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AN INDEPENDENT ASSESSMENT OF THE NAVY'S 30–YEAR SHIPBUILDING PLAN

HEARING

BEFORE THE

SUBCOMMITTEE ON SEAPOWER AND PROJECTION FORCES

OF THE

COMMITTEE ON ARMED SERVICES
HOUSE OF REPRESENTATIVES

ONE HUNDRED THIRTEENTH CONGRESS

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AN INDEPENDENT ASSESSMENT OF THE NAVY'S 30–YEAR SHIPBUILDING PLAN

HOUSE OF REPRESENTATIVES,
COMMITTEE ON ARMED SERVICES,
SUBCOMMITTEE ON SEAPOWER AND PROJECTION FORCES,
Washington, DC, Wednesday, October 23, 2013.

The subcommittee met, pursuant to call, at 2:30 p.m., in room 2212, Rayburn House Office Building, Hon. J. Randy Forbes (chairman of the subcommittee) presiding.

OPENING STATEMENT OF HON. J. RANDY FORBES, A REPRESENTATIVE FROM VIRGINIA, CHAIRMAN, SUBCOMMITTEE ON SEAPOWER AND PROJECTION FORCES

Mr. FORBES. I want to welcome our members and our distinguished panel of experts to today's hearing that will focus on the Navy's 30-year shipbuilding plan. Before we begin this hearing today I want to briefly discuss the future of our naval forces. There are a multitude of thoughts as to the correct size and shape of our United States Navy. The Navy has advocated for a force structure plan and has proposed a 306-ship Navy to meet the national strategy. The 2010 Quadrennial Defense Review Independent Panel proposed a Navy of 346 ships to meet our Nation's requirements.

I have no reason to doubt the size offered by our Nation's preeminent leaders as to the desired direction of our naval forces, but this desired force structure is in sharp contrast to our 285-ship Navy of today, and especially at odds to a projected force structure posed by the Congressional Budget Office of 243 ships.

I believe that our Nation's military strategy should be directly linked to the vitality of our Nation's economy. Our forces should be positioned at locations that will best maintain a stable global commons. Our naval strategy should be prepared to assure our allies and deter potential aggressors.

As I look forward, I believe that our Nation should concentrate our military's efforts on areas deemed important to the United States and to the vitality of our Nation's economy. The lessons of history teach us that we cannot build a Navy that is intended just to protect Norfolk and San Diego. Instead, we need a global-postured Navy that can uphold our interests across the international maritime highways that connect our economy to the world.

Leading the charge to support the Asia-Pacific rebalance is our United States Navy. Unfortunately, institutional inertia continues to impede the ability of the Navy to make smart force structure decisions to support this vital region. The old adage that supports an equal budget share between the Army, Navy, and Air Force is quickly becoming a relic, an obstacle to effectively shaping our

forces. It is time to provide the correct force structure to support our economic and security interests.

As to our hearing today I was disheartened to read the Congressional Budget Office's assessment of the direction of our United States Navy. Using a historic funding model, Dr. Labs projected that the Navy will possess 246 ships in 30 years. Dr. Labs further projected that the Navy will need to increase their overall shipbuilding budget by 34 percent to meet our national military strategy.

We are quickly approaching a fork in the road with two stark alternatives. Our current path puts us on a direction that will increase global instability, encourages our adversaries, and increasingly leads to an isolated United States. But this is not the only alternative. We can also choose to reverse this decline, eliminate defense sequestration, and achieve the force structure that will deter future aggressors.

I have no doubt as to my choice, and I hope that our Nation will review the facts in our current trend line and with steely eyed resolve choose the path that not only maintains our national security, but will also seek to enhance the security of successor generations. It is simply wrong to fail our Nation's greatest generation and drift into global mediocrity.

It is time that we reverse the devastating defense cuts under sequestration and place our national security on a positive trend line. It is time that we assess our direction and apply our precious treasure toward the services that best secure our future. It is time that we properly resource the United States Navy and provide them with the direction that ensures our collective security.

Today we are honored to have as our witnesses a senior analyst for naval weapons and forces at the Congressional Budget Office, Dr. Eric Labs.

Dr. Labs, thank you for being here with us today.

And a specialist in national defense at the Congressional Research Service, Mr. Ron O'Rourke.

And Ron, thank for your hard work in preparing for this hearing during a difficult time as we were all shut down. We know the hard work that you put in. And we thank you both for being here.

And now it is with great pleasure that I recognize my friend, the ranking member, Mr. McIntyre from North Carolina, for any remarks he may have.

[The prepared statement of Mr. Forbes can be found in the Appendix on page 31.]

STATEMENT OF HON. MIKE MCINTYRE, A REPRESENTATIVE FROM NORTH CAROLINA, RANKING MEMBER, SUBCOMMITTEE ON SEAPOWER AND PROJECTION FORCES

Mr. MCINTYRE. Thank you. Thank you, Mr. Chairman, thank you for holding this hearing.

And to our witnesses, thank you for being here.

As you can tell with the room being at capacity, there are many, many people interested in what you have to say. This is an important hearing because we know the future of American naval power is an issue that should concern all Americans. Despite the wonders of satellite and other communications technology, we realize the

world's economy truly does run on and arguably also beneath the surface of the oceans. The vast majority of trade still moves by ship, and most people in the world live within 100 miles of a coastline.

Since World War II, the U.S. and our allies have guaranteed freedom of movement and security in the world's oceans. We know that providing this security is expensive, but that the U.S. gets back far more through the global economic benefits of stable, secure ocean trade routes. And that investment is well worth it and multiplied many times over.

We realize, therefore, we can't take the security of our world's oceans for granted. To maintain American dominance of the oceans we must invest in a Navy that is of the right size and capability, an issue that brings us to the topic of today's hearing. The question I believe that is important for today is how realistic is the Navy's current shipbuilding plan. We know the Navy contends it has a valid plan. We would like to hear your testimony as why those assumptions should be carefully reviewed.

For instance, even if the Navy stays on its current path with the *Virginia*-class attack submarine program, it appears the Navy will fall short of the number of submarines that it says it needs in the 2020s and 2030s.

Second, even if the Littoral Combat Ship [LCS] stays on budget and does deliver on time, we will be replacing far more capable cruisers and destroyers with a very small, much less capable ship. While a large number of LCS ships may make the Navy's overall ship numbers look better, it doesn't mean the Navy will retain the combat capability that it has today.

Third and finally, we want to learn about the health of our shipbuilding industry and whether it is capable, indeed, of delivering all the ships the Navy needs, even if the funding is available. In World War II we had a large amount of excess shipbuilding capacity that we could draw on for our wartime needs. We know that doesn't exist today. And with budgets coming down I am concerned about losing more shipyards. And we know if that happens the Navy's current plan will become even riskier than it is today.

Thank you again for your time, and we look forward to, Mr. Chairman, hearing the answers to these and other questions that our colleagues raise during this panel.

Mr. FORBES. Thank you, Mike.

And, Dr. Labs, Mr. O'Rourke, we thank you both again for being here. And at the end of this hearing, when everyone has asked their questions, I am going to give both of you time to wrap up on anything you want to add that we haven't asked or you feel that you need to correct that you put in the record. And, Dr. Labs, it is my understanding that you are going to be leading off, so we once again thank you for being here and look forward to your comments.

STATEMENT OF DR. ERIC J. LABS, SENIOR ANALYST FOR NAVAL WEAPONS AND FORCES, CONGRESSIONAL BUDGET OFFICE

Dr. LABS. Thank you very much, Mr. Chairman. Chairman Forbes, Representative McIntyre, members of subcommittee, it is a pleasure to be here today to discuss the Navy's 2014——

Mr. FORBES. Eric, can you pull that microphone up just a little bit closer. Sometime it is a little funny.

Dr. LABS. Yes, sir. Does that work? Good.

My written testimony focuses on the costs and force structure implications of that plan and is based on the recently released CBO [Congressional Budget Office] report entitled "An Analysis of the Navy's Fiscal Year 2014 Shipbuilding Plan," which is required under section 1011 of the 2012 National Defense Authorization Act. In my prepared remarks today I will focus on key points and highlights of that report.

First, if the Navy received the same amount of funding for ship construction in the next 30 years that it has over the last 30 years, which is about $16 billion for all activities related to ship construction, it will not be able to afford all 266 ships in its plan.

Second, the Navy estimates that it will cost an average of $16.8 billion per year over 30 years to implement its plan. But I want to stress that that amount is for new construction only. The Navy must fund a number of other activities from its shipbuilding accounts. CBO estimates that those other activities, such as the refueling of nuclear-powered aircraft carriers, outfitting of all new warships, and other smaller items, would add an additional $1.9 billion per year to the Navy's estimate. Thus, the Navy's estimate is actually closer to $19 billion a year or more than 20 percent higher than what the service has received historically.

In contrast, CBO's estimates of the Navy's shipbuilding plan are $2.5 billion per year or 13 percent higher than the Navy's. Using its own methods and assumptions, CBO estimates that it would cost about $19 billion per year for new ship construction alone and about $21 billion for everything the Navy needs to fund in its ship accounts. That amount is one-third higher than the historical average.

Now I would like to discuss some implication of those points. The Navy shipbuilding plan is a statement of resources required to buy the fleet the Navy says it needs. As a result, the Budget Control Act [BCA] of 2011 did not affect the composition of the Navy's report. However, if the BCA remains in place, funding for ship construction will be well below the amounts required for the 2014 plan, unless such funding is protected at the expense of our military activities.

Specifically, if the Navy receives the same percentage of the DOD's [Department of Defense] budget during the coming decade and devotes the same 10 percent of its budget to shipbuilding as it has historically, then the shipbuilding accounts will be 30 percent lower than CBO's estimate of the plan or about a billion dollars less than the historical average.

The Navy shipbuilding report rightly emphasizes the funding challenge the service will face as it replaces the *Ohio*-class ballistic missile submarines in the second decade of its plan. The Navy says

that the money it will need must increase by about 30 percent to pay for the *Ohio* replacement program. However, the Navy's funding challenge is in fact looming much sooner than that. In the second half of the first decade the average new ship construction budget will need to increase by over 40 percent compared to the next 5 years, the period covered by the Future Years Defense Program. Thus, in the absence of a steady and sustained increase in the Navy's shipbuilding budget, the service will inevitably build fewer ships than envisioned in its plan.

Furthermore, CBO estimates that even if an alternative means for funding the *Ohio* replacement program were found, the remaining ships in its shipbuilding program will still cost about $2 billion per year more or about 13 percent more than the historical average.

In its report CBO included for the first time what the Navy might look like if its shipbuilding accounts are limited to the historical average of $16 billion per year. If ship construction were reduced in rough proportion, such that the composition of the fleet at the end of the plan was similar to the composition of the fleet in 2043 under the Navy's plan, then the Navy would purchase only 193 ships versus 266 and the fleet inventory in 2043 would number 243 ships, not 306, or about 20 percent less.

Finally, Mr. Chairman, I would like to highlight one final observation from the CBO report. The Navy shipbuilding plan, even if implemented in its entirety, projects shortfalls in the critical areas of ballistic missile submarines, attack submarines, surface combatants, and amphibious ships.

The issue of the surface combatants is particularly notable. The Navy assumes that all DDG–51 Flight IIA, Flight III, and next-generation destroyers would serve in the fleet for 40 years, a time period considerably longer than previous classes of surface combatant have served. If the Navy is unable to keep those ships for that long and modernize them accordingly, then the shortfall on destroyers will be much larger, last longer, and be very expensive to fix down the road.

Thank you, Mr. Chairman. And I will be happy to respond to any questions the subcommittee would have.

[The prepared statement of Dr. Labs can be found in the Appendix on page 33.]

Mr. FORBES. Thank you, Dr. Labs.

Mr. O'Rourke.

STATEMENT OF RONALD O'ROURKE, SPECIALIST IN NAVAL AFFAIRS, CONGRESSIONAL RESEARCH SERVICE

Mr. O'ROURKE. Chairman Forbes, Ranking Member McIntyre, distinguished members of the subcommittee, thank you for the opportunity to testify today on the Navy's 30-year shipbuilding plan. Chairman Forbes, with your permission I would like to submit my statement for the record and summarize it here in a few brief remarks.

Mr. FORBES. Without objection, it will be admitted.

Mr. O'ROURKE. In discussing the 30-year plan it is possible to focus on ship numbers and procurement costs so much that one can lose track of what is at stake strategically. Strategic considerations

that helped form the context for the 30-year plan include the strategic rebalancing toward the Asia-Pacific, China's naval modernization effort, and requests from regional combatant commanders for forward-deployed U.S. naval forces that would require a Navy of more than 500 ships to fully meet.

In a situation of reduced levels of defense spending such as what would occur if defense spending were to remain constrained to the revised cap levels in the Budget Control Act, the affordability challenge posed by the 30-year shipbuilding plan would be intensified. Even then, however, the current 30-year shipbuilding plan would not necessarily become unaffordable. The required increase of the shipbuilding account equates to 1.5 percent or less of DOD's budget. Some observers, noting the strategic rebalancing toward the Asia-Pacific, have advocated shifting a greater share of the DOD budget to the Navy and the Air Force.

In discussing this idea, some of these observers refer to breaking the so-called one-third, one-third, one-third division of resources among the three military departments. In a context of breaking one-third, one-third, one-third with an aim of better aligning defense spending with strategic rebalancing, shifting 1.5 percent or less of DOD's budget into the Navy shipbuilding account would appear to be quite feasible.

More broadly, if defense spending were to remain constrained to the revised cap levels in the Budget Control Act, then fully funding the Navy's total budget would require shifting 4 or 5 percent of the DOD budget to the Department of the Navy. While doing that would be more ambitious than shifting 1.5 percent of the budget to the Navy shipbuilding account, similarly large reallocations have occurred in the past.

The point here is not to argue whether it would be right or wrong to shift more of the DOD budget to the Navy shipbuilding account or to the Department of the Navy's budget generally. It is rather to note that the allocation of DOD resources is not written in stone, that aligning DOD spending with U.S. strategy in coming years could involve changing the allocation by more than a very marginal amount, and that such a changed allocation could provide the funding needed to implement the current 30-year shipbuilding plan.

The alternative of assuming that there is no potential for making anything more than very marginal shifts in the allocation of DOD resources could unnecessarily constrain options available to policymakers and prevent the allocation of DOD resources from being aligned optimally with U.S. strategy.

In my past work I have suggested options for making Navy shipbuilding more affordable, such as adding EOQ [economic order quantity] authority to the LCS block buy contracts and using a block buy contract to procure CVN–79 and CVN–80. Thinking more expansively about block buy contracting, some observers have raised the possibility of procuring both *Virginia*-class attack submarines and *Ohio* replacement ballistic missile submarines under a joint block buy contract covering both classes of ships. Such a contract might generate savings greater than what would be possible under separate multiyear contracts for each class.

Extending this thinking even further, a potential additional option in implementing a joint cross-class block buy contract would be to modify as needed the current division of work for building *Virginia*-class boats to ensure an optimal joint strategy for building both classes. Given the long history of the Navy encountering and addressing challenges in Navy shipbuilding programs, another option that might be of value in implementing the 30-year shipbuilding plan would be to establish a Navy shipbuilding lessons-learned center roughly analogous to the combat operations lessons-learned centers operated by the military services.

As a final point, the 30-year plan leaves the Navy without a clear road map in the cruiser-destroyer force for restoring ship growth margin, for introducing integrated electric drive technology to a large number of ships, particularly for supporting future high-power electrical weapons, and for substantially reducing ship lifecycle O&S [operations and support] costs by, among other things, reducing crew size. Accordingly, a final option for the subcommittee would be to ask the Navy for a road map that shows how the Navy plans to eventually accomplish these things in the cruiser-destroyer force.

Mr. Chairman, this concludes my statement. Thank you again for the opportunity to testify. And I look forward to the subcommittee's questions.

[The prepared statement of Mr. O'Rourke can be found in the Appendix on page 69.]

Mr. FORBES. Thank you, Ron.

As we go forth, until we get our mikes back on, if our reporters need us to speak up, raise your hand. I will defer my questions so members can get their questions in.

But just to start us off, Dr. Labs, if you can help us with this. As I understand it, the independent panel that reviewed the QDR [Quadrennial Defense Review] basically thought we need about 346 ships. In addition to that, we have the Navy saying 306 ships in their shipbuilding plan. It is my understanding that your assessment is, if we keep the funding historically the way it has been, that we would be at 243, but that has a proportionate reduction across all the lines, and the CNO [Chief of Naval Operations] has indicated that he plans to keep the *Ohio*-class replacement going forward.

If the CNO keeps the *Ohio*-class replacement as he has indicated, what would that do to our total ship count? And then also, if you layer sequestration on that, where would that put our bottom-line ship count in your best estimate?

Dr. LABS. Mr. Chairman, the Navy decided and indicated that its first priority is going to be the *Ohio* replacement program. So, therefore, if you kept to a historical level of funding of $16 billion and you kept all 12 *Ohio* replacements in the plan, that would lead to a reduction in the projected inventory by the end of the plan of an additional 10 ships. So, say, about 233 or so, give or take one or two.

If you are then talking about a further reduction to the sequestration levels—and let's assume for a minute that it would maybe just be for the first 10 years of the plan and it wouldn't continue throughout the 30-year period unless that is what you are prefer-

ring to assume—you are talking about removing another 9 or so billion dollars from the Navy shipbuilding plan, and so that is going to cost you another 5 or so ships. So you are talking about a 230 or so, late 220s size fleet under those two different scenarios, doing a kind of a back-of-the-envelope calculation here.

Mr. FORBES. So basically, as I understand, independent panel recommended 346 that they feel we needed for ships, Navy shipbuilding plan 306. If we stay on the historical funding the way we have been we would be at about 243. If the CNO moved forward as he said he would with the *Ohio* class at the historical funding levels, we would be down to about 233. And if we had sequestration according to what it is in the law now the next 10 years we would be down to 228. Is that a fair assessment?

Dr. LABS. Yes, Mr. Chairman, roughly. If I were sitting at my computer with a spreadsheet, it might look a little bit different, but it is going to be in those ballparks.

Mr. FORBES. Congressman McIntyre, I would like to recognize you.

Mr. MCINTYRE. Just two or three questions, Mr. Chairman.

Mr. O'Rourke, if the Navy cannot fund all the ships it has in the 2014 shipbuilding plan based on our current defense strategic guidance, where is the Navy's money best spent? If tough choices have to be made, what platforms do you believe should be the priorities?

Mr. O'ROURKE. Great question. And I can only kick that question back to you. If I were to state a preference it would amount to a recommendation. And we do have to avoid making recommendations in our work for CRS [Congressional Research Service]. So it is going to be a $64,000 question for policymakers to decide.

Mr. MCINTYRE. Let me ask you about the F–35 program. We know the tests have continued. We have now in excess of 10,000 flight test hours for the F–35. Recent estimates based on actual flight hour testing revealed that lifecycle cost estimates are 20 percent lower than originally thought. The U.S. Marine Corps detailed analysis shows that the cost per flying hour of the F–35B model is 16.6 percent lower than earlier Pentagon estimates, achieving a savings of $12.3 billion over the next five decades. Do you believe that we indeed are on a path to lowering the long-term cost of operating the F–35?

Mr. O'ROURKE. That is a little bit outside my lane. That issue is covered by our aviation analysts at CRS. But to give you an answer right here, what I do want to tell you is that if we are in a scenario of moving to a smaller fleet then the question will become, do you want to take down the F–35 numbers along with the size of the fleet, which would imply a smaller F–35 buy, or conversely do you actually want to enrich the proportion of the air wing that is made up by F–35s because you are going to have fewer carrier air wings?

