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Statement of

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Options and Considerations for Achieving a 355-Ship Navy

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Chairman Wicker, Ranking Member Hirono, distinguished members of the subcommittee, thank you for the opportunity to appear before you today to discuss options and considerations for achieving a 355-ship Navy.

Navy force structure and shipbuilding has been a central focus of my work as a CRS analyst on naval issues for the past 33 years. I worked on these issues closely for Congress during the Reagan-era naval buildup of the 1980s and I remember that period quite well; I am working on them closely for Congress now, in connection with the 355-ship plan; and I worked on them closely for Congress in all the years in between. Of the various witnesses that have testified before this subcommittee at its hearings this year on the 355-ship plan, I might be the only one about which all of that can be said.

My CRS overview report on Navy force structure and shipbuilding, which is updated periodically, provides an overview of the 355-ship force-level goal and various issues for Congress arising from it.[1] The summary of that report is reprinted in this statement as **Appendix A**. Rather than repeating at length what is in that report, this statement provides some additional analytical observations.

For additional reference, this statement presents a summary of some acquisition lessons learned for Navy shipbuilding (**Appendix B**), some considerations relating to warranties in shipbuilding and other defense acquisition (**Appendix C**), and a discussion of minimizing cost growth and minimizing end cost in shipbuilding and other defense acquisition (**Appendix D**).

355-Ship Plan Is Based on 2016 Defense Strategy

It is important to note at the outset that the Navy's 355-ship force-level goal, which was released in December 2016, is the product of a Force Structure Assessment (FSA) done by the Navy in 2016, based on the U.S. defense strategy of 2016, meaning the Obama Administration's defense strategy. The Trump Administration is currently conducting a defense strategy review. If that review leads to one or more changes in U.S. defense strategy—a not-insignificant possibility, particularly given current debate about the future U.S. role the world[2]—the Navy would have an opportunity to conduct a new FSA based on the newly revised strategy, which could lead to changes in the size and composition of the Navy's force-level goal.

A Possible New Shift in Chinese Shipbuilding Could Affect Required Numbers of U.S. Navy Ships

In connection with the possibility of a new FSA reflecting a newly revised defense strategy, China may have decided in recent months (i.e., in the time since the last FSA) to increase its role on the world stage, perhaps in part in reaction to a perception, correct or not, that the United States is reducing its role on the world stage. Such a decision by China could affect its naval modernization effort, which over the last quarter century has tended to focus more on improving the quality of its naval platforms more than it has on increasing total numbers of platforms.[3] Pursuing a larger role on the world stage could lead China to shift to a naval modernization effort that, while maintaining a focus on improving quality, also focuses on

[1] CRS Report RL32665, *Navy Force Structure and Shipbuilding Plans: Background and Issues for Congress*, by Ronald O'Rourke

[2] For further discussion regarding the future U.S. role in the world, see CRS Report R44891, *U.S. Role in the World: Background and Issues for Congress*, by Ronald O'Rourke and Michael Moodie.

[3] For additional discussion 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 Ronald O'Rourke.

increasing total numbers of platforms. Put differently, while China until recently may have been aiming at developing a regionally powerful Navy with an added capability for conducting occasional, limited, or tightly focused naval operations in more distant waters, it might have recently decided to pursue a more ambitious goal of developing a navy with more extensive capabilities for global operations.[4] Such a development could have potentially significant implications for required numbers of U.S. Navy ships.

As one possible indication of a possible shift of this kind in China's naval modernization effort, China reportedly is now finishing work on a new nuclear submarine construction facility that will be the world's largest. Reportedly, this facility includes a 430,000-square-foot assembly hall with two parallel production lines, and is large enough to build four nuclear-powered attack submarines (SSNs) simultaneously. This facility will be on top of China's ongoing production elsewhere of non-nuclear-powered submarines. What is going to happen to China's submarine force after this new nuclear submarine facility goes into production, which reportedly will happen later this year?[5]

China is not the only competitor country whose military modernization efforts could affect required numbers of U.S. Navy ships. Russia is another country of concern in this regard, because of its submarine force and its increased naval activities in the waters around Europe, as discussed below in the section on the option of additional forward homeporting in the Mediterranean. Required numbers of U.S. Navy ships can also be affected by developments in Iranian and North Korean military capabilities. Among all these countries, however, China arguably is of the most concern in this regard, because of the scale of its military forces, the pace and breadth of its naval modernization effort, its ability to continue financing that effort, and the increasingly global scope of its naval operations.

