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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 proposed FY2018 budget, as amended on May 24, 2017, requests the procurement of nine new ships, including one Gerald R. Ford (CVN-78) class aircraft carrier, two Virginia-class attack submarines, two DDG-51 class destroyers, two Littoral Combat Ships (LCSs), one TAO-205 class oiler, and one towing, salvage, and rescue ship.

On December 15, 2016, the Navy released a new force-structure goal that calls for achieving and maintaining a fleet of 355 ships of certain types and numbers. Key points about this new 355-ship force-level goal include the following:

- The 355-ship force-level goal is the result of a Force Structure Assessment (FSA) conducted by the Navy in 2016. The Navy conducts an FSA every few years, as circumstances require, to determine its force-structure goal.
- The new 355-ship force-level goal replaces a 308-ship force-level goal that the Navy released in March 2015. The actual size of the Navy in recent years has generally been between 270 and 290 ships.
- The figure of 355 ships appears close to an objective of building toward a fleet of 350 ships that was announced by the Trump campaign organization during the 2016 presidential election campaign. The 355-ship goal, however, reflects the national security strategy and national military strategy that were in place in 2016 (i.e., the Obama Administration's national security strategy and national military strategy).
- Compared to the previous 308-ship force-level goal, the new 355-ship force-level goal includes 47 additional ships, or about 15% more ships. More than 47 ships, however, would need to be added to the Navy's 30-year shipbuilding plan 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:
  - CRS estimates 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)*.
  - The Congressional Budget Office (CBO) estimates that 73 to 77 ships would need to be added to 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)*.
- Even with increased shipbuilding rates, achieving certain parts of the 355-ship force-level goal could take many years. CBO estimates that the earliest the Navy could achieve all elements of the 355-ship fleet would be 2035. 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.

- 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:
  - CRS estimates 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 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 estimates that procuring the 73 to 77 ships that would need to be added to the Navy's FY2018 30-year shipbuilding plan to achieve the Navy's 355-ship fleet and maintain it through FY2057 would cost, in constant FY2017 dollars, an average of $5.4 billion per year in additional shipbuilding funds over the 30-year period.
- The above 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 Navy's previously envisaged 308-ship fleet. CBO estimates 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.
- If defense spending in coming years is not increased above the caps established in the Budget Control Act of 2011, or BCA (S. 365/P.L. 112-25 of August 2, 2011), as amended, achieving and maintaining a 355-ship fleet could require reducing funding levels for other DOD programs.
- Navy officials have stated that, in general, the shipbuilding industrial base has the ability to take on the additional shipbuilding work needed to achieve and maintain a 355-ship fleet, and that building toward the 355-ship goal sooner rather than later would be facilitated by ramping up production of existing ship designs rather than developing and then starting production of new designs.
- 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.
- Navy officials have indicated that, prior to embarking on a fleet expansion, they would first like to see additional funding provided for overhaul and repair work to improve the readiness of existing Navy ships, particularly conventionally powered surface ships, and for mitigating other shortfalls in Navy readiness.

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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 proposed FY2018 budget, as amended on May 24, 2017, requests the procurement of nine new ships, including one Gerald R. Ford (CVN-78) class aircraft carrier, two Virginia-class attack submarines, two DDG-51 class destroyers, two Littoral Combat Ships (LCSs), one TAO-205 class oiler, and one towing, salvage, and rescue ship. On December 15, 2016, the Navy released a new force-structure goal that calls for achieving and maintaining a fleet of 355 ships of certain types and numbers.

The issue for Congress is whether to approve, reject, or modify the Navy's force structure and 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 RS20643, *Navy Ford (CVN-78) Class Aircraft Carrier Program: Background and Issues for Congress*, by (name redacted) .
- CRS Report R41129, *Navy Columbia Class (Ohio Replacement) Ballistic Missile Submarine (SSBN[X]) Program: Background and Issues for Congress*, by (name r edacted) .
- CRS Report RL32418, *Navy Virginia (SSN-774) Class Attack Submarine Procurement: 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 RL33741, *Navy Littoral Combat Ship/Frigate (LCS/FF) Program: Background and Issues for Congress*, by (name redacted) .
- CRS Report R43543, *Navy 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 New 355-Ship Ship Force-Structure Goal

Introduction

On December 15, 2016, the Navy released a new force-structure goal that calls for achieving and maintaining a fleet of 355 ships of certain types and numbers. The 355-ship force-level goal is the

result of a new Force Structure Assessment (FSA) conducted by the Navy. 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.[1] The analysis takes into account Navy capabilities for both warfighting and day-to-day forward-deployed presence. The Navy conducts an FSA every few years, as circumstances require, to determine its force-structure goal.

The new 355-ship force-level goal replaces a 308-ship force-level goal that the Navy released in March 2015. 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 new 355-ship goal, Navy force-level goals were generally in the low 300s (see **Appendix B**). The actual size of the Navy in recent years has generally been between 270 and 290 ships.

Table 1 compares the Navy's new 355-ship force-level goal to its previous 308-ship force-level goal. As can be seen in the table, compared to the previous 308-ship force-level goal, the new

[1] The Navy states that

> [the] Navy's Force Structure Assessment (FSA) was developed in an effort to determine the right balance of existing forces, the ships we currently have under construction and the future procurement plans needed to address the ever-evolving and increasingly complex threats the Navy is required to counter in the global maritime commons....
>
> The number and mix of ships in the objective force, identified by this FSA, reflects an in-depth assessment of the Navy's force structure requirements—it also includes a level of operational risk that we are willing to assume based on the resource limitations under which the Navy must operate. While the force levels articulated in this FSA are adjudged to be successful in the scenarios defined for Navy combat, that success will likely also include additional loss of forces, and longer timelines to achieve desired objectives, in each of the combat scenarios against which we plan to use these forces. It should not be assumed that this force level is the "desired" force size the Navy would pursue if resources were not a constraint—rather, this is the level that balances an acceptable level of warfighting risk to our equipment and personnel against available resources and achieves a force size that can reasonably achieve success....
>
> In January, the 2016 FSA started with a request to the Combatant Commanders (CCDRs) to provide their unconstrained desire for Navy forces in their respective theaters. In order to fully resource these platform-specific demands, with very little risk in any theater while still supporting enduring missions and ongoing operations, the Navy would be required to double its current annual budget, which is essentially unrealistic in both current and expected future fiscal environments.
>
> After identifying instances where forces were being requested for redundant missions or where enduring force levels were not required, while also looking at areas where we could take some risk in mission success or identify a new way to accomplish the mission, we were able to identify an FSA force level better aligned with resources available....
>
> In order to assess warfighting risk and identify where margins existed that could be reduced, we did an in-depth review and analysis of "what it takes to win", on what timeline, and in which theater, for each major ship class. The goal of this phase of the analysis was to determine the minimum force structure that:
>
> -- complies with defense planning guidance directed combinations of challenges for force sizing and shaping;
>
> -- meets approved Day 0 and warfighting response timelines; [and]
>
> -- delivers future steady state and warfighting requirements, determined by Navy's analytic process, with an acceptable degree of risk (e.g. – does not jeopardize joint force campaign success).
>
> (Source: U.S. Navy, *Executive Summary, 2016 Navy Force Structure Assessment (FSA)*, December 15, 2016, pp. 1-2.)

355-ship force-level goal includes 47 additional ships, or about 15% more ships, including 18 attack submarines, 1 aircraft carrier, 16 large surface combatants (i.e., cruisers and destroyers), 4 amphibious ships, 3 combat logistics force (i.e., resupply) ships, 3 expeditionary support base ships (or ESBs—these were previously called Afloat Forward Staging Bases, or AFSBs), and 2 command and support ships. The 34 additional attack submarines and large surface combatants account for about 72% of the 47 additional ships.

Table 1. New 355-Ship Plan Compared to Previous 308-Ship Plan

					Number of ships that would need to be added to 30-year shipbuilding plan to achieve and maintain 355-ship fleet	
Ship type	**355-ship plan of December 2016**	**308-ship plan of March 2015**	**Difference**	**Difference (%)**	**CRS 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 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 Navy's FY2017 shipbuilding plan and information provided by CBO to CRS 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.

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.

Apparent Reasons for Increasing Force-Level Goal from 308 Ships

The roughly 15% increase in the new 355-ship plan over the previous 308-ship plan can be viewed as a Navy response to, among other things, China's continuing naval modernization effort;[2] resurgent Russian naval activity, particularly in the Mediterranean Sea and the North Atlantic Ocean;[3] and challenges that the Navy has sometimes faced, given the current total number of 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.[4] 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 and wear and tear on Navy ships.[5] 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

[2] 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) .

[3] 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 4, 2016; Nicholas de Larrinaga, "Russian Submarine Activity Topping Cold War Levels," *IHS Jane's 360*, February 2, 2016.

[4] 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.

[5] 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.

more than 308 ships. For example, Navy officials testified in March 2014 that fully meeting such requests would require a Navy of 450 ships.[6]

In releasing its 355-ship plan 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.[7]

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 announced by the Trump campaign organization during the 2016 presidential election campaign. The 355-ship goal, however, reflects the national military strategy that was in place in 2016 (i.e., the Obama Administration's national military strategy). A January 27, 2017, national security presidential memorandum on rebuilding the U.S. Armed Forces signed by President Trump states: "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."[8]

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."[9] The Trump campaign organization did not delineate the composition of its 350-ship fleet. 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 DOD's report on its 2014 Quadrennial Defense Review (QDR).[10]

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).[11]

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[6] 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.

[7] 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.

[8] "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.

[9] "National Defense, Donald J. Trump's Vision," accessed January 19, 2017, at https://www.donaldjtrump.com/policies/national-defense.

[10] 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.

[11] 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.[12] 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],"[13] and an even larger fleet may be necessary if the risk of conflict in the Western Pacific increases.[14]

Additional Shipbuilding Needed to Achieve and Maintain 355-Ship Fleet

CRS and CBO Estimates

Although the 355-ship plan includes 47 more ships than the previous 308-ship plan, as shown in the final two columns of **Table 1**, more than 47 ships would need to be added to the Navy's 30-year shipbuilding plan 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 does 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 estimates 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) estimates that 73 to 77 ships would need to be added to 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.[15]

[12] 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) .

[13] 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.

[14] 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.

[15] 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.

Navy February 2017 White Paper on Notional FY2017-FY2023 Shipbuilding and Aircraft Procurement Increases

A February 2017 Navy white paper entitled "United States Navy Accelerated Fleet Plan" sets forth "a path to expeditiously build capacity and improve lethality of the fleet" as "a first step towards a framework to develop strategic guidance and identify the investments needed to reinvigorate our naval forces."[16] The cover memorandum to the white paper states that the white paper addresses the following question: "How rapidly could the Navy increase its force size guided by operational requirements, industrial base capacity, and good stewardship of the taxpayers' money?" The results of the analysis, the cover memo states, "could be considered as a 'bounding case' for a future plan to recover from a long period of deficit [i.e., less than optimal] investment." The white paper presents notional increases in shipbuilding and aircraft procurement for the seven-year period FY2017-FY2023. **Table 2** shows those notional increases.

Table 2. Navy Notional Accelerated Fleet Plan: Shipbuilding and Aircraft Procurement

From February 2017 Navy white paper

	FY17	FY18	FY19	FY20	FY21	FY22	FY23	Total
Shipbuilding								
Navy FY2017 shipbuilding plan	7	8	7	8	8	10	11	59
Notional accelerated plan	12	12	11	13	13	13	14	88
Difference	+5	+4	+4	+5	+5	+3	+3	+29
Aircraft procurement								
Navy FY2017 aircraft plan	86	95	101	76	93	98	107	656
Notional accelerated plan	137	140	156	144	142	145	134	998
Difference	+51	+45	+55	+68	+49	+47	+27	+342

Source: *United States Navy Accelerated Fleet Plan*, undated, p. 4, 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.

The white paper states that these notional increases are

> the maximum number of additional ships and aircraft that the Navy could purchase over the next seven years to get to required fleets levels as quickly as possible, relative to the current budget plan.... The Navy's accelerated plan... sets the Navy on a path that is achievable with low levels of technical risk, reduces future costs, and provides capabilities that the Navy is highly confident will remain relevant over time."[17]

Table 3 shows, by individual program, the additional shipbuilding summarized in **Table 2**. As can be seen in **Table 3**, compared to the Navy's FY2017 budget submission, the Navy's notional accelerated fleet plan includes the following additional ships, among others, during the seven-year period FY2017-FY2023:

[16] *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.

[17] *United States Navy Accelerated Fleet Plan*, undated, p. 4, 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.

- 3 Virginia-class attack submarines (SSNs);
- 7 DDG-51 class destroyers;
- 3 Littoral Combat Ships/frigates (LCSs/FFs);
- 2 LHA-6 class amphibious assault ships;
- 2 LX(R) class amphibious ships;
- 5 TAO-205 class oilers; and
- 3 TESB expeditionary support base ships.

Table 3. Navy Notional Accelerated Fleet Plan: Shipbuilding by Program

From February 2017 Navy white paper

	FY17	FY18	FY19	FY20	FY21	FY22	FY23	Total
Columbia class ballistic missile submarine (SSBN)								
FY2017 budget					1			1
Accelerated fleet plan					1			1
Virginia class attack submarine (SSN)								
FY2017 budget	2	2	2	2	1	2	2	13
Accelerated fleet plan	2	2	2	2	2	3	3	16
Ford (CVN-78) class aircraft carrier								
FY2017 budget		1					1	2
Accelerated fleet plan		1				1		2
DDG-51 class destroyer								
FY2017 budget	2	2	2	2	2	2	2	14
Accelerated fleet plan	3	3	3	3	3	3	3	21
Littoral Combat Ship/Frigate (LCS/FF)								
FY2017 budget	2	1	1	1	2	2	2	11
Accelerated fleet plan	2	2	2	2	2	2	2	14
LHA-6 class amphibious assault ship								
FY2017 budget	1							1
Accelerated fleet plan	1			1			1	3
LPD-17 class amphibious ship								
FY2017 budget								0
Accelerated fleet plan	1							1
LX(R) class amphibious ship								
FY2017 budget				1		1	1	3
Accelerated fleet plan			1	1	1	1	1	5
TAO-205 class oiler								
FY0217 budget		1	1	1	1	1	1	6
Accelerated fleet plan	1	1	1	2	2	2	2	11

	FY17	FY18	FY19	FY20	FY21	FY22	FY23	Total
AS(X) submarine tender								
FY2017								
Accelerated fleet plan								
TAGOS(X) ocean surveillance ship								
FY2017 budget						1		1
Accelerated fleet plan					1		1	2
TATS(X) fleet towing, salvage, and rescue ship								
FY2017 budget								
Accelerated fleet plan								
TEPF expeditionary fast transport								
FY2017 budget								0
Accelerated fleet plan	1	1						2
TESB expeditionary support base ships								
FY2017 budget								0
Accelerated fleet plan		1	1	1				3
TOTAL								
FY2017 budget	7	8	7	8	8	10	11	59
Accelerated plan	12	12	11	13	13	13	14	88
Difference	+5	+4	+4	+5	+5	+3	+3	+29

Source: *United States Navy Accelerated Fleet Plan*, undated, pp. 7-8, 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.

As can be seen in **Table 3**, compared to the Navy's FY2017 budget submission, the Navy's notional accelerated fleet plan does not include additional aircraft carriers in the seven-year period FY2017-FY2023, but it accelerates the procurement of a carrier from FY2023 to FY2022. The Navy's white paper states that under the accelerated fleet plan, procurement of carriers would be accelerated to a rate of one ship every 3½ years (i.e., a combination of three- and four-year intervals) until a steady-state force of 12 carriers is achieved, and that the Navy would contract for carriers with two-ship multiyear contracts, starting with CVNs 80 and 81, the carriers that would be procured in FY2018 and FY2022.[18]

Time Needed to Achieve 355-Ship Fleet

Even with increased shipbuilding rates, achieving certain parts of the 355-ship force-level goal could take many years. For example, the 355-ship force-level goal includes a goal of 12 aircraft carriers. Increasing aircraft carrier procurement from the current rate of one ship every five years to one ship every three years would achieve a 12-carrier force on a sustained basis by about 2030. As another example, the 355-ship force level includes a goal of 66 attack submarines. Increasing

[18] *United States Navy Accelerated Fleet Plan*, undated, p. 8, 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.

attack submarine procurement to a rate of three attack submarines (or two attack submarines and one ballistic missile submarine) per year could achieve a 65-boat SSN force by the late 2030s. CBO estimates that the earliest the Navy could achieve all elements of the 355-ship fleet would be 2035.[19] 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.

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 estimates 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.
- CBO estimates that procuring the 73 to 77 ships that would need to be added to 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.[20]

The Navy's February 2017 white paper on its notional accelerated fleet plan states that, compared to the Navy's FY2017 budget submission (whose five-year budget period covers the years FY2017-FY2021), the 23 additional ships shown in the first five years (FY2017-FY2021) of the seven-year period presented in **Table 2** would require about $32.2 billion in then-year dollars in additional funding, or an average of about $6.4 billion per year in then-year dollars.[21]

Aircraft Procurement Costs

CBO estimates 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.[22]

The Navy's February 2017 white paper on its notional accelerated fleet plan states that, compared to the Navy's FY2017 budget submission (whose five-year budget period covers the years FY2017-FY2021), the additional 268 additional aircraft shown in the first five years (FY2017-

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

[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, 12 pp.

[21] *United States Navy Accelerated Fleet Plan*, undated, p. 10, 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.

[22] 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.