So as a naval analyst who focuses on ships and the structure of the fleet, the question that that tends to pose for me is, which direction do you then want to take the F–35 program if the fleet is getting smaller? It is not obvious to me that there is only one choice in that matter. I think many people who look at a smaller fleet might be inclined to assume that you would get fewer F–35s, but it is also possible that you might actually enrich the number of F–35s per air wing precisely because you are going to have fewer

air wings. What that would mean in terms of net numbers of F–35s you would then have to calculate because there would be fewer air wings.

But I do think that that is an important consideration for this subcommittee and the full committee generally as we move forward. The composition of the carrier air wing itself is not fixed in a situation of a debate over what the future fleet size is and the answers to what that air wing should look like are not obvious in one direction or the other.

Mr. MCINTYRE. Okay. Thank you.

Thank you, Mr. Chairman.

Mr. FORBES. The gentleman from California, Mr. Hunter, is recognized for 5 minutes.

Mr. HUNTER. Thank you, Mr. Chairman.

Okay, so a couple of basic questions then. Why are the costs for the ships so much higher than the historical average? Is that just the overall cost of commodities and steel and labor and everything or is there something else?

Dr. LABS. Congressman, there are several factors that go into that. You are exactly right, the commodities for labor and steel are higher than it was, and historically inflation in the naval shipbuilding industry has been several points higher than inflation in the economy as a whole. And that probably represents about half of what you can account for in the increase in average Navy ship costs.

The other half would be the increasing capabilities that the Navy has put into its ships over the years, into what they design into the ships. So the ships are more capable. The things that we buy today by and large are more capable than what we bought of the same type historically.

Mr. O'ROURKE. If I could just add very quickly to what Eric said. Eric was speaking about the increase in per-ship costs, but part of what we are talking about here today is the required increase in the size of the shipbuilding budget compared to its historical average in past years. And a big part of the reason why that number would need to go up in the future is simply the number of ships that we would need to procure in the future to meet the force level plan. And that is something that is revealed in the 30-year shipbuilding plan.

Mr. HUNTER. Let me tie this in then, let me ask you this. And use whatever numbers you have because I don't know. If you look back 10 or 15 years or 20 years, however you guys look back on this, and the amount of money that the Navy had going forward to now, can you look back 15 years ago and say they had this much money, they said they were going to have a fleet of 330 ships and they don't, and we lost this many ships due to the lack of funding, can you do that? Going back and looking until now, does that make sense? Meaning we are talking about this now, and so let's say 10 years from now we have a fleet of 240 and we can look back and say the reason we have a fleet of 240 is because of what we are talking about in this hearing. Can you look back 10 years and say, look, this is where the Navy messed up here in what they projected?

Mr. O'ROURKE. I think there is one example of that that is fairly clear cut, and that was the near hiatus in attack submarine procurement that lasted for much of the 1990s. There were plenty of warnings issued at the time by myself and others dating back to 1995 that if you spent a lot of that decade not getting too many attack submarines that we would eventually be in a situation of having to get a lot more just to get back to the plan size that we are looking at. And we are now, 18 or 19 years into my testimony on this point, approaching the time when we will live with the consequences of these decisions.

Mr. HUNTER. Of having to buy more submarines and therefore having fewer ships.

Mr. O'ROURKE. That is right. I mean, part of the reason you need more money in the shipbuilding plan starting 5 years from now and extending for the next 15 years after that is the reduced rates of shipbuilding that took place from the end of the Cold War, from the early 1990s, until really just a few years ago. And if you build ships at a rate much lower than the steady state replacement rate for that long a period of time, then to get back to your required force levels you will have to eventually spend other years where you are building ships at something higher than the steady state replacement rate. And that is the situation that is revealed in the middle years of the 30-year shipbuilding plan today.

Dr. LABS. During the 1990s and most of the 2000s we were buying ships at about an average rate of six or so per year. So to maintain a fleet of 306 ships or 313 or whatever you need, you need numbers that are closer to 9 per year. So if historically you have been buying under your steady state replacement rate, as Ron indicated, then going forward you are going to need to buy above your steady state replacement rate and therefore that is going to account for some of the increased average annual cost of your shipbuilding budget.

Mr. HUNTER. Two more quick questions. You said they spend about 10 percent of their budget on shipbuilding. When you add in modernization and repair and everything else that has to do with making the current fleet last long enough to make the new ships that are coming online add to them, what is that percentage?

Dr. LABS. Sir, I don't know that percentage off the top of my head. I can take that for the record if you would like.

Mr. HUNTER. Yeah, please.

[The information referred to can be found in the Appendix on page 91.]

Mr. HUNTER. Ron, do you know, any idea?

Mr. O'ROURKE. I calculated it at the level of the total Department of the Navy [DON] budget, and that was the figure I gave you in my opening statement, that if you wanted to fully fund the DON budget, which includes the Marine Corps as well as the Navy, and you wanted to keep that at the level shown in the fiscal year 2014 budget submission, then even if the rest of the defense budget went down to the revised cap level in the Budget Control Act and stayed there, you could do that as long as you were willing to shift 4 or 5 percentage points of the DOD budget into the Department of the Navy budget. That is the broadest measure of what it would take to run the Navy, even broader than what you indicated in

your question, but it is at that level that I was able to do the calculation.

Mr. HUNTER. Let me try to get one last question in. What did the Navy do wrong in their calculations that made it so that their answer is wrong? I mean, there is a big disparity between you and they. What did they do wrong in their calculations?

Thank you, Mr. Chairman. And I yield after this.

Dr. LABS. I wouldn't necessarily say that the Navy has done something wrong. We have made some different assumptions than what the Navy has made in sort of conducting this analysis. One of the assumptions is sort of how you treat long-run historical cost growth in the Navy shipbuilding plan. When the Navy does its report it assumes that the higher inflation that occurs in the shipbuilding industry and when they calculate their constant dollar estimates, they wash that back out, all that additional growth.

But what CBO does is that we take an assumption between the difference between GDP [Gross Domestic Product] price inflation and the Navy shipbuilding inflation and we incorporate that into the constant dollar estimates, because that represents a real cost that has to be borne by the American taxpayer. If, for example, the American taxpayer only wants to give the Department of Defense increases each year equivalent to general inflation in the economy and ships are costing you more than that each and every year, then that is a real cost growth factor that you have to factor into the analysis.

In some other places I have made some different assumptions about what ships are going to cost and that is going to drive the subsequent costs of an entire class. For example, the Navy assumes that its next-generation destroyer, the one beyond the Flight III, is going to look not too different from the Flight III. But I made the assumption that it was not realistic to use the DDG–51 hull form for yet a Flight IV, and I made an assumption that they are going to have to design a new destroyer by that time, if not sooner, and therefore that is going to cost more than what the Navy assumed.

Mr. HUNTER. Thank you.

Mr. FORBES. And just to clarify, too, Dr. Labs and Mr. O'Rourke, I think what Mr. Hunter was asking is, it is not an enormous difference between what the Navy is actually estimating as cost and what you are estimating. The big gap is between what has historically been available to the Navy and what it would cost to do their shipbuilding plan, because when the Navy actually submits their 30-year shipbuilding plan they don't submit the dollars necessary to go along with it. They say this is the 30-year shipbuilding plan.

But even based on the Navy's cost, we would have to find where that money is coming from, because it would take a substantial amount more than has historically been allocated for shipbuilding in order to meet the Navy's figures. Am I correct on that?

Dr. LABS. Yes, sir, Mr. Chairman. I agree with that completely.

Mr. FORBES. The gentleman from Connecticut, Mr. Courtney, is recognized for 5 minutes.

Mr. COURTNEY. Thank you, Mr. Chairman.

Ron, your report mentioned the possible benefit of having cross-class block contracts as a way of trying to generate more savings. Has that ever been done before?

Mr. O'ROURKE. To my knowledge it has not. We would be breaking new ground. But one of the points that I wanted to make in my testimony, and it is in my prepared statement, is that the Navy in effect for years now has been breaking new ground in terms of the scope with which it has made use of multiyear procurement contracting authority. That authority has been on the books for many years, and the Navy through MYP and also now through block buy contracting authority, is making a lot more use of multiyear contracting than was the case in the past. And arguably, as I pointed out in my statement, it amounts to a quiet revolution in Navy ship acquisition, one that is very significant in my mind looking at it, but perhaps unheralded in terms of the amount of attention it has received.

But if you are breaking new ground doing that, it does raise the question of whether you could break further new ground in the future moving into a situation where we have to be very careful about how we are spending our defense dollars.

Mr. COURTNEY. Right. Well, there is clearly going to be overlap between the *Virginia* and the *Ohio* replacement. So I actually think it is an interesting idea.

Dr. Labs, I mean, your report didn't really I think have any kind of assumptions about using that approach, but, I mean, if you have any comment, I mean, in terms of whether you think it has potential.

Dr. LABS. Mr. Courtney, I do think that is certainly something worth exploring. The Navy should look, frankly, in every nook, cranny, and crevice to see what it can do to reduce costs in the shipbuilding program.

The CBO report did not assume cross-class multiyear procurement contracts in terms of the cost estimates, and if such a thing were feasible, even if they aren't quite as efficient as some of the within-class multiyear contracts, it is still something that could generate savings.

The CBO report did, however, include an assumption that in the same years that you are buying, which is pretty much every year in the plan you are buying an attack submarine and you are buying a ballistic missile submarine, you do gain overhead efficiencies in the submarine yard. So there are cost savings built into the CBO analysis for that aspect of the overlap.

Mr. COURTNEY. Right. Again, I think Mr. Forbes' basic point is correct, which is that we are sort of paying for the sins of the past here in terms of these gaps in the cost of the shipbuilding plan to get to an adequate fleet size. But there definitely is a delta between what the Navy is projecting for the *Ohio* replacement and what you projected. And I have to say, looking at the six sort of changes that were made in the *Ohio* replacement, which you itemize on page 23 of your report, in terms of reducing the number of missile tubes, reducing their diameter, again, getting the benefit of *Virginia* class, you know, modifications in terms of savings, it doesn't seem like you really kind of give them much credit for that. And to me it seems awfully substantial in terms of the changes that they made.

Dr. LABS. Actually, Mr. Courtney, we actually have given them credit for those changes. If you had looked at the estimates that

both the Navy and CBO put out, say, 2 or 3 years ago, both estimates were considerably higher. When the Navy submitted its 2011 shipbuilding plan it had a price estimate for the boomers [ballistic missile submarines] around $7 billion, CBO was like $8 billion, and that was in 2011 dollars, 2010 dollars, I can't remember precisely.

Both numbers are come down over time. CBO's do actually remain larger, and one of the reasons for that is that when I look at the submarine industry historically on a cost-and-weight relationship there hasn't been a lot of difference between attack submarines and ballistic missile submarines. I have a chart here I could show you and you could sort of see what I am talking about historically.

So the Navy is assuming, and they may be correct, I mean, these are just sort of projections going forward, but the Navy is assuming that on a cost-weight relationship basis ballistic missile submarines are going to be a lot less expensive than attack submarines. And I don't see a lot of historical evidence for that, so I am inclined to think that that may be optimistic planning at this point. I hope the Navy is correct, I hope all of my numbers are wrong and their numbers are correct.

Mr. COURTNEY. And, again, I don't think their point of view is really pie in the sky. I mean, again, looking at the progress that has been made in terms of savings on each succeeding *Virginia* class. And, again, I mean, they are going to use a lot of same systems in terms of photonics, you know, their modular construction, which has been real, I think, all-star in term of savings.

So, again, the thrust of your report I completely agree with and the need to look at whether we shift DOD's overall pie in terms of orienting it more to shipbuilding, I completely agree with it. But I also kind of think they deserve a little bit more credit in terms of the fact that they have really sharpened the pencil program on the *Ohio* program over the last couple of years and I think have made some real progress.

Dr. LABS. Mr. Courtney, I completely agree. That is why I enumerated actually all the changes the Navy did make to its original design of a few years ago in the *Ohio* replacement and that they have driven the cost down. Certainly if you would compare year to year what the Navy has estimated for that program, the costs have come down on the Navy side and correspondingly the CBO costs have also come down as well.

Mr. FORBES. Thank you, Joe.

The gentleman from New Jersey, Mr. Runyan, is recognized for 5 minutes.

Mr. RUNYAN. Thank you, Mr. Chairman.

The first question is for Mr. O'Rourke. In your sense, is the size of the current fleet adequate and do you think the mix of ships is adequate?

Mr. O'ROURKE. If you adopt as a metric for measuring adequacy a fleet that can meet its commitments in a sustainable way without overstressing both the ships and the people, I think the Navy would tell you that the levels of presence that they are maintaining right now are requiring lengths of deployments that are placing a strain on both the ships and to some degree the people as well and

that in the Navy's view that situation, although it is something they can maintain for a while, is not sustainable over the long run. And consequently I think the Navy would tell you that that size fleet that we have today is not enough over the long run to meet the Navy's commitments in a sustainable manner.

Mr. RUNYAN. What about the mix of the ships?

Mr. O'ROURKE. The mix is a matter of constant study and occasional readjustment by the Navy. And they come forward with a new force structure mix every few years. They did so about a year ago and before that about 5 years before that.

What is interesting to me observing this as a naval analyst is that there is a debate underway right now between people who support the current fleet architecture, which is more or less the mix that we have today and that we are planning going forward, on the one hand, and a different school of thought that says we should think about moving toward a more distributed, a more highly distributed force structure that had fewer larger ships and a greater number of smaller ships.

I am watching that debate right now. I am struck at how the people in those two schools of thought at times almost seem to be talking past one another in terms of their assumptions and conclusions. I don't know what to make of that debate right now, but I am watching it carefully, and I think it is something that the subcommittee may also consider tracking carefully. Because if the alternative school of thought does begin to gain more traction it could increase the possibility of larger-scale changes coming forward from the Navy in terms of the fleet mix that they are proposing for the future.

Mr. RUNYAN. And in your infinite knowledge, if you will, has there been any major, major changes? As you say, there are a lot of people floating that out there.

Mr. O'ROURKE. The idea for a more highly distributed naval force structure has been out there in various specific proposals for a number of years now. That debate has continued during that time. The Navy, in terms of its proposed force structure, has been more or less constant since the end of the Cold War. There have been puts and takes in the Navy's proposed force structure, but the basic fleet architecture has remained more or less the same. The larger-scale changes in that have been the appearance and disappearance of the Maritime Prepositioning Force of the Future squadron and then the advent of the Littoral Combat Ship. I guess those would be the two larger-scale changes that have come into the plan over the last 10 or 15 years.

Mr. RUNYAN. Next question is probably for both of you, but I will start with Dr. Labs. Now kind of turning to the new *Ford*-class carrier and talking about, are you confident that it will stay within the cost projection? And really what is the greatest risk to keeping it under and in that budget?

Dr. LABS. Congressman, right now the CBO does estimate a somewhat higher price for the lead ship of the *Ford*-class program as well as the follow-on ships. And right now a lot of the potential cost growth that could still occur in that ship is if they encounter problems in final stages construction; the ship is about 60, 65 percent complete I believe at this stage. When they get to sort of the

test program, if they uncover a serious problem in sort of the testing of the ship that is going to be expensive to fix, that is where you would find potential cost growth above what the Navy is currently projecting. Such problems like that would cause it, I think, to exceed its current cost cap that Congress has imposed and would bring it even closer to the CBO estimate.

If there are no problems with the final stages of construction and the test programs only reveal some minor things—test programs always reveal some problems. The question is whether they are expensive, as in one, two, or tens of millions or hundreds of millions. If it is on the low end of that then the lead ship will come under what the CBO estimate will be most likely.

But then subsequent ships of the class, the Navy has currently priced the CVN–79, in my opinion, aggressively. But in the Navy's opinion aggressively. They have called it an aggressive but achievable target. The CBO estimate is about a billion dollars more than what the Navy's is. And I expect to see that as that ship gets built it will end up costing more than what the Navy projects. But the Navy is well aware of the situation and they are keeping a sharp eye on it and they are going to work very aggressively to see that that does not happen.

Mr. RUNYAN. Thank you.

Chairman, I yield back.

Mr. FORBES. Thank you. And, Jon, I think your questions about the mix, something the subcommittee is going to have to look at and continue to get more information on because we are going to have to weigh in on that. And on that carrier one of the interesting things, regardless of the cost, one of the things that is kind of frightening to many of us is the current carrier 29 percent of the vendors are sole source, but the next carrier are going to be 85 percent of them are going to be sole source. It shows what we are doing to our industrial base.

And Ms. Hanabusa is now recognized for 5 minutes.

Ms. HANABUSA. Thank you, Mr. Chairman.

Mr. O'Rourke, the discussion that you were just having about basically the architecture of the fleet is probably the definitive question, the threshold that we all got to get to, but that is going to be determined by what we think the needs are going to be. So, for example, if we go to, because of the pivot to Asia-Pacific or the rebalance, whatever word you want to use, and if you look at the concepts of the A2/AD [anti-access/area denial] and where we are going to be and under basically what circumstances are we going to need, have the need, wouldn't that then determine which fleet architecture we would look at? And then would that not then determine the cost that we are talking about?

Mr. O'ROURKE. I think that is absolutely right, and in fact the connection you make between fleet architecture and the strategic rebalancing to the Asia-Pacific I think is very much on point, because the advocates of the more highly distributed fleet architecture are making their arguments in favor of that new architecture precisely in connection with countering A2/AD forces, from China in particular, in the western Pacific. And so when you get into the debate between those two camps about what the future fleet architecture might be, it is very much in connection with what each side

thinks will be appropriate in that part of the world more than any other, although there is also some discussion of structuring the fleet for scenarios in the Persian Gulf region as well.

But I think that is absolutely on target, because very frequently the debates over future fleet architecture are occasioned or eventually get into a discussion of the western Pacific and the situation that we will have there at some point in the future.

Ms. HANABUSA. We have had discussions with, I believe, former Secretary of Navy John Lehman was here, as well as former Admiral Roughead had testified before this committee, and they were, like, I think one ship off, one was 325, 326, and the other one was 327 or something around there. And when asked to explain the difference, they all said, well, it depended on what we needed and where we were going to be.

So I guess the problem I have always had with the 30-year shipbuilding plan is that it is almost like we don't know what the demands are going to be 30 years from now and yet we are planning what that fleet is going to be. So it is almost like to a certain extent we are setting policy by our acquisition structure, so that what we decide to acquire in terms of the fleet, whether it is distributive or the current fleet architecture or distributive architecture, it seems to me we are almost deciding where we believe we are going to be and what we are going to need versus having where we have to be and what we are going to need make the determining factor.

But given the nature of shipbuilding is that something that we can do? Because it seems to me it is just going to be continually reactionary for the next 30 years. So why then would we have a 30-year shipbuilding plan?

Mr. O'ROURKE. I understand the question. It is a very fair question to put out there in connection with reviewing the 30-year shipbuilding plan.

I guess what I would say in reaction to that is that if it is decided to move to a different architecture and to a different mix of ships that you will then begin to reflect that in next year's 30-year plan and the 30-year plan after that. So there is time for the 30-year plan to accommodate changes in the planned fleet mix and the corresponding mix of shipbuilding programs that support it.

For me the greatest value perhaps of the 30-year shipbuilding plan is giving policymakers a look ahead to the general investment burden that we might face in future years if we are to continue with the plan for putting out a certain kind of fleet. And it is worth knowing what that investment burden might be so that it doesn't take you by surprise when you get there and so that you can begin to take actions if you want to years ahead of time to head those off, or to mitigate them, or to respond to them in some other way.

And so for me it is not so much the precision of the outyears of the 30-year plan or the fine details of it that are important, it is the general picture that it paints about the future investment burden and what, if anything, we might want or need to do about it today to better prepare ourselves for that situation 5 and 10 and 20 years from now.