Some Recent Comments from Navy Officials Suggest Hedging on 355-Ship Plan

It can also be noted that while the Navy in general continues to support the 355-ship force-level plan, certain comments from Navy officials in recent months (particularly since the release in mid-March of the Administration's FY2018 budget outline) can be interpreted as hedging somewhat on the plan.[6] Observers detected similar hedging in remarks made by Secretary of the Navy nominee Richard Spencer at his July 11, 2017, confirmation hearing.[7] This apparent hedging appears due to a combination of at least three factors:

- growing Navy interest in how the Navy's future fleet architecture might be changed by unmanned vehicles (particularly very large ones that might be launched from a pier) and by other new technologies;

[4] See, for example, Ryan Martinson and Katsuya Yamamoto, "How China's Navy Is Preparing to Fight in the 'Far Seas'," *National Interest*, July 18, 2017.

[5] See Jeffrey Lin and P. W. Singer, "China Is Building the World's Largest Nuclear Submarine Facility," *Popular Science*, May 1, 2017. See also Lyle J. Goldstein, "China Prepares to Ramp Up its Shipbuilding Process," *National Interest*, April 2, 2017.

[6] See, for example, pages 4-5 and pages 8-9 of *The Future Navy*, a May 17, 2017, white paper from the Chief of Naval Operations. The document is posted at: https://news.usni.org/2017/05/17/document-chief-of-naval-operations-white-paper-the-future-navy. See also Connor O'Brien, "New Navy Vision Coming 'In the Next Few Weeks,' CNO Says," *Politico Defense Whiteboard*, April 27, 2017; and 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.

[7] See, for example, Sydney J. Freedberg Jr., "SecNav Nominee Spencer Soft-Pedals Trump's 355-Ship Navy, Touts Robots," *Breaking Defense*, July 11, 2017; David B. Larter, "A 355-Ship Navy? We'll See, Says Trump's Navy Secretary Pick," *Defense News*, July 13, 2017.

- uncertainty about whether future Navy budgets will be sufficient to achieve and maintain a 355-ship fleet; and
- the time (20 years or more) that would be needed to achieve all elements of the 355-ship force structure (particularly the 12-ship aircraft carrier force and the 66-boat attack submarine force), and how this timeline compares to rates of improvement in the naval capabilities of competitor countries, particularly China.

Potential Economies in an Increased Navy Shipbuilding Effort

Although the increased shipbuilding effort that would be needed to achieve the Navy's 355-ship force-level goal would have a substantial cost (see **Appendix A**), there would also be some potential economies in that effort:

- Increasing annual procurement rates for ships can reduce their unit procurement costs due to improved production economies of scale. Doubling the rate of procurement from one ship per year to two ships per year, or from two ships per year to four ships per year, for example, might reduce unit procurement costs by roughly 10 percent. Unit procurement costs for aircraft carriers and large-deck amphibious assault ships, which are procured at a rate of one ship every few years, can be reduced by procuring these ships at more-frequent intervals.
- Increasing annual procurement rates for ships can also increase opportunities for reducing unit procurement costs through use of competition for quantity in the awarding of shipbuilding contracts. In instances where competition for quantity is still not possible, the Navy, as in the DDG-51 program, can use Profit Related to Offers (PRO) bidding (i.e., competition for profit rather than quantity) to generate bargaining leverage for the government.[8]
- Compared to using annual contracting, using multiyear contracting in the form of multiyear procurement (MYP) or block buy contracting can reduce unit procurement costs by about five percent without use of Economic Order Quantity (EOQ) purchases of selected components, and by about ten percent with use of EOQ purchases. The Navy in recent years has made extensive use of multiyear contracting in procuring attack submarines, destroyers, LCSs, and oilers.[9]
- Cross-program purchases of common materials and components, such as those authorized for nuclear-powered ships under the statute governing the National Sea-Based Deterrence Fund, can further reduce ship procurement costs at the margin. Such purchases, if pursued, have a potential for becoming a third element of what might be viewed as a quiet revolution in recent years in Navy ship funding and contracting practices.[10]