FY2021) of the seven-year period presented in **Table 2** would require about $29.6 billion in then-year dollars in additional funding, or an average of about $5.9 billion per year in then-year dollars.[23]

Shipbuilding and Aircraft Procurement Costs

A March 22, 2017, press report stated:

> The Navy needs potentially as much as $150 billion over current budget plans to "jump-start" shipbuilding and get on a trajectory for a 355-ship fleet, the vice chief of naval operations said on Wednesday.
>
> The money would add about 30 ships to the fleet beyond current plans, Adm. Bill Moran said.
>
> The exact size of the future fleet doesn't matter right now, but rather the Navy just needs to start boosting its investment in shipbuilding quickly—which means buying many more Virginia-class attack submarines, Arleigh Burke-class destroyers and Ford-class aircraft carriers in the next few years, he said.
>
> "I'm not here to argue that 355 or 350 is the right number. I'm here to argue that we need to get on that trajectory as fast as we can. And as time goes on you start to figure out whether that number is still valid—10 years from now, 20 years from now 355 may not be the number," Moran said today at the annual McAleese/Credit Suisse "Defense Programs" event.
>
> "Our number, give or take, to get to 355, or just to get started in the first seven years, is $150 billion. That's a lot of money."
>
> Moran told USNI News following his remarks that dollar figure wasn't exact but was based on the Navy's best guess for how much it would cost to immediately begin a fleet buildup. A Navy official told USNI News later that one internal Navy estimate put the cost at about $80 billion over the seven years....
>
> "When you look at the number that started our 355 trajectory, to jump-start it – in order to jump-start it we think we need to build an additional 29 or 30 ships in the first seven years," he said.
>
> "When you do all that math, it's a lot of money that we don't have. But we were asked to deliver on that, so we've passed along what we think it would take. And obviously, any number you give in this environment is going to be sticker shock. So that's why I say don't take me literally, all it is is a math equation right now."...
>
> "We definitely wanted to go after SSNs, DDGs and carriers, to get carriers from a five-year center to a four-year center and even looked at a three-year option. So the numbers I will give to you are reflective of those three priorities, because those are the big impacters in any competition at sea," he told USNI News.
>
> "Amphibs come later, but I'm talking about initial, what are we building that we can stamp out that are good. We know how to build Virginia-class, we know how to build DDGs."...
>
> Moran said during his presentation that the Navy is currently on track to hit 310 ships – if the Fiscal Year 2017 spending bill is passed by Congress this spring after an extended continuing resolution, the Navy would finish buying the last ships that will eventually push it to 310. Without this quick ramp-up of shipbuilding, though, the Navy won't just

[23] *United States Navy Accelerated Fleet Plan*, undated, p. 14, 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.

> fail to reach 355 ships but will actually slip back below 300 ships, he said. Dozens of ships built during the Reagan-era buildup are headed for decommissioning in the 2020s and the Navy needs to act quickly to either replace them at pace and stay around 310, or ramp up even faster to grow the fleet.
>
> The vice chief told reporters that the plan for a 355-trajectory includes building more destroyers, building carriers faster, and maintaining two SSNs a year even as the new Columbia-class ballistic missile submarine begins production. A Columbia-class SSBN is the equivalent of about two SSNs, meaning the submarine industrial base would see about double the workload in any given year under this plan.[24]

CRS analysis of the Navy's February 2017 white paper suggests that the figure of $150 billion mentioned above is a hybrid cost figure that includes the following amounts shown in the white paper:

- $32.2 billion in *additional* shipbuilding costs for the five-year period FY2017-FY2021;
- $55.1 billion in *total* shipbuilding costs (i.e., both previously planned shipbuilding for the previously planned 308-ship fleet, plus additional shipbuilding for the 355-ship fleet) for the two-year period FY2022-FY2023;
- $29.6 billion in *additional* aircraft procurement costs for the five-year period FY2017-FY2021; and
- $35.4 billion in *total* aircraft procurement costs (i.e., both previously planned aircraft procurement for previously planned 308-ship fleet, plus additional aircraft procurement for the 355-ship fleet) for the two-year period FY2022-FY2023.

The sum total of the above four figures—a hybrid sum that mixes together both *additional* shipbuilding and aircraft procurement costs for FY2017-FY2021 and *total* shipbuilding and aircraft procurement costs for FY2022-FY2023—is $152.3 billion.

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 estimates 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.[25]

CRS estimates that a total of roughly 15,000 additional sailors and aviation personnel might be needed for the 47 additional ships.[26] The Navy testified in May 2017 that the Navy would need a

[24] Megan Eckstein, "Moran: Navy Needs As Much As $150B Extra to 'Jump-Start' Path to 355 Ships; Would Buy Mostly DDGs, SSNs, Carriers," USNI News, March 22, 2017.

[25] 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.

[26] 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

(continued...)

total of 20,000 to 40,000 more sailors at sea and ashore to operate a fleet of about 350 ships, depending on the composition of that 350-ship fleet, than the Navy currently has at sea and ashore for operating today's fleet of about 275 ships.[27]

Industrial Base Ability for Taking on Additional Shipbuilding Work

Navy and industry officials have stated that, in general, the shipbuilding industrial base has the ability to take on the additional shipbuilding work needed to achieve and maintain a 355-ship fleet, and that building toward the 355-ship goal sooner rather than later would be facilitated by ramping up production of existing ship designs rather than developing and then starting production of new designs.

Ramping up to higher rates of shipbuilding, Navy and industry officials have stated, would require additional tooling and equipment at some shipyards and some supplier firms. Additional production and supervisory workers would need to be hired and trained at shipyards and supplier firms. Depending on their specialties, newly hired workers could be initially less productive per unit of time worked than more experienced workers. Given the time needed to increase tooling and hire and train new workers, some amount of time would be needed to ramp up to higher shipbuilding rates—production could not jump to higher rates overnight.[28] Some parts of the shipbuilding 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. As stated in the April 2017 CBO report,

> all seven shipyards 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

(...continued)

> 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 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.

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

[28] For further discussion regarding the challenges of expanding shipyard workforces, see Mike Stone, "Missing from Trump's Grand Navy Plan: Skilled Workers to Build the Fleet," *Reuters*, March 17, 2017; and James Bach, "Massive Navy Expansion May Be Easier Said Than Done for U.S. Shipbuilders," *Washington Business Journal*, March 3, 2017.

> 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].[29]

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**.

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.

Consistent with U.S. law, the seven shipyards that build most of the Navy's major ships are all located in the United States.[30] As of 2016, these seven yards reportedly employed a total of more than 66,000 people.[31] Production workers account for a sizeable fraction of that figure. Some of

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

[30] 10 USC 7309 states:

> §7309. Construction of vessels in foreign shipyards: prohibition
>
> (a) Prohibition.-Except as provided in subsection (b), no vessel to be constructed for any of the armed forces, and no major component of the hull or superstructure of any such vessel, may be constructed in a foreign shipyard.
>
> (b) Presidential Waiver for National Security Interest.-(1) The President may authorize exceptions to the prohibition in subsection (a) when the President determines that it is in the national security interest of the United States to do so.
>
> (2) The President shall transmit notice to Congress of any such determination, and no contract may be made pursuant to the exception authorized until the end of the 30-day period beginning on the date on which the notice of the determination is received by Congress.
>
> (c) Exception for Inflatable Boats.-An inflatable boat or a rigid inflatable boat, as defined by the Secretary of the Navy, is not a vessel for the purpose of the restriction in subsection (a).

In addition, the paragraph in the annual DOD appropriations act that makes appropriations for the Navy's primary shipbuilding account (the Shipbuilding and Conversion, Navy, or SCN, account) typically includes provisions stating "*Provided further*, That none of the funds provided under this heading for the construction or conversion of any naval vessel to be constructed in shipyards in the United States shall be expended in foreign facilities for the construction of major components of such vessel: *Provided further*, That none of the funds provided under this heading shall be used for the construction of any naval vessel in foreign shipyards."

[31] Two of these seven shipyards—Newport News Shipbuilding of Newport News, VA, and Ingalls Shipbuilding of Pascagoula, MIS—are owned by Huntington Ingalls Industries (HII). HII's primary activities are building new submarines and aircraft carriers and performing mid-life refueling overhauls of existing aircraft carriers. HII states that it employed a total of almost 37,000 people as of January 2017. (Source: HII website, http://www.huntingtoningalls.com/, accessed January 26, 2017.)

Three of these seven shipyards—Bath Iron Works of Bath, ME; the Electric Boat division of Groton, CT, and Quonset Point, RI; and National Steel and Shipbuilding Company (NASSCO) in San Diego, CA—are owned by General Dynamics (GD). GD reportedly employed a total of roughly 23,600 people at these three shipyards as of 2016, with the breakdown as follows:

- GD/BIW reportedly employed 6,100 people as of September 2016. (Source: Beth Brogan, "Bath Iron Works cuts 160 jobs, including layoff of 30 workers," *Bangor Daily News*, September 23, 2016.).
- GD/EB reportedly employed about 14,000 people as of 2016. (Source: Stephen Singer, Electric Boat To Hire Thousands As Military Strategy Shifts Back To Subs, *Hartford Courant*, April 18, 2016. The article states: "As many as 850 high-skilled, well-paid manufacturing and other jobs are being filled this year and nearly 4,000 in the next 15 years, establishing a workforce of 18,000 at the submarine manufacturer's sites in Groton

(continued...)

the production workers are assigned to projects other than building Navy ships.[32] (The remaining employees at the yards include designers and engineers, management and supervisory staff, and administrative and support staff.) Navy shipbuilding additionally supports thousands of manufacturing and other jobs at hundreds of supplier firms located throughout the United States. (Some states have more of these firms, while others have fewer of them.)

Shipbuilding can also have broader effects on 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."[33]

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."[34] 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 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."[35]

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

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(...continued)

and Quonset Point, R.I.")

- GD/NASSCO reportedly employed about 3,500 people as of October 2016. (Source: Chris Jennewein, "NASSCO Warns Employees 700 Layoffs May Be Coming in January," *Times of San Diego*, October 25, 2016.)

The remaining two shipyards are Fincantieri/Marinette Marine of Marinette, WI, and Austal USA of Mobile, AL. Both yards build Littoral Combat Ships (LCSs), and Austal USA additionally builds Expeditionary Fast Transports (EPFs—these ships were previously called Joint High Speed Vessels, or JHSVs). As of March 2016, Marinette Marine reportedly employed more than 2,000 people and Austal USA reportedly employed more than 4,000 people. (Source: Allyson Versprille, "LCS Cuts Could Strain Shipbuilding Industry," *National Defense*, March 2016.)

[32] For example, at HII/Newport News Shipbuilding, a sizeable fraction of the production workforce is assigned to mid-life nuclear refueling overhauls of existing aircraft carriers. At HII/Ingalls, some production workers are assigned to building national Security Cutters (NSCs) for the Coast Guard. At GD/NASSCO, some production workers may be assigned to the production of commercial cargo ships.

[33] 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.

[34] Yasmin Tadjdeh, "Navy Shipbuilders Prepared for Proposed Fleet Buildup," *National Defense*, March 2017. Similarly, another press report states: "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.)

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

state that they are exploring 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 state that they are also exploring options for reactivating recently retired conventional surface ships, particularly Oliver Hazard Perry (FFG-7) class frigates. The technical feasibility and potential cost effectiveness of these options is currently not clear.[36]

A June 19, 2017, press report states:

> The chief of naval operations said this week the service may take the remaining Oliver Hazard Perry-class guided missile frigates out of retirement to increase the Navy's fleet size.
>
> Chief of Naval Operations Adm. John Richardson said June 13 at the Naval War College the service needs to conduct a cost-benefit analysis of the proposal to determine the price to modernize the frigates.
>
> The last Perry-class frigate in the Navy's inventory retired in 2015 after 30 years of service. Other ships in the class have been transferred to Egypt, Pakistan, Taiwan and Turkey.
>
> The service is in the "very initial stages of looking at the option," according to Navy spokeswoman Lt. Kara Yingling.[37]

June 16, 2017, press report states:

> While all options are on the table in the Navy's push to field a 355-ship fleet, when it comes to reactivating ships in the inactive fleet, the service is realistically only looking at seven decommissioned Oliver Hazard Perry-class frigates (FFG-7), Chief of Naval Operations Adm. John Richardson told USNI News on Thursday.
>
> Since the December reveal of the Navy's new fleet size goal, calls have come from some analysts to reactivate three older Ticonderoga-class cruisers (CG-47) that have been sidelined for more than a dozen years or the conventionally powered Kitty Hawk (CV-63) aircraft carrier....
>
> The Navy has about 50 warships in the inactive fleet, but so far only the Perrys are seriously being studied for reactivation, Richardson said following a hearing of the Senate Armed Services Committee. He first mentioned the possibility of reactivating Perrys earlier this week during a presentation at the Naval War College.
>
> "Bringing those back—we're examining it and we don't want to overlook any options, but really on the face of it it's going to be very complicated," he said.
>
> "As a ship class comes to the end of its life, it's not like we're pouring a lot of money into keeping that class modernized. Although the last of the frigates were decommissioned a couple of years ago, we've really stopped modernizing far before that because we just wanted to bring it to a graceful end and there were better places to spend our money at the time."
>
> Rather, the Navy is looking at what it could do now to extend the life of the Arleigh Burke-class guided-missile destroyers (DDG-51) past an expected service life of 35 years, in a more realistic bid to keep up the fleet size.

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

[37] Lee Hudson, "CNO Considers Modernizing Oliver Hazard Perry-Class Frigates," *Inside the Navy*, June 19, 2017.

> The DDG life extension plan would prompt a reexamination of key decisions the Navy has made over the last few years on the mid-life modernization of the Burke class.
>
> The Navy elected not to modernize the Aegis Combat Systems of some of the earlier Burkes as a cost-savings measure and instead just executed hull, mechanical and engineering upgrades.
>
> The Baseline 9 combat system upgrade replaces the 1980s-era computer infrastructure of the combat system with faster and more easily upgraded commercial servers, an additional signal processor that allows the ship to fight both traditional air and ballistic missile threats, and a networking capability that allows data to flow from the upgraded destroyer to other ships and aircraft.
>
> How extensively the Navy will take a second look at the DDG upgrade schedule or combat system modernization plan is also being evaluated, Richardson said.
>
> "It's the same cost-benefit tradeoff [as the frigates]. You take a look at how much more life might we get, and if it's a significant period of time then it might be worth investing in the combat system to modernize and we'll take it from there," he said.
>
> "Everything has to be on the table, and I want to understand the entire decision space and that entire landscape."[38]

A June 15, 2017, press report states:

> The U.S. Navy is studying the ideas of pulling up to eight mothballed Oliver Hazard Perry-class frigates back to service, extending the Arleigh Burke-class guided missile destroyers, and increased networking to achieve a larger fleet faster than expected, the Chief of Naval Operations (CNO) said Tuesday [June 13].
>
> Speaking at the Naval War College, Adm. John Richardson said the service is looking at all of the options to both increase the number of platforms in the fleet as well as increasing their capabilities as the Defense Department plans a 355 ship fleet. In response to a question, Richardson said the Navy is "taking a hard look at the Oliver Hazard Perry-class frigates. There's seven or eight of those that I think we could take a look at. But those are some old ships and the technology on those ships is old."...
>
> Richardson also talked about life extension of current ships, focusing on the Arleigh Burke-class guided missile destroyers (DDGs). "If we plan now, for instance, to extend the life Arleigh Burke DDGs beyond the current projections, the initial returns are we could buy 10 to 15 years to the left in terms of reaching that 350 ship goal.
>
> Keeping ships out of mothballs for longer will be "money in the bank if we do that," he added.
>
> Richardson and a Navy spokesperson elaborated later on Twitter that bringing back the Perrys is not a foregone conclusion and efforts to extend service life are more mature. "We need to be deliberate as we work or way through these decisions," Richardson said.[39]

[38] Sam LaGrone, "CNO Richardson: Perry Frigates Only Inactive Hulls Navy Considering Returning to Active Fleet; DDG Life Extension Study Underway," *USNI News*, June 16, 2017.

[39] Richard Abott, "Navy Looking At Bringing Back Perry Frigates, Life Extension, Networking For Larger Fleet," *Defense Daily*, June 15, 2017:1. See also Richard Abott, "NAVSEA Chief Says Increased Maintenance Funds Will Help Reach 355-Ship Fleet Faster," *Defense Daily*, June 2, 2017: 1; Megan Eckstein, "NAVSEA: Extending Surface Ship Service lives Could Speed Up 355-Ship Buildup By 10-15 Years," *USNI News*, June 1, 2017; Tyler Rogoway, "US Navy Looking At Bringing Back Carrier USS Kitty Hawk Out of Mothballs," *The Drive*, June 8, 2017.

A June 13, 2017, press report states:

> Studies are underway to "take a hard look" at putting eight mothballed Oliver Hazard Perry frigates back into service as well as extending the life of existing Arleigh Burke guided-missile destroyers to help the Navy reach its goal of a 355-ship fleet, Chief of Naval Operations Adm. John Richardson said on Tuesday [June 13].
>
> Speaking before an audience at the U.S. Naval War College, Richardson said service leaders were looking at "every trick" to put more platforms into the fleet including bringing back some Perrys into service.
>
> "We're taking a hard look at the Oliver Hazard Perry-class frigates. There's seven or eight of those that we could take a look at but those are some old ships and everything on these ships is old… a lot has changed since we last modernized those," Richardson said in a response to an audience question on how the Navy's inactive reserve fleet could be used to grow the fleet.
>
> "It'll be a cost benefit analysis in terms of how we do that. The other part is how we do life extension and how do we plan to keep them out of mothballs longer. That's going to be money in the bank if we do that."
>
> He said early looks at extending the planned service life of the Arleigh Burke-class guided-missile destroyers could help the service reach a 355 total ten to 15 years faster.
>
> "If we plan now, for instance, to extend the life Arleigh Burke DDGs beyond the current projections, the initial returns are we could buy ten to 15 years to the left in terms of reaching that 350 ship goal," he said.
>
> In follow-up tweets to his remarks at the Current Strategy Forum, Richardson and a Navy spokesperson stressed the service was still in the early stages of formulating how it would reach the 355 ship goal and that the progress on the life extension program was more mature than reactivating the frigates.[40]

Navy Desire to Improve Ship Readiness Before Expanding Fleet

Navy officials have indicated that, prior to embarking on a fleet expansion, they would first like to see additional funding provided for overhaul and repair work to improve the readiness of existing Navy ships, particularly conventionally powered surface ships, and for mitigating other shortfalls in Navy readiness.[41]

A December 12, 2016, press report states:

> Despite President-elect Donald Trump's goal of building toward a 350-ship Navy, the service's immediate priorities under an increased budget would be catching up on ship and aircraft maintenance, as well as buying more strike fighters and munitions, according to a top officer.
>
> Eying the potential for increased military spending under Trump's administration, the Navy is developing a list of priorities the service has if more funding becomes available, according to Vice Chief of Naval Operations Adm. Bill Moran.