Dr. LABS. I would actually take that even one step further, that if the decision gets made that a different fleet architecture is required, then looking at what that investment burden is going to be

for that alternative fleet architecture would be very important to know, because if it is going to be considerably more expensive than what the current fleet architecture is, policymakers such as Congress need to be prepared and be aware of that going forward since appropriation decisions are made on an annual basis.

Ms. HANABUSA. Thank you, Mr. Chair.

Mr. FORBES. Thank you, Ms. Hanabusa.

I think one of the things, too, is the 30-year plan gives us kind of a projected curve line that we can look at not just for us, but also how our peer competitors line up with us. And the Navy does need to give us a new one every year, so they can modify that any time they want to and change those projected curve lines.

Mr. Wittman is recognized for 5 minutes.

Mr. WITTMAN. Thank you, Mr. Chairman.

Before I begin questioning I would like to take a moment to honor the 241 marines, sailors, and soldiers of the 24th Marine Amphibious Unit who 30 years ago today were killed in a terrorist attack in Beirut, Lebanon. And we should never forget their sacrifice or those who have served before and after who gave the last full measure of devotion to this country. We are blessed today to have great men and women that serve in uniform around the world deployed in the most dangerous places defending this Nation's freedom, and we are eternally grateful for that.

Gentlemen, thank you so much, too, for your service to our Nation.

I want to dig a little bit deeper into the aspects of the architecture of our fleet and talk specifically about our amphibious ships and where we are today with amphibious ships, especially with the redirection of our strategy to the Asia-Pacific and what the need is there to make sure that we are able to project force and to meet the needs in the Asia-Pacific.

I wanted to get your perspective on where you see the gaps in our amphibious fleet, both today and where the gaps may be with a shipbuilding plan going into the future. And then will we have the requisite number of ships to maintain operational capability within that theater and in other areas in the world based on the current plan and where we may be with the number of amphibious ships.

Mr. O'ROURKE. Just very briefly to make three opening points on that and then Eric can add further if he likes. We are going to have a shortfall on amphibious ships relative to the stated goal during the earlier years of the 30-year plan, basically now and for the next several years for about the first decade of the 30-year period until we get up to that number.

In looking at the shortfall against the 33-ship goal, it is important to bear in mind that the 33-ship goal itself represents a reduction from a less fiscally constrained number of 38, which itself represented a reduction from an unconstrained fiscal goal for 2.0 MEB [Marine Expeditionary Brigade] lift of about 42 or 43 ships. So the requirement itself got knocked down a couple times from 42, 43 to 38. Thirty-eight is a number that I think many people on this subcommittee have heard, and then that got knocked down to 33.

So every time you knock it down you are putting a little bit more operational risk into your plans, and when you have a shortfall

against that final number then you add to your operational risk. So there is a gap there in terms of sheer numbers.

There are two other things that I wanted to mention. One is that we are building a couple of large deck amphibious assault ships that because of the nature of our shipbuilding plan several years ago will not have a well deck in them. And consequently we are looking at the possibility of operating amphibious ready groups, ARGs, built around each of those two large deck ships, even though those large deck ships don't have well decks. And I think the Navy and the Marine Corps face a challenge right now in figuring out what the operational concept will be for ARGs that are built around large deck amphibious ships that themselves do not have well decks in them.

And then the third issue moving forward is the cost and capabilities and design of the new LXR amphibious ship, which is several years out, but there is already an AOA [analysis of alternatives] underway to examine what that ship should be. And I think a key potential issue for this subcommittee moving forward is to keep track of the Navy's cost goal for that ship and how that cost goal relates to the potential capabilities of that ship relative to what the Marine Corps might desire to have in that ship for operating future ARGs and future amphibious forces generally.

Mr. WITTMAN. Mr. O'Rourke, let me follow on the question that you talked about with the LXR. Are there ways that we can decrease costs on that future ship class? In other words, can we look at existing hull forms? Are there ways that we can actually try to reduce cost there so we can possibly build more ships within that class? Do you have any thoughts on that?

Mr. O'ROURKE. Yeah. There are three broad categories of cost for the LXR; one is design cost, one is construction, and one is lifecycle O&S [operations and oupport]. One way to reduce the design cost of the class is to use a common hull, such as has been proposed in terms of using a variant of the LPD–17 design. That path would definitely reduce your design costs. You would then want to examine what implications it would have for construction and for lifecycle O&S costs. The other way to reduce the cost for the class offhand would be to build the ships using a block buy contract for the initial ships moving into a multiyear procurement contract in the later years of the program.

Mr. WITTMAN. Dr. Labs.

Dr. LABS. I would really quite just agree with everything that Ron said there on that front. The only two things I would add is that when I look at the shortfalls for amphibious ships, those shortfalls are relatively smaller compared to the potential shortfalls in attack submarines and large surface combatants. Those kinds of shortfalls, particularly when you think about the pivot to the East Asia region, the Pacific region, give me more of a pause than they do for amphibious ships.

And then what Ron said is very correct about the LXR. Right now the Navy has got a cost goal on that ship that is potentially quite ambitious for them to be able to put everything onto the ship that the Marine Corps said that they want to need. So watching that debate evolve, go forward, and looking at the AOA carefully and what the options the Navy considers, whether it is an existing

design, a new design, or a foreign design of some sort, I think will be a critical part of the oversight process that the subcommittee will need to be doing.

Mr. WITTMAN. Very good.

Thank you, Mr. Chairman. I yield back.

Mr. FORBES. Thank you, Mr. Wittman.

Mr. Langevin is recognized for 5 minutes.

Mr. LANGEVIN. Thank you, Mr. Chairman. And I would like to thank our witnesses for their very informative testimony here today as always.

As you both have noted in your written testimony, the decisions obviously that we make in the near term ripple out for the complete lifespan of these systems 30, 40, or even 50 years, and obviously we have to make sure that we get this right. So I would like to briefly touch on *Ohio* replacement funding.

Mr. O'Rourke, I appreciate your making the point that service spending shares and the allocation to shipbuilding don't happen in a vacuum, and that funding ships are entirely feasible based on past practice. And one idea that has been floated in the past, though, is a separate pot of money external to the Navy shipbuilding budget that would pay for the *Ohio* replacement boats, since they are national platforms. Could you speak about the possible drawbacks or advantages, particularly with regard to project oversight and management of such a funding arrangement?

Mr. O'ROURKE. The first thing I would want to point out is that in a way there are precedents that one might be able to cite for having such an arrangement. One would be our treatment of spending for missile defense programs, which has been put into its own part of the defense budget that is handled through the defense-wide part of the budget rather than through the service-specific budgets.

The other precedent would be the National Defense Sealift Fund, which was established in the early 1990s, originally for the procurement of DOD sealift ships, and which is now also used for the procurement of Navy auxiliary ships.

So there are at least two instances in which separate pots of money, if you will, for pursuing specific defense programs have been established. So it would not be the first time that we would have done something like.

In terms of advantages and disadvantages, one potential advantage would be to insulate that money from the competition that would otherwise take place against other Navy shipbuilding priorities inside the shipbuilding account. Some people might say that is not really an advantage if you take the program out of the shipbuilding account but you also move the money along with it.

One thing that the Navy has testified is that wherever the ship is funded, whether it is funded inside or outside the Navy shipbuilding account, the Navy has expressed a desire to retain control over those resources so that they can continue to act as the agency in charge of executing the program because they know how to build ships. And so there really are two questions here. One is where in the DOD budget should that money reside? And secondly, regardless of how that question is answered, who has control over the resources? And the Navy has expressed a view on the second of those

questions, which is that even if the money is outside the Navy shipbuilding account, they would strongly prefer to retain control over it so that they can be the people to execute the money in the construction of the ships.

Mr. LANGEVIN. Thank you.

As was touched on in testimony, there are concerns with regard to the growth margin of the DDG–51 Flight III ships, similar to the *Perry*-class frigates and very unlike the *Spruance*-class destroyers. Given that we are now asking these ships to last 40 years, and these ships likely would have to be able to support next-generation energy-intensive weapons, how do we ensure that we are not building ourselves into a corner in terms of large service combatant capabilities? And when will we have to start looking at a DD(X)-type program in order to roll out additional capabilities out to the fleet?

Mr. O'ROURKE. Putting more growth margin back into the cruiser-destroyer force is one of the issues that I highlighted in my prepared statement and also in my opening remarks for the hearing. There are two basic options for doing that. One would be a further modification of the DDG–51 hull, and here we would be looking quite possibly at the lengthening of the hull so as to accommodate more equipment or more growth margin. And the other would be to undertake the design of a new-design destroyer. And whether you do one option or the other, that is something we could initiate at some point. It could perhaps be at a point after which we procured some number of DDG Flight IIIs. It would be a matter for policymakers to decide whether to initiate that project sooner or later.

Dr. LABS. I would like to add one point on that. All of the options that Ron mentioned as being able to put growth margin back into the destroyer force are absolutely correct, but all of them would likely lead to costs above and beyond what has already been projected in either the Navy's or the CBO estimates for the 30-year plan. Those are all going to be more expensive ships most likely.

Mr. LANGEVIN. Similar in cost to the 1000s?

Dr. LABS. Not necessarily that large. They don't necessarily have to be that large. But certainly if you put a plug in the 51, you are not going to have a $1.5 billion ship anymore or $1.7 billion ship, you are going to have something above that. If you design an all-new destroyer, that will depend very much on what the dimensions and the size and displacement of that ship are going to be.

You could design maybe even a smaller destroyer, maybe it wouldn't be as expensive, that within that design has a lot of growth margin, but it might not have as much capability because it is going to be physically more limited. But it doesn't necessarily have to be as expensive as the 1000 currently is.

Mr. O'ROURKE. A new-design ship would also probably give you more latitude than the option of a further modification of the DDG–51 would for putting features into the ship for substantially reducing the ship's lifecycle O&S costs. That could include among other things features for substantially reducing the ship's crew size.

There is a limit to what you can accomplish in that regard probably working with the basic DDG–51 hull, but if you were to do a clean sheet design for a new ship you might be able to accomplish

more in that regard, and over the long run if you were to then put those ships into service, it would reduce the O&S costs of supporting the cruiser-destroyer fleet and free money up for other Navy priorities, including, for example, building ships.

Mr. LANGEVIN. Very good. Thank you, gentlemen, for your testimony and your service to our Nation.

And I yield back.

Mr. FORBES. Thank you, Jim.

Mr. Conaway is recognized for 5 minutes.

Mr. CONAWAY. Thank you, Mr. Chairman.

Gentlemen, thank you.

It seems to me inherent in the 30-year projection is getting the useful life correct on any one ship and how long that lasts across there.

Dr. Labs, you in your report, I think, indicate that the Navy has not been particularly successful in getting the full service life out of any one particular vessel. Can you talk to us about why that is happening? I have got some thoughts, but give us yours.

Dr. LABS. There are a variety of reasons that come up as to why the Navy might not get as much service life out of the ships as it originally projected or originally intended. One could be that insufficient maintenance was done on the ships over the course of their operational life. That usually tends to be one of the higher, more important reasons as to why the ships don't last as long as the Navy would like.

A second reason related to that one would be that if the Navy does not invest the necessary resources to modernize the combat capabilities of a ship, at a certain point in time, historically at least, the Navy has made the determination, well, a given ship is no longer relevant for the potential threat environment it might face, therefore they don't want to continue operating it, they don't want to take the risk to the crew, they don't want to take the risk to the ship, and they don't want to pay the expense for continuing to operate the ship.

So maintenance and modernization are usually the two reasons why ships don't last as long as the Navy would like them to last.

Mr. CONAWAY. Yeah. Well, you mentioned, though, that assumes that the first number is correct. So it would seem to me that that first number as to what the expected useful life is going to be would take into account that, given our history of deferred maintenance on every ship we have got, and the fact that over a 50-year lifespan or a 40-year lifespan the obsolescence issue, which is what the second issue you are talking about, the boat becomes obsolete and you can't retrofit it or it no longer makes sense to do that. Are those issues already factored into the front end as to what they think the boat or each ship, how long it will last?

Dr. LABS. Well, sir, I am not a ship architect, but my understanding of sort of the way ship design works is that when the designer comes up with a particular expected service life for a ship, they factor in the fact that they assume that maintenance is done correctly and properly and that a certain amount of modernization does take place over the course of the life of ship. So if that fails to happen, then clearly it would not meet the initial design expectations.

But that doesn't necessarily mean that even if that happens the threat might far exceed what the initial design or modernization expectations would be. So, I mean, there is certainly a possibility that could occur above and beyond.

Mr. CONAWAY. Those kind of things I think are just risks of building a long-life asset.

You mentioned earlier when you talked to Mr. Runyan about the cost of the *Ford*-class carrier and you said if some of the component pieces don't come in on budget then that could push it past the expected number. I read recently an article about the catapult system for the ship and that it is new design and the folks that were in charge had some very seeming to be rosy pictures as to fixing all of the issues that might be associated with it. Can you talk to us about that detail at this stage?

Dr. LABS. I can't talk to you in detail about that. I would say that that is the type of issue that is going to come up when the *Ford* itself is fairly complete and they have to go through the test program. How well the integration of the catapult system went into the ship and how well that it operates after the fact is going to be one of the potential cost risks that are still outstanding for that particular ship program.

Maybe Mr. O'Rourke might have more details on it at his fingertips than I do.

Mr. O'ROURKE. The EMALS system that you are referring to, the Electromagnetic Aircraft Launch System, has been a subject of oversight for a few years now in part because of the risk it could pose to the ship's construction schedule. My impression is that the period of maximum concern and risk in connection with EMALS was 2 or 3 years ago, and that while we are not out of the forest yet, we appear to be in a better situation today than we were 2 or 3 years ago when the Navy had to focus a lot of time and attention on making sure that they were getting that effort stabilized. The advanced arresting gear is another issue and GAO [Government Accountability Office] has highlighted the dual-band radar as a third. So there are technical issues out there that remain on the ship.

Mr. CONAWAY. You mentioned that that always happens with a new ship. You put those into the relatively—I mean, still big numbers. Are we at the point where we are now talking tens of millions and it can still work, or you are beyond the point that it would be a catastrophic wreck if it didn't work?

Mr. O'ROURKE. I think Eric is the best person for that.

Dr. LABS. I do think we are, certainly in the case of the EMALS and the arresting gear, that we are past the point where it is going to be a catastrophic wreck. I do not believe that you are going to end up with a very large helicopter carrier. But at the same time that doesn't mean that there aren't going to be risks associated with the final installation, integration, and testing of the catapult system, and any potential problems that may erupt from that could range anywhere from just a few million dollars to fix to maybe something substantially more than that, into, you know, $100 million or something like that. But I don't consider it a catastrophic potential risk at this point.

Mr. CONAWAY. Thank you, gentlemen.

Mr. Chairman, thank you.

Mr. FORBES. Thank you, Mr. Conaway.

Just two last questions for you and then any comments that you might have. It is my understanding as we started out, and Mr. Hunter basically began this line of questioning, but if we assume that we are going to have a similar funding stream for ship construction as to what we have had for the last 30 years, if we assume that the CNO means what he says about how he plans to fund the *Ohio* class, and if we assume that sequestration, which is currently the law, remains the law, then, Dr. Labs, it is your projection that we will be in 30 years at approximately 228 ships in the United States Navy. Is that a fair assessment?

Dr. LABS. Approximately, yes, Mr. Chairman.

Mr. FORBES. Approximately.

The second question, we had testimony by at least one of our admirals that talked about some of our peer competitors, particularly the Russians, that when they set out a projected number of submarines, for example, that they are going to produce, you can pretty much set your watch based on the fact that they are going to be produced in that number. We have a little bit of a difficult time in our projections on our 30-year shipbuilding plan.

If we have a stable funding stream, can both of you share with us what is the greatest source of risk associated with projecting the Navy's force structure under our 30-year shipbuilding plan?

Dr. LABS. When you say a stable funding stream, that is at the historical level, or a stable funding stream that is somewhere closer to what the Navy estimates or what CBO estimates needs for the 30-year plan?

Mr. FORBES. You can pick at either one, because if you have the stable funding source you are still going to at least know what amount of money you have. But still whatever projections you make there are other factors that can play other than just the dollars that you have that could impact on the number of ships we ultimately produce. What would you say the major other risk would be?

Dr. LABS. I would say that in my view there would be two other potential risks to the shipbuilding plan or the potential cost growth that could occur as a result of it. One would be that even with a stable funding source you are still going to want to have a stable plan to sort of minimize cost growth, to the extent that you can for at least 4- or 5-year periods that the number of ships of particular types and particular quantities does not radically shift around a lot, give the industry an opportunity to plan, to optimize their workforce, optimize their shipbuilding processes.

The other potential risk that would be out there would be some sort of change in the threat environment such that some components of the plan, more than one perhaps, are no longer considered to be as viable to deal with the threat, an emerging threat, as the Navy had thought, and therefore a substantial change is required, a change that could lead to design of different types of ships, purchases of particular kinds, more of one kind over another. All of that would definitely then cause perturbations inside a stable funding stream.

Mr. FORBES. Both of those coming back of course to what Mrs. Hanabusa raised in terms of the fluid nature really of that 30-year shipbuilding plan.

Dr. LABS. Yes, sir.

Mr. FORBES. Mr. O'Rourke, any comment on that?

Mr. O'ROURKE. My answer was going to be the same as the final part of Eric's. I think the largest risk would be a shift in the international security environment that might require a larger scale change in the plan, one that would take years to implement, and we might be in a situation of trying to catch up for a while before we were back on an even keel.

Mr. FORBES. We thank you both for being here. I want to end up with the promise that I made at the beginning. Do either of you have any wrap-up comments that you want to get on the record, things that we did not ask that you think were important that we should have had on the record in looking and assessing this 30-year plan?

And, Dr. Labs, I would like to start with you with any final wrap-up comments you might have.

Dr. LABS. Well, Mr. Chairman, I don't believe I really have too many in terms of the final comments. I guess the one clarification I would like to make is that on the potential for a 228-ship plan there, you said assuming that sequestration remains in place. I would interpret that to be quite literally that sequestration would actually be having that effect. Because clearly under the BCA policymakers could choose to fund different parts of the Department of Defense differently, so they could fully fund the shipbuilding program at the expense of other programs. So it would simply assume that proportionate reduction that I was referring to early on.

But beyond that, I would say that one of the things that concerns me the most, and it is not that I haven't stated it, I would just like to emphasize it, is the assumptions that go into service lives of these ships. The 40-year assumptions for cruisers and destroyers when we are already looking at a shortfall is something that needs to keep an eye on very closely, that the Navy is properly funding, modernizing, and operating and maintaining those ships so that they can last even what the designers have suggested that they would last. Because if you end up getting where the ships aren't going to last as long as the Navy had expected you are just going to be increasing your shortfall substantially or you are going to require substantially additional resources in a relatively short period of time to be able to compensate for that potential.

Mr. FORBES. Which is what Mr. Conaway was addressing in his questions, I believe.

Mr. O'Rourke.

Mr. O'ROURKE. Three points. I want to return to the point I spoke about earlier about air wing composition in connection with Ranking Member McIntyre's question. If we go to a smaller fleet that has fewer carriers, there are in broad form three options for what you might want to do concerning the richness or the composition of the mix of that air wing.

One would be to say that if you are in an environment where you are cutting costs you might also want to think about reducing proportionately the cost of each air wing, and that might involve

under some people's calculations an air wing that would have a greater number of Super Hornets and fewer F–35s.

A second way of responding to that situation is to say that, although you are going to have a fewer number of air wings to correspond to your smaller number of carriers, you keep the air wing composition the same as currently planned.

And the third option is the one that I spoke about at the beginning, which is to say that, well, if we are going to have a fewer number of air wings we might want to have each air wing be enriched in terms of its use of the newest technologies, which might argue in favor of having each air wing have a greater number of F–35s and perhaps a smaller number of Super Hornets than currently planned.