[8] For more on PRO bidding, see Statement of Ronald O'Rourke, Specialist in Naval Affairs, Congressional Research Service, before the House Armed Services Committee on Case Studies in DOD Acquisition: Finding What Works, June 24, 2014, p. 7, and Sydney J. Freedberg Jr., "Can Navy Afford Next-Gen DDG-51 Destroyer, Packard Award Or Not?" *Breaking Defense*, November 12, 2012.

[9] For additional discussion, see CRS Report R41909, *Multiyear Procurement (MYP) and Block Buy Contracting in Defense Acquisition: Background and Issues for Congress*, by Ronald O'Rourke and Moshe Schwartz.

[10] The first two elements would be increased use of incremental funding for procuring aircraft carriers and amphibious assault ships (which can prevent funding spikes that might force uneconomic disruptions to other Navy programs) and increased use of multiyear contracting.

Potential Economies in Coast Guard Shipbuilding Might Indirectly Benefit Navy Shipbuilding

Potential economies in Coast Guard shipbuilding might indirectly permit a bit of additional Navy shipbuilding, because such economies could permit the Coast Guard to fund more of its shipbuilding effort through its own acquisition account and thereby reduce the need for using the SCN account as an additional source of funding for Coast Guard shipbuilding. As noted in other CRS testimony and reports,[11] although the Navy for years has made extensive use of multiyear contracting to reduce ship procurement costs, the Coast Guard to date has made no use of multiyear contracting in its shipbuilding (or other) acquisition efforts.

CRS in previous testimony and reports has estimated that using multiyear contracting in the Coast Guard's 25-ship Offshore Patrol Cutter (OPC) program might reduce the total acquisition cost of those 25 ships by roughly $1 billion, and that using multiyear contracting in the Coast Guard's polar icebreaker program could reduce the cost of a three-ship heavy polar icebreaker acquisition by roughly $200 million. These programs represent a once-in-a-generation opportunity for achieving savings of these magnitudes in Coast Guard shipbuilding. Navy expertise in using multiyear contracting can be used to assist the Coast Guard in using such contracts, and the Navy is providing such assistance in the case of the polar icebreaker program.[12]

Congress Has the Option of Fully Funding Additional Ships in the Near Term, As Early as FY2018

Construction rates for major Navy ships cannot be markedly increased overnight—shipyards and supplier firms would need time to increase tooling and to hire and train the new workers that would be needed to handle the additional work. Even so, Congress has the option of fully funding additional ships in the near term—starting as early as FY2018—with the understanding that those additional ships would not begin construction until the industrial base is ready to accept the additional work, which could be years from now. Fully funding ships in the near term could send a near-term signal of commitment to industry, and a near-term signal of deterrence to potential adversaries, particularly China.

The option of fully funding additional ships as early as FY2018 includes nuclear-powered ships, such as attack submarines, for which there has been no prior-year advance procurement (AP) funding. As discussed in the CRS report on the Virginia-class attack submarine program,[13] although attack submarines

[11] See, CRS Testimony TE10004, *The Status of Coast Guard Cutter Acquisition Programs*, by Ronald O'Rourke, CRS Report R42567, *Coast Guard Cutter Procurement: Background and Issues for Congress*, by Ronald O'Rourke, and CRS Report R42567, *Coast Guard Cutter Procurement: Background and Issues for Congress*, by Ronald O'Rourke.