[40] Sam LaGrone, "CNO: Navy 'Taking a Hard Look' at Bringing Back Oliver Hazard Perry Frigates, DDG Life Extensions as Options to Build Out 355 Ship Fleet," *USNI News*, June 13, 2017.

[41] In addition to the press reports cited here, see also *United States Navy Accelerated Fleet Plan*, undated, pp. 2-4, 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.

> "Maintenance and modernization for ships, submarines and aircraft are at the top of our list," Moran told reporters....[42]

A January 11, 2017, press report similarly states:

> Speaking at the Surface Navy Association's annual symposium near Washington, D.C., on Tuesday, Moran said Navy leaders have already told President-elect Donald Trump's transition team that they want any additional funding that comes available within this fiscal year to go to maintenance first.
>
> "The transition team came around to all of us in the building and asked us what we could do with more money right now," Moran said. "The answer was not, 'Buy more ships.' The answer was, 'Make sure that the 274 that we had were maintained and modernized to provide 274 ships' worth of combat time.' Then, we'll start buying more ships."[43]

Another January 11, 2017, press report similarly states:

> The message Navy leaders are sending to President-elect Donald Trump's team is: We need money to keep the current 274 ships in the fleet maintained and modernized first and then give us the money to buy more ships....
>
> In talking with the press and in his address, he said, "It is really hard to see the light at the end of the tunnel" if maintenance is continuously deferred, causing ships to be in the yards far longer in the yards than expected with costs rising commensurately.
>
> "Deferred maintenance is insidiously taking its toll."
>
> Not only does this add greater risk and a growing gap between the combatant commanders' requirements and what the service can deliver, "you can't buy back that experience" and proficiency sailors lose when they can't use their skills at sea.
>
> "At some point, we have to dig ourselves out of the hole," Moran said in his address.[44]

A January 24, 2017, press report states:

> The Navy wants $2 billion in additional funding this year for much-needed ship maintenance and fleet operations, and would also buy two dozen Super Hornets and an additional San Antonio-class amphibious warship if money were made available, according to an early January draft wish list obtained by USNI News.
>
> While the list is not as official as the February 2016 Unfunded Priorities List from which it stems, it is meant to be a conversation-starter with Congress and the new Trump Administration on the Navy's needs for today and in the near term, a senior service official told USNI News on Tuesday. The main message of that conversation is that current readiness must be addressed first, with acquisitions wishes being addressed afterwards with whatever funding may remain, a senior Navy official told USNI News.
>
> "Our priorities are unambiguously focused on readiness—those things required to get planes in the air, ships and subs at sea, sailors trained and ready," the official said....
>
> The first section of the updated list addresses afloat readiness, which both the Navy and the new Trump Administration have said would be a primary focus of any FY 2017 supplemental....

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[42] Justin Doubleday, "Maintenance, Modernization Are Navy's Priorities Under Higher Topline," *Inside the Navy*, December 12, 2016.

[43] Hope Hodge Seck, "Navy to Trump Team: Fund Maintenance Before Buying New Ships," *DoD Buzz*, January 11, 2017.

[44] John Grady, "Navy to Trump: We Need Maintenance Funded Before New Ships," *USNI News*, January 11, 2017.

> More than $500 million for air operations and flying hours, as well as $339 million for ship operations and $647 for ship depot maintenance, sit atop the wish list. These items were included in the original UPL but have been prioritized first in this most recent version....
>
> Earlier this month Vice Chief of Naval Operations Adm. Bill Moran said that, while President Donald Trump had expressed interest in growing the Navy fleet, readiness needed to be a top priority before growing a larger fleet. "Deferred maintenance is insidiously taking its toll," he said, and "at some point, we have to dig ourselves out of the hole" that has been created from years of too little funding for operations and maintenance.[45]

Another January 24, 2017, press report similarly states:

> With no fiscal 2017 defense budget in sight and little chance of an agreement before April—if then—the military services are submitting second and possibly third rounds of unfunded requirements lists to Congress. The lists include items left out of the original budget requests, ranked in order of priority should Congress find a way to fund them.
>
> The latest list from the US Navy was sent to Congress Jan. 5, updating a similar list sent over at the end of February but rejiggered in light of the new 355-ship Force Structure Assessment, changes in requirements and the lateness of the fiscal year, which limit what can be done in the current budget. The new list also reflects what Navy leaders have been saying in recent weeks they need most—maintenance funding. While the late February list lead off with acquisition needs, the new top priorities include $2 billion in afloat readiness funding....
>
> The maintenance needs reflect Navy decisions in recent years to put off upkeep and protect long-term procurement accounts from successive cuts mandated by the Budget Control Act – also known as sequestration. But recent statements from top Navy brass underscore the need to restore maintenance money.
>
> "Our priorities are unambiguously focused on readiness -- those things required to get planes in the air, ships and subs at sea, sailors trained and ready," the Navy official declared. "No new starts."[46]

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

FY2018-FY2022 Five-Year Shipbuilding Plan

Table 4 shows the Navy's FY2018-FY2022 five-year shipbuilding plan, as assembled from data in the Navy's FY2018 budget-justification documentation. (For reference purposes, the table also shows figures for FY2017.) The figures shown for FY2018 reflect the Navy's announcement on May 24, 2017, that it was amending its budget submission to include two LCSs for FY2018, rather than the one LCS shown in the Navy's original budget submission, which was delivered on May 23, 2017.

As shown in **Table 4**, the Navy's proposed FY2018 budget, as amended on May 24, 2017, requests the procurement of nine new ships, including one Gerald R. Ford (CVN-78) class aircraft carrier, two Virginia-class attack submarines, two DDG-51 class destroyers, two Littoral Combat Ships (LCSs), one TAO-205 class oiler, and one towing, salvage, and rescue ship. With one

[45] Megan Eckstein, "Update to Navy Unfunded Priorities List Emphasizes Readiness; Would Add More Super Hornets, Additional Amphib," *USNI News*, January 24, 2017.

[46] Christopher P. Cavas, "Fix the Fleet! US Navy Makes Maintenance Top Priority," *Defense News*, January 24, 2017.

exception, these are the same ships that the Navy's FY2017 budget submission projected would be requested for FY2018. The exception is that the Navy's FY2017 budget submission projected an FY2018 request for one LCS rather than two (and consequently a total FY2018 request for eight new ships rather than nine).

DOD officials state that figures for FY2019-FY2022 in DOD's FY2018 budget submission are subject to change, pending the outcome of DOD's current defense strategy review, and consequently should be treated as something more akin to placeholder figures. Changes to FY2019-FY2022 figures resulting from the defense strategy review, they have stated, will be reflected in DOD's FY2019 budget submission.

Table 4. Navy FY2018-FY2022 Five-Year Shipbuilding Plan

(Battle force ships—i.e., ships that count against 308-ship goal; FY2017 figures shown for reference)

			Data for FY19-FY22 subject to change pending outcome of defense strategy review				
Ship type	**FY17**	**FY18 (req.)**	***FY19***	***FY20***	***FY21***	***FY22***	***FY18-FY22 Total***
Columbia (SSBN-826) class ballistic missile submarine					*1*		*1*
Gerald R. Ford (CVN-78) class aircraft carrier		1					*1*
Virginia (SSN-774) class attack submarine	2	2	*2*	*2*	*2*	*2*	*10*
Arleigh Burke (DDG-51) class destroyer	2	2	*2*	*2*	*2*	*2*	*10*
Littoral Combat Ship (LCS)/Frigate	3	2	*1*	*1*	*1*	*2*	*7*
LHA(R) amphibious assault ship	1						*0*
San Antonio (LPD-17) class amphibious ship	1						*0*
LX(R) amphibious ship				*1*		*1*	*2*
John Lewis (TAO-205) class oiler		1	*1*	*1*	*1*	*1*	*5*
Towing, salvage, and rescue ship (TATS)		1	*1*	*1*	*1*	*1*	*5*
TAGOS(X) ocean surveillance ship						*1*	*1*
Expeditionary Support Base (ESB) ship							*0*
TOTAL	***9***	***9***	***7***	***8***	***8***	***10***	***42***

Source: Table prepared by CRS based on FY2018 Navy budget submission.

FY2017-FY2046 30-Year Shipbuilding Plan

Table 5 shows the Navy's FY2017-FY2046 30-year shipbuilding plan, which was intended to support the Navy's previous 308-ship force-level objective.[47] 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.

[47] *Report to Congress on the Annual Long-Range Plan for Construction of Naval Vessels for Fiscal Year 2017*, April 2016, 14 pp., posted at *Politico Pro* (subscription required) on May 6, 2016, and at *USNI News* on May 9, 2016.

Table 5. Navy FY2017-FY2046 30-Year Shipbuilding Plan

FY	CVN	LSC	SSC	SSN	SSBN	AWS	CLF	Supt	Total
17		2	2	2		1			**7**
18	1	2	1	2			1	1	**8**
19		2	1	2			1	1	**7**
20		2	1	2		1	1	1	**8**
21		2	2	1	1		1	1	**8**
22		2	2	2		1	1	2	**10**
23	1	2	2	2		1	1	2	**11**
24		2	2	1	1	2	1	2	**11**
25		2	1	2		1	1	2	**9**
26		2		1	1	1	1	1	**7**
27		2		1	1	1	1	1	**7**
28	1	2		1	1	2	1		**8**
29		2	1	1	1	1	1	1	**8**
30		2		1	1	1	1	2	**8**
31		2	1	1	1	1	1	2	**9**
32		2	1	1	1	1	1	2	**9**
33	1	2	1	1	1		1	2	**9**
34		2	2	1	1			1	**7**
35		2	2	1	1				**6**
36		2	2	2		1			**7**
37		2	3	2					**7**
38	1	3	4	2					**10**
39		3	4	2					**9**
40		3	4	1		2			**10**
41		2	4	2					**8**
42		3	4	1		1			**9**
43	1	2	2	2			1		**8**
44		3	3	1		2			**9**
45		2	3	2		1	2		**10**
46		3	3	1		1	2		**10**
Total	6	66	58	44	12	23	21	24	**254**

Source: Table prepared by CRS based on Navy's FY2017-FY2046 30-year shipbuilding plan.

Key: FY = Fiscal Year; **CVN** = aircraft carriers; **LSC** = surface combatants (i.e., cruisers and destroyers); **SSC** = small surface combatants (i.e., Littoral Combat Ships [LCSs]); **SSN** = attack submarines; **SSGN** = cruise missile submarines; **SSBN** = ballistic missile submarines; **AWS** = amphibious warfare ships; **CLF** = combat logistics force (i.e., resupply) ships; **Supt** = support ships.

Projected Force Levels Under FY2017 30-Year Shipbuilding Plan

Table 6 shows a projection of ship force levels for FY2017-FY2046 that would result from implementing the FY2017-FY2046 30-year shipbuilding plan shown in **Table 5**. As noted in the previous section, the FY2017-FY2046 30-year shipbuilding plan was intended to support the Navy's previous 308-ship force-level goal.

Table 6. Projected Force Levels Resulting from FY2017-FY2046 30-Year Shipbuilding Plan

	CVN	LSC	SSC	SSN	SSGN	SSBN	AWS	CLF	Supt	Total
355-ship plan of 12/16	**12**	**104**	**52**	**66**	**0**	**12**	**38**	**32**	**39**	**355**
308-ship plan of 3/15	**11**	**88**	**52**	**48**	**0**	**12**	**34**	**29**	**34**	**308**
FY17	11	90	25	52	4	14	32	29	30	**287**
FY18	11	91	29	53	4	14	32	29	32	**295**
FY19	11	94	32	52	4	14	33	29	31	**300**
FY20	11	95	33	52	4	14	33	29	35	**306**
FY21	11	97	34	51	4	14	33	30	34	**308**
FY22	12	98	35	48	4	14	34	30	35	**310**
FY23	12	99	31	49	4	14	34	30	36	**309**
FY24	12	100	31	48	4	14	35	30	37	**311**
FY25	11	100	32	47	4	14	36	30	39	**313**
FY26	11	99	35	45	2	14	36	30	37	**309**
FY27	11	99	37	44	1	13	36	30	38	**309**
FY28	11	100	39	42		13	37	30	38	**310**
FY29	11	98	40	41		12	37	30	38	**307**
FY30	11	95	40	42		11	37	30	38	**304**
FY31	11	91	40	43		11	37	30	36	**299**
FY32	11	89	40	43		10	37	30	37	**297**
FY33	11	88	40	44		10	38	30	37	**298**
FY34	11	86	40	45		10	37	30	37	**296**
FY35	11	86	40	46		10	35	30	38	**296**
FY36	11	86	41	47		10	35	29	38	**297**
FY37	11	87	41	48		10	35	29	37	**298**
FY38	11	88	42	47		10	34	29	35	**296**
FY39	11	89	44	47		10	34	29	33	**297**
FY40	10	88	45	47		10	33	29	32	**294**
FY41	10	87	43	47		11	34	29	32	**293**
FY42	10	84	43	49		12	33	29	32	**292**
FY43	10	83	43	49		12	32	29	32	**290**
FY44	10	82	43	50		12	32	29	32	**290**
FY45	10	82	45	50		12	33	29	32	**293**
FY46	10	80	45	51		12	33	29	32	**292**

Source: Table prepared by CRS based on Navy's FY2017-FY2046 30-year 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; **CVN** = aircraft carriers; **LSC** = surface combatants (i.e., cruisers and destroyers); **SSC** = small surface combatants (i.e., frigates, Littoral Combat Ships [LCSs], and mine warfare ships); **SSN** = attack submarines; **SSGN** = cruise missile submarines; **SSBN** = ballistic missile submarines; **AWS** = amphibious warfare ships; **CLF** = combat logistics force (i.e., resupply) ships; **Supt** = support ships.

Issues for Congress for FY2018

Navy's New 355-Ship Force-Level Goal

Potential Oversight Questions

The Navy's new 355-ship force-level goal poses a number of potential oversight issues for Congress, including but not limited to the following:

- **Appropriateness of new 355-ship goal.** Is the Navy's new 355-ship force-level goal appropriate in terms of planned fleet size and composition, given current and projected strategic and budgetary circumstances? For further discussion of some elements of this issue, see the next section.
- **Potential impact of new national security and national military strategies.** As noted earlier, the 355-ship goal reflects the Obama Administration's national security strategy and national military strategy. How might the new national security strategy and national military strategy being developed by the Trump Administration affect the 355-ship goal?
- **Potential impact of fleet platform architecture studies.** The 355-ship goal does not address options presented in the fleet platform architecture studies directed by the FY2016 NDAA (see **Appendix F**). How might the results of those studies affect the 355-ship goal? For further discussion of this issue, see the fleet architecture part of the next section.
- **Affordability of 355-ship goal.** If defense spending in coming years is not increased above the caps established in the Budget Control Act of 2011, or BCA (S. 365/P.L. 112-25 of August 2, 2011), as amended, how much would achieving and maintaining a 355-ship fleet reduce funding levels for other DOD programs, and what would be the resulting net impact on U.S. military capabilities?
- **Potential for extending service lives and/or reactivating retired ships.** As noted earlier, the CRS and CBO estimates of the number of ships that would need to be added to the Navy's 30-year shipbuilding plan to achieve and maintain the Navy's 355-ship fleet assume no service life extensions of existing Navy ships, and no reactivations of retired Navy ships. How feasible and (if feasible) cost-effective might such service life extensions or reactivations be, and how might they affect the number of new ships that would need to be added to the Navy's 30-year shipbuilding plan to achieve and maintain a 355-ship fleet? How much could service life extensions and/or reactivations boost the size of the Navy in the nearer term, before new-built ships are able to finish construction and enter service?[48]
- **Industrial base capacity.** What are the potential industrial-base bottlenecks or risk areas of increasing shipbuilding to achieve and maintain the 355-ship fleet?

[48] As of September 27, 2016, the Navy's inactive fleet—sometimes referred to informally as the "mothball" fleet—included a total of 50 retired ships, including three Ticonderoga (CG-47) class Aegis cruisers, 22 Oliver Hazard Perry (FFG-7) class frigates, and nine LHA- and LPD-type amphibious ships. Most of the 50 ships in the Navy's inactive fleet were retired upon reaching the ends of their service lives. Many of them are currently designated for eventual sale or transfer to foreign countries, experimental use as targets in Navy ship-sinking exercises, or scrapping.

What investments in shipyard or supplier-firm capacity might be needed to support the additional shipbuilding capacity that would be needed to achieve the 355-ship fleet?

- **Manufacturing employment impact.** How many additional manufacturing (and other) jobs would be created by the additional shipbuilding work that would be needed to achieve and maintain the 355-ship fleet? How does Navy shipbuilding compare to other areas of defense acquisition or other types of federal expenditures in terms of numbers and types of manufacturing (and other) jobs created per dollar spent?

Appropriateness of 355-Ship Goal: Some Elements of the Discussion

Below are brief discussions of some elements of the discussion of the appropriateness of the Navy's new 355-ship force-level goal.