So there are three broad options out there for how you might want to respond to a situation of reduced spending for the Navy as a whole and therefore a smaller number of carriers and carrier air wings.

The second point I want to make is to emphasize what Eric has said about the risk of service lives, and I think there is a considerable risk in that regard right now with the DDG–51 fleet. They are being used quite intensively, and it is not clear to me that the Navy's maintenance of these ships is what the Navy would prefer it to be for a ship that actually is intended to remain in service for 35 years.

We might already be behind the curve in terms of the amount of maintenance we have put into those ships already, and we might already be in a situation of having to play catchup to make sure that those ships can last to 35 years, or even to 30 years in the view of some observers. So I think the service life of the DDG–51 fleet and the maintenance we are putting into that fleet and the intensity with which we are using it today bears watching.

And the third final comment I wanted to make is something I didn't have a chance to mention in my opening remarks, and that is how we look at technology in this overall situation. One of the points I make in my prepared statement is that the discussion of technology in defense acquisition in recent years in my view has become very heavily weighted toward looking at technology as a source of program risk for schedule and technical and cost risk. And it seems to me that what is in danger of being lost by focusing so much on technology as a source of risk is the idea that technology also represents an opportunity for reducing costs, for reducing both procurement costs and lifecycle O&S costs.

And my hope is that as we go ahead in the evaluation of technology, that we continue to look at it not only in terms of its implications for program risk, but also in terms of opportunity for reducing costs and therefore improving the affordability situation regarding the 30-year shipbuilding plan. If we don't, we could begin to drift toward a situation where we take programs in a direction that might be technologically safer, but in the end, even though they might be safer and less controversial, they might wind up being more expensive than necessary, in which case we have made the situation of the affordability of the 30-year shipbuilding plan more challenging than it needed to be.

Mr. FORBES. Gentlemen, thank you both for your service to our country, to Congress, and thanks for sharing your research with us today. And with that, we are adjourned.

[Whereupon, at 3:45 p.m., the subcommittee was adjourned.]

A P P E N D I X

OCTOBER 23, 2013

PREPARED STATEMENTS SUBMITTED FOR THE RECORD

OCTOBER 23, 2013

Statement of Congressman J. Randy Forbes
Chairman, Subcommittee on Seapower and Projection Forces

An Independent Assessment of the Navy's 30-Year Shipbuilding Plan

October 23, 2013

I want to welcome all of our members and our distinguished panel of experts to today's hearing, that will focus on the Navy's 30-year shipbuilding plan.

Before we begin this hearing today, I want to briefly discuss the future of our naval forces. There are a multitude of thought as to the correct size and shape of our United States Navy. The Navy has advocated for a force structure plan and has proposed a 306-ship Navy to meet the national strategy. The 2010 Quadrennial Defense Review Independent Panel proposed a Navy of 346 ships to meets our nation's requirements. I have no reason to doubt the size offered by our nation's preeminent leaders as to the desired direction of our naval forces. But this desired force structure is in sharp contrast to our 285-ship Navy of today and especially at odds to a projected force structure posed by the Congressional Budget Office of 243 ships.

I believe that our nation's military strategy should be directly linked to the vitality of our nation's economy. Our forces should be positioned at locations that will best maintain a stable global commons. Our naval strategy should be prepared to assure our allies and deter potential aggressors.

As I look forward, I believe that our nation should concentrate our military's efforts on areas deemed important to the United States and to the vitality of our nation's economy. The lessons of history teach us that we cannot build a Navy that is intended just to protect Norfolk and San Diego. Instead, we need a global postured Navy that can uphold our interests across the international maritime highways that connect our economy to the world.

Leading the charge to support this Asia-Pacific rebalance is our United States Navy. Unfortunately, institutional inertia continues to impede the ability of the Navy to make smart force structure decisions to support this vital region. The old adage that supports an equal budget share between the Army, Navy and Air

Force is quickly becoming a relic and an obstacle to effectively shaping our forces. It is time to provide the correct force structure to support our economic and security interests.

As to our hearing today, I was disheartened to read the Congressional Budget Office's assessment of the direction of our United States Navy. Using an historical funding model, Dr. Labs projected that the Navy will possess 246 ships in 30 years. Dr. Labs further projected that the Navy will need to increase their overall shipbuilding budget by 34 percent to meet our national military strategy.

My friends, we are quickly approaching a fork in the road with two stark alternatives. Our current path puts us on a direction that will increase global instability, encourages our adversaries and increasing leads to an isolated United States. But this is not the only alternative. We can also choose to reverse this decline, eliminate defense sequestration and achieve the force structure that will deter future aggressors.

I have no doubt as to my choice. I hope that our nation will review the facts and our current trend line, and with steely eyed resolve, choose the path that not only maintains our national security but will also seek to enhance the security of successor generations. It is simply wrong to fail our nation's greatest generation and drift into global mediocrity.

It is time that we reverse the devastating defense cuts under sequestration and place our national security on a positive trend line. It is time that we assess our direction and apply our precious treasure toward the services that best secure our future. It is time that we properly resource the United States Navy and provide them with a direction that ensures our collective security.

Today we are honored to have as our witnesses:

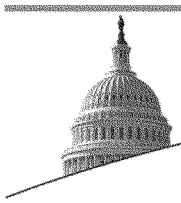
a senior analyst for Naval Weapons and Forces at the Congressional Budget Office, Dr. Eric Labs;

and

a Specialist in National Defense at the Congressional Research Service, Mr. Ron O'Rourke.

Gentlemen, thank you all for being here.

I now recognize the Ranking Member, Mr. McIntyre, the distinguished gentleman from North Carolina, for any remarks he may have.



Congressional Budget Office

Testimony

An Analysis of the Navy's Fiscal Year 2014 Shipbuilding Plan

Eric J. Labs
Senior Analyst for Naval Forces and Weapons

Before the
Subcommittee on Seapower and Projection Forces
Committee on Armed Services
U.S. House of Representatives

October 23, 2013

This document is embargoed until it is delivered at 2:00 p.m. (EDT) on Wednesday, October 23, 2013. The contents may not be published, transmitted, or otherwise communicated by any print, broadcast, or electronic media before that time.

Notes

Unless otherwise indicated, all dollar amounts in this study are in 2013 dollars, and all years are federal fiscal years (which run from October to September).

Numbers in the text and tables may not add up to totals because of rounding.

Chairman Forbes, Ranking Member McIntyre, and Members of the Subcommittee, thank you for the opportunity to testify on the Navy's 2014 shipbuilding plan and 2012 force structure assessment. My submitted statement today reprises the Congressional Budget Office's (CBO's) recently released report *An Analysis of the Navy's Fiscal Year 2014 Shipbuilding Plan*. That report was required under the 2012 National Defense Authorization Act.

The Navy is required by law to submit each year a report to the Congress that projects the service's inventory goals, procurement plans, and cost estimates for its shipbuilding program over the next 30 years. Since 2006, CBO has been performing an independent analysis of the Navy's latest shipbuilding plan. The CBO report on which I am testifying today examines the implications of the Navy's 2014 plan and its ability to meet inventory goals through 2043. The report also provides independent estimates of the cost of the Navy's shipbuilding program and compares those cost estimates to the levels of funding that the Navy is likely to receive.

According to its most recent 30-year plan, the Navy envisions buying a total of 266 ships over 30 years at an average annual cost of about $17 billion for new construction alone and roughly $19 billion for total shipbuilding (which includes new-ship construction, refueling of nuclear-powered aircraft carriers, and other costs related to shipbuilding). By comparison, CBO's estimates of the costs of the Navy's plan are $2.5 billion more—an average of $19 billion per year for new construction and $21 billion per year for total shipbuilding. Those amounts are significantly higher than the amounts the Navy has received annually for shipbuilding over the last 30 years.

Contents

An Analysis of the Navy's Fiscal Year 2014 Shipbuilding Plan

Summary

At the direction of the Congress, the Department of Defense (DoD) generally issues annual reports that describe its plan for building new ships over the next 30 years. DoD submitted its 2014 shipbuilding plan to the Congress in May 2013, covering fiscal years 2014 to 2043.[1] The 2014 plan reflects the Navy's most recent goals for battle force ships—goals that were developed in 2012 and outlined in a report to the Congress in January 2013; that analysis is hereafter referred to as the 2012 force structure assessment.[2] The goals developed in 2012 were slightly different from the ones that were outlined in the 2005 force structure assessment and were reflected in the Navy's shipbuilding plans up through last year.[3]

The 2013 and 2014 shipbuilding plans are very similar, but not identical, with respect to the Navy's total inventory goal (in military parlance, its requirement) for battle force ships, the number and types of ships the Navy would purchase over 30 years, and the proposed funding to implement the plans. The Congressional Budget Office (CBO) examined the 2014 plan in detail and estimated the costs of the proposed ship purchases using its own estimating methods and assumptions. CBO also analyzed how those ship purchases would affect the Navy's inventories of various types of ships over the next three decades.

The total costs of carrying out the 2014 plan—an average of about $21 billion in 2013 dollars per year over the next 30 years—would be one-third higher than the funding amounts that the Navy has received in recent decades but slightly less than the costs of the 2013 plan, CBO estimates.

Inventory Goals

The Navy's 2014 shipbuilding plan states that the service's goal for its inventory of battle force ships is 306 ships. That goal reflects the Navy's 2012 force structure assessment and is slightly smaller than the goal of 310 to 316 ships specified in the 2013 plan and the goal of 313 ships that resulted from the 2005 force structure assessment. However, the goal of 306 ships is greater than the Navy's current number of ships; at the end of 2013, the Navy's battle force fleet will consist of 285 ships.

1. The 2014 shipbuilding plan is Department of the Navy, *Report to Congress on the Annual Long-Range Plan for Construction of Naval Vessels for FY 2014* (May 2013), http://tinyurl.com/mwrgdn3 (PDF; 3.3 MB).

2. Department of the Navy, *Report to Congress: Navy Combatant Vessel Force Structure Requirement* (January 2013), http://tinyurl.com/kvhspjs. Although the report was released in early 2013, the force structure assessment was conducted in 2012. Battle force ships comprise aircraft carriers, submarines, surface combatants, amphibious warfare ships, and combat logistics and some support ships.

3. In February 2006, the Navy presented a long-term shipbuilding plan that called for expanding the battle force fleet from the then-current size of 285 ships to 313 ships by 2020. A few months later, CBO issued a study analyzing that plan and estimating its potential costs. In every year that the Navy has issued its shipbuilding plan since then, CBO has performed an independent analysis of that plan. See Department of the Navy, *Report to Congress on Annual Long-Range Plan for Construction of Naval Vessels for FY 2007* (February 2006) and Congressional Budget Office, *Options for the Navy's Future Fleet* (May 2006), www.cbo.gov/publication/17802. See also Statement of J. Michael Gilmore, Assistant Director, and Eric J. Labs, Principal Analyst, before the Subcommittee on Projection Forces of the Committee on Armed Services, U.S. House of Representatives, *Potential Costs of the Navy's 2006 Shipbuilding Plan* (March 30, 2006), www.cbo.gov/publication/17679.

Table 1.

Comparison of the Navy's 2013 and 2014 Shipbuilding Plans

	2013 Plan (2013–2042)	2014 Plan (2014–2043)	Change from 2013 to 2014
	Number of Ships Purchased Over 30 Years		
Combat Ships			
Aircraft carriers	6	6	0
Ballistic missile submarines	12	12	0
Attack submarines	46	47	1
Destroyers	70	70	0
Littoral combat ships	70	66 [a]	-4
Amphibious warfare ships	18	19	1
Subtotal	222	220	-2
Combat Logistics and Support Ships	46	46	0
Total	**268**	**266**	**-2**
	Costs of New-Ship Construction[b] (Billions of 2013 dollars)		
Total Cost Over 30 Years			
Navy's estimate	520	504	-16
CBO's estimate	617	580	-37
Average Annual Cost			
Navy's estimate	17.3	16.8	-0.5
CBO's estimate	20.6	19.3	-1.3
Average Cost per Ship			
Navy's estimate	1.9	1.9	0
CBO's estimate	2.3	2.2	-0.1

Source: Congressional Budget Office based on data from the Department of the Navy.

a. Under the 2014 plan, the Navy will have 52 littoral combat ships in service after 2029. However, because those ships are expected to be in service for 25 years each, the Navy will begin buying replacements in 2030.

b. Costs of new-ship construction exclude funds for refueling nuclear-powered aircraft carriers. They also exclude funds for ship conversions, construction of ships that are not part of the Navy's battle force (such as oceanographic survey ships), training ships, outfitting and postdelivery costs (which include the purchase of many smaller tools and pieces of equipment that are needed to operate a ship but are not necessarily provided by the manufacturing shipyard as part of ship construction), and smaller items. Costs for the mission packages for littoral combat ships, which are not funded in the Navy's shipbuilding accounts, also are not included.

The Navy's shipbuilding plan would fall short of meeting the service's inventory goals for some types of ships. For example, the plan would fail to meet the goal of 88 large surface combatants (destroyers and cruisers) in 2030 and beyond. Moreover, the Navy assumes in its plan that most of its destroyers will serve for 40 years, even though the Navy's large surface combatants have typically served for 30 years or less. If the current destroyers serve for only 35 or 30 years, the shortfall in large surface combatants would be more than twice as large as projected in the Navy's plan.

Purchasing Plan

Under the 2014 plan, the Navy would buy a total of 266 ships over the 2014–2043 period: 220 combat ships and 46 combat logistics and support ships (see the top panel of Table 1). Given the rate at which the Navy plans to retire ships from the fleet, that construction plan would not achieve a fleet equal to the inventory goal of 306 ships until 2037. The 2013 shipbuilding plan called for the purchase of 2 more ships over 30 years, but because the Navy's inventory goal was 4 to 10 ships higher in 2013, that year's plan would have fallen even further short of the goal.

Costs

The Navy estimates that buying the new ships as specified in the 2014 plan would cost $504 billion over 30 years, or an average of $16.8 billion per year (see the bottom panel of Table 1). (Unless otherwise indicated, all dollar amounts in this report reflect budget authority in 2013 dollars.) Those figures are solely for the construction of new ships—the only type of costs reported in the Navy's 30-year shipbuilding plans. Other activities typically funded from the Navy's budget accounts for ship construction—such as refueling nuclear-powered aircraft carriers and outfitting new ships with various small pieces of equipment after the ships have been built and delivered—would, in CBO's estimation, add $1.9 billion to the Navy's average annual shipbuilding costs under the 2014 plan. (Between 2009 and 2013, the cost of those other activities averaged $1.9 billion per year.) Including those extra costs, the average cost of the Navy's 2014 plan is $18.7 billion per year, slightly less than the cost of the 2013 plan.

Using its own models and assumptions, CBO estimates that the cost of new-ship construction in the Navy's 2014 plan would total $580 billion over 30 years, or an average of $19.3 billion per year. Generally, CBO estimates the cost of a future ship on the basis of the relationship between the weight and cost of analogous ships. The resulting figure is then adjusted for factors such as the number of ships of the same type being built at a given shipyard; production efficiencies that occur as more ships of the same class are produced simultaneously; and the fact that the costs of labor and materials have generally risen faster in the shipbuilding industry than in the economy as a whole, which generates growth in the inflation-adjusted cost of a given ship over time. Including the costs of refueling aircraft carriers and other items, such as outfitting new ships, raises the overall average cost of the Navy's plan to $21.2 billion per year, CBO estimates. That figure is slightly less than CBO's estimate of the average annual cost of the Navy's 2013 plan.

CBO's estimate of the cost of new-ship construction in the Navy's 2014 shipbuilding plan is $76 billion, or 15 percent, higher than the Navy's estimate. Specifically, CBO's estimate is 6 percent higher than the Navy's for the first 10 years of the plan, 14 percent higher for the following decade, and 26 percent higher for the final 10 years. Two factors explain most of the differences between the two estimates. First, the Navy and CBO used different estimating methods and assumptions regarding the designs and capabilities of future ships. Second, the Navy, in contrast with CBO, does not appear to have accounted for the fact that costs of labor and materials have traditionally grown faster in the shipbuilding industry than in the economy as a whole; that difference produces a widening gap between the two estimates over time.

Costs of the Plan Compared with Historical Funding

If the Navy receives the same amount of funding (in constant dollars) for new-ship construction in each of the next 30 years that it has on average over the past three decades, it will not be able to afford all of the purchases in the 2014 plan.[4] CBO's estimate of $19.3 billion per year for new-ship construction in the Navy's 2014 shipbuilding plan is 38 percent above the historical average funding of $14.0 billion (see Figure 1). And CBO's estimate of $21.2 billion per year for the full cost of the plan is 34 percent higher than the $15.8 billion the Navy has spent on average per year for all items in its shipbuilding accounts over the past 30 years.

The Effect of the Budget Control Act of 2011 on Navy Ship Programs

The Navy's 2014 shipbuilding plan, like its 2013 plan, does not address the caps on defense funding from 2014 to 2021 that stem from the Budget Control Act of 2011 (BCA) as amended by the American Taxpayer Relief Act of 2012. Because this report provides CBO's analysis of the costs of the Navy's plan, it also does not incorporate those caps.

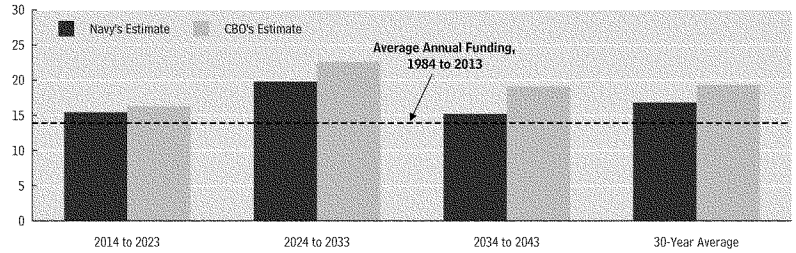
If the BCA is left in place, however, it will probably have three effects on the Navy's shipbuilding plan. First, the sequestration of appropriated funds in 2013 required the Navy to slow or alter elements of its shipbuilding programs that were under way. So far, however, the Navy has not canceled any ship purchases because of insufficient funding. Second, the Congress provided authority and some funding to purchase a third destroyer in 2013, one more than in the Navy's 2013 request. The BCA's funding caps may prevent the purchase of that ship if the

4. For a broader discussion of historical cost trends in Navy shipbuilding, see the statement of Eric J. Labs, Senior Analyst for Naval Forces and Weapons, Congressional Budget Office, before the Subcommittee on Seapower and Expeditionary Forces of the House Committee on Armed Services, *The Long-Term Outlook for the U.S. Navy's Fleet* (January 20, 2010), www.cbo.gov/publication/41886.

Figure 1.

Average Annual Costs of New-Ship Construction Under the Navy's 2014 Plan

(Billions of 2013 dollars)



Source: Congressional Budget Office based on data from the Department of the Navy.

Note: Costs of new-ship construction exclude funds for refueling existing nuclear-powered aircraft carriers. They also exclude funds for ship conversions, construction of ships that are not part of the Navy's battle force (such as oceanographic survey ships), training ships, outfitting and postdelivery costs (which include the purchase of many smaller tools and pieces of equipment needed to operate a ship but not necessarily provided by the manufacturing shipyard as part of ship construction), and smaller items. Costs for the mission packages for littoral combat ships, which are not funded in the Navy's shipbuilding accounts, also are not included.

Navy is unable to secure additional funding for it in 2014. Third, funding for new-ship construction will probably be well below the amounts required for the 2014 shipbuilding plan, unless such funding is protected at the expense of funding for other military activities. Specifically, if the Navy receives the same percentage of DoD's budget during the coming decade and devotes the same percentage of its budget to ship construction as it has historically, the shipbuilding budget would be 30 percent below CBO's estimate of the amount required by the Navy's 2014 shipbuilding plan.