[12] In connection with this issue, it can be noted that on three occasions in recent years—in 2002, 2006, and 2013—Navy and Coast Guard leaders have signed a joint National Fleet Policy Statement to provide (as stated in the 2013 edition) "direction and guidance for our Services to achieve commonality and interoperability for 21st century maritime and naval operations." The document states that "This Policy is particularly important in light of: significantly constrained fiscal resources; the growing costs of acquiring, training, and maintaining technologically advanced forces; and the complexity and lethality of national security threats and challenges confronting the Nation in and from the maritime domain." It states further that "This Policy enables Navy and Coast Guard forces to effectively and efficiently support each other while identifying specific methods and measurements, avoid redundancies and achieve economies of scale to maximize our Nation's investment of increasingly scarce resources." (*The National Fleet, A Joint Untied States Navy and United States Coast Guard Policy Statement*, undated but issued in 2013. Accessed July 17, 2017, at: https://www.uscg.mil/seniorleadership/DOCS/National%20Fleet%20Policy%20-%20signed%2025Jun13.pdf .

[13] See Appendix B of CRS Report RL32418, *Navy Virginia (SSN-774) Class Attack Submarine Procurement: Background and* (continued...)

are normally procured with two years of AP funding, Congress can fund the procurement of an SSN without prior-year AP funding (an option might be referred to as single-year fully funding or point-blank funding), or with only one year of AP funding.

Single-year full funding has been used in the past by Congress to procure nuclear-powered ships for which no prior-year AP funding had been provided. Specifically, Congress used single-year full funding in FY1980 to procure the nuclear-powered aircraft carrier CVN-71, and again in FY1988 to procure the CVNs 74 and 75. In the case of the FY1988 procurement, under the Administration's proposed FY1988 budget, CVNs 74 and 75 were to be procured in FY1990 and FY1993, respectively, and the FY1988 budget was to make the initial AP payment for CVN-74. Congress, in acting on the FY1988 budget, decided to accelerate the procurement of both ships to FY1988, and fully funded the two ships that year at a combined cost of $6.325 billion. The ships entered service in 1995 and 1998, respectively.

The existence in both FY1980 and FY1988 of a spare set of Nimitz-class reactor components was not what made it possible for Congress to fund CVNs 71, 74, and 75 with single-year full funding; it simply permitted the ships to be built more quickly. What made it possible for Congress to fund the carriers with single-year full funding was Congress's constitutional authority to appropriate funding for that purpose.

Funding the procurement of an SSN with no AP funding or one year of AP funding would not materially change the way the SSN would be built—the process would still encompass about two years of advance work on long-leadtime components, and an additional five or six years of construction work on the ship itself. The outlay rate for the SSN could be slower, as outlays for construction of the ship itself would begin at least one or two years later than normal, and the interval between the recorded year of full funding and the year that the ship enters service would be longer than normal.

Congress in the past has funded the procurement of certain ships in the knowledge that those ships would not begin construction for some time and consequently would take longer to enter service than a ship of that kind would normally require. When Congress procured two nuclear-powered aircraft carriers (CVNs 72 and 73) in FY1983, and another two (CVNs 74 and 75) in FY1988, it did so in both cases in the knowledge that the second ship in each case would not begin construction until some time after the first.

The Value of Surprise

If competitor countries, particularly China, continue to reduce the U.S. margin of military superiority, policymakers may need to consider placing increased emphasis on finding opportunities for surprising China and other competitor countries with capabilities that are *not* reflected in the 355-ship plan. The aim would be to enhance deterrence of China and other competitor countries by suddenly unveiling new capabilities, not previously spoken about in public, at carefully selected moments, so as to throw off competitor calculations and reduce their confidence about success in confronting U.S. Navy forces.

Such actions could assist in managing any increased risk of a failure of deterrence during the projected valley in U.S. attack submarine force levels (see discussion below), or more generally, risks associated with the extended period during which the Navy will be well short of 355 ships. Surprises might take the form of suddenly revealed new weapons, or suddenly revealed multiple squadrons of large unmanned surface or underwater vehicles.

