2017, pp. 4-11.

> the continued development of a skilled workforce also needs to be included in our national maritime strategy....
>
> In conclusion, the U.S. shipyard industry is certainly up to the task of building a 355-ship Navy and has the expertise, the capability, the critical capacity and the unmatched skilled workforce to build these national assets. Meeting the Navy's goal of a 355-ship fleet and securing America's naval dominance for the decades ahead will require sustained investment by Congress and Navy's partnership with a defense industrial base that can further attract and retain a highly-skilled workforce with critical skill sets. Again, I would like to thank this Subcommittee for inviting me to testify alongside such distinguished witnesses. As a representative of our nation's private shipyards, I can say, with confidence and certainty, that our domestic shipyards and skilled workers are ready, willing and able to build and maintain the Navy's 355-ship Fleet.[70]

[70] Testimony of Matthew O. Paxton, President, Shipbuilders Council of America, before the United States Senate Committee on Armed Services, Subcommittee on Seapower, [on] Industry Perspectives on Options and Considerations for Achieving a 355-Ship Navy, May 24, 2017, pp. 3-8.

Appendix I. 2014 Journal Article on Fleet Architecture

As additional information on the question of future fleet architecture, one observer—a person who for many years was the Navy's lead force-structure planner—stated the following in 2014 regarding the Navy's approach to fleet design:

> It is time to rethink how we will design the future Fleet in a way that rebalances affordability, platform capability, and deployment processes. We must build it as a whole instead of continuing to "let it happen" one platform requirements decision at a time....
>
> Today the Navy operates about 50 different types of ships and aircraft with individual design-service lives of 20 to 50 years. On average, about two classes of ship or aircraft annually come up for a decision on replacement at the end of their service lives. Each of these decisions, a multi-year joint bureaucratic process with dozens of participating organizations, is made individually. Typically, as a starting point, the new platform must do everything the old one did, except in the more challenging threat environment of the future. All of the decision-making organizations generally advocate for the next-generation platform to have the desired capabilities unmet by the old one—particularly since any additional unit cost is not their bill. It is no surprise that this process leads to steadily increasing platform and overall Fleet cost....
>
> The future Fleet is being designed ad hoc, one platform at a time, and we cannot afford this. How can we change the trend toward an ever-smaller Fleet of ever-better platforms while maintaining the capability superiority needed to execute our missions? It will take a top-down design to provide a structure in which individual platform requirements can be shaped and disciplined despite all of the pressures. We will have to consider distributing capabilities to a greater extent across a force that is securely networked, at least within line of sight, rather than putting as many as possible on each individual platform and continuing to drive up its size and cost.
>
> We will have to consider separating weapon magazines from the sensors that direct the weapons rather than putting both on the same platform. Another option is increasing reliance on deep-magazine directed energy systems, and on force-wide coordinated soft-kill and counter-targeting techniques, rather than on engaging each threat with ever-larger and more expensive kinetic weapons. We can also think about increasing reliance on penetrating high-threat areas with longer-range weapons or with preprogrammed unmanned systems rather than with manned platforms. Few of these options would rise to the top in the requirements decision-making process for any individual platform. They only start to make sense when considered and competed at a Fleet-wide level.
>
> Developing an overall fleet design to structure and discipline individual platform requirements is no small task. Simply constraining platform cost without dealing with how capabilities might be delivered differently is not sufficient. This is not a once-and-done process, as changes in threat and in our own technology options will never stop. But neither can it be a process that changes the design in some fundamental way every year or two—it will have to influence platform requirements for a long period of time to affect a significant number of new platform designs.
>
> We cannot afford to retire legacy platforms prematurely simply because they are not optimized within our new Fleet design, which will take time to implement and have to be done incrementally. Real and fundamental change in the roles, missions, and interdependencies among platform types, and in the balance between manned and unmanned and between platform and payload, is an inevitable outcome of a Fleet design process. That is the point. Change is hard, and it will have to be authorized and directed by the Navy's leadership or risk not happening.

A number of ideas for a new Fleet design have been offered recently from outside the Navy's decision-making mainstream. However, all have had significant flaws, so they have not received serious consideration. They have assumed things such as beyond line-of-sight networking that has no survivable future in the face of adversary counter-space capability; autonomy of unmanned vehicles in executing lethal missions that is beyond the projected capability of software and U.S. rules of engagement to support; and the use of platforms too small to be capable of global deployment and sustained sea-based operations, which is how the U.S. Navy must deliver global naval power. The future Fleet design must be grounded in technical and operational reality, and it has to come from inside the Navy system....