Changes in Inventory Goals Under the 2014 Plan

The Navy's 2014 shipbuilding plan was submitted to the Congress by the Secretary of Defense on May 10, 2013. That plan reflects the Navy's new goal of 306 battle force ships—a goal that was first described in a report by the Navy to the Congress in January 2013 and was based on the Navy's 2012 force structure assessment.[5] That goal replaced the 313-ship goal developed in the 2005 force assessment plan and the goal of 310 to 316 ships specified in the 2013 shipbuilding plan. (Box 1 discusses the major ships in the Navy's fleet and the roles they play.)

The changes in the Navy's inventory goals from the 2013 plan are as follows:

- The number of ballistic missile submarines was changed from a range of 12–14 to 12 (see Table 2).
- The number of guided missile submarines was changed from a range of zero–4 to zero.
- The number of large surface combatants was lowered from approximately 90 to 88.
- The number of small surface combatants and mine countermeasures ships was reduced from approximately 55 to 52.
- The number of amphibious warfare ships was increased from approximately 32 to 33.

Taken together, those changes amount to a reduction in the overall inventory goal of 4 to 10 ships for the battle force fleet, lowering the previous goal of 310 to 316 ships to 306 ships.

5. Department of the Navy, *Report to Congress: Navy Combatant Vessel Force Structure Requirement* (January 2013).

Box 1.

The Roles of Major Types of Ships in the Navy's Battle Force Fleet

Nimitz Class Aircraft Carrier

The Navy's 10 **aircraft carriers** are the heart of the battle force fleet. Each carries an air wing of about 60 aircraft, which can attack hundreds of targets per day for up to a month before needing to be rested. Carriers are by far the largest ships in the fleet, with a weight (displacement) of about 100,000 tons. All 10 current carriers belong to the Nimitz class.

Ohio Class Ballistic Missile Submarine

Strategic **ballistic missile submarines** carry one of the major parts of the U.S. nuclear deterrent, up to 24 Trident missiles with one to eight nuclear warheads apiece. The Navy has 14 Ohio class ballistic missile submarines in that strategic role. In addition, the Navy has converted 4 submarines of that class to a conventional guided missile (SSGN) configuration, each of which displaces about 19,000 tons when submerged. Those SSGNs carry up to 154 Tomahawk missiles as well as special-operations forces.

Los Angeles Class Attack Submarine

Attack submarines are the Navy's premier undersea warfare and antisubmarine weapon. Since the end of the Cold War, however, they have mainly performed covert intelligence-gathering missions. They have also been used to launch Tomahawk missiles at inland targets in the early stages of conflicts. The Navy has 55 attack submarines, 42 of which belong to the Los Angeles class. At 7,000 tons, they are less than half the size of ballistic missile submarines.

Arleigh Burke Class Destroyer

Large surface combatants, which include cruisers and destroyers, are the workhorses of the fleet. They provide ballistic missile defense for the fleet and for regional areas overseas. They defend the Navy's aircraft carriers and amphibious warfare ships against other surface ships, aircraft, and submarines. They also perform many day-to-day missions, such as patrolling sea lanes, providing an overseas presence, and conducting exercises with allies. In addition, they are capable of striking land targets with Tomahawk missiles. Most of the Navy's surface combatants displace about 9,000 to 10,000 tons.

Freedom Class Littoral Combat Ship

Small surface combatants include frigates and littoral combat ships. Frigates today are used to perform many of the same day-to-day missions as large surface combatants. Littoral combat ships are intended to counter mines, small boats, and diesel electric submarines in the world's coastal regions. More routinely, they will also patrol sea lanes, provide an overseas presence, and conduct exercises with allies. They range in size from 3,000 to 4,000 tons.

Wasp Class Amphibious Assault Ship

Austin Class Amphibious Transport Dock

The Navy has six classes of **amphibious warfare ships**. Two classes, referred to as **amphibious assault ships** (also known as large-deck amphibious ships or helicopter carriers), are the second-largest ships in the fleet at 40,000 tons. They form the centerpiece of amphibious ready groups, and each can carry about half the troops and equipment of a Marine expeditionary unit. They also carry as many as 30 helicopters and 6 fixed-wing Harrier jump jets, or up to 20 Harriers. The other four classes are divided into two types: **amphibious transport docks** and **dock landing ships**. Two of those ships together provide the remaining transport capacity for a Marine expeditionary unit in an amphibious ready group. They range in size from 16,000 to 25,000 tons.

Supply Class Fast Combat Support Ship

The many **combat logistics and support ships** in the Navy's fleet provide the means to resupply, repair, salvage, or tow combat ships. The most prominent of those vessels are fast combat support ships, which operate with carrier strike groups to resupply them with fuel, dry cargo (such as food), and ammunition. Logistics and support ships can be as small as 2,000 tons for an oceangoing tug or as large as 50,000 tons for a fully loaded fast combat support ship.

Source: Congressional Budget Office.

Note: Ship silhouettes are not to scale.

Table 2.

The Navy's Evolving Goals for Its Force Structure

	Goals for a 313-Ship Fleet in the Navy's 2005 Force Structure Assessment	Goals Implied in the Navy's 2013 Shipbuilding Plan	Goals for a 306-Ship Fleet in the Navy's 2012 Force Structure Assessment
Aircraft Carriers	11	11	11
Submarines			
Ballistic missile	14	12 to 14	12
Attack	48	~48	48
Guided missile	4	0 to 4	0
Large Surface Combatants			
Destroyers	69	~90	88
Cruisers	19	0	0
Small Surface Combatants and Mine Countermeasures Ships[a]	55	~55	52
Amphibious Warfare Ships	31	~32	33
MPF(F) Ships	12	0	0
Combat Logistics Ships	30	~29	29
Support Ships			
Joint high-speed vessels	3	10	10
Other[b]	17	~23	23
Total	**313**	**310 to 316** [c]	**306**

Source: Congressional Budget Office based on data from the Department of the Navy.

Note: MPF(F) = Maritime Prepositioning Force (Future); ~ = approximately.

a. Includes littoral combat ships, Oliver Hazard Perry FFG-7 frigates, and Avenger class mine ships.

b. Includes command ships, salvage ships, ocean tugs, ocean surveillance ships, and tenders.

c. The Navy described its total goal in last year's shipbuilding plan as about 300 ships, but the specific numbers included in that plan implied a range of 310 to 316 ships.

This report does not evaluate the validity of the goals identified by the Navy, such as the fleet's ability to fulfill its missions in the national military strategy. Rather, the report assesses the costs of the Navy's 2014 shipbuilding plan, the effects of that plan on the force structure, and the extent to which the plan would satisfy the Navy's goals for major components of the U.S. fleet.

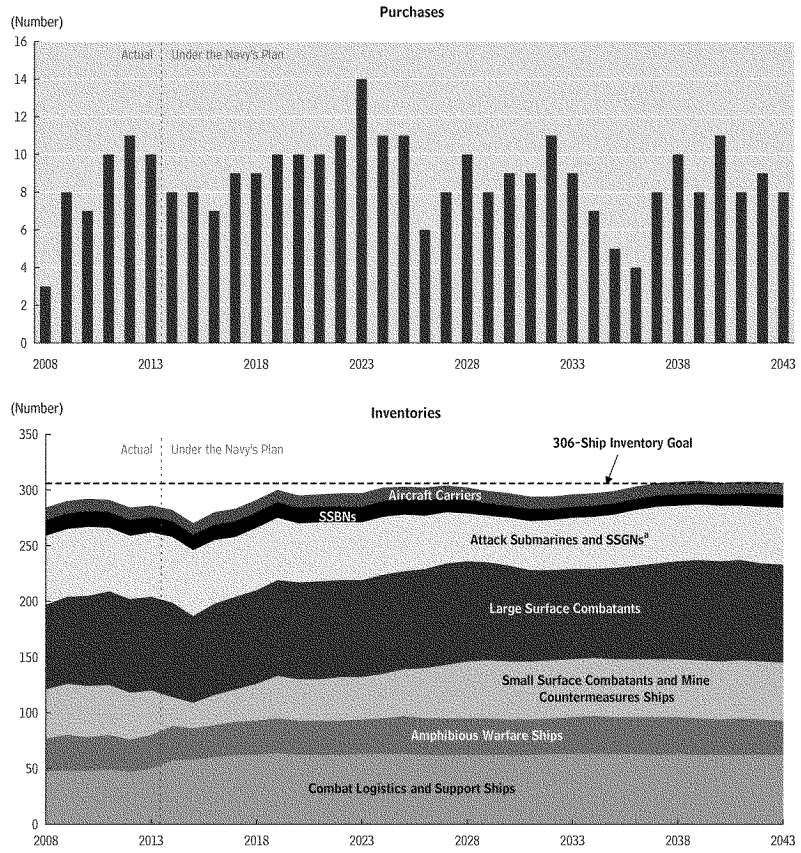
Ship Purchases and Inventories Under the 2014 Plan

The Navy intends to buy 8 ships in 2014 and a total of 41 ships between 2014 and 2018—the period covered by DoD's 2014 Future Years Defense Program (FYDP), which is a five-year funding plan that DoD updates annually (see Figures 2 and 3). Thereafter, the Navy would buy an additional 225 ships through 2043, for a total of 266 ships over 30 years or an average of about 9 per year. The pace of shipbuilding would be slightly faster, on average, in the near term than later on. The Navy plans to purchase an average of about 10 ships annually between 2014 and 2023, a little more than 9 ships per year between 2024 and 2033, and not quite 8 ships per year between 2034 and 2043. If implemented as described above, the 2014 plan would not achieve the intended force of 306 ships until 2037 (see the bottom panel of Figure 2).

Altogether, the Navy would buy 2 fewer ships over 30 years under the 2014 plan than it would have under the 2013 plan. The composition of ship purchases—particularly, the mix of combat ships and logistics and support vessels—is virtually the same under the 2013 and 2014 plans.

Figure 2.

Annual Ship Purchases and Inventories Under the Navy's 2014 Plan



Source: Congressional Budget Office based on data from the Department of the Navy.

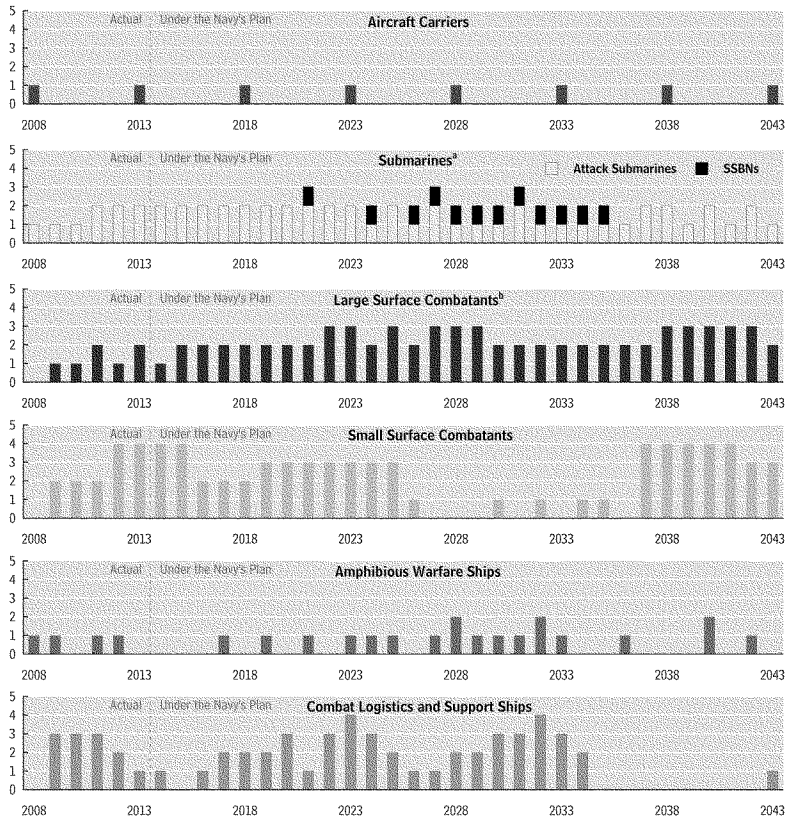
Notes: Small surface combatants and mine countermeasures ships include littoral combat ships, Oliver Hazard Perry FFG-7 frigates, and Avenger class mine ships.

SSBNs = ballistic missile submarines; SSGNs = guided missile submarines.

a. Although the Navy does not plan to build more SSGNs, four will be in service through the mid-2020s.

Figure 3.

Annual Ship Purchases, by Category, Under the Navy's 2014 Plan



Source: Congressional Budget Office based on data from the Department of the Navy.

Note: SSBNs = ballistic missile submarines.

a. Although SSGNs (guided missile submarines) are included in the Navy's inventory, the service does not plan to build more of them.

b. This figure excludes the additional destroyer authorized by Congress in 2013.

Combat Ships

Under the 2014 plan, the Navy envisions buying 220 combat ships—aircraft carriers, submarines, large and small surface combatants, and amphibious warfare ships—between 2014 and 2043. That total is 2 fewer ships than under the 2013 plan. Those purchases would still leave the Navy short of its inventory objectives for ballistic missile and attack submarines, large surface combatants, and amphibious warfare ships for significant parts of the 2014–2043 period. The shortfalls are roughly what they were under the 2013 plan. For aircraft carriers, the Navy would meet or exceed its goal of 11 ships throughout the 2014–2043 time frame, except for brief periods from 2013 to 2016 and 2040 to 2043. For small surface combatants, the Navy plans to replace its frigates and mine countermeasures ships with littoral combat ships; it would not reach its new objective of having 52 such ships in the fleet until 2029, the same year the 2013 plan intended to meet the original goal of 55 ships.

Ballistic Missile Submarines. The 2014 shipbuilding plan calls for buying the first replacement for the Ohio class ballistic missile submarines, also known as the SSBN(X), in 2021 and for purchasing 12 SSBN(X)s in total (see Figure 3); those boats would begin to enter the fleet in 2030. (The Navy estimates that the lead submarine will take 7 to 8 years to build and that an additional year or more will be needed to complete testing before it is ready for at-sea operations.) However, the retirement of Ohio class submarines as they reach the end of their 42-year service life means that the Navy's inventory of ballistic missile submarines (SSBNs) would fall below the stated goal of 12 by 1 or 2 submarines between 2029 and 2041 (see Figure 4). In particular, between 2032 and 2040, the Navy would have 10 SSBNs.

Attack Submarines. Under the 2014 plan, the Navy would purchase 47 attack submarines (SSNs) through 2043, which would not be enough to keep that force up to the stated goal of 48 throughout the next 30 years. The number of attack submarines would decline from 48 in 2024 to a low of 42 in 2029 and then increase to about 50 after 2035. (The Navy will be able to meet the goal of 48 SSNs for 3 more years over the next 30 than assumed in last year's plan because the Congress approved—by providing advance procurement funding in 2013—the planned purchase of an additional submarine in 2014.) The reason for the decline in the number of attack submarines after 2024 is that, in 2014, the Navy expects to begin retiring Los Angeles class attack submarines (SSN-688s), which were generally built at rates of 3 or 4 per year during the 1970s and 1980s, as they reach the end of their service life. The Navy would replace those submarines with Virginia class attack submarines (SSN-774s) and their successors at rates of generally 1 or 2 per year.

Large Surface Combatants. The 2014 shipbuilding plan calls for buying 70 destroyers based on the existing Arleigh Burke class destroyer (DDG-51) design (see Table 1 on page 2). Those purchases would allow the Navy's inventory of large surface combatants to meet the goal of 88 ships for 13 years over the next 30. Specifically, the number of such ships would meet the goal in 2021 and for six years in the mid-2020s, but then would fall to a low of 80 in 2034 before increasing to 88 or more by 2038. As with the attack submarine force, the number of large surface combatants would decline as the Navy began retiring the remainder of its Ticonderoga class cruisers (CG-47s) in the 2020s (after retiring 7 cruisers in 2015) and DDG-51s in the late 2020s at a faster pace than their replacements would be commissioned.[6]

The assumptions about the service life of large surface combatants remain the same under the 2014 plan as under the 2013 plan. The 2013 plan assumed that all 34 Arleigh Burke class destroyers commissioned after 2000 would have a service life of 40 years, and that the 28 destroyers of that class that were commissioned in 2000 and earlier would remain in the fleet for 35 years. Historically, very few cruisers or destroyers have served in the fleet longer than 30 years.[7]

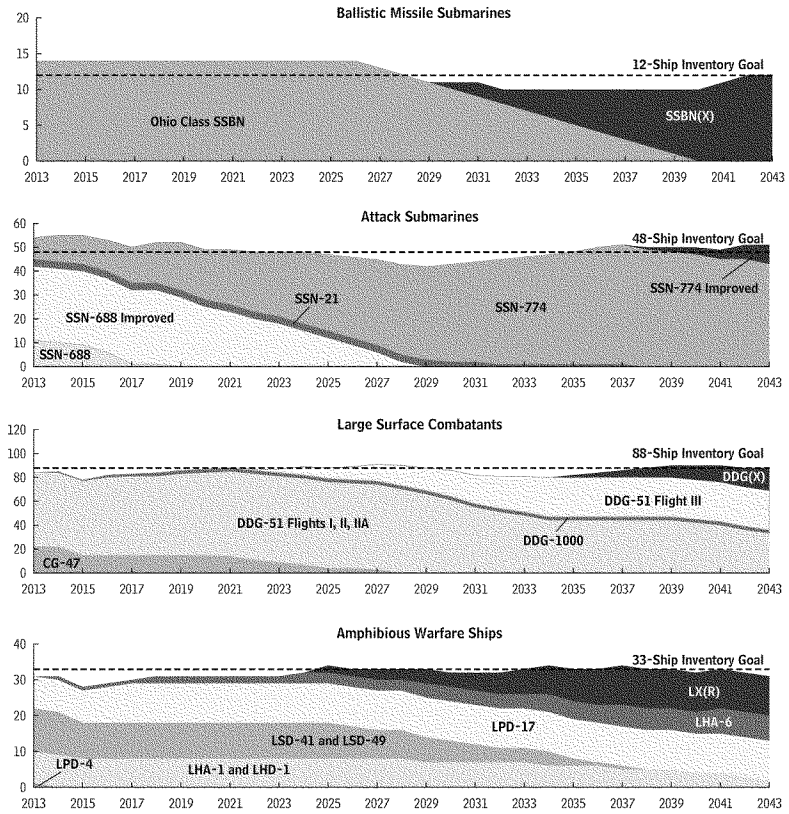
Amphibious Warfare Ships. The current shipbuilding plan calls for buying 19 amphibious warfare ships through 2043, which would increase the amphibious force from 31 ships today to the current goal of 33 by 2025. The force would stay at that size or greater through

6. Under the 2013 plan, the Navy proposed retiring those 7 cruisers in 2013 and 2014. The Congress, however, wanted the Navy to keep the cruisers for a longer period and provided an additional $2.4 billion for that purpose in the National Defense Authorization Act for Fiscal Year 2013, creating a special account called the Ship Modernization, Operation and Sustainment Fund (SMOSF). That fund is scheduled to expire at the end of 2014, and, assuming no further funding is provided, the Navy would retire those 7 ships in 2015.

7. See Congressional Budget Office, *Resource Implications of the Navy's Fiscal Year 2009 Shipbuilding Plan* (June 9, 2008), p. 25, www.cbo.gov/publication/41703.

Figure 4.

Annual Inventories Versus Goals for Selected Categories of Ships Under the Navy's 2014 Plan



Source: Congressional Budget Office.

Notes: SSBN = ballistic missile submarine; SSN = attack submarine; DDG = guided missile destroyer; CG = guided missile cruiser; LSD = dock landing ship; LHA and LHD = amphibious assault ship; LPD = amphibious transport dock; LX(R) = amphibious ship replacement.