Competitor countries sometimes surprise U.S. observers with new military capabilities that those observers did not expect (or did not expect to see until some later time). But this is a game that can be played both ways, and doing so might take on greater importance in a situation of reduced U.S. military

(...continued)

Issues for Congress, by Ronald O'Rourke.

superiority. Surprises, of course, can also be destabilizing, so care would need to be exercised to ensure that unveiling an unexpected capability would have the effect of enhancing deterrence rather than weakening or undermining it.

The Potential—and Limits—of Unmanned Vehicles

There is much interest in the potential for using unmanned vehicles (UVs) of various kinds to expand Navy capabilities, and in the possibility that a significant application of UVs could lead to a new fleet architecture. UVs were featured prominently in 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).[14] This interest is warranted, particularly given developments with large surface and underwater UVs that could be launched from a pier. At the same time, it can be noted that while UVs have significant potential for performing various missions—potential that is likely not yet fully understood—there will be limits to what UVs can do relative to manned platforms, and that beyond a certain point, UVs will not be able to serve as substitutes for manned ships and aircraft, and therefore as a general reason or argument for not procuring ships and aircraft in needed numbers.

Addressing the Projected Valley in Attack Submarines

Discussion of the attack submarine portion of the 355-ship plan has tended to focus on how soon the Navy can increase the size of the attack submarine force to 66 boats, the number called for in the 355-ship plan. This focus has tended to obscure another issue that will come first, which is how to address the dip or valley in the attack submarine force level that is projected to occur during the period FY2025-FY2036, reaching a minimum of 41 boats in FY2029. I first called attention to this projected valley in 1995 and have been testifying, reporting, and speaking about it every year since. For several years now, I have been concerned that this valley, in addition to potentially causing a period of increased operational strain on the attack submarine force, could also lead to a period of weakened conventional deterrence against potential adversaries, particularly China.

It is now apparent that China has taken note of the valley. The November 2014 edition of a Chinese military journal, for example, includes an article with a passage that translates as follows:

> ... in 2028, the [U.S. Navy] force of nuclear attack submarines will fall from the current number of 55 down to 41 boats. Some are concerned about whether this force level can meet the requirements of the Asia-Pacific rebalance."[15]

As discussed in the CRS report on the Virginia-class attack submarine program, the Navy has been exploring options for mitigating the projected valley since at least 2006. Notional options for mitigating the valley include (but are not necessarily limited to) the following:

- shifting planned maintenance periods on SSNs where possible from the valley years to years before or after the valley years, so as to maximize the fraction of the SSN force that is available for operation during the valley years;
- extending the service lives of a few of the youngest Los Angeles (SSN-688) class SSNs from the currently planned notional figure of 33 years to 36 or 37 years (a figure achieved

[14] For excerpts from these studies, see Appendix F of CRS Report RL32665, *Navy Force Structure and Shipbuilding Plans: Background and Issues for Congress*, by Ronald O'Rourke.

[15] Lyle Goldstein, "Evolution of Chinese Power Projection Capabilities," presentation to Center for a New American Security (CNAS) roundtable discussion, September 29, 2016, slide 7 of 41.

by at least three earlier Los Angeles-class boats), so that those boats can continue serving further into the valley years;

- performing a nuclear refueling on a few of the youngest Los Angeles (SSN-688) class boats, for the purpose of permitting those boats to operate for a few more years, so as to help fill in the valley; and
- procuring additional Virginia-class boats in the near term, meaning early enough so that they could enter service prior to or during the valley years.

Roadmap for Achieving Three Things in Cruiser-Destroyer Force

The Navy in coming years will have many DDG-51 class destroyers—the two DDG-51s requested for FY2018, for example, are to be the 78th and 79th ships in the class. DDG-51s are highly capable ships, and the Navy is reducing their procurement costs through use of multiyear procurement and PRO bidding. DDG-51 unit procurement costs could be reduced further by increasing the DDG-51 procurement rate from two ships per year to three or four ships per year, which is something that might be done to achieve and maintain the force of 104 cruisers and destroyers included in the 355-ship plan.