Developing a rich list of operationally-realistic options supported by rigorous analysis of cost and feasibility is foundational. It could include:

• The use of a common large aviation-ship hull for Navy sea-control/power-projection air wings and for Marine Corps vertical-raid/assault-air wings, reconfigurable between the two missions between the deployments;

• Surface combatants with smaller vertical-launch magazines that can reload at sea from logistic ships or remotely fire weapons carried in supplementary magazines on logistic ships;

• Separate classes of surface combatants optimized for air defense or antisubmarine warfare within a common hull type that can self-defend in peacetime but aggregate to fight offensively in wartime;

• Tactical-combat aircraft that are optimized for endurance and carriage of long-range weapons rather than for penetrating sophisticated defenses carrying short-range weapons;

• Large shore-launched unmanned undersea vehicles that take the place of submarines for preprogrammed missions such as covert surveillance or mine-laying;

• Use of a common hull type for all of the large non-combatant ship missions such as command ships, tenders, hospital ships, ground vehicle delivery, and logistics; and

• Elimination of support models that are based on wartime reliance on reach-back access to unclassified cyber networks connected by vulnerable communications satellites or to an indefensible global internet....

The Navy's long-term force structure requirement is a 306-ship Fleet of the currently-planned designs, of which about 120 (or 40 percent of the force) would be deployed day-to-day. It would also be able to surge an additional 75 ships (another 25 percent) within two months to meet warfighting capacity requirements. In other words, about 65 percent is employed or rapidly employable.

This sounds good, but the reality is that 30 of these 120 deployed ships would be permanently homeported overseas; 26 would be LCSs that use the rotation of their small military crews to keep 50 percent of that class forward deployed; and 40 would be Military Sealift Command support ships that use rotational civilian mariner crewing to keep the ships deployed 75 percent of the time. The remaining 25 of the forward-deployed force will be large and complex multibillion dollar warships with all-military crews, supported out of a rotation base of 140 such ships.

In other words, we plan to buy and operate five of our most expensive ships to keep one deployed. This is not an efficient way to operate. In times of reduced funding our design must address ways to meet our deployment goals with a smaller rotation base while preserving wartime surge capacity.

Many studies and trials have been done over the years on options for reducing the total number of ships needed to sustain the Navy's robust peacetime forward-deployed posture. Increasing forward homeporting in other nations always comes up as the first

choice. While it is a good one, few countries beyond those that currently support this (Japan, Spain, Italy, and Bahrain) are willing to tolerate a permanent new U.S. shore footprint. Building new shore-support infrastructure in foreign countries to back this results in a large bill for construction jobs outside the United States, which Congress normally finds unappetizing.

Using rotational crews to keep ships forward for extended periods without long deployments for their sailors is an efficient option that works for ships with small crews like LCSs, legacy mine-warfare ships, or Military Sealift Command support ships. Experiments in which this has been done with military crews on large complex warships have not turned out well. This was due both to the logistics of moving large crews overseas for turnovers and the difficulty of maintaining exact configuration commonality within ships of a class so that a crew arriving on a ship overseas has trained before deployment on an identical ship (or simulator) at home. Conversions of ships from military manning to Military Sealift Command civilian mariner crews that routinely rotate individual crewmembers to sustain ships forward are limited by the law of war concerning what military actions civilians can perform, and there are few legal options left for further expansion of this approach.

What is left in the force-generation model of our current Fleet is a force of our most complex warships—aircraft carriers, submarines, destroyers, and amphibious ships—operating with permanently-assigned military crews in the "Fleet Readiness Program" cycle of maintain-train-deploy with a deployed output of one in five. Future designs must address this model and find ways to get more deployed time out of these expensive ships and crews—without exceeding the current objective of having military crewmembers spend no more than 50 percent of their time away from homeport over a complete multi-year operating cycle. The current limiting factor is the period required to train the crew as a team before deployment following the inactivity and crew turnover of the shipyard maintenance period.