Changing Strategic Circumstances

Changes in strategic and budgetary circumstances in recent years have led to a broad debate over the future size and structure of the military, including the Navy. Regarding changing strategic circumstances, world events have led some observers, starting in late 2013, 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 and challenges to elements of the U.S.-led international order that has operated since World War II.[49] For further discussion of changes in strategic circumstances, see **Appendix A**. For additional discussion of the relationship between U.S. strategy and the size and structure of U.S. naval forces, see **Appendix K**.

Navy Planning Factors

The Navy's new 355-ship goal reflects a number of judgments and planning factors (some of which the Navy receives from the Office of the Secretary of Defense), including but not limited to the following:

- U.S. interests and the U.S. role in the world, and the U.S. military strategy for supporting those interests and that role;
- current and projected Navy missions in support of U.S. military strategy, including both wartime operations and day-to-day forward-deployed operations;
- technologies available to the Navy, and the individual and networked capabilities of current and future Navy ships and aircraft;
- current and projected capabilities of potential adversaries, including their anti-access/area-denial (A2/AD) capabilities;
- regional combatant commander (CCDR) requests for forward-deployed Navy forces;
- basing arrangements for Navy ships, including numbers and locations of ships homeported in foreign countries;

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

- maintenance and deployment cycles for Navy ships; and
- fiscal constraints.

Regarding regional combatant commander (CCDR) requests for forward-deployed Navy forces, as mentioned earlier, 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.[50] The difference between a fleet of 450 ships and the current goal for a fleet of 355 ships can be viewed as one measure of operational risk associated with the goal of a fleet of 355 ships. A goal for a fleet of 450 ships might be viewed as a fiscally unconstrained goal.

Fleet Architecture Studies and Proposed Navy Force Structures

Some observers, viewing advancements in technologies for networked operations and unmanned vehicles, have raised the issue of whether the U.S. Navy's current fleet architecture—meaning its current mix of ship types, and how those ships are combined to create Navy formations—should be altered in coming years to make greater use of such technologies:

- Observers viewing advancements in technologies for supporting networked operations speculate (or argue) that fully exploiting networked operations could (or should) lead to a new fleet architecture that incorporates a greater reliance on distributed sensor networks or an architecture that features ship designs that distribute ship-based sensors and weapon launchers across the fleet in a different pattern from today's ship designs.
- Observers viewing developments in technologies for unmanned air, surface, and underwater vehicles speculate (or argue) that fully exploiting unmanned vehicles that are launched from Navy ships—including vehicles capable of autonomous operations, and vehicles launched in large numbers to operate as coordinated "swarms"—might (or should) lead to new or modified ship designs, and that larger unmanned vehicles with longer cruising ranges that are launched directly from pier (sometimes referred to as unmanned ships) might in the future carry out certain missions currently performed by manned Navy ships.[51]

Other observers, viewing China's maritime anti-access/area-denial (A2/AD) forces, have raised the question of whether the U.S. Navy should respond by shifting over time to a more highly distributed fleet architecture featuring a reduced reliance on aircraft carriers and other large ships and an increased reliance on smaller ships. The question of whether the U.S. Navy concentrates too much of its combat capability in a relatively small number of high-value units, and whether it should shift over time to a more highly distributed fleet architecture, has been debated at various

[50] 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.

[51] See, for example, Megan Eckstein, Board Recommends Further Use Of Autonomy In Sea Control, Support Of Ground Troops, *USNI News*, August 24, 2016; Sandra I. Erwin, "Crewless Ships in the Navy: Not If, But When," *National Defense*, August 14, 2016; Kris Osborn, "New Evolving Navy Drone Strategy Envisions More Autonomy, Faster Processing," *Scout Warrior*, June 9, 2016.James Hasik, "DARPA's New Robotic Frigate Might Seriously Change Naval Warfare," *Real Clear Defense*, April 14, 2016; Harry J. Kazianis, "Get Ready, China: Tech Breakthrough Could Turn U.S. Subs into Carriers," *National Interest*, March 2,2 2014; Megan Eckstein, "Navy: Future Undersea Warfare Will Have Longer Reach, Operate With Network of Unmanned Vehicles," *USNI News*, March 24, 2016.

times over the years, in various contexts. The issue was examined, for example, in a report by DOD's Office of Force Transformation (OFT) that was submitted to Congress in 2005.[52]

Supporters of shifting to a more highly distributed fleet architecture argue that the Navy's current architecture, including its force of large aircraft carriers, in effect puts too many of the Navy's combat-capability eggs into a relatively small number of baskets on which an adversary can concentrate its surveillance and targeting systems and its anti-ship weapons. They argue that although a large Navy aircraft carrier can absorb hits from multiple conventional weapons without sinking, a smaller number of enemy weapons might cause damage sufficient to stop the carrier's aviation operations, thus eliminating the ship's primary combat capability and providing the attacker with what is known as a "mission kill." A more highly distributed fleet architecture, they argue, would make it more difficult for China to target the Navy and reduce the possibility of the Navy experiencing a significant reduction in combat capability due to the loss in battle of a relatively small number of high-value units.

Opponents of shifting to a more highly distributed fleet architecture argue that large carriers and other large ships are not only more capable, but proportionately more capable, than smaller ships, that larger ships are capable of fielding highly capable systems for defending themselves, and that they are much better able than smaller ships to withstand the effects of enemy weapons, due to their larger size, extensive armoring and interior compartmentalization, and extensive damage-control systems. A more highly distributed fleet architecture, they argue, would be less capable or more expensive than today's fleet architecture. Opponents of shifting to a more highly distributed fleet architecture could also argue that the Navy has already taken important steps toward fielding a more distributed fleet architecture through its plan to acquire 40 LCSs and 11 EPFs, and through the surface fleet's recently announced concept of distributed lethality, under which offensive weapons are to be distributed more widely across all types of Navy surface ships and new operational concepts for Navy surface ship formations are to be implemented.[53]

Section 1067 of the FY2016 National Defense Authorization Act (S. 1356/P.L. 114-92 of November 25, 2015) required the Secretary of Defense to provide for three independent studies on alternative fleet platform architectures for the Navy in the 2030 time frame, and to submit the results of each study to the congressional defense committees. The three studies were completed in 2016 and reviewed at a March 8, 2017, hearing before the Seapower and Projection Forces

[52] OFT's report, along with two other reports on Navy fleet architecture that were submitted to Congress in 2005, are discussed at length in CRS Report RL33955, *Navy Force Structure: Alternative Force Structure Studies of 2005—Background for Congress*, by (name redacted) . See also Wayne P. Hughes Jr., *The New Navy Fighting Machine: A Study of the Connections Between Contemporary Policy, Strategy, Sea Power, Naval Operations, and the Composition of the United States Fleet*, Monterey (CA), Naval Postgraduate School, August 2009, 68 pp.

[53] Navy surface fleet leaders announced the distributed lethality concept in early 2015. The aim of distributed lethality is to boost the surface fleet's capability for attacking enemy ships and make it less possible for an enemy to cripple the U.S. fleet by concentrating its attacks on a few very-high-value Navy surface ships (particularly the Navy's aircraft carriers). See Thomas Rowden, Peter Gumataotao, and Peter Fanta, "Distributed Lethality," *U.S. Naval Institute Proceedings*, January 2015: 18-23; Sam LaGrone, "SNA: Navy Surface Leaders Pitch More Lethal Ships, Surface Action Groups," *USNI News*, January 14, 2015; Kris Osborn, "Navy Unveils New Surface Warfare Strategy," *Military.com*, January 14, 2015; Sydney J. Freedberg Jr., "'If It Floats, It Fights,': Navy Seeks 'Distributed Lethality,'" *Breaking Defense*, January 14, 2015; Mike McCarthy and Megan Eckstein, "Navy Eyeing A 'Hunter Killer' Surface Fleet, Would Require Upgunning Existing Ship Fleets," *Defense Daily*, January 15, 2015: 1-3; Richard Scott, "Offensive Language: USN Sets Out Surface Firepower Strategy," *Jane's International Defence Review*, May 2015: 42-47; Megan Eckstein, "Navy Studying Implications of Distributed Lethality in Wargames Series," *USNI News*, July 9, 2015; Lara Seligman, "Navy Establishes Task Force To Study Impact of Distributed lethality," *Inside the Navy*, July 10, 2015.

subcommittee of the House Armed Services Committee. The results of the three studies are summarized in **Appendix F**. The Navy states that the FSA that led to the 355-ship plan

> assumes that the future plans for our Navy, in ship types and numbers of ships, continues to replace the ships we have today with ships of similar capability and in similar numbers as we transition to the future Navy—it does not address potential options that may come out of the ongoing review of the potential Future Fleet Architecture studies that were directed by Congress [in the FY2016 NDAA] and completed in October 2016. As we evaluate the options presented in these studies and move to include them in our plans for tomorrow's Navy, this FSA will need to be updated to reflect those changes that are determined to be most beneficial to meeting the Navy's missions of the future.[54]

Other study groups over the years have made their own proposals for Navy ship force structure that reflect their own perspectives on various issues that can affect Navy force structure. **Appendix G** presents some of these proposals. The proposals shown in **Appendix G** were all 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 to a new and different strategic situation that features, among other things, renewed great power competition and challenges to elements of the U.S.-led international order that has operated since World War II.

Section 128(d) of the FY2015 National Defense Authorization Act (NDAA) (S. 1356/P.L. 114-92 of November 25, 2015) requires the Secretary of the Navy to submit a report on potential requirements, capabilities, and alternatives for the future development of aircraft carriers that would replace or supplement the new Gerald R. Ford (CVN-78) class aircraft carrier. Depending on its findings or recommendations, it is possible that this report could lead to a change in aircraft carrier design that might in turn lead to a change in fleet architecture.

For an excerpt from a 2014 journal article that provides further discussion of the issue of future Navy fleet architecture, see **Appendix I**.

Budgetary Context: Potential Impact on Size and Capability of Navy of Limiting DOD Spending to BCA Caps Through FY2021

Navy officials stated in 2015 that limiting DOD spending through FY2021 to levels at or near the caps established in the Budget Control Act of 2011 (BCA) as amended would lead to a smaller and less capable Navy that would not be capable of fully executing all the missions assigned to it under the defense strategic guidance document of 2012. For additional details, see **Appendix J**.

FY2018 Shipbuilding Funding Requests

One issue for Congress relating to the Navy's FY2018 shipbuilding budget request is whether to approve, reject, or modify the Navy's FY2018 funding requests for its various shipbuilding programs. In assessing this question, Congress may consider various factors. One is whether the Navy has accurately priced the work to be funded in FY2018. Another is whether to begin building toward the Navy's 355-ship force-level goal in FY2018, or instead wait until FY2019 or a subsequent fiscal year to begin such a buildup.

DOD officials have stated that DOD's proposed FY2018 budget focuses on addressing readiness issues, and that actions to begin building up the size of the military were deferred to FY2019,

[54] U.S. Navy, *Executive Summary, 2016 Navy Force Structure Assessment (FSA)*, December 15, 2016, p. 1.

pending the outcome of DOD's current defense strategy review. If policymakers were to decide to begin building toward the Navy's 355-ship force-level goal in FY2018, there would be several potential options for adding to the Navy's proposed FY2018 shipbuilding budget, including but not limited to the following:

- providing advance procurement (AP) funding in FY2018 for the aircraft carrier CVN-81, so as to start building the carrier force toward the Navy's 12-carrier force-level goal by accelerating the procurement of CVN-81 from FY2023 to an earlier year; and/or enable a block buy contract or combined material buy for the aircraft carriers CVN-80 and CVN-81;
- providing procurement and/or advance procurement (AP) funding in FY2018 for the procurement of one or more additional Virginia-class submarines in FY2018-FY2021, so as to start building the attack submarine force toward the Navy's 66-boat force-level goal and/or mitigate a valley in attack submarine force levels projected for the mid-2020s to the mid-2030s;
- fully or partially funding the procurement of one or two additional DDG-51 class destroyers in FY2018 (i.e., procure a total of three or four destroyers in FY2018), so as to start building the cruiser-destroyer force toward the Navy's 104-ship large surface combatant (i.e., cruiser-destroyer) force-level goal;
- fully or partially funding the procurement of one or two additional LCSs in FY2018 (i.e., procure a total of three or four LCSs in FY2018), so as to accelerate the attainment of the Navy's 52-ship small surface combatant (i.e., LCS-frigate) force-level goal;
- fully or partially funding the procurement of an additional LPD-17 class amphibious ship in FY2018, so as to further close a gap between the end of LPD-17 class amphibious ship procurement and the start of LX(R) amphibious ship procurement, and/or accelerate the attainment of the Navy's 38-ship amphibious ship force-level goal;
- funding the procurement of an additional TAO-205 class oiler in FY2018 (i.e., procure a total of two oilers in FY2018), so as to accelerate the attainment of the Navy's 20-ship oiler force-level objective; and
- funding the procurement of an Expeditionary Support Base (ESB) ship (i.e., a ship previously known as an Afloat Forward Staging Base, or AFSB), so as to accelerate the attainment of the Navy's six-ship force-level objective for ESBs.

In a situation of constraints on FY2018 defense spending, pursuing one or more of the options above could require making offsetting reductions in FY2018 funding for DOD programs, potentially reducing DOD capabilities in other areas.

Affordability of 30-Year Shipbuilding Plan

Another issue for Congress concerns the prospective affordability of the Navy's 30-year shipbuilding plan. The affordability of the Navy's 30-year shipbuilding plan has been an annual oversight issue in recent years. In assessing the prospective affordability of the 30-year plan, key factors that Congress may consider include estimated ship procurement costs and future shipbuilding funding levels. Each of these is discussed below.

Estimated Ship Procurement Costs

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 the 30-year shipbuilding plan will not be sufficient to procure all the ships shown in the 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 (Ohio-replacement) ballistic missile submarines (SSBNXs), the Flight III version of the DDG-51 destroyer, the John Lewis (TAO-205) class oiler, and the LX(R) amphibious ship.

As shown in **Table 7**, the Navy estimates that the FY2017 30-year shipbuilding plan, which was intended to support the Navy's previous 308-ship force-level goal, would cost an average of about $17.0 billion per year in constant FY2016 dollars to implement, including an average of about $15.0 billion per year during the first 10 years of the plan, an average of about $18.6 billion per year during the middle 10 years of the plan, and an average of about $17.1 billion per year during the final 10 years of the plan.

As also shown in **Table 7**, CBO estimates that the plan would require 11.1% more funding to implement than the Navy estimates, including 2% more than the Navy estimates during the first 10 years of the plan, 5.9% more than the Navy estimates during the middle 10 years of the plan, and 14.6% more than the Navy estimates during the final 10 years of the plan.[55] Over the years, CBO's estimates of the cost to implement the Navy's 30-year shipbuilding plan have generally been higher than the Navy's estimates.

Some of the difference between CBO's estimates and the Navy's estimates is due to a difference between CBO and the Navy in how to treat inflation in Navy shipbuilding. 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 and further apart as one proceeds from the earlier years of the plan to the later years of the plan.

The shipbuilding program that contributes the most to the difference between the CBO and Navy estimates of the cost of the FY2017 30-year plan is a future large surface combatant (i.e., a cruiser- or destroyer-type ship) that appears in the final 17 years of the 30-year plan. As shown in the CBO report, this one program accounts for 26% of the total difference between CBO and the Navy on the estimated cost implement the FY2016 30-year shipbuilding plan.[56] The next-largest contributor to the overall difference is the Columbia-class ballistic missile submarine program, which accounts for 18%, followed by a future class of small surface combatants (i.e., a frigate-

[55] Congressional Budget Office, *An Analysis of the Navy's Fiscal Year 2016 Shipbuilding Plan*, Table 4 on p. 13.

[56] The relatively large contribution of the future large surface combatant to the overall difference between CBO and the Navy on the cost of the FY2017 30-year shipbuilding plan appears to be due primarily to three factors:

(1) There are many of these ships in the FY2017 30-year plan—a total of 40, or about 16% of the 254 total ships in the plan.

(2) There may be a difference between CBO and the Navy over the likely size (and thus cost) of this ship. The Navy may assume the ship will use a hull closer in size to the hull of the current DDG-51 design, whereas CBO may assume a hull size that is somewhat larger than that.

(3) These destroyers occur in the final 17 years of the FY2017 30-year plan, where the effects of the difference between CBO and the Navy on how to treat inflation in Navy shipbuilding are the more pronounced.

type ship), which accounts for 16%.[57] Together, these three programs account for 60% of the total difference between CBO and the Navy.

Table 7. Navy and CBO Estimates of Cost of 30-Year Shipbuilding Plan

Funding for new-construction ships, in billions of constant FY2016 or FY2015 dollars

	First 10 years of the plan	Middle 10 years of the plan	Final 10 years of the plan	Entire 30 years of the plan
FY2017 (FY2017-FY2046) 30-Year Shipbuilding Plan (constant FY2016 dollars)				
Navy estimate	15.0	18.6	17.1	17.0
CBO estimate	15.3	19.7	19.6	18.9
% difference between Navy and CBO estimates	2.0%	5.9%	14.6%	11.1%
FY2016 (FY2016-FY2045) 30-Year Shipbuilding Plan (constant FY2015 dollars)				
Navy estimate	16.9	17.2	15.2	16.5
CBO estimate	18.2	19.2	17.8	18.4
% difference between Navy and CBO estimates	7.7%	11.6%	17.1%	11.5%

Source: For FY2017 30-year plan: Congressional Budget Office, *An Analysis of the Navy's Fiscal Year 2017 Shipbuilding Plan*, February 2017, Table 4 on p. 12. For FY2016 30-year plan: Congressional Budget Office, *An Analysis of the Navy's Fiscal Year 2016 Shipbuilding Plan*, Table 4 on p. 13.