The Navy is not, however, taking steps to significantly reduce the operation and support (O&S) costs of DDG-51s, which could lock much of the future fleet into substantial annual O&S costs, potentially reducing options for future Navy leaders to fund other priorities in coming years within a Navy budget of a given size. More generally, as discussed in the CRS report on destroyer procurement,[16] the Navy does not have an announced roadmap for accomplishing three things in the cruiser-destroyer force:

- restoring ship growth margins;[17]
- introducing large numbers of ships with integrated electric drive systems or other technologies that could provide ample electrical power for supporting future electrically powered weapons; and
- introducing technologies (such as those for substantially reducing ship crew size) for substantially reducing ship operating and support (O&S) costs.

The Navy's pre-2008 plan to procure DDG-1000 destroyers and then CG(X) cruisers based on the DDG-1000 hull design represented the Navy's roadmap at the time for restoring growth margins, and for introducing into the cruiser-destroyer force significant numbers of ships with integrated electric drive systems and technologies for substantially reducing ship crew sizes. The ending of the DDG-1000 and CG(X) programs in favor of continued procurement of DDG-51s leaves the Navy without an announced roadmap to do these things, because the Flight III DDG-51 will not feature a fully restored growth margin, will not be equipped with an integrated electric drive system or other technologies that could provide ample electrical power for supporting future

[16] CRS Report RL32109, *Navy DDG-51 and DDG-1000 Destroyer Programs: Background and Issues for Congress*, by Ronald O'Rourke.

[17] Growth margins refer to a ship's capacity for accommodating over its service life new equipment that is larger or heavier than the older equipment it replaces, or which requires more electrical power or cooling capacity than the older equipment it replaces. Key measures of a ship's growth margin include available space, additional weight-carrying capacity, ability to accept resulting changes in the ship's vertical center of gravity, available electrical power, and available cooling capacity. Growth margin can also refer to a ship's ability to accept an increase in crew size due to changes in equipment or other causes.

electrically powered weapons, and will not incorporate features for substantially reducing ship crew size or for otherwise reducing ship O&S costs substantially below that of Flight IIA DDG-51s.

One option for addressing this issue would be to further modify the DDG-51 design. Another would be to initiate a program to design a new cruiser or destroyer class.

Opportunity to Create a Firm Analytical Foundation for Small Surface Combatant Acquisition

As discussed over the years in the CRS report on the LCS/Frigate program,[18] much of the controversy in that program over the years might be viewed as a consequence of the program's weak analytical foundation. The Navy's current effort to define a new frigate can be viewed as the third attempt in the last 15 years to create a firm analytical foundation for the Navy's small surface combatant acquisition efforts. Creating such a foundation involves providing analytically rigorous answers to three questions before committing to a particular acquisition:

- What capability gaps need to be addressed?
- What is the best general approach for addressing those gaps? (For example, should these gaps be addressed with a new ship? A new aircraft? An unmanned vehicle? Something else? In years past, this was sometimes referred to as an analysis of multiple concepts, though it can also be called an analysis of alternatives.)
- For the best general approach identified above, what are the key performance parameters (KPPs)?

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 to 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.[19] Some parts of the shipbuilding industrial base, such as the submarine construction industrial base, could face more challenges than others in ramping up to the higher production rates required to build the various parts of the 355-ship fleet.

[18] See earlier editions of CRS Report RL33741, *Navy Littoral Combat Ship/Frigate (LCS/FF) Program: Background and Issues for Congress*, by Ronald O'Rourke.

[19] 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.

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. As of 2016, these seven yards reportedly employed a total of more than 66,000 people. Production workers account for a sizeable fraction of that figure. Some of the production workers are assigned to projects other than building Navy ships.[20] (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."[21]

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."[22] 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."[23]

[20] For example, at Huntington Ingalls Industries (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 General Dynamics/National Steel and Shipbuilding Company (GD/NASSCO), some production workers may be assigned to the production of commercial cargo ships.

[21] 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.

[22] 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.)