Naval aviation is steadily moving toward the increased use of high-fidelity single and multi-aircraft simulation as a means of developing and sustaining operational proficiency with reduced use of expensive live flying. These simulators are funded as part of the overall fielding plan for the aircraft and were also built for the ballistic-missile submarine force to support its Blue-Gold crew manning concept. There is no equivalent model or set of off-ship simulators for major sections of the crews of conventional surface warships (other than the LCS) for nuclear-aircraft carriers or for attack submarines. A Fleet design that bought such simulation capability as part of its ship production programs—the way that aircraft programs do—would have significant potential for improving operational output by reducing the time to train for deployment after maintenance periods.

Today's Fleet design is the product of many separate and disconnected decisions about the required capabilities of 50 different types of ships and aircraft. While not ineffective, it is definitely too expensive. The budget constraints facing the Navy for the next 20 years are not matched by a projected reduction in the quantity or capability of forces that must be delivered forward every day or surged forward in wartime.

The only way to meet these demands within available resources is to develop a design that provides a structure within which the capabilities of future platforms can be shaped to meet the Fleet's missions efficiently as an overall force. Doing this will require a systems-level approach to defining what it must be able to do, and will mean abandoning some cherished traditions of what each type of platform should do. The alternative is a Navy no longer large or capable enough to do the nation's business.[71]

[71] Arthur H. Barber, "Rethinking The Future Fleet," *U.S. Naval Institute Proceedings*, May 2014: 48-52.

Appendix J. A Summary of Some Acquisition Lessons Learned for Navy Shipbuilding

This appendix presents a general summary of lessons learned in Navy shipbuilding, reflecting comments made repeatedly by various sources over the years.[72] These lessons learned include the following:

- **At the outset, get the operational requirements for the program right.** Properly identify the program's operational requirements at the outset. Manage risk by not trying to do too much in terms of the program's operational requirements, and perhaps seek a so-called 70%-to-80% solution (i.e., a design that is intended to provide 70%-80% of desired or ideal capabilities). Achieve a realistic balance up front between operational requirements, risks, and estimated costs.
- **Impose cost discipline up front.** Use realistic price estimates, and consider not only development and procurement costs, but life-cycle operation and support (O&S) costs.
- **Employ competition** where possible in the awarding of design and construction contracts.
- **Use a contract type that is appropriate for the amount of risk involved**, and structure its terms to align incentives with desired outcomes.
- **Minimize design/construction concurrency** by developing the design to a high level of completion before starting construction and by resisting changes in requirements (and consequent design changes) during construction.
- **Properly supervise construction work.** Maintain an adequate number of properly trained Supervisor of Shipbuilding (SUPSHIP) personnel.
- **Provide stability for industry**, in part by using, where possible, multiyear procurement (MYP) or block buy contracting.
- **Maintain a capable government acquisition workforce** that understands what it is buying, as well as the above points.

Identifying these lessons is arguably not the hard part—most if not all these points have been cited for years. The hard part, arguably, is living up to them without letting circumstances lead program-execution efforts away from these guidelines.

[72] This appendix is adapted from Appendix B of CRS Testimony TE10019, *Options and Considerations for Achieving a 355-Ship Navy*, by (name redacted) .

Appendix K. Some Considerations Relating to Warranties in Shipbuilding and Other Defense Acquisition

This appendix presents some considerations relating to warranties in shipbuilding and other defense acquisition.[73]

In discussions of Navy (and also Coast Guard) shipbuilding, one question that sometimes arises is whether including a warranty in a shipbuilding contract is preferable to not including one.

Including a warranty in a shipbuilding contract (or a contract for building some other kind of defense end item), while potentially valuable, might not always be preferable to not including one—it depends on the circumstances of the acquisition, and it is not necessarily a valid criticism of an acquisition program to state that it is using a contract that does not include a warranty (or a weaker form of a warranty rather than a stronger one).

Including a warranty generally shifts to the contractor the risk of having to pay for fixing problems with earlier work. Although that in itself could be deemed desirable from the government's standpoint, a contractor negotiating a contract that will have a warranty will incorporate that risk into its price, and depending on how much the contractor might charge for doing that, it is possible that the government could wind up paying more in total for acquiring the item (including fixing problems with earlier work on that item) than it would have under a contract without a warranty.