Future Shipbuilding Funding Levels

In large part due to the statutory requirement for the Navy to annually submit a report on its 30-year shipbuilding plan, it has been known for years that fully implementing the 30-year shipbuilding plan would require shipbuilding budgets in coming years that are considerably greater than those of recent years, and that funding requirements for the Columbia-class (i.e., Ohio-replacement, or OR) ballistic missile submarine (SSBN) program will put particular pressure on the shipbuilding budget during the middle years of the 30-year plan. The Navy's report on the FY2016 30-year plan states:

> Within the Navy's traditional Total Obligation Authority (TOA), and assuming that historic shipbuilding resources continue to be available, the OR SSBN would consume about half of the shipbuilding funding available in a given year – and would do so for a period of over a decade. The significant drain on available shipbuilding resources would manifest in reduced procurement quantities in the remaining capital ship programs. Therefore, additional resources for shipbuilding will likely be required during this period.
>
> Since the CVN funding requirements are driven by the statutory requirement to maintain eleven CVNs, and accounting for one OR SSBN per year (starting in FY2026), there would only be about half of the resources normally available to procure the Navy's remaining capital ships. At these projected funding levels, Navy would be limited to on average, as few as two other capital ships (SSN, DDG, CG, LPD, LHA, etc.) per year throughout this decade. In assessing the Navy's ability to reach the higher annual shipbuilding funding levels described above, one perspective is to note that doing so would require the shipbuilding budget to be increased by 30% to 50% from levels in

[57] Congressional Budget Office, *An Analysis of the Navy's Fiscal Year 2016 Shipbuilding Plan*, October 2015, Table B-1 on page 35.

> recent years. In a context of constraints on defense spending and competing demands for defense dollars, this perspective can make the goal of increasing the shipbuilding budget to these levels appear daunting....
>
> The cost of the OR SSBN is significant relative to the resources available to DON in any given year. At the same time, the DON will have to address the block retirement of ships procured in large numbers during the 1980s, which are reaching the end of their service lives. The convergence of these events prevents DON from being able to shift resources within the shipbuilding account to accommodate the cost of the OR SSBN.
>
> If DON funds the OR SSBN from within its own resources, OR SSBN construction will divert funding from construction of other ships in the battle force such as attack submarines, destroyers, aircraft carriers and amphibious warfare ships. The resulting battle force will not meet the requirements of the Force Structure Assessment (FSA), National Security Strategy, or the Quadrennial Defense Review (QDR). Additionally, there will be significant impact to the shipbuilding industrial base.[58]

The Navy's report on the FY2017 30-year plan states:

> In order to procure [the Ohio replacement boats] without impacting remaining procurement plans, the Navy will continue to need increases in [its budget] topline beyond the FYDP, not unlike those that occurred during construction of the Ohio class in the 1980's....
>
> There are two significant challenges to resourcing the DoN shipbuilding program. First will be funding and delivering the OR SSBN and second addressing the number of ship and submarine retirements as they reach the end of their service lives. The DoN contents that the only way to effectively overcome these challenges while supporting the defense strategy is with increases in DoN top-line funding commensurate with the funding required to procure the OR SSBN and executing the phased maintenance plan for the CGs [cruisers].[59]

The amount of additional shipbuilding funding that would be needed in coming years to fully implement the Navy's 30-year shipbuilding plan, compared to recent levels of shipbuilding funding—an average of about $4.5 billion per year[60]—can be characterized in at least two ways. One is to note that this figure would equate to a roughly one-third increase in the shipbuilding budget above historical levels. Another is to note that this same amount of additional funding would equate to less than 1% of DOD's annual budget.

Legislative Activity for FY2018

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:

[58] U.S. Navy, *Report to Congress on the Annual Long-Range Plan for Construction of Naval Vessels for Fiscal Year 2016*, March 2015, pp. 7, 13-14.

[59] *Report to Congress on the Annual Long-Range Plan for Construction of Naval Vessels for Fiscal Year 2017*, April 2016, pp. 5 and 7.

[60] Congressional Budget Office, *An Analysis of the Navy's Fiscal Year 2016 Shipbuilding Plan*, October 2015, p. 3.

- CRS Report RS20643, *Navy Ford (CVN-78) Class Aircraft Carrier Program: Background and Issues for Congress*, by (name redacted) .
- CRS Report R41129, *Navy Columbia Class (Ohio Replacement) Ballistic Missile Submarine (SSBN[X]) Program: Background and Issues for Congress*, by (name r edacted) .
- CRS Report RL32418, *Navy Virginia (SSN-774) Class Attack Submarine Procurement: 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 RL33741, *Navy Littoral Combat Ship/Frigate (LCS/FF) Program: Background and Issues for Congress*, by (name redacted) .
- CRS Report R43543, *Navy 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 FY2018 Funding Request

The Navy's proposed FY2018 budget, as amended on May 24, 2017 (with supporting documentation for that amendment provided on June 29, 2017), requests the procurement of nine new ships, including:

- 1 Gerald R. Ford (CVN-78) class aircraft carrier,
- 2 Virginia (SSN-774) class attack submarines,
- 2 Arleigh Burke (DDG-51) class destroyers,
- 2 Littoral Combat Ships (LCSs),
- 1 John Lewis (TAO-205) class oiler, and
- 1 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 8 summarizes congressional action on the Navy's FY2018 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. Some things to note about the table:

- The amount shown in the table as requested for the LCS program (line 011) ($1,136.1 million) and the total requested amount shown at the bottom of the table ($20,403.6 million) reflect the Navy's May 24, 2017, announced amendment to its proposed FY2018 budget and a June 29, 2017, Administration budget amendment document detailing the resulting changes to its proposed

FY2018 budget. The changes increase the requested amount in line 011 and the requested total shown at the bottom by $499.9 million.[61]

- The HASC, SASC, and HAC reports on the FY2018 National Defense Authorization Act and FY2018 DOD appropriations Act use the Navy's pre-amendment (i.e., May 23, 2017) budget submission, which requests one LCS for $636.1 million. In **Table 8** below, however, the HASC-, SASC-, and HAC-recommended changes to line 011 are calculated against the amended budget request for two LCSs at a combined cost of $1,136.1 million. For example, the HAC report recommends procuring three LCSs at a combined cost of $1,567.0 million. The HAC report shows this as an increase of $930.8 million over the originally requested figure of $636.1 million. **Table 8** below, however, shows it as an increase of $430.9 million over the amended requested figure of $1.136.1 million.
- HASC funding changes are the combined result of figures shown on pages 377-378 (procurement) and 419-420 (procurement for overseas contingency operations for base requirements) of H.Rept. 115-200 of July 6, 2017, on H.R. 2810.
- The funding line for ESB (formerly AFSB)—line 014—is shown in the SASC report (S.Rept. 115-125 of July 10, 2017) as line 030.
- HAC funding figures do not include any additional funding for shipbuilding programs that may result from $12,622.9 million (i.e., about $12.6 billion) in DOD procurement funding included in the National Defense Restoration Fund. Line-item allocations for this $12.6-billion fund are to be determined after the Administration submits a new national defense strategy. (See pages 4-5 and 208 of H.Rept. 115-219 of July 13, 2017, on H.R. 3219.)

[61] The Navy's original FY2018 budget, submitted on May 23, 2017, requested procurement of one LCS for $636.146 million. On May 24, 2017, the Navy announced that it was amending its proposed FY2018 budget to request the procurement of two LCSs rather than one. Navy officials originally stated that an additional $541 million would be needed to convert the proposed FY2018 LCS procurement from a one-ship buy into a two-ship buy. The June 29, 2017, budget amendment document states that the increase is actually $499.925 million. The budget amendment document proposes offsets for this additional $499.925 million that come from Navy budget accounts other than the Navy's shipbuilding account, including the following:

- $100 million from the Aircraft Procurement, Navy (APN) account, reducing funding for the F/A-18 Infrared Search and Track (IRST) program due to the cancellation of procurement of an earlier version of the IRST system while continuing with plans for procuring a later and more advanced version;
- $374.9 million from the Other Procurement, Navy (OPN) account, reducing funding by
  - $325 million for the procurement of a Nimitz-class aircraft carrier reactor fuel core for a future mid-life refueling overhaul of a Nimitz-class carrier;
  - $40 million for the modernization of an amphibious ship, reflecting recently identified opportunities to save on contract costs; and
  - $10 million for the SPQ-9B radar program that is available due to program under-execution; and
- $25 million from the Navy's research and development account, reducing funding for Navy energy activities, due to a change in program strategy that maintains energy funding at previous execution levels.

Table 8. Summary of Congressional Action on FY2018 Funding Request

(Millions of dollars, rounded to nearest tenth; totals may not add due to rounding; *request column reflects June 29 Administration budget amendment document increasing by $499.9 million the amount requested in Line 011 [LCS] and the total shown at bottom*)

			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	842.9						
002	CVN-78	4,441.8	-700.0	-300.0		-11.1		
003	CVN-78 AP	0	+200.0					
004	Virginia class	3,305.3	+943.0					
005	Virginia class AP	1,920.6		+1,173.0				
006	CVN refueling overhaul	1,604.9	-423.3			-35.2		
007	CVN refueling overhaul AP	75.9						
008	DDG-1000	224.0		-50.0		-59.0		
009	DDG-51	3,499.1	+1,896.8	+1,559.0				
010	DDG-51 AP	90.3	+45.0	+300.0				
011	LCS	1,136.1	+533.1	-540.0		+430.9		
012	LX(R)	0		+1,000.0				
012A	LX(R) AP	0	+100.0					
013	LPD-17	0	+1,786.0					
014	ESB (formerly AFSB)	0	+635.0	+661.0		+635.0		
015	LHA-8	1,710.9	-500.0			-15.9		
016	LHA-8 AP	0						
017	EPF (formerly JHSV)	0						
018	TAO-205 (formerly TAO[X])	466.0				-16.6		
019	TAO-205 AP	75.1						
020	TATS	76.2						
021	Moored training ship	0						
022	Moored training ship AP	0						
023	LCU 1700 landing craft	31.9						
024	Outfitting	548.7		-38.2		-6.1		
025	Ship to Shore Connector	212.6	+312.0	+297.0		+178.0		
026	Service craft	24.0	+39.0	+39.0				
027	LCAC SLEP	0						
028	YP craft	0						
029	Completion of prior-year shipbuilding programs	117.5						
032	Cable ship	0		+250.0				
TOTAL		**20,403.6**	**+4,866.6**	**+4,350.8**		**+1,100.0**		

Source: Table prepared by CRS based on Navy FY2018 budget submission, June 29, 2017, Administration budget amendment document, and committee reports on the FY2018 National Defense Authorization Act and FY2018 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.

The amount shown in the table as requested for the LCS program (line 011) ($1,136.1 million) and the total requested amount shown at the bottom of the table ($20,403.6 million) reflect the Navy's May 24, 2017, announced amendment to its proposed FY2018 budget and a June 29, 2017, Administration budget amendment document detailing the resulting changes to its proposed FY2018 budget. The changes increase the requested amount in line 011 and the requested total shown at the bottom by $499.9 million.
The HASC, SASC, and HAC reports on the FY2018 National Defense Authorization Act and FY2018 DOD appropriations Act use the Navy's pre-amendment (i.e., May 23, 2017) budget submission, which requests one LCS for $636.1 million. In the table above, however, the HASC-, SASC-, and HAC-recommended changes to line 011 are calculated against the amended budget request for two LCSs at a combined cost of $1,136.1 million. For example, the HAC report recommends procuring three LCSs at a combined cost of $1,567.0 million. The HAC report shows this as an increase of $930.8 million over the originally requested figure of $636.1 million. The table above, however, shows it as an increase of $430.9 million over the amended requested figure of $1.136.1 million.
HASC funding changes are the combined result of figures shown on pages 377-378 (procurement) and 419-420 (procurement for overseas contingency operations for base requirements) of H.Rept. 115-200 of July 6, 2017, on H.R. 2810.
The funding line for ESB (formerly AFSB)—line 014—is shown in the SASC report (S.Rept. 115-125 of July 10, 2017) as line 030.
HAC funding changes do not include any additional funding for shipbuilding programs that may result from $12,622.9 million (i.e., about $12.6 billion) in DOD procurement funding included in the National Defense Restoration Fund. Line-item allocations for this $12.6 billion are to be determined after the Administration submits a new national defense strategy. (See pages 4-5 and 208 of H.Rept. 115-219 of July 13, 2017, on H.R. 3219.)

FY2018 National Defense Authorization Act (H.R. 2810/S. 1519)

House

The House Armed Services Committee, in its report (H.Rept. 115-200 of July 6, 2017) on H.R. 2810, recommends the funding levels for shipbuilding programs shown in the HASC column of **Table 8**. These recommended funding levels are the combined result of figures shown on pages 377-378 (procurement) and 419-420 (procurement for overseas contingency operations for base requirements) of H.Rept. 115-200. Among other things, H.Rept. 115-200 recommends funding for:

- 1 additional DDG-51 class destroyer;
- 1 additional LCS (for a total of 3 LCSs, compared to 2 LCSs in the Navy's amended budget request);
- 1 additional LPD-17 class amphibious ship;
- 1 additional Expeditionary Support Base (ESB) ship; and
- 5 additional Ship-to-Shore Connector (SSC) landing craft.
- **Section 121(b)** of H.R. 2810 as reported states:

  SEC. 121. Aircraft carriers

  ...

  (b) Increase in number of operational aircraft carriers.—

  (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, 2023.

Section 127(a) of H.R. 2810 as reported states:

SEC. 127. Extensions of authorities relating to construction of certain vessels.

(a) Extension of authority to use incremental funding for LHA Replacement.—Section 122(a) of the National Defense Authorization Act for fiscal year 2017 (114–328; 130 Stat. 2030) is amended by striking "for fiscal years 2017 and 2018" and inserting "for fiscal years 2017, 2018, and 2019".

Section 1015 of H.R. 2810 as reported states:

SEC. 1015. Availability of funds for retirement or inactivation of Ticonderoga-class cruisers or dock landing ships.

None of the funds authorized to be appropriated by this Act or otherwise made available for the Department of Defense for fiscal year 2018 may be obligated or expended—

(1) to retire, prepare to retire, or inactivate a cruiser or dock landing ship; or

(2) to place more than six cruisers and one dock landing ship in the modernization program under section 1026(a)(2) of the Carl Levin and Howard P. "Buck" McKeon National Defense Authorization Act for Fiscal Year 2015 (Public Law 113–291; 128 Stat. 3490).

Section 1016 of H.R. 2810 as report states:

SEC. 1016. Policy of the United States on minimum number of battle force ships.

It shall be the policy of the United States to have available, as soon as practicable, not fewer than 355 battle force ships, with funding subject to the annual authorization of appropriation and the annual appropriation of funds.

Section 1035 of H.R. 2810 as reported states:

SEC. 1035. Prohibition on use of funds for retirement of legacy maritime mine countermeasures platforms.

(a) Prohibition.—Except as provided in subsection (b), the Secretary of the Navy may not obligate or expend funds to—

(1)) retire, prepare to retire, transfer, or place in storage any AVENGER-class mine countermeasures ship or associated equipment;

(2) retire, prepare to retire, transfer, or place in storage any SEA DRAGON (MH–53) helicopter or associated equipment;

(3) make any reductions to manning levels with respect to any AVENGER-class mine countermeasures ship; or

(4) make any reductions to manning levels with respect to any SEA DRAGON (MH–53) helicopter squadron or detachment.

(b) Waiver.—The Secretary of the Navy may waive the prohibition under subsection (a) if the Secretary certifies to the congressional defense committees that the Secretary has—

(1) identified a replacement capability and the necessary quantity of such systems to meet all combatant commander mine countermeasures operational requirements that are currently being met by any AVENGER-class ship or SEA DRAGON helicopter to be retired, transferred, or placed in storage;

(2) achieved initial operational capability of all systems described in paragraph (1); and

(3) deployed a sufficient quantity of systems described in paragraph (1) that have achieved initial operational capability to continue to meet or exceed all combatant commander mine countermeasures operational requirements currently being met by the

AVENGER-class ships and SEA DRAGON helicopters to be retired, transferred, or placed in storage.

Section 1257 of H.R. 2810 as reported states:

SEC. 1257. Sense of Congress on enhancing maritime capabilities.

Congress notes the 2016 Force Structure Assessment (FSA) that increased the requirement for fast attack submarine (SSN) from 48 to 66 and supports an acquisition plan that enhances maritime capabilities that address this requirement.

Section 3116 of H.R. 2810 as reported states:

SEC. 3116. Research and development of advanced naval reactor fuel based on low-enriched uranium.

(a) Prohibition on availability of funds for fiscal year 2018.—

(1) RESEARCH AND DEVELOPMENT.—Except as provided by paragraph (2), none of the funds authorized to be appropriated by this Act or otherwise made available for fiscal year 2018 for the Department of Energy or the Department of Defense may be obligated or expended to plan or carry out research and development of an advanced naval nuclear fuel system based on low-enriched uranium.

(2) EXCEPTION.—Of the funds authorized to be appropriated by this Act or otherwise made available for fiscal year 2018 for defense nuclear nonproliferation, as specified in the funding table in division D—

(A) $5,000,000 shall be made available to the Deputy Administrator for Naval Reactors of the National Nuclear Security Administration for low-enriched uranium activities (including downblending of high-enriched uranium fuel into low-enriched uranium fuel, research and development using low-enriched uranium fuel, or the modification or procurement of equipment and infrastructure related to such activities) to develop an advanced naval nuclear fuel system based on low-enriched uranium; and

(B) if the Secretary of Energy and the Secretary of the Navy determine under section 3118(c)(1) of the National Defense Authorization Act for Fiscal Year 2016 (Public Law 114–92; 129 Stat. 1196) that such low-enriched uranium activities and research and development should continue, an additional $30,000,000 may be made available to the Deputy Administrator for such purpose.