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

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 state that they are exploring options for increasing the service lives of certain existing surface ships, particularly DDG-51 class destroyers.[24] Extending DDG-51 service lives could make it possible to defer, for a period of years, the procurement of some number of destroyers that would otherwise need to be procured in the nearer term to achieve and maintain the 104-ship cruiser-destroyer force included in the 355-ship plan. The funding and industrial base capacity that would have been used for these destroyers in the nearer term could instead be used for funding and building other types of ships included in the 355-ship plan, such as frigates and amphibious ships. Extending the service lives of DDG-51s could involve increasing funding for maintaining and modernizing these ships, with the increases perhaps starting right away.[25] Even with extended DDG-51 service lives, maintaining a force of 104 cruisers and destroyers would eventually involve procuring replacement ships for the extended DDG-51s.

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.[26] The technical feasibility and potential cost effectiveness of these options, however, is currently not clear.[27] It may be possible to do something creative with the FFG-7 class ships.[28] Exploring options for reactivating recently retired ships can be viewed, at a minimum, as a matter of due diligence.

Option of Additional Forward Homeporting in Mediterranean

During the Cold War, the waters around Europe constituted one of three major operating hubs for the U.S. Navy, along with the Indian Ocean/Persian Gulf region and the Western Pacific. Following the end of the Cold War, U.S. Navy operations around Europe were significantly reduced, and major Navy forward-deployed operations were focused primarily on the two remaining hubs. Now, with more recent changes in the international security environment,[29] including increased Russian naval activity around Europe and

[24] Megan Eckstein, "NAVSEA: Extending Surface Ship Service Lives Could Speed Up 355-Ship Buildup By 10-15 Years," *USNI News*, June 1, 2017; 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; Richard Abott, "Navy Looking At Bringing Back Perry Frigates, Life Extension, Networking For Larger Fleet," *Defense Daily*, June 15, 2017; 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.

[25] See, for example, "Richard Abott, "NAVSEA Chief Says Increased Maintenance Funds Will Help Reach 355-Ship Fleet Faster," *Defense Daily*, June 2, 2017.

[26] See footnote 24, and also Lee Hudson, "CNO Considers Modernizing Oliver Hazard Perry-Class Frigates," *Inside the Navy*, June 19, 2017.

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

[28] See, for example, Tony Butera and Dale Rielage, "Innovate to Return Perry Frigates Faster & Better," *U.S. Naval Institute Proceedings*, June 2017.

[29] For a discussion of the changing international security environment, see CRS Report R43838, *A Shift in the International Security Environment: Potential Implications for Defense—Issues for Congress*, by Ronald O'Rourke.

instability and conflict in North Africa and Syria, the European theater, and particularly Mediterranean, is re-emerging as a third major operating hub for the Navy, putting upward pressure on Navy force-level requirements. For example, increasing by eight the number of Navy ships that are continuously forward deployed in the Mediterranean and sourcing that additional deployment from ships that are homeported on the U.S. East Coast could increase the Navy's force structure requirement (other things held equal) by about 42 ships.[30]

One option for managing this upward pressure on Navy force-structure requirements—that is, for increasing Navy ship deployments to the Mediterranean while minimizing reductions to Navy operations in the other two operating hubs—would be to homeport additional Navy ships in the Mediterranean. Forward homeporting additional Navy ships in the Mediterranean could substantially reduce the number of additional ships the Navy would need to support a larger forward-deployed presence there. Returning to the example cited in the previous paragraph, forward homeporting seven surface ships in the Mediterranean (and accounting for the fact that those seven ships would require periodic maintenance) could reduce from about 42 to about 14 the additional number of ships that would be needed to support eight additional forward-deployed ships in the Mediterranean.[31]

It is well known that the U.S. Navy has forward-homeported a carrier group in Japan since the early 1970s. What is less well-remembered is that the Navy in the early 1970s was also pursuing a plan for homeporting a carrier group in Greece, at the port of Piraeus, near Athens. The initial surface combatants for that group, in fact, were sent to Greece. Following a military coup in Greece, however, the United States canceled the plan to homeport a carrier group in Greece. If the coup had not occurred, the United States today might have a carrier group homeported in Greece, as it does in Japan.