When a warranty is not included in the contract and the government pays later on to fix problems with earlier work, those payments can be very visible, which can invite critical comments from observers. But that does not mean that including a warranty in the contract somehow frees the government from paying to fix problems with earlier work. In a contract that includes a warranty, the government will indeed pay something to fix problems with earlier work—but it will make the payment in the less-visible (but still very real) form of the up-front charge for including the warranty, and that charge might be more than what it would have cost the government, under a contract without a warranty, to pay later on for fixing those problems.

From a cost standpoint, including a warranty in the contract might or might not be preferable, depending on the risk that there will be problems with earlier work that need fixing, the potential cost of fixing such problems, and the cost of including the warranty in the contract. The point is that the goal of avoiding highly visible payments for fixing problems with earlier work and the goal of minimizing the cost to the government of fixing problems with earlier work are separate and different goals, and that pursuing the first goal can sometimes work against achieving the second goal.[74]

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[73] This appendix is adapted from Appendix C of CRS Testimony TE10019, *Options and Considerations for Achieving a 355-Ship Navy*, by (name redacted) .

[74] It can also be noted that the country's two largest builders of Navy ships—General Dynamics (GD) and Huntington Ingalls Industries (HII)—derive about 60% and 96%, respectively, of their revenues from U.S. government work. (See General Dynamics, *2016 Annual Report*, page 9 of Form 10-K [PDF page 15 of 88]) and Huntington Ingalls Industries, *2016 Annual Report*, page 5 of Form 10-K [PDF page 19 of 134]). These two shipbuilders operate the only U.S. shipyards currently capable of building several major types of Navy ships, including submarines, aircraft carriers, large surface combatants, and amphibious ships. Thus, even if a warranty in a shipbuilding contract with one of these firms were to somehow mean that the government did not have pay under the terms of that contract—either up front or later (continued...)

The Department of Defense's guide on the use of warranties states the following:

> Federal Acquisition Regulation (FAR) 46.7 states that "the use of warranties is not mandatory." However, if the benefits to be derived from the warranty are commensurate with the cost of the warranty, the CO [contracting officer] should consider placing it in the contract. In determining whether a warranty is appropriate for a specific acquisition, FAR Subpart 46.703 requires the CO to consider the nature and use of the supplies and services, the cost, the administration and enforcement, trade practices, and reduced requirements. The rationale for using a warranty should be documented in the contract file....
>
> In determining the value of a warranty, a CBA [cost-benefit analysis] is used to measure the life cycle costs of the system with and without the warranty. A CBA is required to determine if the warranty will be cost beneficial. CBA is an economic analysis, which basically compares the Life Cycle Costs (LCC) of the system with and without the warranty to determine if warranty coverage will improve the LCCs. In general, five key factors will drive the results of the CBA: cost of the warranty + cost of warranty administration + compatibility with total program efforts + cost of overlap with Contractor support + intangible savings. Effective warranties integrate reliability, maintainability, supportability, availability, and life-cycle costs. Decision factors that must be evaluated include the state of the weapon system technology, the size of the warranted population, the likelihood that field performance requirements can be achieved, and the warranty period of performance.[75]

(...continued)

on—for fixing problems with earlier work done under that contract, there would still be a question as to whether the government would nevertheless wind up eventually paying much of that cost as part of the price of one or more future contracts the government may have that firm.

[75] Department of Defense, *Department of Defense Warranty Guide*, Version 1.0, September 2009, accessed July 13, 2017, at: https://www.acq.osd.mil/dpap/pdi/uid/docs/departmentofdefensewarrantyguide[1].doc.

Appendix L. Some Considerations Relating to Avoiding Procurement Cost Growth vs. Minimizing Procurement Costs

This appendix presents some considerations relating to avoiding procurement cost growth vs. minimizing procurement costs in shipbuilding and other defense acquisition.[76]

The affordability challenge posed by the Navy's shipbuilding plans can reinforce the strong oversight focus on preventing or minimizing procurement cost growth in Navy shipbuilding programs, which is one expression of a strong oversight focus on preventing or minimizing cost growth in DOD acquisition programs in general. This oversight focus may reflect in part an assumption that avoiding or minimizing procurement cost growth is always synonymous with minimizing procurement cost. It is important to note, however, that as paradoxical as it may seem, avoiding or minimizing procurement cost growth is not always synonymous with minimizing procurement cost, and that a sustained, singular focus on avoiding or minimizing procurement cost growth might sometimes lead to higher procurement costs for the government.