(b) Prohibition on availability of funds regarding certain accounts and purposes.—

(1) RESEARCH AND DEVELOPMENT AND PROCUREMENT.—Chapter 633 of title 10, United States Code, is amended by adding at the end the following new section:

"§ 7319. Requirements for availability of funds relating to advanced naval nuclear fuel systems based on low-enriched uranium

"(a) Authorization.—Low-enriched uranium activities may only be carried out using funds authorized to be appropriated or otherwise made available for the Department of Energy for atomic energy defense activities for defense nuclear nonproliferation.

"(b) Prohibition regarding certain accounts.— (1) None of the funds described in paragraph (2) may be obligated or expended to carry out low-enriched uranium activities.

"(2) The funds described in this paragraph are funds authorized to be appropriated or otherwise made available for any fiscal year for any of the following accounts:

"(A) Shipbuilding and conversion, Navy, or any other account of the Department of Defense.

"(B) Any account within the atomic energy defense activities of the Department of Energy other than defense nuclear nonproliferation, as specified in subsection (a).

"(3) The prohibition in paragraph (1) may not be superseded except by a provision of law that specifically supersedes, repeals, or modifies this section. A provision of law, including a table incorporated into an Act, that appropriates funds described in paragraph (2) for low-enriched uranium activities may not be treated as specifically superseding this section unless such provision specifically cites to this section.

"(c) Low-enriched uranium activities defined.—In this section, the term 'low-enriched uranium activities' means the following:

"(1) Planning or carrying out research and development of an advanced naval nuclear fuel system based on low-enriched uranium.

"(2) Procuring ships that use low-enriched uranium in naval nuclear propulsion reactors.".

(2) CLERICAL AMENDMENT.—The table of sections at the beginning of such chapter is amended by adding at the end the following new item:

"7319. Requirements for availability of funds relating to advanced naval nuclear fuel systems based on low-enriched uranium".

(c) Reports.—

(1) SSN(X) SUBMARINE.—Not later than 180 days after the date of the enactment of this Act, the Secretary of the Navy and the Deputy Administrator for Naval Reactors shall jointly submit to the Committees on Armed Services of the House of Representatives and the Senate a report on the cost and timeline required to assess the feasibility, costs, and requirements for a design of the Virginia-class replacement nuclear attack submarine that would allow for the use of a low-enriched uranium fueled reactor, if technically feasible, without changing the diameter of the submarine.

(2) RESEARCH AND DEVELOPMENT.—Not later than 60 days after the date of the enactment of this Act, the Deputy Administrator for Naval Reactors shall submit to the Committees on Armed Services of the House of Representatives and the Senate a report on—

(A) the planned research and development activities on low-enriched uranium and highly enriched uranium fuel that could apply to the development of a low-enriched uranium fuel or an advanced highly enriched uranium fuel; and

(B) with respect to such activities for each such fuel—

(i) the costs associated with such activities; and

(ii) a detailed proposal for funding such activities.

H.Rept. 115-200 states:

Implications of a 355-ship Navy on Naval and Marine Corps Aviation force structure requirements

The committee notes that the Navy's most recent Force Structure Assessment indicates a need to increase Navy force structure to 355 ships, which includes a 12th aircraft carrier. The committee also notes that this greater fleet size may in turn impact Navy and Marine Corps Aviation force structure requirements.

Consequently, the committee directs the Secretary of the Navy to provide a briefing to the House Committee on Armed Services not later than September 30, 2018, or 12 months after the issuance of a new National Defense Strategy, whichever date is earlier. The briefing should provide estimates as to the number of Navy and Marine Corps

aircraft by series and type needed to achieve the objectives of the National Defense Strategy and to complement the capability resident in a 355-ship Navy with 12 aircraft carriers. The briefing shall also include the following elements: (1) a detailed explanation of the strategy and associated force sizing and shaping constructs, associated scenarios and assumptions used to conduct the analysis; and (2) quantification of risk using Chairman of the Joint Chiefs of Staff risk management classifications. (Page 17)

H.Rept. 115-200 also states:

America-class amphibious assault ships

The committee is concerned that the Navy program of record for America-class amphibious assault ships (LHA–9) would result in a break in production of 7 years following delivery of LHA–8, thereby accruing significant additional costs at both the shipyard and the supply chain. The committee believes the optimal schedule would be to begin construction of LHA–9 in 2020. Therefore, the committee directs the Secretary of the Navy to provide a briefing to the House Committee on Armed Services by March 1, 2018, that provides an assessment of the cost savings and other benefits of accelerating LHA–9 to 2020 compared to 2024, assuming LHA–9 is identical to LHA–8. (Page 21)

H.Rept. 115-200 also states (emphasis added):

Naval Shipyard Development Plans

The Department of the Navy operates and maintains four public shipyards in the United States: Norfolk Naval Shipyard, Virginia; Portsmouth Naval Shipyard, Maine; Puget Sound Naval Shipyard, Washington; and Pearl Harbor Naval Shipyard, Hawaii. The committee recognizes the vital role these shipyards play in generating readiness, supporting the Navy's surface and submarine fleet by performing depot- and intermediate-level maintenance, modernization, emergent repairs, and inactivations. **However, the committee notes that the infrastructure at these shipyards has not been properly sustained, modernized, or configured to efficiently and effectively support the Navy's future force structure and shipyard workload.** The committee believes that long-term underfunding of the Navy's infrastructure investment accounts has created capability gaps in shipyard infrastructure that will result in the public shipyards being unable to properly complete assigned and projected work. In fact, disturbing delays in ship overhaul work have already occurred.

The committee also notes that the public shipyards are supported by more than 34,000 employees and the Navy is planning to expand the workforce by another 2,000 employees by 2020 to accommodate anticipated workload. The committee notes that almost half of the entire public shipyard workforce has less than 5 years of experience and lacks the journeyman skills associated with a more experienced workforce. The Navy has testified that the manpower shortfall and inexperience in the public shipyard workforce may result in extended maintenance availabilities, thus affecting operational availability of combat-ready ships. This comes at a time when existing maintenance backlogs have expanded due to the increased operational tempo of the fleet, and continuing delays in receipt of appropriations have further affected the public shipyards' ability to execute work on time.

The shortage of journeyman-level experience and the insufficient industrial capacity have led to severe throughput issues at the public shipyards, highlighted by six nuclear attack submarines languishing in the shipyards for years beyond their scheduled completion date. As a result, some crews have spent their entire submarine assignment rotation pier-side, which degrades military personnel readiness and operational effectiveness. Further, insufficient capacity has led the Navy to decertify the USS Boise (SSN 764) for diving operations until this submarine can be inducted for its engineered overhaul. Other attack submarines are likely to experience similar operational limitations until sufficient public-sector throughput can be provided. The committee is disappointed by the Navy's failure

to respond in a timely and effective manner to growing backlogs and to implement corrective actions. The committee believes that significant workforce, workload planning, and infrastructure management changes should occur to enable more efficient planning and execution of maintenance availabilities.

While the public sector is expanding to accommodate the growing maintenance requirements, the committee also notes that private-sector shipyards currently have infrastructure and workforce capacity to help mitigate the shortfalls in nuclear maintenance availabilities. The committee believes that the Naval Sea Systems Command has moved away from the ''One Naval Shipyard'' concept that it had previously embraced at a time when it should be fully leveraging the entire industrial base. Furthermore, the committee notes that a significant private-sector workload expansion is programmed in conjunction with the start of the Columbia-class program. To reduce risk associated with the delivery of the Columbia-class ballistic missile submarine, the committee believes that the Navy should analyze the feasibility of moving additional workload to the private sector until the public sector can establish a higher workload throughput baseline. At the same time, the Navy must not divert funding from or delay the public shipyards' modernization and workforce expansion that are necessary to meet future Navy requirements. This will allow the private sector to build up its workforce gradually prior to commencing work on the first Columbia-class submarine rather than rapidly expanding its workforce in 2021. The committee further believes that this temporary move may lead to a more efficient private-sector workforce and eventually lower program costs associated with the Columbia-class program, which, at a cost of $100.2 billion, is the second largest acquisition program in the Department of Defense. Naval Sea Systems Command should examine ways to eliminate the barriers between the public- and private-sector nuclear shipyards and consider innovative ways to share resources and infrastructure across the enterprise while the public yards recapitalize.

Finally, the committee notes that the deficiencies within the public shipyard enterprise will be further exacerbated by the Navy's goal to expand ship force structure. The committee believes that the growth in the public shipyard enterprise should be paced by the anticipated growth in the Navy force structure, as detailed by the administration's 30-year shipbuilding plan, required annually pursuant to section 231 of title 10, United States Code.

Therefore, the committee directs the Secretary of the Navy to provide a report to the congressional defense committees, by March 1, 2018, on a comprehensive plan to address shortfalls in the public shipyard enterprise. Specifically, this plan shall address the following elements:

(1) Personnel Roadmap: Prepare an employment development plan by shipyard that estimates resourcing shortfalls and full-time equivalent allotments, including overtime and contracting support, workforce hiring targets, and the numbers and types of employees needed. To the degree possible include the number of apprentices by trade skill, the number of engineers, and the number of overhead disciplines; and the training initiatives and time needed to meet the emerging workload requirements for fiscal year 2019 and beyond.

(2) Infrastructure Development Plan: Identify current infrastructure deficiencies at U.S. naval shipyards and prepare a detailed master plan for each shipyard that includes a list of specific infrastructure projects, scope of work, cost estimates, and schedule associated with the current and **30-year force structure projections**.

(3) Metrics Assessment Plan: Develop holistic workload metrics to better assess the efficiency of the entire shipyard versus a narrow review by maintenance availability.

(4) Workload Management Plan: Using the limitation currently imposed by the shortfall of personnel and the existing material condition of the public shipyards, prepare a 5-year

> workload management plan to include the entirety of the nuclear maintenance enterprise, both public- and private-sector capacities, that limits lost operational days.
>
> (5) Funding and Authority Plan: Each plan shall identify the additional funding and any legislative authority needed to achieve an end state, as quickly as practicable, of elimination of all ship maintenance backlogs and a return to predictable, sustainable, and affordable ship maintenance availabilities, including for **the anticipated growth in Navy force structure**. (Pages 104-106)

Senate

The Senate Armed Services Committee, in its report (S.Rept. 115-125 of July 10, 2017) on S. 1519, recommends the funding levels for shipbuilding programs shown in the SASC column of **Table 8**. Among other things, S.Rept, 115-125 recommends funding for:

- 1 additional DDG-51 class destroyer;
- 1 LCS (compared to 2 LCSs in the Navy's amended budget request);
- 1 additional LX(R) or LPD-30 amphibious ship;
- 1 additional Expeditionary Support Base (ESB) ship;
- 1 additional cable ship; and
- 5 additional Ship-to-Shore Connector (SSC) landing craft.

In addition, the S.Rept, 115-125 recommends $450 million in advance procurement funding for the Virginia-class attack submarine program "for the Secretary of the Navy to use for (1) procurement of a third Virginia-class submarine in fiscal year 2020; or (2) to expand second and third tier contractors in the submarine industrial base to support planned increased production requirements, which may include economic order quantity procurement for existing programs." (Pages 15-15; see also page 402.)

Section 126 of S. 1519 as reported states:

> SEC. 126. Extension of limitation on use of sole-source shipbuilding contracts for certain vessels.
>
> Section 124 of the National Defense Authorization Act for Fiscal Year 2017 (Public Law 114–328) is amended by striking "2017" and inserting "2017 or fiscal year 2018".

Regarding Section 126, S.Rept. 115-125 states:

> **Extension of limitation on use of sole-source shipbuilding contracts for certain vessels (sec. 126)**
>
> The committee recommends a provision that would extend to include fiscal year 2018 the prohibition on funds from being used to enter into, or prepare to enter into, sole source contracts for one or more Joint High Speed Vessels (JHSV) or Expeditionary Fast Transports (EPF), unless the Secretary of the Navy submits to the congressional defense committees a certification and a report.
>
> The committee notes that since 2011 the Navy requirement for EPFs has been 10 ships, which was most recently validated in December 2016. In 2013, this requirement was met with the procurement of the tenth EPF, and the Navy planned to shut down the production line.
>
> Without an authorization or request in the President's budget request, the Department of Defense Appropriations Act for Fiscal Year 2015 (Public Law 113–235) included procurement of an eleventh EPF at a cost of $200.0 million. Again, without an authorization or request in the President's budget, a twelfth EPF was added at a cost of

$225.0 million into the Department of Defense Appropriations Act for Fiscal Year 2016 (Public Law 114–113). Both of these EPFs were awarded to a single shipbuilder, with no competition, using a sole source contract. (Pages 9-10)

Section 1016 of S. 1519 as reported states:

SEC. 1016. 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 ships" has the meaning given the term in Secretary of the Navy Instruction 5030.8C.

Regarding Section 1016, S.Rept. 115-125 states:

Policy of the United States on minimum number of battle force ships (sec. 1016)

The committee recommends a provision that would codify at least a 355-ship Navy battle force as U.S. policy. The committee notes the Navy's latest Force Structure Assessment (FSA), completed in December 2016, increased the battle force requirement from 308 ships to 355 ships. This requirement includes inventory objectives by ship category, which the committee views as the optimal mix of platforms for the purposes of this provision.

The committee further notes the latest Navy FSA concluded, ''[The 355-ship requirement] reflects an in-depth assessment of the Navy's force structure requirements—it also includes a level of operational risk that we are willing to assume based on the resource limitations under which the Navy must operate . . . To fully resource [Combatant Commander demands,] enduring missions, ongoing operations and setting the theater for prompt warfighting response, [the] Navy would require a 653-ship force.''

Recognizing this unconstrained demand for 653 ships and recent testimony on the increasingly dangerous security environment, the committee believes the Navy's requirement of 355 ships should be achieved and all options for doing so should be reviewed as soon as possible.

The committee further believes that a clear policy statement on achieving the 355-ship objective, which could take at least 18 years according to an April 2017 Congressional Budget Office report, is warranted because of the long-term commitment required by current and future Congresses and administrations. (Pages 226-227)

Section 1019 of S. 1519 as reported states:

SEC. 1019. Surveying ships.

(a) Surveying ship requirement.—Not later than 120 days after the date of the enactment of this Act, the Chief of Naval Operations shall submit to the congressional defense committees a report setting forth a force structure assessment that establishes a surveying ship requirement. The Chief of Naval Operations shall conduct the assessment for purposes of the report, and may limit the assessment to surveying ships.

(b) Definitions.—In this section:

(1) The term "surveying ship" has the meaning given the term in Secretary of the Navy Instruction 5030.8C.

(2) The term "force structure assessment" has the meaning given the term in Chief of Naval Operations Instruction 3050.27.

Regarding Section 1019, S.Rept. 115-125 states:

Surveying ships (sec. 1019)

The committee recommends a provision that would require the Chief of Naval Operations to conduct a force structure assessment for the purpose of establishing a surveying ship requirement and provide the results to the congressional defense committees not later than 120 days after the date of enactment of this Act. This assessment may be limited in scope to identifying a force structure assessment requirement for surveying ships.

The committee notes the U.S. Navy currently has six surveying ships in service, but does not have a force structure assessment requirement for this class of ships because it is not included in the Navy battle force. The committee further notes surveying ships perform critical missions in support of fleet operations, including gathering much of the U.S. military's ocean environment information.

The committee further believes a greater number of these ships may be required as surveying ships continue to operate around the world with an expanding mission set. For example, in December 2016 a Chinese navy ship illegally seized a U.S. Navy unmanned underwater vehicle, which was collecting oceanographic data, while operating with the USNS Bowditch (T–AGS–62) in the South China Sea. In addition, the newest surveying ship, USNS Maury (T–AGS–66), includes an innovative moon pool for deployment and retrieval of autonomous underwater vehicles.

Accordingly, the committee urges the Chief of Naval Operations to review the full range of potential applications for surveying ships in conducting this force structure assessment. (Page 228)

Section 1046 of S. 1519 as reported states:

SEC. 1046. Extension of prohibition on use of funds for retirement of legacy maritime mine countermeasure platforms.

Section 1045(a) of the National Defense Authorization Act for Fiscal Year 2017 (Public Law 114–328) is amended in the matter preceding paragraph (1) by striking "authorized to be appropriated by this Act or otherwise made available for fiscal year 2017 for the Navy" and inserting "authorized to be appropriated or otherwise made available for the Navy for fiscal year 2017 or 2018".

Regarding Section 1046, S.Rept. 115-125 states:

Extension of prohibition on use of funds for retirement of legacy maritime mine countermeasures platforms (sec. 1046)

The committee recommends a provision that would extend the prohibition on use of funds for retirement of legacy maritime mine countermeasures platforms to include fiscal year 2018.

The committee notes the Navy's current plan to reach an initial operational capability of replacement mine countermeasures systems is not scheduled to occur until fiscal year 2020 at the earliest. However, the Navy's latest Annual Long-Range Plan for Construction of Naval Vessels calls for the Avenger-class mine countermeasures ships to begin retiring in fiscal year 2019.

The committee remains concerned a capability gap may result if current mine countermeasures systems are not maintained until operationally effective and suitable replacements are fielded in sufficient quantities. (Page 232)

Section 1074 of S. 1519 as reported states:

SEC. 1074. Report on Navy capacity to increase production of anti-submarine warfare and search and rescue rotary wing aircraft in light of increase in the size of the surface fleet to 355 ships.

> Not later than September 15, 2017, the Secretary of the Navy shall submit to the congressional defense committees a report describing and assessing the capacity of the Navy, in light of an increase in the size of the surface fleet of the Navy to 355 ships, to increase production of the following:
>
> (1) Anti-submarine warfare rotary wing aircraft.
>
> (2) Search and rescue rotary wing aircraft.