2043—except for 2030 to 2032, when the force would fall to 32 ships, and 2040, 2042, and 2043, when the force would have 32, 32, and 31 ships, respectively. The Navy assumes that it would keep its LHD class amphibious assault ships in the fleet for 43 to 45 years, the same as in the 2013 plan but longer than in some earlier plans.

Combat Logistics and Support Ships

In its 2014 plan, the Navy envisions buying 46 combat logistics and support ships in the next three decades—the same as in the 2013 plan. Combat logistics ships include T-AKE dry cargo ships, T-AO oilers, and AOE fast combat support ships; they operate with or directly resupply combat ships that are on deployment. Those planned purchases include 17 new oilers (which provide fuel and a few other supplies to ships at sea) at a rate of 1 per year through the 2020s; that program would conclude in 2033. The plan also includes the purchase of 1 replacement T-AKE dry cargo and ammunition ship in 2043.

Support ship purchases in the Navy's plan include 10 joint high speed vessels (JHSVs), 4 salvage ships, 5 surveillance ships, 2 tenders, 4 fleet tugs, 2 command ships to replace ones in the existing fleet that will retire over the next 30 years, and 1 new afloat forward staging base, a variant of the Navy's mobile landing platform ships.[8]

The only significant change from the Navy's 2013 plan in this category is the decision to retire 2 of the existing AOEs in 2014 and 2015; the 2013 plan would have retired those ships in 2033 and 2034. The Navy now plans to retire those ships early because of a determination in the 2012 force structure assessment that 2 fewer combat logistics ships would be needed in the future. The AOEs were chosen because they are more expensive to operate than other Navy logistics ships that can perform the same missions.

Shipbuilding Costs Under the 2014 Plan

According to the Navy's estimates, carrying out its planned purchases of new ships would cost an average of $16.8 billion per year through 2043—3 percent less than the $17.3 billion average under its 2013 plan (in 2013 dollars). In making its estimates, the Navy divided the time frame of the 2014 plan into three periods: the near term (2014 to 2023), the midterm (2024 to 2033), and the far term (2034 to 2043). CBO also estimated the costs of the Navy's 2014 plan; to price the Navy's ships, it used its own cost models and assumptions, which are explained in detail later in this report. Overall, CBO's estimates are $2.5 billion per year, or 15 percent, higher than the Navy's, but the differences are smaller for the near term, larger for the midterm, and much larger for the far term (see Figure 5). Including other items that the Navy would need to fund from its budget accounts for ship construction would raise both the Navy's estimates and CBO's estimates by about $2 billion per year, leaving CBO's estimates of that full cost 13 percent above the Navy's corresponding figures.[9]

The Navy's Estimates

The Navy's 2014 report offers a frank discussion of the difficulties in estimating the capabilities that the Navy will want ships to have—and thus the cost of those ships—over the three planning periods. For the near term, the report explained, "the projections in the period are based on our most accurate understanding of required combat capabilities, future defense budget toplines, and shipbuilding costs based on actual procurements in progress. The cost estimates for this period are the most accurate of the three planning periods." For the midterm, "the accuracy of cost estimates diminishes in this time frame." And for the far term, "since the strategic environment and state of technology 20–30 years hence are both sure to be much different than they are today, the precision and accuracy of the ship types and cost projections in this period are much more speculative."[10]

New-Ship Construction Costs. According to this year's plan, in the near term, building new ships will cost an average of $15.4 billion per year (see the top row of Table 3). That number excludes $1.4 billion in cost overruns for ships that were funded before 2014 but that will

8. The afloat forward staging base is a ship designed to remain on station overseas for long periods of time, providing support to other naval forces, such as special operations units, patrol craft, or minesweepers.

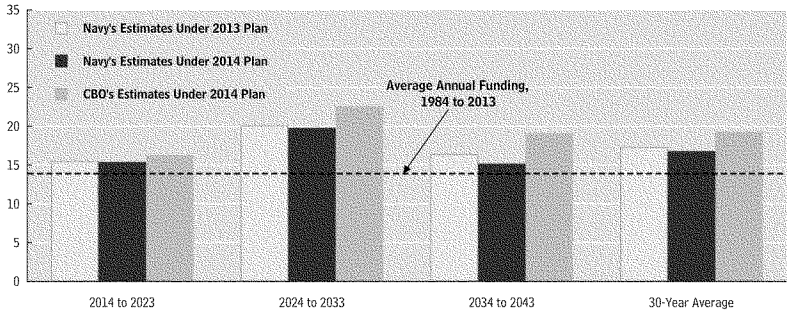
9. The Navy funds shipbuilding through two accounts: Ship Construction, Navy (commonly called the SCN account); and the National Defense Sealift Fund, which includes, among other things, funding for the procurement of some types of logistics ships.

10. Department of the Navy, *Report to Congress on the Annual Long-Range Plan for Construction of Naval Vessels for FY 2014* (May 2013), pp. 12–13.

Figure 5.

Average Annual Costs of New-Ship Construction Under the Navy's 2013 and 2014 Plans

(Billions of 2013 dollars)



Source: Congressional Budget Office based on data from the Department of the Navy.

Note: Costs of new-ship construction exclude funds for refueling nuclear-powered aircraft carriers. They also exclude funds for ship conversions, construction of ships that are not part of the Navy's battle force (such as oceanographic survey ships), training ships, outfitting and postdelivery costs (which include the purchase of many smaller tools and pieces of equipment that are needed to operate a ship but are not necessarily provided by the manufacturing shipyard as part of ship construction), and smaller items. Costs for the mission packages for littoral combat ships, which are not funded in the Navy's shipbuilding accounts, also are not included.

require additional funds to be paid out in 2014 and 2015. In the midterm, replacing the Navy's current Ohio class ballistic missile submarines drives up the average cost of new-ship construction to $19.8 billion per year. According to the Navy's estimates, building the SSBN(X) will cost $5.5 billion per year in the middle decade of their plan. In the far term, the Navy's estimated costs fall to an average of $15.2 billion.

Although the Navy's shipbuilding plan suggests that the midterm will be its most challenging fiscal period, the latter half of the near term (2019 to 2023) would require shipbuilding budgets that are almost as large as the middle decade. According to the Navy's estimates, the average budget for new-ship construction rises from $12.7 billion per year for the 2014–2018 period to $18.2 billion per year for the 2019–2023 period and then to $19.8 billion per year for the following decade (see Figure 6).

Total Shipbuilding Costs. As in previous shipbuilding plans, the Navy's latest estimates exclude other costs that it would have to pay out of its budget accounts for ship construction. Specifically:

- Costs of refueling nuclear-powered aircraft carriers, whose reactors are replaced midway through the ships' service lives;[11] and
- Other costs, such as those for ship conversions, construction of ships that are not part of the Navy's battle force (such as oceanographic survey ships), training ships; outfitting and postdelivery costs (which include the purchase of many smaller tools and pieces of equipment that are needed to operate a ship but are not necessarily provided by the shipyard when the ship is built), and smaller items.

Including the costs of refueling carriers, as estimated by CBO, would increase the Navy's estimate for the cost of the 2014 shipbuilding plan by roughly $1 billion per year to an average of $17.8 billion a year through 2043.

11. In 2010, the Navy transferred funding for refueling nuclear-powered submarines to other accounts (Other Procurement, Navy; Operation and Maintenance, Navy; and Weapons Procurement, Navy) that are not used to purchase ships. Thus, CBO did not include the refueling costs for submarines in its estimates of future shipbuilding costs.

Table 3.

Average Annual Shipbuilding Costs Under the Navy's 2014 Plan, by Decade

	Near Term (2014–2023)	Midterm (2024–2033)	Far Term (2034–2043)	Total (2014–2043)
	Navy's Estimates (Billions of 2013 dollars)			
New-Ship Construction	15.4	19.8	15.2	16.8
New-Ship Construction and Refueling of Nuclear-Powered Aircraft Carriers[a]	16.6	20.9	16.0	17.8
New-Ship Construction, Refueling of Nuclear-Powered Aircraft Carriers, and Other Items[b]	17.6	21.8	16.6	18.7
	CBO's Estimates (Billions of 2013 dollars)			
New-Ship Construction	16.3	22.6	19.1	19.3
New-Ship Construction and Refueling of Nuclear-Powered Aircraft Carriers	17.5	23.7	19.9	20.4
New-Ship Construction, Refueling of Nuclear-Powered Aircraft Carriers, and Other Items	18.5	24.5	20.5	21.2
	Percentage Difference Between the Navy's and CBO's Estimates			
New-Ship Construction	6	14	26	15
New-Ship Construction and Refueling of Nuclear-Powered Aircraft Carriers	5	13	24	14
New-Ship Construction, Refueling of Nuclear-Powered Aircraft Carriers, and Other Items	5	13	23	13
Memorandum (Billions of 2013 dollars):				
CBO's Estimate of the Costs of Reaching the Navy's Goal of a Fleet of 306 Ships[c]	18.5	21.2	17.7	19.1
Costs of Mission Packages for Littoral Combat Ships	0.4	0.1	0.3	0.3

Source: Congressional Budget Office based on data from the Department of the Navy.

Note: Other items include construction of non–battle force ships (such as oceanographic survey ships), training ships, outfitting and postdelivery costs (which include the purchase of many smaller tools and pieces of equipment needed to operate a ship but not necessarily provided by the manufacturing shipyard as part of ship construction), and other small items. Actual costs for the Navy's shipbuilding accounts over the past 30 years averaged about $16 billion per year for all items.

a. These numbers represent the Navy's estimate for new-ship construction and CBO's estimate for the refueling of nuclear-powered aircraft carriers.

b. These numbers represent the Navy's estimate for new-ship construction, its estimates for cost-to-complete funding for ships purchased in prior years, and CBO's estimate for the refueling of nuclear-powered aircraft carriers and other items.

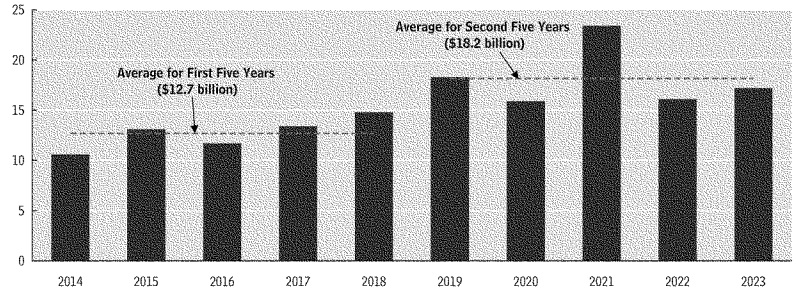
c. Includes new-ship construction only.

Adding the $1.4 billion in cost-to-complete funding that will be spent in 2014 and 2015 and the costs for other items listed above would boost the Navy's estimate for the full cost of the 2014 shipbuilding plan to $18.7 billion per year, or $1.9 billion more than the Navy's estimate for new ship construction alone. That figure is 18 percent higher than the average funding for total shipbuilding the Navy has received in the past three decades—$15.8 billion per year.

Figure 6.

The Navy's Estimates of New-Ship Construction, 2014 to 2023

(Billions of 2013 dollars)



Source: Congressional Budget Office based on data from the Department of the Navy.

Note: Costs of new-ship construction exclude funds for refueling nuclear-powered aircraft carriers. They also exclude funds for ship conversions, construction of ships that are not part of the Navy's battle force (such as oceanographic survey ships), training ships, outfitting and postdelivery costs (which include the purchase of many smaller tools and pieces of equipment that are needed to operate a ship but are not necessarily provided by the manufacturing shipyard as part of ship construction), and smaller items. Costs for the mission packages for littoral combat ships, which are not funded in the Navy's shipbuilding accounts, also are not included.

CBO's Estimates

In CBO's estimation, the full annual cost of the 2014 shipbuilding plan would average $21.2 billion over the 2014–2043 period—13 percent more than the Navy's estimate of $18.7 billion and 34 percent more than the average funding the Navy has received in the past three decades. CBO's estimates are only 5 percent higher than the Navy's for the first 10 years of the plan but are 23 percent higher for the last 10 years. The full costs have a fair amount of yearly variation but trend upward for the first two decades of the plan (see Figure 7). Looking at the 30-year period as a whole, CBO estimated that:

- Costs for new-ship construction alone would average $19.3 billion per year, 15 percent more than the Navy's figure of $16.8 billion (see Table 3 on page 13);
- New-ship construction plus refueling of nuclear-powered aircraft carriers would cost an average of $20.4 billion per year, 14 percent more than the Navy's figure of $17.8 billion; and
- All other items would add annual costs of about $900 million, raising CBO's estimate to an average of $21.2 billion per year through 2043, 13 percent more than the Navy's figure of $18.7 billion.

For the near term, CBO's and the Navy's cost estimates are similar because most of the ships that the Navy plans to buy are already under construction and their costs are reasonably well known. For the midterm and far terms however, CBO and the Navy made different assumptions about the size and capabilities of future ships that led to different cost estimates. In addition, CBO incorporated into its estimates (which are in constant 2013 dollars) the fact that costs for labor and materials would probably continue to grow faster in the shipbuilding industry than in the economy as a whole, as they have for the past several decades. The Navy does not allow for such faster growth in its estimates (see Box 2). That difference is much more pronounced in the last decade of the plan, after 20 or more years of compounded growth, than in the early years.

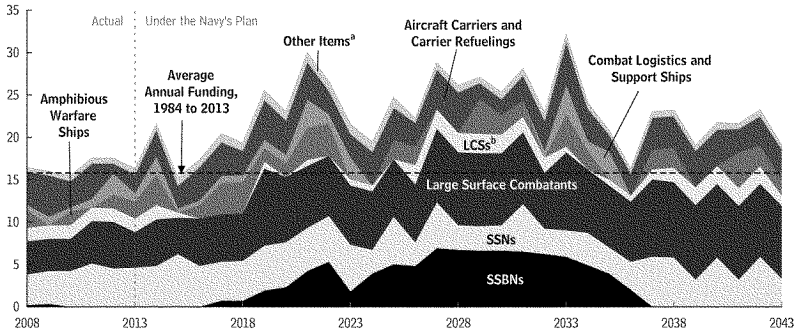
Costs of Reaching the Navy's Goal of a Fleet of 306 Ships

Under its 2014 shipbuilding plan, the Navy would not build enough ships at the right times to meet the service's inventory goal of 306 battle force ships until 2037. In particular, the plan would lead to temporary shortfalls relative to the Navy's goals for ballistic missile

Figure 7.

CBO's Estimates of Annual Shipbuilding Costs Under the Navy's 2014 Plan

(Billions of 2013 dollars)



Source: Congressional Budget Office based on data from the Department of the Navy.

Note: LCSs = littoral combat ships; SSNs = attack submarines; SSBNs = ballistic missile submarines.

a. Other items include funds for ship conversions, construction of ships that are not part of the Navy's battle force (such as oceanographic survey ships), training ships, outfitting and postdelivery costs (which include the purchase of many smaller tools and pieces of equipment needed to operate a ship but not necessarily provided by the manufacturing shipyard as part of ship construction), and smaller items.

b. Costs for the mission packages for littoral combat ships, which are not funded in the Navy's shipbuilding accounts, are not included.

submarines, attack submarines, large surface combatants, and amphibious warfare ships (see Figure 4 on page 10).

The shortfalls could be avoided or reduced by lowering the inventory goals for the various types of ships or, in many cases, by accelerating or increasing ship purchases beyond those specified in the 2014 shipbuilding plan. To meet the existing goals, the Navy could make several changes to the current shipbuilding plan:

- To prevent the ballistic missile submarine force from falling below the inventory goal of 12 submarines, the Navy could purchase the second new submarine in 2023 instead of 2024 and build 1 per year thereafter. All 12 boats would then be purchased by 2033, rather than 2035 as in the Navy's 2013 and 2014 plans. However, building a new class of large, technically complex submarines faster than the Navy plans would increase the technical risks.

- To prevent the attack submarine force from falling below the inventory goal of 48 submarines, the Navy could accelerate the purchase of 6 submarines. Specifically, it could purchase 6 additional submarines from 2019 through 2024, increasing the production rate to 3 submarines per year for most of those years. If that increase occurred, the Navy could buy 6 fewer attack submarines between 2025 and 2034 than are called for under the 2014 plan and still maintain the desired inventory level.

- To meet its goal of 88 large surface combatants, the Navy could purchase 8 additional destroyers between 2020 and 2029, increasing the production rate to 3 or 4 ships per year. If that increase occurred, the Navy could buy 7 fewer destroyers between 2030 and 2035 and still maintain the desired inventory level.

- The only way to prevent a shortfall in amphibious warfare ships relative to the Navy's goal in the first few years of the 2014 plan would be to not retire existing amphibious ships. Because ships of this sort take four to five years to build, construction of additional ships would not solve the shortfall over the next five years but would allow the Navy to meet its inventory goal of 33 ships after 2017.

Box 2.

Inflation in Shipbuilding

The costs of building future ships depends on the sizes and capabilities of those ships as well as on the evolution of the cost of building a ship of any given size and capability. The differences between the Navy's and the Congressional Budget Office's (CBO's) estimates of the cost of the Navy's shipbuilding plans arise in part because of differences in the projected future cost of building a ship of any given size and capability.

The Navy provided CBO with a historical index of shipbuilding costs between 1960 and 2012; that index measures the historical growth in the costs of labor and materials used in shipbuilding. To project the increase in those costs for 2013 through 2019, the service extrapolated from that historical experience and also incorporated information from advance pricing agreements, vendor surveys, and projections of the cost of materials from the Bureau of Labor Statistics. For those years, the Navy projects that the index of shipbuilding costs will increase at an average annual rate of 2.9 percent. By comparison, CBO projects that the gross domestic product (GDP) price index, which measures the prices of all final goods and services produced in the economy, will increase at an average annual rate of 2.0 percent during those years. Thus, CBO estimates that the cost of building a given ship will increase between 2013 and 2019 at a rate that is 0.9 percentage points faster per year, on average, than inflation for the economy as a whole. That difference in projected inflation rates is smaller than the 1.3 percentage point difference when CBO published its analysis of the Navy's 2013 plan. Since 1983, the difference between the rate of increase in the Navy's shipbuilding cost index and the GDP price index has averaged about 1.3 percentage points per year (see the figure to the right).

The Navy incorporated that 2.9 percent per year projected increase in shipbuilding costs into its budget request for 2014 and into the associated Future Years Defense Program; both of those documents express costs in nominal dollars. However, in projecting the constant-dollar costs for its 2014 shipbuilding plan, the Navy did not allow for a difference between shipbuilding inflation and overall inflation. Instead, the 2014 shipbuilding plan incorporates the view that a ship that costs $2.5 billion to build in 2013 would cost the same (in 2013 dollars) to build in 2030 or 2040.

In contrast, CBO projects that inflation in shipbuilding will exceed overall inflation for the next 30 years—partly because cost growth in the shipbuilding industry has exceeded general inflation for most of the past three decades and partly because CBO lacks an analytic basis for determining when and to what extent the difference between the two growth rates might narrow. CBO projects that shipbuilding inflation will outpace inflation as measured

Continued

According to CBO's estimates, incorporating those changes into the Navy's 2014 plan would raise costs in the first decade of the plan and lower costs in the second and third decades. The cost of new-ship construction would average $18.5 billion between 2014 and 2023 (instead of $16.3 billion, as under CBO's estimate of the Navy's plan), $21.2 billion between 2024 and 2033 (instead of $22.6 billion), and $17.7 billion between 2034 and 2043 (instead of $19.1 billion). Over the entire 30-year period, new-ship construction would average $19.1 billion per year—virtually the same as CBO's estimate of the Navy's plan, although greater front-loading of those costs raises their present value.[12]

Other approaches to prevent falling short of the inventory goal of 306 ships could have different costs. For example, if the Navy was able to extend the service life of

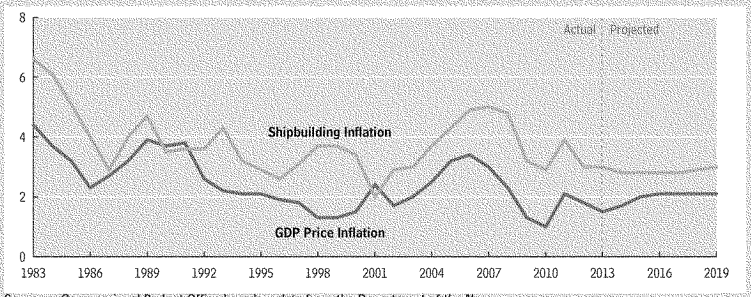
12. Present value is a single number that expresses a flow of current and future income (or payments) in terms of an equivalent lump sum received (or paid) today. The present value depends on the rate of interest, known as the discount rate, that is used to translate future cash flows into current dollars.