How could this be? Consider the example of a design for the lead ship of a new class of Navy ships. The construction cost of this new design is uncertain, but is estimated to be likely somewhere between Point A (a minimum possible figure) and Point D (a maximum possible figure). (Point D, in other words, would represent a cost estimate with a 100% confidence factor, meaning there is a 100% chance that the cost would come in at or below that level.) If the Navy wanted to avoid cost growth on this ship, it could simply set the ship's procurement cost at Point D. Industry would likely be happy with this arrangement, and there likely would be no cost growth on the ship.

The alternative strategy open to the Navy is to set the ship's target procurement cost at some figure between Points A and D—call it Point B—and then use that more challenging target cost to place pressure on industry to sharpen its pencils so as to find ways to produce the ship at that lower cost. (Navy officials sometimes refer to this as "pressurizing" industry.) In this example, it might turn out that industry efforts to reduce production costs are not successful enough to build the ship at the Point B cost. As a result, the ship experiences one or more rounds of procurement cost growth, and the ship's procurement cost rises over time from Point B to some higher figure—call it Point C.

Here is the rub: Point C, in spite of incorporating one or more rounds of cost growth, might nevertheless turn out to be lower than Point D, because Point C reflected efforts by the shipbuilder to find ways to reduce production costs that the shipbuilder might have put less energy into pursuing if the Navy had simply set the ship's procurement cost initially at Point D.

Setting the ship's cost at Point D, in other words, may eliminate the risk of cost growth on the ship, but does so at the expense of creating a risk of the government paying more for the ship than was actually necessary. DOD could avoid cost growth on new procurement programs starting tomorrow by simply setting costs for those programs at each program's equivalent of Point D. But as a result of this strategy, DOD could well wind up leaving money on the table in some instances—of not, in other words, minimizing procurement costs.

[76] This appendix is adapted from Appendix D of CRS Testimony TE10019, *Options and Considerations for Achieving a 355-Ship Navy*, by (name redacted) .

DOD does not have to set a cost precisely at Point D to create a potential risk in this regard. A risk of leaving money on the table, for example, is a possible downside of requiring DOD to budget for its acquisition programs at something like an 80% confidence factor—an approach that some observers have recommended—because a cost at the 80% confidence factor is a cost that is likely fairly close to Point D.

Procurement cost growth is often embarrassing for DOD and industry, and can damage their credibility in connection with future procurement efforts. Procurement cost growth can also disrupt congressional budgeting by requiring additional appropriations to pay for something Congress thought it had fully funded in a prior year. For this reason, there is a legitimate public policy value to pursuing a goal of having less rather than more procurement cost growth.

Procurement cost growth, however, can sometimes be in part the result of DOD efforts to use lower initial cost targets as a means of pressuring industry to reduce production costs—efforts that, notwithstanding the cost growth, might be partially successful. A sustained, singular focus on avoiding or minimizing cost growth, and of punishing DOD for all instances of cost growth, could discourage DOD from using lower initial cost targets as a means of pressurizing industry, which could deprive DOD of a tool for controlling procurement costs.

The point here is not to excuse away cost growth, because cost growth can occur in a program for reasons other than DOD's attempt to pressurize industry. Nor is the point to abandon the goal of seeking lower rather than higher procurement cost growth, because, as noted above, there is a legitimate public policy value in pursuing this goal. The point, rather, is to recognize that this goal is not always synonymous with minimizing procurement cost, and that a possibility of some amount of cost growth might be expected as part of an optimal government strategy for minimizing procurement cost. Recognizing that the goals of seeking lower rather than higher cost growth and of minimizing procurement cost can sometimes be in tension with one another can lead to an approach that takes both goals into consideration. In contrast, an approach that is instead characterized by a sustained, singular focus on avoiding and minimizing cost growth may appear virtuous, but in the end may wind up costing the government more.

Appendix M. Size of the Navy and Navy Shipbuilding Rate

Size of the Navy

Table M-1 shows the size of the Navy in terms of total number of ships since FY1948; the numbers shown in the table reflect changes over time in the rules specifying which ships count toward the total. Differing counting rules result in differing totals, and for certain years, figures reflecting more than one set of counting rules are available. Figures in the table for FY1978 and subsequent years reflect the battle force ships counting method, which is the set of counting rules established in the early 1980s for public policy discussions of the size of the Navy.

As shown in the table, 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.[77] The Navy fell below 300 battle force ships in August 2003 and as of November 21, 2017, included 279 battle force ships.