Regarding Section 1074, S.Rept. 115-125 states:

> **Report on Navy capacity to increase production of anti-submarine warfare and search and rescue rotary wing aircraft in light of increase in the size of the surface fleet to 355 ships. (Sec. 1074)**
>
> The committee recommends a provision that would require the Secretary of the Navy to report to the congressional defense committees, no later than September 15, 2017, on the capacity of the United States Navy to increase production of anti-submarine warfare and combat search and rescue rotary wing aircraft given the stated intent to increase the size of the fleet to 355 ships.
>
> The committee is aware that the Navy is currently performing an assessment for the fleet. The committee is also aware that much of the current fleet of MH–60 helicopters are approaching the end of their planned service life and will have to undergo a service life extension in the next few years which will take roughly thirty aircraft out of service annually.
>
> Given the anticipated growth of the fleet the committee assesses there will be an increased requirement for combat search and rescue and anti-submarine warfare helicopters. All of these requirements place future demand on the naval helicopter industrial base while the Navy's procurement plan is imposing a gap in production between the ending of the latest MH–60R contract and procurement to fulfill future aircraft requirements. This gap will cause a loss of skilled labor and extensively impact the broader supply chain, driving the cost per airframe up significantly and unnecessarily. (Page 239)

S.Rept. 115-125 also states:

> **Cable ship**
>
> The budget request included no funding in line item 32 of Shipbuilding and Conversion, Navy (SCN), for a cable ship.
>
> The committee recommends an increase of $250.0 million for procurement of one cable ship and directs the Secretary of the Navy to utilize an existing United States or foreign design, with modifications he deems necessary, to maximize affordability and expedite delivery. (Page 18)

S.Rept. 115-125 also states:

> **Amphibious assault ship acceleration**
>
> The committee is concerned with the Navy procurement profile for large deck amphibious assault ships, which includes a span of seven years until the next large deck amphibious assault ship (LHA–9) is procured in 2024.
>
> The committee notes efficiencies could be gained by reducing this span and thereby enabling a steadier workforce with an increased learning curve, material and equipment suppliers on more reliable and fixed delivery contracts and a more effective continuous improvement schedule.

Therefore, the committee urges the Secretary of the Navy to accelerate procurement of LHA–9 to not later than 2021. (Page 24)

S.Rept. 115-125 also states:

Ship and submarine depot maintenance

The committee is concerned by challenges with maintaining the current Navy fleet of 276 ships. For example, the committee notes the USS George H.W. Bush (CVN–77) availability was scheduled for an eight-month availability that required 13 months in 2016; USS Albany (SSN–753) took over 48 months to complete its 22-month maintenance availability and missed a deployment as a result; and the USS Boise (SSN–764) was originally scheduled for a 2016 public shipyard availability that was recently shifted to a 2019 private shipyard availability. In addition to the USS Boise, the Navy has also recently shifted the USS Montpelier (SSN–765) and USS Columbus (SSN–762) availabilities from public shipyards to private shipyards.

The committee understands insufficient public shipyard capacity has led to cost inefficiency and delay, and the rescheduling of some submarine maintenance availabilities to private shipyards. The committee further understands the Navy does not anticipate eliminating the current maintenance backlog of 5.5 million man-days at public shipyards until 2023. The committee notes the latest Navy shipbuilding plan indicates the fleet will grow by 33 ships to 309 ships in 2023. The committee is concerned by the task of accomplishing the increased maintenance requirements while simultaneously eliminating a maintenance backlog that has continued to grow since 2011.

Therefore, the committee directs the Secretary of the Navy to submit to the Committees on Armed Services of the Senate and House of Representatives a detailed plan to accomplish surface ship and submarine maintenance through fiscal year 2023. For this period, by fiscal year, this plan shall include: the planned maintenance workload by ship class, public and private shipyard workforce capacity based on recent demonstrated performance (i.e., performance factor), comparison of workload to workforce (adjusted for performance) for public and private shipyards by ship class, plans to shift maintenance from public to private shipyards, estimated costs, and budgeted costs in the fiscal year 2018 budget request. This plan shall be submitted with the fiscal year 2019 budget request. (Pages 119-120; see also pages 113-114 regarding public shipyards and page 114 regarding dry dock capacity.)

S.Rept. 115-125 also states:

355 ship build-up review

The committee supports the Navy's Force Structure Assessment requirement for 355 battle force ships. The committee is aware that the Chief of Naval Operations, Admiral John Richardson, published a white paper, The Future Navy, which calls for the Navy to achieve the 355 ship objective in the 2020s.

Furthermore, the committee is aware that achieving the FSA battle fleet objective may require options other than solely relying on new-construction shipbuilding. The committee understands that the Navy is examining options to extend the service life of ships currently in the fleet and reactivate inactive ships. The committee believes it is important that Congress fully understand the business case analysis for these options and others which could grow the fleet.

Therefore, not later than 180 days after the enactment of this Act, the committee directs the Secretary of the Navy to deliver a report to the congressional defense committees which shows a detailed business case analysis for each option to grow the battle fleet other than new construction. The report shall include business case analyses for service life extension and reactivation options. (Page 241)

FY2018 DOD Appropriations Act (Division A of H.R. 3219)

H.R. 3219 as reported by the House Appropriations Committee (H.Rept. 115-219 of July 13, 2017) was the FY2018 DOD Appropriations Act. H.R. 3219 as passed by the House is called the Make America Secure Appropriations Act, 2018. H.R. 3219 as passed by the House includes the FY2018 DOD Appropriations Act as Division A and four other appropriations acts as Divisions B through E. The discussion below relates to Division A.

House

The House Appropriations Committee, in its report (H.Rept. 115-219 of July 13, 2017) on H.R. 3219, recommends the funding levels for shipbuilding programs shown in the HAC column of **Table 8**. Among other things, H.Rept, 115-219 recommends funding for:

- 1 additional LCS (for a total of 3 LCSs, compared to 2 LCSs in the Navy's amended budget request);
- 1 additional Expeditionary Support Base (ESB) ship; and
- 3 additional Ship-to-Shore Connector (SSC) landing craft.

Funding figures recommended by H.Rept. 115-219 that are shown in **Table 8** and the summary above do not include any additional funding for shipbuilding programs that may result from $12,622.9 million (i.e., about $12.6 billion) in DOD procurement funding included in the National Defense Restoration Fund. Line-item allocations for this $12.6-billion fund are to be determined after the Administration submits a new national defense strategy. (See pages 4-5 and 208 of H.Rept. 115-219.)

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 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.[62]

Declining U.S. Technological and Qualitative Edge

Department of Defense (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.[63] 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.[64]

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.[65] 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.

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. From a U.S. perspective, grand strategy can be understood as strategy considered at a global or interregional level, as opposed to strategies for specific countries, regions, or issues.

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

[63] 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) .

[64] 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) .

[65] 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) .

Geopolitics refers to the influence on international relations and strategy of basic world geographic features such as the size and location of continents, oceans, and individual countries.

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.

The traditional U.S. goal of preventing the emergence of a regional hegemon in one part of Eurasia or another is a major reason why the U.S. military has been 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. This issue is discussed further in a CRS In Focus publication,[66] and in **Appendix K**.

U.S. Strategic Rebalancing to Asia-Pacific Region

For decades, the Western Pacific has been a major operational area (i.e., operational "hub") for forward-deployed U.S. Navy forces. In coming years, the importance of the Western Pacific as an operational hub for forward-deployed U.S. Navy forces may grow further: A 2012 DOD strategic guidance document[67] and DOD's report on the 2014 Quadrennial Defense Review (QDR)[68] state that U.S. military strategy will place an increased emphasis on the Asia-Pacific region (meaning, for the U.S. Navy, the Western Pacific in particular). Although Administration officials state that this U.S. strategic rebalancing toward the Asia-Pacific region, as it is called, is not directed at any single country, many observers believe it is in no small part intended as a response to China's military (including naval) modernization effort and its assertive behavior regarding its maritime territorial claims. As one reflection of the U.S. strategic rebalancing to the Asia-Pacific region, Navy plans call for increasing over time the number of U.S. Navy ships that are deployed to the region on a day-to-day basis.

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

[67] Department of Defense, Sustaining U.S. Global Leadership: Priorities for 21st Century Defense, January 2012, 8 pp. For additional discussion, see CRS Report R42146, *Assessing the January 2012 Defense Strategic Guidance (DSG): In Brief*, by (name redacted) and (name redacted)

[68] Department of Defense, Quadrennial Defense Review 2014, 64 pp. For additional discussion, see CRS Report R43403, *The 2014 Quadrennial Defense Review (QDR) and Defense Strategy: Issues for Congress*, by (name redacted)

Continued Operations in Persian Gulf/Indian Ocean

In announcing the U.S. strategic rebalancing to the Asia-Pacific region, DOD officials noted that the United States would continue to maintain a forward-deployed military presence in the Middle East (meaning, for the U.S. Navy, primarily the Persian Gulf/Indian Ocean region). U.S. military operations to counter the Islamic State organization and other terrorist organizations in the Middle East are reinforcing demands for forward-deploying U.S. military forces, including U.S. naval forces, to that region.

Potential Increased Demand for U.S. Naval Forces Around Europe

During the Cold War, the Mediterranean was one of three major operational hubs for forward-deployed U.S. Navy forces (along with the Western Pacific and the Persian Gulf/Indian Ocean region). Following the end of the Cold War, the Mediterranean was deemphasized as an operating hub for forward-deployed U.S. Navy forces. This situation might be changing once again: Russia's seizure and annexation of Crimea in March 2014, Russia's actions in Eastern Ukraine, operations by Russian military forces around the periphery of Europe and in the Arctic, and developments in North Africa and Syria are once again focusing U.S. policymaker attention on U.S. military operations in Europe and its surrounding waters, and in the Arctic (meaning, for the U.S. Navy, potentially increased operations in the Mediterranean and perhaps the Norwegian Sea and the Arctic).

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.[69] 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

[69] 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.

Middle East. U.S. Navy officials have stated that if defense spending remains constrained to levels set forth in the BCA as amended, the Navy in coming years will not be able to fully execute all the missions assigned to it under the 2012 DOD strategic guidance document.[70]

[70] 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 plan of March 2015	306-ship plan of January 2013	~310-316 ship plan of March 2012	Revised 313-ship plan of September 2011	Changes to February 2006 313-ship plan announced through mid-2011	February 2006 Navy plan for 313-ship fleet	Early-2005 Navy plan for fleet of 260-325 ships		2002-2004 Navy plan for 375-ship Navy[a]	2001 QDR plan 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.

Note: 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 Class (Ohio Replacement) Ballistic Missile Submarine (SSBN[X]) 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 plan 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
FY01 plan (2000)	8	8	8	8	7	5	6	6	6	7																
FY02 plan (2001)		6	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a															
FY03 plan (2002)			5	5	7	7	11	n/a	n/a	n/a	n/a	n/a														
FY04 plan (2003)				7	8	7	7	9	14	15	13	14	15													
FY05 plan (2004)					9	6	8	9	17	14	15	14	16	15												
FY06 plan (2005)						4	7	7	9	10	12	n/a	n/a	n/a	n/a											
FY07 plan (2006)							7	7	11	12	14	13	12	11	11	10										
FY08 plan (2007)								7	11	12	13	12	12	10	12	11	6									
FY09 plan (2008)									7	8	8	12	12	13	13	12	12	13								
FY10 plan (2009)										8	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a							
FY11 plan (2010)											9	8	12	9	12	9	12	9	13	9						
FY12 plan (2011)												10	13	11	12	9	12	10	12	8	9					
FY13 plan (2012)													10	7	8	9	7	11	8	12	9	12				
FY14 plan (2013)														8	8	7	9	9	10	10	10	11	14			
FY15 plan (2014)															7	8	11	10	8	11	8	11	11	13		
FY16 plan (2015)																9	10	10	9	10	9	11	13	12	10	
FY17 plan (2016)																	7	8	7	8	8	10	11	11	9	7
FY18 plan (2017)																		9	7	8	8	10	n/a	n/a	n/a	n/a

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 submits 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. 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.

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 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
FY01 plan (2000)	316	315	313	313	313	311	311	304	305	305																
FY02 plan (2001)		316	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a															
FY03 plan (2002)			314	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a														
FY04 plan (2003)				292	292	291	296	301	305	308	313	317	321													
FY05 plan (2004)					290	290	298	303	308	307	314	320	328	326												
FY06 plan (2005)						289	293	297	301	301	306	n/a	n/a	305	n/a											
FY07 plan (2006)							285	294	299	301	306	315	317	315	314	317										
FY08 plan (2007)								286	289	293	302	310	311	307	311	314	322									
FY09 plan (2008)									286	287	289	290	293	287	288	291	301	309								
FY10 plan (2009)										287	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a							
FY11 plan (2010)											284	287	287	285	285	292	298	305	311	315						
FY12 plan (2011)												290	287	286	286	297	301	311	316	322	324					
FY13 plan (2012)													285	279	276	284	285	292	300	295	296	298				
FY14 plan (2013)														282	270	280	283	291	300	295	296	297	297			
FY15 plan (2014)															274	280	286	295	301	304	304	306	311	313		
FY16 plan (2015)																282	284	294	300	304	306	309	310	315	317	
FY17 plan (2016)																	287	295	300	306	308	310	309	311	313	309

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. 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. The FY2006 plan included data for only selected years beyond FY2011. 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 submits 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. 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.

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,[71] and as of August 4, 2017, included a total of 276 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 August 2017 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 non-state terrorist organizations. In addition, the Navy of FY1987 differed substantially from the August 2017 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.[72]

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 276-ship fleet of August 2017 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.

[71] 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.

[72] 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 O-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 plan 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.[73]

[73] Navy force structure plans that predate those shown in **Table B-1** include the Reagan-era 600-ship plan of the 1980s, the Base Force fleet of more than 400 ships planned during the final two years of the George H. W. Bush Administration, the 346-ship fleet from the Clinton Administration's 1993 Bottom-Up Review (or BUR, sometimes also called Base Force II), 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 (10 U.S.C. 118) stated that the results of each QDR were to be assessed by an independent panel.[74] 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.[75] 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 plan, but called for decreasing to 416 ships by end of FY1999.
b. Original total of about 305 ships was increased to about 310 due to increase in number of attack submarines to 55 from 50.
c. Plan originally included 80 attack submarines, but this was later reduced to about 55.
d. Plan originally included 50 attack submarines but this was later increased to 55.
e. Plus 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.

[74] 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 USC 118 generally, substituting provisions relating to a once-every-four-years defense strategy review for provisions that had related to a QDR.

[75] 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, Navy Plan from 1993 BUR, and Navy Plan from 2010 QDR Review Panel

Ship Type	Navy's 355-ship goal of December 2016	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 add to 331-341)**[a]	**346**

Source: 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 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.[76]

[76] 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.[77] 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***

[77] 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 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.[78]

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.[79] **Table F-2**, which reprints (with minor clarifications) a table from the MITRE study, summarizes that study's recommendations.

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

[79] 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 n 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:

> **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."[80] 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.[81]

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

[80] 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.

[81] 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 plan)		
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 plan)		
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 plan, the 22 CG-47 class cruisers are to be eventually replaced by DDGs and a future large surface combatant.

The CSBA study stated:

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.[82]

[82] 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 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]**

Source: 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 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."[83]

A January 17, 2017, press report states:

> 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

[83] 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."[84]

A January 24, 2017, press report states:

> 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.[85]

A January 12, 2017, press report states:

> 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.[86]

A March 2017 press report states:

> 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.

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

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

[86] 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.[87]

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 plan, John P. Casey, executive

[87] 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:

> 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."[88]

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

[88] 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.[89]

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

> 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

[89] 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.[90]

[90] 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.[91]

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

Appendix J. Potential Impact on Size and Capability of Navy of Limiting DOD Spending to BCA Caps Through FY2021

This appendix presents additional details on the potential impact on the size and capability of the Navy of limiting DOD spending to the BCA caps through FY2021.

January 2015 Navy Testimony

In testimony on this issue to the Senate Armed Services Committee on January 28, 2015, then-Chief of Naval Operations Admiral Jonathan Greenert stated:

> A return to sequestration in FY 2016 would necessitate a revisit and revision of the DSG [Defense Strategic Guidance document of January 2012]. Required cuts will force us to further delay critical warfighting capabilities, reduce readiness of forces needed for contingency response, forego or stretch procurement of ships and submarines, and further downsize weapons capability. We will be unable to mitigate the shortfalls like we did in FY2013 [in response to the sequester of March 1, 2013] because [unobligated] prior-year investment balances [which were included in the funds subject to the sequester] were depleted under [the] FY 2013 sequester [of March 1, 2013].
>
> The revised discretionary caps imposed by sequestration would be a reduction of about $10 billion in our FY 2016 budget alone, as compared to PB-2015. From FY 2016-2020, the reduction would amount to approximately $36 billion. If forced to budget at this level, it would reduce every appropriation, inducing deep cuts to Navy Operation and Maintenance (O&M), investment, and modernization accounts. The Research, Development, Test and Evaluation (RDT&E) accounts would likely experience a significant decline across the FYDP, severely curtailing the Navy's ability to develop new technologies and asymmetric capabilities.
>
> As I testified to this committee in November 2013, any scenario to address the fiscal constraints of the revised discretionary caps must include sufficient readiness, capability and manpower to complement the force structure capacity of ships and aircraft. This balance would need to be maintained to ensure each unit will be effective, even if the overall fleet is not able to execute the DSG. There are many ways to balance between force structure, readiness, capability, and manpower, but none that Navy has calculated that enable us to confidently execute the current defense strategy within dictated budget constraints.
>
> As detailed in the Department of Defense's April 2014 report, "Estimated Impacts of Sequestration-Level Funding," one potential fiscal and programmatic scenario would result in a Navy of 2020 that would be unable to execute two of the ten DSG missions due to the compounding effects of sequestration on top of pre-existing FY 2013, 2014, and 2015 resource constraints. Specifically, the cuts would render us unable to sufficiently Project Power Despite Anti-Access/Area Denial Challenges and unable to Deter and Defeat Aggression. In addition, we would be forced to accept higher risk in five other DSG missions: Counter Terrorism and Irregular Warfare; Defend the Homeland and Provide Support to Civil Authorities; Provide a Stabilizing Presence; Conduct Stability and Counterinsurgency Operations; and Conduct Humanitarian, Disaster Relief, and Other Operations. (Table 2 provides more detail on mission risks.) In short, a return to sequestration in FY 2016 will require a revision of our defense strategy.
>
> Critical assumptions I have used to base my assessments and calculate risk:
>
> - Navy must maintain a credible, modern, and survivable sea-based strategic deterrent

- Navy must man its units
- Units that deploy must be ready
- People must be given adequate training and support services
- Readiness for deployed forces is a higher priority than contingency response forces
- Capability must be protected, even at the expense of some capacity
- Modernized and asymmetric capabilities (advanced weapons, cyber, electronic warfare) are essential to projecting power against evolving, sophisticated adversaries
- The maritime industrial base is fragile—damage can be long-lasting, hard to reverse

The primary benchmarks I use to gauge Navy capability and capacity are DoD Global Force Management Allocation Plan presence requirements, Combatant Commander Operation and Contingency Plans, and Defense Planning Guidance Scenarios. Navy's ability to execute DSG missions is assessed based on capabilities and capacity resident in the force in 2020.