Box 2. Continued

Inflation in Shipbuilding

Annual Rates of Shipbuilding Inflation and GDP Price Inflation

(Percent)



Source: Congressional Budget Office based on data from the Department of the Navy.

Note: GDP = gross domestic product.

by the GDP price index by 0.9 percentage points per year between 2013 and 2019 and by 1.3 percentage points per year—the 30-year historical average—thereafter. That difference represents projected growth in the cost of a future ship of any given size and capability relative to prices for the average good or service in the economy.[1] For example, CBO estimates that a ship costing $2.5 billion to build in 2013 would cost $3.1 billion (in 2013 dollars) to build in 2030. Nevertheless, shipbuilding costs cannot continue indefinitely to grow faster than the costs of goods and services in the economy as a whole. If that were to happen, the price of ships would eventually outstrip the Navy's ability to pay for them, even in very small numbers.

1. Including the historical difference between shipbuilding costs and overall inflation in the economy is necessary to ensure that the historical growth in shipbuilding costs is fully accounted for in CBO's estimates.

some existing ships, it would need fewer new ships, thus lowering procurement costs but possibly increasing operation and maintenance costs because older ships tend to be more expensive to operate than newer ships. However, the Navy's plan already assumes that most destroyers will be in service for 40 years, while historically very few have served longer than 30 years. Consequently, CBO does not expect that those ships could serve for an even longer period in order to prevent the shortfall in large surface combatants.

Shipbuilding Given Historical Average Funding Amounts

CBO's estimate of $21.2 billion per year for the full cost of the Navy's 2014 shipbuilding plan is 34 percent higher than the $15.8 billion the Navy has spent on average per year for all items in its shipbuilding accounts over the past 30 years. If the Navy's future funding for shipbuilding is in line with its past funding, the Navy would need to reduce substantially the number of ships it purchased compared with its 2014 plan. To illustrate how much smaller the fleet of battle force ships would be under that scenario, CBO constructed an alternative shipbuilding

plan to meet two criteria. First, the purchase of specific types of ships would be reduced relative to the 2014 plan in rough proportion, so the distribution of the fleet in 2043 among types of ships would be about the same as it would be in the 2014 plan, although the number of ships of each type would be smaller. Second, spending would be fairly similar during the near term, midterm, and far term planning periods. That alternative plan is not a recommendation by CBO but simply an illustration of the possible consequences of continuing funding for shipbuilding at its historical average amount rather than increasing it, as would be required under the Navy's 2014 plan.

Purchases under that alternative plan would number 193 ships (versus 266 in the Navy's plan), including 157 combat ships and 36 support ships. The purchases of combat ships would include:

- 5 aircraft carriers (compared with 6 in the Navy's plan),
- 9 ballistic missile submarines (compared with 12 in the Navy's plan),
- 35 attack submarines (compared with 47 in the Navy's plan),
- 51 destroyers (compared with 70 in the Navy's plan),
- 46 littoral combat ships (compared with 66 in the Navy's plan), and
- 11 amphibious ships (compared with 19 in the Navy's plan).

Under that alternative plan, the battle force fleet in 2023 would be about the same size as in the Navy's plan but by 2043 would number 243 ships, as opposed to the 306 ships in the Navy's plan. The inventory in 2043 would include:

- 8 aircraft carriers (compared with 10 in the Navy's plan),[13]
- 9 ballistic missile submarines (compared with 12 in the Navy's plan),
- 41 attack submarines (compared with 51 in the Navy's plan),
- 73 destroyers (compared with 88 in the Navy's plan),
- 33 littoral combat ships (compared with 52 in the Navy's plan),
- 27 amphibious ships (compared with 29 in the Navy's plan), and
- 52 support ships (compared with 62 in the Navy's plan).

Other approaches to staying within historical funding amounts could have very different results. If the Navy reduced the number of larger and more expensive ships more sharply than in the alternative plan described above, then the overall fleet would be larger. Conversely, if the Navy preserved the programs of more expensive ships, then the overall fleet would be smaller. Ultimately, decisions about which ships to build would depend on the priorities that policymakers established for certain naval missions relative to others. For example, stressing strategic deterrence as the Navy's top priority, as the Chief of Naval Operations did in recent testimony before the Congress, could lead to the Navy's buying the entire force of 12 new ballistic missile submarines envisioned in the 2014 plan, even if shortfalls in funding required substantial cuts in other shipbuilding relative to that plan.

Shipbuilding Under the Budget Control Act of 2011

The BCA imposed caps on annual appropriations for defense from 2013 through 2021; it also established procedures that led to automatic spending reductions, including a lowering of the caps on defense funding for 2014 through 2021. Under those lower caps, the Department of Defense will receive funding for its base budget—which excludes the cost of overseas contingency operations, such as the war in Afghanistan—that is substantially lower in real terms than the funding it received in 2010, when such funding reached its peak. Specifically, DoD's base budget (after adjusting for inflation) will fall

13. The alternative plan would also fund one fewer carrier refueling.

in 2014 to about the amount that the department received in 2007 and will then remain essentially flat through 2021.[14]

During the past 15 years, the Department of the Navy has received about 30 percent of DoD's base budget, and it has devoted about 10 percent of its funding to shipbuilding. If the Navy receives the same percentage of DoD's budget during the coming decade and devotes the same percentage of its budget to ship construction that it has historically, the shipbuilding budget would be a little less than $13 billion per year from 2014 through 2021. That amount would be $5.5 billion per year—or 30 percent—below CBO's estimate of the amount required by the Navy's 2014 shipbuilding plan. Whether DoD funding would be allocated in that proportional manner is unclear, although the department's recently completed Strategic Choices Management Review (SCMR) indicated that substantial cuts to military forces, including battle force ships, would be likely if DoD received the amounts specified in the BCA.[15]

Outlook for Specific Ship Programs

To estimate the costs of implementing the Navy's 2014 shipbuilding plan, CBO calculated the cost of each of the 266 ships that the Navy intends to purchase from 2014 through 2043. For ships under construction, the estimates were based in part on data for actual costs from the Navy; for ships yet to be built, the estimates were based on relationships between the cost and weight of similar ships in the past. Specifically, CBO used the cost per thousand tons of lightship displacement—the weight of the ship itself without its crew, materiel, weapons, or fuel. CBO then adjusted its estimates to incorporate the effects of "rate" (the reduction in average overhead costs that occurs when a shipyard builds more than one of the same type of ship at a time) and "learning" (the efficiencies that shipyards gain as they produce additional units of a given type of ship). The effects of rate and learning were applied to the estimated cost of the first ship of a class (the lead ship) to determine the estimated costs for all subsequent ships of that class. Thus, CBO's estimate of the cost of the lead ship in a class drove its estimate of the costs of subsequent ships of that class. To estimate the costs of ships for which the Navy has yet to develop even notional designs, CBO had to make assumptions about the size and capabilities of those ships. All costs of individual ships described in this section exclude outfitting and postdelivery costs, which typically add about 3 percent to the cost of a ship.

A source of uncertainty in estimating the cost of major ship programs is how competition among shipbuilders will affect costs. The effects of past competition on ship costs—for example, in the littoral combat ship program—are reflected in the historical cost information that are the basis of the Navy's and CBO's estimates of the cost of future ships. However, competition among shipbuilders may have a larger effect on ship costs in the future because the Navy plans to open up more shipbuilding programs to head-to-head competition. According to the Navy, recent competitions for the two blocks of 10 littoral combat ships purchased in 2010 and for multiyear procurement contracts for destroyers resulted in savings of 15 to 30 percent compared with prices that might have been offered in an uncompetitive, sole-source procurement. If future competitions generate similar savings, the costs of some of the ships discussed in this section would be lower than what the Navy and CBO estimate.

Aircraft Carriers

The 2014 shipbuilding plan states that the Navy's goal is to have 11 aircraft carriers. The Navy intends to buy 6 CVN-78 Gerald R. Ford class aircraft carriers over the 2014–2043 period. Building 1 carrier every five years (referred to as five-year centers) will enable the Navy to have a force of at least 11 carriers almost continuously through 2043, with two exceptions. One exception will be from 2013 to 2016, when the number of carriers drops to 10. That temporary decline would occur because the *Enterprise* (CVN-65) retired in early 2013 after 52 years of service, and the next new carrier, the *Gerald R. Ford* (CVN-78), will not be commissioned until 2016. Any delays in completing that new carrier would extend the period during which the Navy had only 10 carriers. The other exception would be from 2040 to 2043 and beyond; because carriers would be built every five years

14. For a more thorough discussion of the Budget Control Act and its effect on the Department of Defense, see Congressional Budget Office, *Approaches for Scaling Back the Defense Department's Budget Plans* (March 2013), www.cbo.gov/publication/43997.

15. Deputy Secretary of Defense Ashton B. Carter and Vice Chairman of the Joint Chiefs of Staff James A. Winnefeld, Jr., Prepared Testimony, House Armed Services Committee, August 1, 2013, http://go.usa.gov/DMaH (PDF, 2 MB).

and serve for 50 years, the Navy's carrier force would fall to 10 in 2040.

The Navy currently projects that the cost of the lead ship of the CVN-78 class will be $12.8 billion in nominal dollars (which is just below the new Congressional cost cap of $12.9 billion.) Using the Navy's inflation index for naval shipbuilding, CBO converted that figure to $13.9 billion in 2013 dollars.[16] That amount is 22 percent more than the President's budget requested in 2008 when the ship was authorized. The Navy's estimate does not include $4.7 billion in research and development costs that apply to the entire class. In its 2014 budget request, the Navy requested an extra $506 million in nominal dollars in 2014 and 2015 ($483 million in 2013 dollars) to cover additional cost growth and additional tooling and vendor services; that amount is included in the Navy's estimate.

CBO estimates that the cost of the lead ship of the CVN-78 class will be $13.5 billion in nominal dollars and $14.5 billion in 2013 dollars. To generate that estimate, CBO used the actual costs of the previous carrier—the CVN-77—and adjusted them for the higher costs of government-furnished equipment and for more than $3 billion in costs for nonrecurring engineering and detail design (the plans, drawings, and other one-time items associated with the first ship of a new class). Subsequent ships of the CVN-78 class will not require as much funding for one-time items, although they will incur the same costs for government-furnished equipment. Altogether, CBO estimates the average cost of the 6 carriers in the 2014 plan at $12.7 billion, compared with the Navy's estimate of $12.5 billion (see Table 4).

The final cost of the CVN-78 could be higher or lower than CBO's estimate. Possible reasons for a higher cost include the following:

- The costs of many lead ships built in the past 20 years have increased more than 30 percent from the original budgeted estimate. CBO's estimate of the cost of the CVN-78 incorporates an amount of growth that falls within the range of historical cost growth for lead ships. However, construction of the ship is only about 60 percent complete, and costs have tended to rise more in the latter stages of ship construction, when systems are being installed and integrated.
- The Navy has stated that there is a 50 percent probability that the cost of the CVN-78 will exceed its estimate. Specifically, in its most recent Selected Acquisition Report, the Navy stated that it has budgeted an amount for the CVN-78 that covers up to the 50th percentile of possible cost outcomes. By comparison, in a written response to CBO and the Congressional Research Service last year, the Navy stated that it had budgeted an amount "greater than [the] 50th percentile" (though without specifying how much greater).
- The Navy has stated that the test program for the carrier could reveal one or more major, possibly expensive, problems.

Possible reasons for a lower cost than CBO's estimate include the following:

- The Navy and the builder of the CVN-78 recognize that cost growth for lead ships is a significant concern, and they are actively managing the CVN-78 program to restrain costs.
- All of the materials for the CVN-78 have been purchased, and much of the equipment for the vessel is being purchased under fixed-price contracts—which essentially eliminates the risk of further cost growth for about half of the projected cost of the carrier.
- A successful test program that revealed only minor problems would likely limit additional costs to less than $100 million.[17]

The next carrier following the CVN-78 will be the CVN-79, the *John F. Kennedy*. Funding for that ship

16. Using a different method, the Navy estimated that the $12.8 billion cost in nominal dollars for the lead ship would be a little over $15 billion in constant 2013 dollars. The Navy's calculation is based on a unique method that is not comparable to CBO's method for estimating costs in constant dollars and is not used by the Navy to estimate costs in constant dollars for any other shipbuilding program. If CBO used the Navy's unique method to convert its own estimate for the carrier program (which involves using different carrier-specific inflation indexes for different cost components of the ship) from nominal dollars to constant dollars, CBO's estimate for the CVN-78 would still be about $600 million more than the Navy's.

17. A successful test program that revealed only minor problems could still cost more than the Navy estimates but would likely be lower CBO's estimate.

Table 4.

Comparison of the Navy's and CBO's Estimates of the Cost of Construction of Major New Ships Under the Navy's 2014 Plan

(Billions of 2013 dollars)

	Number of Ships Purchased Under the 2014 Plan	Total Costs per Class Over the 2014–2043 Period		Average Costs per Ship Over the 2014–2043 Period		Memorandum: Average Costs per Ship Under the 2013 Plan	
		Navy's Estimates	CBO's Estimates	Navy's Estimates	CBO's Estimates	Navy's Estimates	CBO's Estimates
CVN-78 Gerald R. Ford Class Aircraft Carriers	6	73 [a]	75 [a]	12.5 [a]	12.7 [a]	11.2	13.4
SSBN(X) Ballistic Missile Submarines (Replacements for Ohio class)	12	77	87	6.4	7.2	6.7	7.7
Virginia Class Attack Submarines	33	90	89	2.7	2.7	2.8	2.8
Improved Virginia Class Attack Submarines (Replacements for Virginia class)	14	45	43	3.2	3.1	3.0	3.3
DDG-51 Arleigh Burke Class Destroyers							
Flight IIA	4	6	6	1.5	1.6	1.6	1.8
Flight III	33	58	63	1.8	1.9	2.2	2.5
DDG(X) Destroyers (Replacements for Arleigh Burke class)	33	64	108	2.0	3.3	2.3	3.4
Littoral Combat Ships	36	16	19	0.4 [b]	0.5	0.5	0.5
LCS(X)s (Replacements for littoral combat ships)	30	13	18	0.4 [b]	0.6	0.4	0.6
LX(R)s (Replacements for amphibious dock landing ships)	11	15	18	1.4	1.6	1.4 [c]	1.8 [c]
LHA-6 Amphibious Assault Ships	6	22	26	3.6	4.3	3.7	4.4
T-AO(X) Oilers	17	8	9	0.5	0.5	0.5	0.5

Source: Congressional Budget Office based on data from the Department of the Navy.

Notes: The costs in this table exclude funding for research and development for these ships.

Relative to Table 1, this table excludes 2 LPD-17 replacement amphibious warfare ships and 29 support ships of various types.

a. Funding for aircraft carriers is spread out over a six-year period. Thus, in CBO's and the Navy's estimates for aircraft carriers, total costs per class include funds for the CVN-78 and CVN-79 that would be appropriated in 2014 or later, even though those ships were authorized in 2008 and 2013, respectively. Total costs per class also include funds that would be appropriated in 2043 and prior years for the aircraft carrier the Navy plans to buy in 2043, but does not include funds that would be appropriated for that ship after 2043. CBO's and the Navy's estimates of the average cost per ship include all funds for the construction of the 6 ships the Navy plans to purchase over the 2014–2043 period, regardless of the years in which the funds are appropriated.

b. The Navy's estimate for the littoral combat ships (LCSs) is $446 million per ship, and its estimate for the LCS(X)—the replacement ship—is $433 million. Those costs exclude the cost of LCS mission packages, which CBO also excluded from its estimates.

c. Under the 2013 plan, this ship was designated as the LSD(X) amphibious dock landing ship.

began in 2007, the Congress officially authorized its construction in 2013, and appropriations for it are expected to be complete by 2018. The Navy estimates that the ship will cost $10.2 billion in 2013 dollars, or $11.3 billion in nominal dollars. In its new Selected Acquisition Report on the CVN-79, the Navy describes its cost estimate as an "aggressive but achievable target." In contrast, CBO estimates that the cost of the ship will be $11.3 billion in 2013 dollars, or about 10 percent more than the Navy's estimate, and $12.0 billion in nominal dollars.

Submarines

Under the 2014 shipbuilding plan, submarines would overtake surface combatants as the largest source of demand for shipbuilding funds over the next 20 years (see Table 5). The Navy currently operates 14 Ohio class

Table 5.

Total Shipbuilding Costs, by Major Category, 1984 to 2043

	Historical				CBO's Estimates Under the Navy's 2014 Plan			
	1984-1993	1994-2003	2004-2013	1984-2013	2014-2023	2024-2033	2034-2043	2014-2043
	Average Annual Costs (Billions of 2013 dollars)							
New-Ship Construction								
Aircraft carriers	1.5	1.6	1.8	1.6	2.4	2.4	2.7	2.5
Submarines	6.9	2.2	3.8	4.3	6.8	9.6	5.4	7.3
Surface combatants	7.6	4.6	4.1	5.4	5.4	6.7	9.3	7.1
Amphibious ships	1.6	1.4	1.9	1.6	1.0	2.5	1.3	1.6
Logistics and support ships	1.9	0.3	0.8	1.0	0.8	1.2	0.3	0.8
Subtotal	19.5	10.1	12.4	14.0	16.3	22.6	19.1	19.3
Carrier and Submarine Refuelings[a]	0.4	0.8	1.2	0.8	1.2	1.1	0.8	1.0
Other Items	1.1	1.2	0.6	1.0	1.0	0.8	0.6	0.8
Total	**21.0**	**12.1**	**14.2**	**15.8**	**18.5**	**24.5**	**20.5**	**21.2**
	Percentage of Average Annual Costs							
New-Ship Construction								
Aircraft carriers	8	16	14	12	13	10	13	12
Submarines	36	22	30	31	37	39	26	34
Surface combatants	39	46	33	39	29	27	46	34
Amphibious ships	8	14	15	12	5	10	6	8
Logistics and support ships	10	3	6	7	4	5	2	4
Subtotal	93	84	87	89	88	92	93	91
Carrier and Submarine Refuelings[a]	2	6	9	5	6	5	4	5
Other Items	5	10	4	6	5	3	3	4
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Source: Congressional Budget Office.

Note: Costs of new-ship construction exclude funds for refueling nuclear-powered aircraft carriers. They also exclude funds for ship conversions, construction of ships that are not part of the Navy's battle force (such as oceanographic survey ships), training ships, outfitting and postdelivery costs (which include the purchase of many smaller tools and pieces of equipment that are needed to operate a ship but are not necessarily provided by the manufacturing shipyard as part of ship construction), and smaller items. Costs for the mission packages for littoral combat ships, which are not funded in the Navy's shipbuilding accounts, also are not included.

a. CBO's estimates under the Navy's 2014 plan reflect only the costs of refueling aircraft carriers. Historically, the refueling of nuclear-powered submarines was also included in the Navy's shipbuilding accounts. In 2010, however, the Navy transferred the funding for those refuelings to other accounts.

ballistic missile submarines (SSBNs), 4 Ohio class guided missile submarines (SSGNs) modified from the SSBN version, and 55 attack submarines (SSNs) of several classes. Over the next three decades, the Navy plans to buy 12 new SSBNs starting in 2021; 33 Virginia class attack submarines at a rate of mostly 2 per year through 2033; and 14 submarines based on a redesign and improvement of the Virginia class, with production of the new version to start in 2034. The Navy does not plan to replace its 4 SSGNs when they are retired in the mid- to late 2020s.