As discussed in **Appendix D**, historical figures for total fleet size might not be a reliable yardstick for assessing the appropriateness of proposals for the future size and structure of the Navy, 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, and because the number of ships in the fleet in an earlier year might itself have been inappropriate (i.e., not enough or more than enough) for meeting the Navy's mission requirements in that year.

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 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.

[77] Some publications have stated 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. The battle force ships figure is the number used in government discussions of the size of the Navy. In recent years, the total number of active ships has been larger than the total number of battle force ships. For example, the Naval History and Heritage Command (formerly 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. Comparing the total number of active ships in one year to the total number of battle force ships in another year is thus an apples-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.

Table M-1. Total Number of Ships in Navy Since FY1948

FY[a]	Number	FY[a]	Number	FY[a]	Number	FY[a]	Number
1948	737	1970	769	1992	466	2014	289
1949	690	1971	702	1993	435	2015	271
1950	634	1972	654	1994	391	2016	275
1951	980	1973	584	1995	373	2017	279
1952	1,097	1974	512	1996	356		
1953	1,122	1975	496	1997	354		
1954	1,113	1976	476	1998	333		
1955	1,030	1977	464	1999	317		
1956	973	1978	468	2000	318		
1957	967	1979	471	2001	316		
1958	890	1980	477	2002	313		
1959	860	1981	490	2003	297		
1960	812	1982	513	2004	291		
1961	897	1983	514	2005	282		
1962	959	1984	524	2006	281		
1963	916	1985	541	2007	279		
1964	917	1986	556	2008	282		
1965	936	1987	568	2009	285		
1966	947	1988	565	2010	288		
1967	973	1989	566	2011	284		
1968	976	1990	547	2012	287		
1969	926	1991	526	2013	285		

Source: Compiled by CRS using U.S. Navy data. Numbers shown reflect changes over time in the rules specifying which ships count toward the total. Figures for FY1978 and subsequent years reflect the battle force ships counting method, which is the set of counting rules established in the early 1980s for public policy discussions of the size of the Navy.

a. Data for earlier years in the table may be for the end of the calendar year (or for some other point during the year), rather than for the end of the fiscal year.

Shipbuilding Rate

Table M-2 shows past (FY1982-FY2017) and requested or programmed (FY2018-FY2022) rates of Navy ship procurement.

Table M-2. Battle Force Ships Procured or Requested, FY1982-FY2018

(Procured in FY1982-FY2017; *requested for FY2017, and programmed for FY2019-FY2022*)

82	**83**	**84**	**85**	**86**	**87**	**88**	**89**	**90**	**91**	**92**	**93**	**94**	**95**	**96**	**97**	**98**	**99**	**00**
17	14	16	19	20	17	15	19	15	11	11	7	4	4	5	4	5	5	6
01	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	***18***	***19***
6	6	5	7	8	4	5	3	8	7	10	11	11	8	8	9	9	*9*	*10*
20	***21***	***22***	***23***															
10	*10*	*11*	13															

Source: CRS compilation based on Navy budget data and examination of defense authorization and appropriation committee and conference reports for each fiscal year. The table excludes nonbattle force ships that do not count toward the 355-ship goal, such as certain 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).

Notes: (1) **The totals shown for FY2006, FY2007, and FY2008**, reflect the cancellation two LCSs funded in FY2006, another two LCSs funded in FY2007, and an LCS funded in FY2008.

(2) **The total shown for FY2012** includes two JHSVs—one that was included in the Navy's FY2012 budget submission, and one that was included in the Army's FY2012 budget submission. Until FY2012, JHSVs were being procured by both the Navy and the Army. The Army was to procure its fifth and final JHSV in FY2012, and this ship was included in the Army's FY2012 budget submission. In May 2011, the Navy and Army signed a Memorandum of Agreement (MOA) transferring the Army's JHSVs to the Navy. In the FY2012 DOD Appropriations Act (Division A of H.R. 2055/P.L. 112-74 of December 23, 2011), the JHSV that was in the Army's FY2012 budget submission was funded through the Shipbuilding and Conversion, Navy (SCN) appropriation account, along with the JHSV that the Navy had included in its FY0212 budget submission. The four JHSVs that were procured through the Army's budget prior to FY2012, however, are not included in the annual totals shown in this table.

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