Additional Navy ships homeported in the Mediterranean could be of various types, and need not amount to a carrier strike group. And Greece is not the only potential option for forward-homeporting Navy ships in the Mediterranean—other possibilities, at least in theory, include Spain (which homeports four U.S. Navy destroyers at Rota), Italy (which homeports a Navy command ship at Gaeta), and France. Some observers have also suggested Haifa, Israel, as a possible homeporting location.

Forward homeporting is an option that has been discussed in previous CRS reports[32] and in reports from the Congressional Budget Office (CBO).[33] Aside from substantially reducing the number of ships needed to support a given level of forward-deployed presence, forward homeporting offers other potential benefits. Although it can substantially reduce the number of ships needed to support a given level of

[30] Source: CRS calculation based on Navy stationkeeping multipliers provided by the Navy to CRS and CBO on December 15, 2015. A stationkeeping multiplier is the number of ships of a certain kind that are needed to keep one ship of that kind on station in an overseas operating area. The calculation here is based on an additional continuous presence of a carrier strike group (CSG) consisting of one aircraft carrier and three surface combatants, an amphibious ready group (ARG) consisting of three amphibious ships, and one attack submarine.

[31] Source: CRS calculation based on Navy stationkeeping multipliers provided by the Navy to CRS and CBO on December 15, 2015. As noted in footnote 30, in the notional example here, the additional forward-deployed presence in the Mediterranean includes one aircraft carrier, three surface combatants, three amphibious ships, and one attack submarine. In the calculation here, one carrier, three surface combatants, and three amphibious ships would be forward homeported in the Mediterranean, while the attack submarine presence would continue to be sourced from submarines homeported on the U.S. East Coast. (The Navy does not currently homeport any attack submarines outside U.S. territory.)

[32] See, for example, CRS Report RS21338, *Navy Ship Deployments: New Approaches—Background and Issues for Congress*, by Ronald O'Rourke.

[33] See, for example, Congressional Budget Office, *Preserving the Navy's Forward Presence With a Smaller Fleet*, March 2015, 29 pp.

forward-deployed presence, forward homeporting does not substantially change the number of ships needed for warfighting. In addition, forward homeporting also poses certain challenges, costs, and risks.[34]

Chairman Wicker, this concludes my statement. Thank you again for the opportunity to testify, and I will be pleased to respond to any questions the subcommittee may have.

[34] For a discussion of the benefits, challenges, costs, and risks of forward homeporting, see pp. 8-10 of CRS Report R44635, *Navy Force Structure: A Bigger Fleet? Background and Issues for Congress*, by Ronald O'Rourke.

Appendix A. Summary of CRS Overview Report on Navy Force Structure and Shipbuilding Plans

This appendix reprints the summary of my CRS overview report on Navy force structure and shipbuilding.[35] The text of the summary is as follows:

> 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.

[35] CRS Report RL32665, *Navy Force Structure and Shipbuilding Plans: Background and Issues for Congress*, by Ronald O'Rourke.

- 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.

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

A general summary of lessons learned in Navy shipbuilding, reflecting comments made repeatedly by various sources over the years, includes 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 not the hard part—most if not all these points have been cited for years. The hard part is living up to them without letting circumstances lead program-execution efforts away from these guidelines.

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

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.[36]

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

[36] 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 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.

> 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.[37]

[37] 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 D. 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.[38]

The affordability challenge posed by the Navy's 355-ship force-level goal 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.

Now, 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,

[38] This appendix is adapted from Statement of Ronald O'Rourke, Specialist in Naval Affairs, Congressional Research Service, before the House Armed Services Committee on Case Studies in DOD Acquisition: Finding What Works, June 24, 2014, pp. 15-16; and Statement of Ronald O'Rourke, Specialist in Naval Affairs, Congressional Research Service, before the House Armed Services Committee Subcommittee on Seapower and Projection Forces on the Navy's FY2014 30-Year Shipbuilding Plan, October 23, 2013, pp. 4-5.

DOD could well wind up leaving money on the table in some instances—of not, in other words, minimizing procurement costs.

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.