The following section describes specific sequestration impacts to presence and readiness, force structure investments, and personnel under this fiscal and programmatic scenario:

Presence and Readiness

A return to sequestration would reduce our ability to deploy forces on the timeline required by Global Combatant Commands in the event of a contingency. Of the Navy's current battle force, we maintain roughly 100 ships forward deployed, or 1/3 of our entire Navy. Included among the 100 ships are two CSG and two ARG forward at all times. CSGs and ARGs deliver a significant portion of our striking power, and we are committed to keeping, on average, three additional CSGs and three additional ARGs in a contingency response status, ready to deploy within 30 days to meet operation plans (OPLANs). However, if sequestered, we will prioritize the readiness of forces forward deployed at the expense of those in a contingency response status. We cannot do both. We will only be able to provide a response force of one CSG and one ARG. Our current OPLANs require a significantly more ready force than this reduced surge capacity could provide, because they are predicated on our ability to respond rapidly. Less contingency response capacity can mean higher casualties as wars are prolonged by the slow arrival of naval forces into a combat zone. Without the ability to respond rapidly enough, our forces could arrive too late to affect the outcome of a fight.

Our PB-2015 base budget funded ship and aviation depot maintenance to about 80 percent of the requirement in FY 2016-2019. This is insufficient in maintaining the Fleet and has forced us to rely upon Overseas Contingency Operations (OCO) funding to address the shortfall. Sequestration would further aggravate existing Navy backlogs. The impacts of these growing backlogs may not be immediately apparent, but will result in greater funding needs in the future to make up for the shortfalls each year and potentially more material casualty reports (CASREPs), impacting operations. For aviation depot maintenance, the growing backlog will result in more aircraft awaiting maintenance and fewer operational aircraft on the flight line, which would create untenable scenarios in which squadrons would only get their full complement of aircraft just prior to deployment. The situation will lead to less proficient aircrews, decreased combat effectiveness of naval air forces, and increased potential for flight and ground mishaps.

Critical to mission success, our shore infrastructure provides the platforms from which our Sailors train and prepare. However, due the shortfalls over the last three years, we have been compelled to reduce funding in shore readiness since FY 2013 to preserve the operational readiness of our fleet. As a result, many of our shore facilities are degrading. At sequestration levels, this risk will be exacerbated and the condition of our shore infrastructure, including piers, runways, and mission-critical facilities, will further erode.

This situation may lead to structural damage to our ships while pierside, aircraft damage from foreign object ingestion on deteriorated runways, and degraded communications within command centers. We run a greater risk of mishaps, serious injury, or health hazards to personnel.

Force Structure Investments

We must ensure that the Navy has the required capabilities to be effective, even if we cannot afford them in sufficient capacity to meet the DSG. The military requirements laid out in the DSG are benchmarked to the year 2020, but I am responsible for building and maintaining capabilities now for the Navy of the future. While sequestration causes significant near-term impacts, it would also create serious problems that would manifest themselves after 2020 and would be difficult to recover from.

In the near term, the magnitude of the sequester cuts would compel us to consider reducing major maritime and air acquisition programs; delaying asymmetric capabilities such as advanced jammers, sensors, and weapons; further reducing weapons procurement of missiles, torpedoes, and bombs; and further deferring shore infrastructure maintenance and upgrades. Because of its irreversibility, force structure cuts represent options of last resort for the Navy. We would look elsewhere to absorb sequestration shortfalls to the greatest extent possible.

Disruptions in naval ship design and construction plans are significant because of the long-lead time, specialized skills, and extent of integration needed to build military ships. Because ship construction can span up to nine years, program procurement cancelled in FY 2016 will not be felt by the Combatant Commanders until several years later when the size of the battle force begins to shrink as those ships are not delivered to the fleet at the planned time. Likewise, cancelled procurement in FY 2016 will likely cause some suppliers and vendors of our shipbuilding industrial base to close their businesses. This skilled, experienced and innovative workforce cannot be easily replaced and it could take years to recover from layoffs and shutdowns; and even longer if critical infrastructure is lost. Stability and predictability are critical to the health and sustainment of this vital sector of our Nation's industrial capacity.

Personnel

In FY 2013 and 2014, the President exempted all military personnel accounts from sequestration out of national interest to safeguard the resources necessary to compensate the men and women serving to defend our Nation and to maintain the force levels required for national security. It was recognized that this action triggered a higher reduction in non-military personnel accounts.

If the President again exempts military personnel accounts from sequestration in FY 2016, then personnel compensation would continue to be protected. Overall, the Navy would protect personnel programs to the extent possible in order to retain the best people. As I testified in March 2014, quality of life is a critical component of the quality of service that we provide to our Sailors. Our Sailors are our most important asset and we must invest appropriately to keep a high caliber all-volunteer force. We will continue to fund Sailor support, family readiness, and education programs. While there may be some reductions to these programs if sequestered in FY 2016, I anticipate the reductions to be relatively small. However, as before, this would necessitate higher reductions to the other Navy accounts.

Conclusion

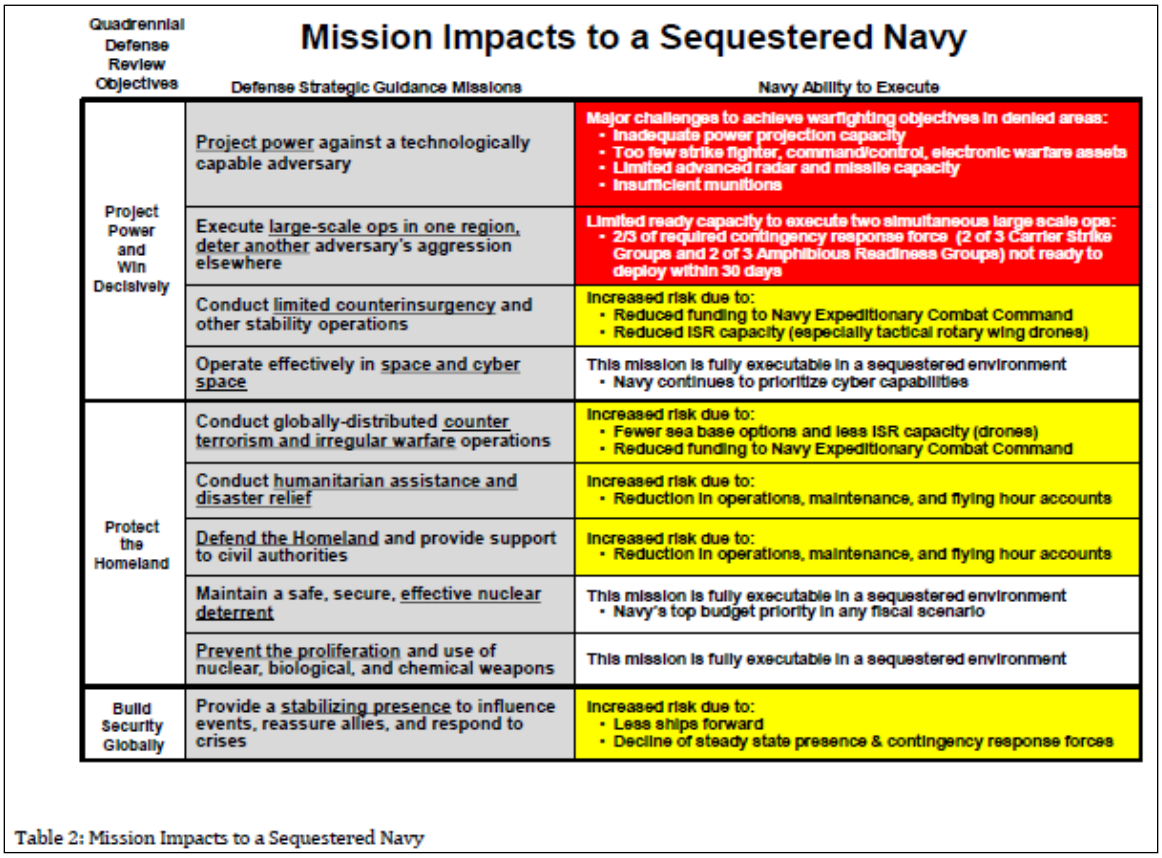
Navy is still recovering from the FY 2013 sequestration in terms of maintenance, training, and deployment lengths. Only 1/3 of Navy contingency response forces are ready to deploy within the required 30 days. With stable and consistent budgets, recovery is possible in 2018. However, if sequestered, we will not recover within this FYDP.

> For the last three years, the Navy has been operating under reduced top-lines and significant shortfalls: $9 billion in FY 2013, $5 billion in FY 2014 and $11 billion in FY 2015, for a total shortfall of about $25 billion less than the President's budget request. Reverting to revised sequester-level BCA caps would constitute an additional $5-10 billion decrement each year to Navy's budget. With each year of sequestration, the loss of force structure, readiness, and future investments would cause our options to become increasingly constrained and drastic. The Navy already shrank 23 ships and 63,000 personnel between 2002 and 2012. It has few options left to find more efficiencies.
>
> While Navy will do its part to help the Nation get its fiscal house in order, it is imperative we do so in a coherent and thoughtful manner to ensure appropriate readiness, warfighting capability, and forward presence—the attributes we depend upon for our Navy. Unless naval forces are properly sized, modernized at the right pace, ready to deploy with adequate training and equipment, and capable to respond in the numbers and at the speed required by Combatant Commanders, they will not be able to carry out the Nation's defense strategy as written. We will be compelled to go to fewer places, and do fewer things. Most importantly, when facing major contingencies, our ability to fight and win will neither be quick nor decisive.
>
> Unless this Nation envisions a significantly diminished global security role for its military, we must address the growing mismatch in ends, ways, and means. The world is becoming more complex, uncertain, and turbulent. Our adversaries' capabilities are diversifying and expanding. Naval forces are more important than ever in building global security, projecting power, deterring foes, and rapidly responding to crises that affect our national security. A return to sequestration would seriously weaken the United States Navy's ability to contribute to U.S. and global security.[92]

Greenert's testimony concluded with the following table:

[92] 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, pp. 4-9.

Figure J-1. Navy Table on Mission Impacts of Limiting Navy's Budget to BCA Levels



Mission Impacts to a Sequestered Navy

Quadrennial Defense Review Objectives	Defense Strategic Guidance Missions	Navy Ability to Execute
Project Power and Win Decisively	Project power against a technologically capable adversary	Major challenges to achieve warfighting objectives in denied areas: • Inadequate power projection capacity • Too few strike fighter, command/control, electronic warfare assets • Limited advanced radar and missile capacity • Insufficient munitions
	Execute large-scale ops in one region, deter another adversary's aggression elsewhere	Limited ready capacity to execute two simultaneous large scale ops: • 2/3 of required contingency response force (2 of 3 Carrier Strike Groups and 2 of 3 Amphibious Readiness Groups) not ready to deploy within 30 days
	Conduct limited counterinsurgency and other stability operations	Increased risk due to: • Reduced funding to Navy Expeditionary Combat Command • Reduced ISR capacity (especially tactical rotary wing drones)
	Operate effectively in space and cyber space	This mission is fully executable in a sequestered environment • Navy continues to prioritize cyber capabilities
Protect the Homeland	Conduct globally-distributed counter terrorism and irregular warfare operations	Increased risk due to: • Fewer sea base options and less ISR capacity (drones) • Reduced funding to Navy Expeditionary Combat Command
	Conduct humanitarian assistance and disaster relief	Increased risk due to: • Reduction in operations, maintenance, and flying hour accounts
	Defend the Homeland and provide support to civil authorities	Increased risk due to: • Reduction in operations, maintenance, and flying hour accounts
	Maintain a safe, secure, effective nuclear deterrent	This mission is fully executable in a sequestered environment • Navy's top budget priority in any fiscal scenario
	Prevent the proliferation and use of nuclear, biological, and chemical weapons	This mission is fully executable in a sequestered environment
Build Security Globally	Provide a stabilizing presence to influence events, reassure allies, and respond to crises	Increased risk due to: • Less ships forward • Decline of steady state presence & contingency response forces

Table 2: Mission Impacts to a Sequestered Navy

Source: 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.

March 2015 Navy Report

The Navy's March 2015 report to Congress on its FY2016 30-year shipbuilding plan states:

> **Long Term Navy Impact of Budget Control Act (BCA) Resource Level**
>
> The BCA is essentially a ten-percent reduction to DOD's TOA. With the CVN [aircraft carrier] and OR [Ohio replacement] SSBN programs protected from this cut, as described above, there would be a compounding effect on the remainder of the Navy's programs. The shortage of funding could potentially reverse the Navy's progress towards recapitalizing a 308 ship battle force and could damage an already fragile shipbuilding industry. There are many ways to balance between force structure, readiness, capability, and manpower, but none that Navy has calculated that enable us to confidently execute the current defense strategy within BCA level funding.
>
> If the BCA is not rescinded, it may impact Navy's ability to procure those ships we intend to procure between now and FY2020. Although Navy would look elsewhere to absorb sequestration shortfalls because of the irreversibility of force structure cuts, a result might be that a number of the ships reflected in the current FYDP may be delayed to the future. The unintended consequence of these potential delays would be the increased costs of restoring these ships on top of an already stretched shipbuilding account that is trying to deal with the post FY2021 OR SSBN costs.

As previously articulated, barring changes to the Fleet's operational requirements, the annual impact of sequestration level funding may require Navy to balance resources to fund readiness accounts to keep what we have operating, manned, and trained. The net result of these actions could potentially create a smaller Navy that is limited in its ability to project power around the world and simply unable to execute the nation's defense strategy. A decline would not be immediate due to the ongoing shipbuilding projects already procured but would impact the future fleet size. Disruptions in naval ship design and construction plans are significant because of the long-lead time, specialized skills, and integration needed to build military ships. The extent of these impacts would be directly related to the length of time we are under a BCA and the TOA reductions that are apportioned to the Navy.[93]

[93] U.S. Navy, *Report to Congress on the Annual Long-Range Plan for Construction of Naval Vessels for Fiscal Year 2016*, March 2015, pp. 7-8.

Appendix K. U.S. Strategy and the Size and Structure of U.S. Naval Forces

This appendix presents some observations on the relationship between U.S. strategy and the size and structure of U.S. naval forces that can form part of the context for assessing Navy force structure goals and shipbuilding plans.[94]

Strategic considerations that can be considered in assessing Navy force structure goals and shipbuilding plans include, among other things, the U.S. strategic rebalancing toward the Asia-Pacific region,[95] China's modernization of its maritime military capabilities,[96] Russia's resurgent naval (particularly submarine) operations, and requests from U.S. regional combatant commanders (CCDRs) for forward-deployed U.S. naval forces that the Navy testified in 2014 would require a Navy of about 450 ships to fully meet.[97]

More broadly, from a strategic 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.

An additional point that can be noted in relating U.S. naval forces to U.S. national strategy is 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 last 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 operations in recent decades—both wartime operations and day-to-day operations—have been carried out in no small part in support of this key goal.

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[94] A similar discussion can be found in CRS In Focus IF10485, *Defense Primer: Geography, Strategy, and U.S. Force Design*, by (name redacted) .

[95] For more on the strategic rebalancing, see CRS Report R42146, *Assessing the January 2012 Defense Strategic Guidance (DSG): In Brief*, by (name redacted) and (name redacted), and CRS Report R42448, *Pivot to the Pacific? The Obama Administration's "Rebalancing" Toward Asia*, coordinated by (name redacted) .

[96] For more on China's modernization of its maritime military capabilities, see CRS Report RL33153, *China Naval Modernization: Implications for U.S. Navy Capabilities—Background and Issues for Congress*, by (name redacted) .

[97] 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. (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.)

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.

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.

Appendix L. 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.[98] 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.

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

Appendix M. 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.[99]

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.[100]

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

[100] 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:

> 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.[101]

(...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.

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

Appendix N. 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.[102]

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.

[102] 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 percent confidence factor—an approach that some observers have recommended—because a cost at the 80 percent 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 O. Size of the Navy and Navy Shipbuilding Rate

Size of the Navy

Table O-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.[103] The Navy fell below 300 battle force ships in August 2003 and as of August 4, 2017, included 276 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.

[103] 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 O-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		
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 O-2 shows past (FY1982-FY2017) and requested or programmed (FY2018-FY2022) rates of Navy ship procurement.

Table O-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*	*7*
20	***21***	**22**																
8	*8*	*10*																

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 non-battle 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.

(3) DOD officials state that **figures for FY2019-FY2022** in DOD's FY2018 budget submission are subject to change, pending the outcome of DOD's current defense strategy review, and consequently should be treated as something more akin to placeholder figures. Changes to FY2019-FY2022 figures resulting from the defense strategy review, they have stated, will be reflected in DOD's FY2019 budget submission.

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