SSBN(X) Ohio Replacement Ballistic Missile Submarines. SSBNs carry Trident ballistic missiles and are the sea-based leg of the United States' strategic triad for delivering nuclear weapons. (The other two legs are

land-based intercontinental ballistic missiles and manned strategic bombers.) The design, cost, and capabilities of the SSBN(X)—the submarine class slated to replace the Ohio class—are among the most significant uncertainties in the Navy's and CBO's analyses of the cost of future shipbuilding. Under the 2014 plan, the first SSBN(X) would be purchased in 2021, although advance procurement funds would be needed starting in 2017 for items with long lead times. The second submarine would be purchased in 2024, followed by 1 per year from 2026 to 2035 (see Figure 3 on page 8).

The recent history of cost estimates for the SSBN(X) illustrates both the high expected costs of the program and the uncertainty regarding those costs. The Navy's 2007 and 2008 shipbuilding plans included a projection that the SSBN(X) would cost an average of $3.8 billion (in 2013 dollars) per ship. The 2011 plan estimated the costs of the SSBN(X) class at an average of $7.9 billion apiece, while under the 2012 plan, the cost was lowered to $6.7 billion.[18] The Navy currently estimates the cost of the lead SSBN(X) at $12.0 billion. The estimated average cost of follow-on ships is now $5.9 billion, and the Navy has stated an objective of reducing that cost to $5.4 billion in 2013 dollars.[19] All told, the Navy estimates that building 12 submarines will cost $77 billion, an average of $6.4 billion each.

Between the 2011 and 2012 plans, the Navy redefined its SSBN(X) design with the primary goal of reducing the cost. The Navy's cost estimate in the 2011 plan was based on a design similar in size to the Ohio class and on the cost of building Ohio class submarines using contemporary technology and under current conditions of the shipbuilding industry (such as the number of shipbuilders and vendors and the amount of other business in the shipyards). The Navy states that it was able to reduce the estimated cost of the SSBN(X) to the current projection by making the following changes:

- Using a less expensive and more specific basic design (eliminating some costs in the estimate for the 2011 plan that were associated with uncertainty);
- Reducing the number of missile tubes from 20 to 16;
- Reducing the diameter of the missile tubes from 97 inches to 87 inches, which is the minimum needed to launch the Trident D-5 submarine-launched ballistic missile;
- Reducing the capability of the torpedo room and various sensor arrays and reducing the size of the sail mast;
- Increasing the use of components from the Virginia class attack submarines; and
- Simplifying many small elements in the design of the new submarine.[20]

While the Navy estimates that the lead SSBN(X) will cost $12.0 billion, CBO estimates that it will cost $13.0 billion. Estimating the cost of the first submarine of a class is particularly difficult because it is not clear how much the Navy will spend on nonrecurring engineering and detailed design. The Navy spent about $2 billion on those items for the lead Virginia class attack submarine. The historical record for the lead ship of new classes of submarines in the 1970s and 1980s indicates that there is little difference in those items on a per-ton basis between a lead attack submarine and a lead SSBN. Therefore, CBO projects that the cost of nonrecurring engineering and detailed design is proportional to the weight of submarines, which implies that nonrecurring items would cost about $5 billion for the lead SSBN(X)—a submarine that will be somewhat larger than an Ohio class submarine and about 2½ times the size of a Virginia class submarine. The Navy's estimate for the lead SSBN(X) takes into account nonrecurring costs of an estimated $4.5 billion.

18. The Navy's 2009 plan did not include a cost estimate for the SSBN(X), and the Navy did not submit a plan for fiscal year 2010.

19. Briefing by the Navy to the staff of the House Committee on Armed Services, CBO, and the Congressional Research Service, February 28, 2011. The Navy's numbers in that briefing, expressed in 2010 dollars, were $5.6 billion for the average follow-on submarine with an objective of reducing it to $4.9 billion. Although the Navy's 2014 plan does not yet reflect it, the Navy's Ohio Replacement program office currently estimates that it has reduced the cost to $5.4 billion in 2010 dollars.

20. For more information, see Ronald O'Rourke, *Navy SSBN(X) Ballistic Missile Submarine Program: Background and Issues for Congress*, CRS Report for Congress R41129 (Congressional Research Service, September 25, 2013); and the statement of Eric J. Labs, Senior Analyst for Naval Forces and Weapons, Congressional Budget Office, before the Subcommittee on Seapower and Expeditionary Forces of the House Committee on Armed Services, *The Long-Term Outlook for the U.S. Navy's Fleet* (January 20, 2010), www.cbo.gov/publication/41886.

All told, 12 SSBN(X)s would cost about $87 billion in CBO's estimation, or an average of $7.2 billion each—$0.8 billion higher per boat than the Navy's estimate. That average includes the $13.0 billion estimated cost of the lead submarine and a $6.7 billion average estimated cost for the 2nd through 12th submarines. Research and development would cost an additional $10 billion to $15 billion, for a total program cost of $97 billion to $102 billion, CBO estimates.

Attack Submarines. Under the 2014 plan, the Navy would buy 33 Virginia class attack submarines. Between 2014 and 2027, those purchases would occur mostly at a rate of 2 per year, with the exceptions of 2024 and 2026, when the Navy would buy 1 per year. Between 2028 and 2036, those purchases would occur mostly at a rate of 1 per year, with a switch to an improved Virginia class beginning in 2034. Beginning in 2037, the service would buy those submarines at a rate of 1 or 2 per year through 2043. With such a procurement schedule, the attack submarine force would remain at or above the Navy's goal of 48 submarines through 2024 but would then fall to between 42 and 47 submarines between 2025 and 2034 before reaching or exceeding 48 submarines again between 2035 and 2043 (see Figure 4 on page 10).

Senior Navy leaders have stated that Virginia class SSNs would have to cost $2.7 billion or less for the Navy to be able to afford 2 per year, and the 2014 shipbuilding plan assumes that they would.[21] The President's 2014 budget indicates a cost of $2.5 billion. According to the Navy's estimates, the total cost for all of the Virginia class submarines purchased between 2014 and 2033 would be about $90 billion—very close to CBO's estimate of $89 billion.

The Navy has assumed in recent plans that the improved Virginia class would be a further evolution of the current Virginia class, which itself incorporates regular technological upgrades to its systems and capabilities. Similarly, CBO assumed that the replacement for the Virginia class would incorporate technological improvements that would be sufficiently important to make the improved submarines a new class but would not constitute an entirely new design. On the basis of that assumption, CBO estimated that the average cost of the improved Virginia class would be $3.1 billion, compared with the Navy's estimate of $3.2 billion.

Although the Navy's plan does not include submarines to replace the existing SSGNs when they retire in the 2020s, the service is considering an option to physically lengthen the Virginia class design and insert four large-diameter payload tubes, each of which could carry seven Tomahawk missiles. That change would increase the submerged displacement of the submarine by nearly 30 percent and would raise the number of the Virginia class's vertical-launch weapons from 12 to 40 (in addition to the 27 weapons in the torpedo room). The Navy estimates that 20 Virginia class submarines that had those additional payload modules would provide a "near equivalent" to the strike capability of the existing force of 4 SSGNs. The President's 2014 budget proposed spending $600 million between 2014 and 2018 for research and development of the payload module and for modifying the design of the Virginia class. If the payload module was included in submarine purchases after 2017, the modified boats would require greater funding than what the Navy or CBO estimates for the 2014 plan.

Large Surface Combatants

The Navy's 2014 plan incorporates the purchase of the same types of destroyers as the 2013 plan. The service restarted the production of DDG-51 Flight IIA destroyers in 2010 and purchased 6 ships through 2013 (in addition to the 62 ships that had been purchased when production was initially stopped in 2005.) An additional ship was authorized by the Congress in the 2013 appropriations for DoD, but it is not clear at this point whether the Navy has sufficient funds to complete the purchase of that ship given the reduction in funding under the Budget Control Act.[22] The Navy plans to purchase 4 more DDG-51 Flight IIAs through 2016.

21. Specifically, the Navy has said that to purchase 2 Virginia class submarines a year, the cost would have to decline to $2.0 billion each in 2005 dollars, which is equivalent to $2.7 billion in 2013 dollars.

22. The fate of that destroyer apparently will be determined by the funding provided for fiscal year 2014. The Navy hopes to include the ship as part of a multiyear procurement contract for the ships purchased from 2013 through 2017. However, the reductions that were taken from the 2013 appropriation as a result of the automatic enforcement mechanism of the Budget Control Act left the Navy short of the funds it needed to include the additional ship in the multiyear contract. If the Navy receives the necessary appropriations in 2014, the ship would be purchased. If the Navy does not receive in 2014 the remaining funds it needs to include the ship in the procurement contract, then the ship apparently would not be purchased.

Beginning with 1 of 2 ships ordered in 2016 and then continuing through 2029, new DDG-51s would have an upgraded design, a configuration known as Flight III. In 2030, the Navy would start buying 33 DDG(X)s, an as-yet-undesigned destroyer intended to replace the DDG-51 class. Those programs, if implemented as planned, would allow the Navy to meet its goal of 88 large surface combatants in 2021, in 2024 through 2029, and again after 2037 (see Figure 4 on page 10).

In addition to the ship purchases, a critical element of the Navy's plan to achieve its projected inventory levels is to keep all DDG-51 Flight IIAs and subsequent destroyers serving in the fleet for 40 years. The class was originally designed to serve for 30 years, but the Navy has gradually increased the planned service life—first to 35 years and then, in the 2009 shipbuilding plan, to 40 years for Flight IIA and Flight III ships. Of the last 13 classes of destroyers and cruisers, 12 have been retired after having served 30 years or less, and many ships, including in recent years, Spruance class destroyers and some Ticonderoga class cruisers, have been retired after having served 25 years or less; the only exception was the CGN-9 *Long Beach*, a class of 1 ship. The Navy retired those ships for different reasons: because they reached the end of their service life, because they became too expensive to maintain in the waning years of their service life, or because improving their combat capabilities to meet existing threats was judged not cost-effective.[23] If the DDG-51 class met the same fate, the shortfall in achieving the Navy's inventory goal for destroyers and cruisers would grow substantially. (For an illustration of the effect on the force level of large surface combatants if the service life of those ships is only 35 or 30 years and if the Navy does not increase the number of ships it purchases, see Figure 8.)

DDG-51 Flight IIAs. The Navy's existing force of 62 DDG-51 destroyers was built in three primary configurations. The first 28 ships, designated Flight I or II, did not include a hangar for embarking helicopters, which play important roles in countering enemy submarines, attacks by small boats, and, to a lesser degree, mines. The next 34 ships, designated Flight IIA, included a hangar and were thus able to carry two helicopters or several ship-launched unmanned aerial vehicles.[24] In the Navy's 2014 plan, 4 new DDG-51s purchased through 2016 (in addition to 6 or 7 purchased between 2010 and 2013 but not yet in the fleet) would use the Flight IIA configuration but would also incorporate the latest ballistic missile defense capabilities.[25] Those ships would have an average cost of $1.6 billion, in CBO's estimation—about $100 million more than the Navy's per-ship estimate.

DDG-51 Flight IIIs. The Navy's strategy to meet combatant commanders' demand for greater ballistic missile defense capabilities than existing DDG-51s provide—and to replace Ticonderoga class cruisers when they are retired in the 2020s—is to modify the design of the DDG-51 Flight IIA destroyer substantially, creating a Flight III configuration.[26] That configuration would incorporate the new Air and Missile Defense Radar (AMDR), now under development, which is larger and more powerful than the radars on earlier DDG-51s. Adding the AMDR so that it could operate effectively would require increasing the amount of electrical power and cooling available on a Flight III.[27] With those changes and associated increases in the ship's displacement, a DDG-51 Flight III destroyer would cost about $300 million, or about 20 percent, more than a new

23. See the statement of Eric J. Labs, Senior Analyst for Naval Forces and Weapons, Congressional Budget Office, before the Subcommittee on Seapower and Expeditionary Forces of the House Committee on Armed Services, *The Navy's Surface Combatant Programs* (July 31, 2008), www.cbo.gov/publication/20065.

24. For a detailed discussion of the differences between the DDG-51 flights, see Norman Polmar, *The Naval Institute Guide to the Ships and Aircraft of the U.S. Fleet*, 19th ed. (Naval Institute Press, 2013), pp. 140–145.

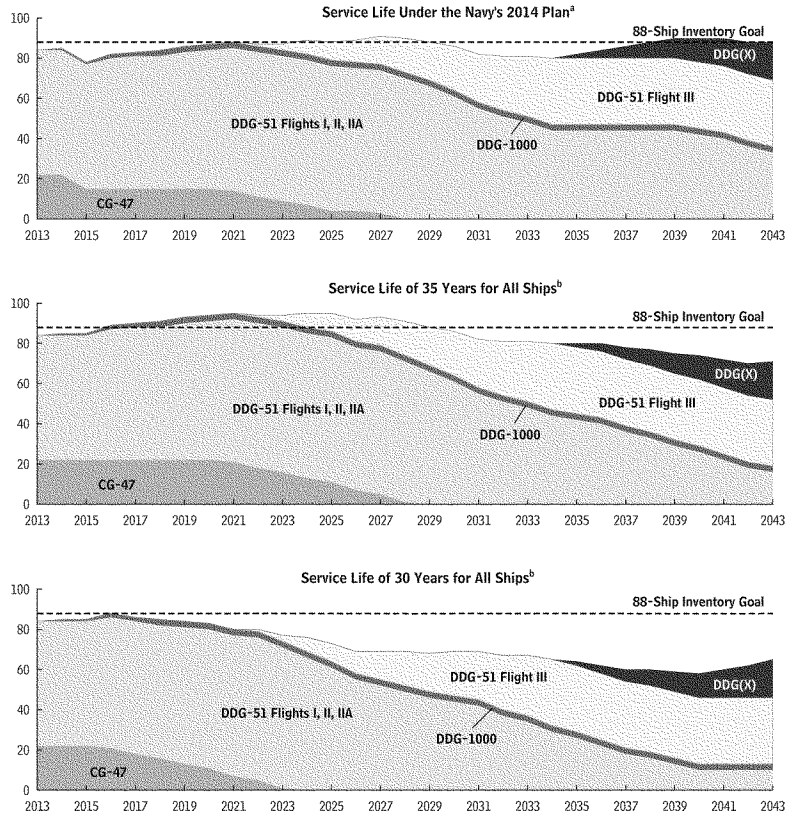
25. The Navy has announced that all existing DDG-51s will eventually be equipped with improved ballistic missile defenses; up to 32 of those upgrades will have been funded by the end of 2013. For more about the Navy's plans for the DDG-51 program, see Ronald O'Rourke, *Navy DDG-51 and DDG-1000 Destroyer Programs: Background and Issues for Congress*, CRS Report for Congress RL32109 (Congressional Research Service, September 27, 2013).

26. Combatant commanders are the four-star generals or admirals who head the regional commands responsible for all U.S. military operations within their geographic areas.

27. See Ronald O'Rourke, *Navy Aegis Ballistic Missile Defense (BMD) Program: Background and Issues for Congress*, CRS Report for Congress RL33745 (Congressional Research Service, September 20, 2013), and *Navy DDG-51 and DDG-1000 Destroyer Programs: Background and Issues for Congress*, CRS Report for Congress RL32109 (Congressional Research Service, September 27, 2013).

Figure 8.

Inventory of Large Surface Combatants Under Various Scenarios for Service Life



Source: Congressional Budget Office.

Notes: This figure does not include the additional destroyer authorized by Congress in 2013.

DDG = guided missile destroyer; CG = guided missile cruiser.

a. The Navy's 2014 plan assumes that DDG-51 Flights I and II and CG-47s would serve for 35 years and that all other ships would serve for 40 years.

b. These figures assume that the Navy retains the 7 CG-47s slated for retirement in 2015.

Flight IIA destroyer, CBO estimates.[28] Thus, the average cost per ship would be $1.9 billion. Overall, the Navy plans to buy 33 DDG-51 Flight III ships between 2016 and 2029.[29]

CBO's estimate of the costs of the DDG Flight IIA and Flight III ships to be purchased in the future is less than it was last year. Most of the decrease for the Flight III can be attributed to updated information on the cost of incorporating the AMDR into the Flight III configuration. The cost of the AMDR itself, according to the Navy, has declined steadily through the development program, and the Department of Defense's Cost Analysis and Program Evaluation (CAPE) office concurs in the reduced estimate. The Navy decreased its estimate for the average price of a DDG-51 Flight III ship from $2.2 billion in the 2013 plan to $1.8 billion in the 2014 plan, primarily as a result of the reduced cost of the AMDR. CBO reduced its estimate by a similar amount. Considerable uncertainty remains in the DDG-51 Flight III program, however. Costs could be higher or lower than CBO's estimate, depending on how well the restart of the DDG-51 program goes, on the eventual cost and complexity of the AMDR, and on associated changes in the ship's design to integrate the new radar.

DDG(X) Future Guided Missile Destroyers. Like the Navy's 2013 shipbuilding plan, the current plan includes a future class of destroyers intended to replace the DDG-51 Flight I and II ships when they retire in the late 2020s and 2030s.[30] The 2014 plan designates those ships as the DDG-51 Flight IV, consistent with the 2012 and 2013 plans, whereas the 2011 plan used a more generic DDG(X) designation. CBO uses the DDG(X) designation because the agency considers it unlikely that the Navy would or could use the DDG-51 design for the next-generation destroyer.

Under the 2014 plan, production of the DDG(X) would start in 2030, which would make it a successor to the DDG-51 Flight III program. Some Navy officials have suggested that the DDG(X) could be based on the hull and configuration of the DDG-51 class but incorporate technological improvements appropriate for the late 2020s and early 2030s. According to the Navy, it would buy 33 DDG(X)s at an average cost of $2.0 billion, or about $200 million more than the cost of DDG-51 Flight III ships. Those cost estimates imply that the DDG(X)'s capabilities would be a relatively modest improvement over those of the DDG-51 Flight III, and the Navy's use of the Flight IV designation suggests that it would retain the DDG-51 hull and simply improve the systems on it. However, the DDG-51 Flight III design consumes almost all available space on the ship and leaves only a small margin for further growth over the life of the ship. Unless the Flight IV systems require less power, weight, and space than the Flight III systems—which would be contrary to the historical trend of improvements to surface combatants requiring more power, weight, and space—then it is not clear that major upgrades to the DDG-51 Flight III constituting a new flight would be possible.

CBO, in contrast, expects that the DDG(X) would have a largely new design and would be about 10 percent heavier than the DDG-51 Flight III. By 2030, when the first DDG(X) would be authorized under the current plan, the initial DDG-51 design would be about 50 years old. The Navy has made and will continue to make improvements to the DDG-51 class, as the plans for Flight III illustrate. Nevertheless, CBO considers it unlikely that a ship design from the late 1970s and early 1980s would prove robust enough to accommodate changes made to counter threats at sea until the 2070s and 2080s, when the DDG(X)s would be reaching the end of their notional 40-year service life. For example, the Navy has limited ability to improve the stealthiness of the DDG-51 class if it does not redesign the hull. If it does redesign the hull, it will, in effect, have created an entirely new ship. Under those assumptions, CBO projects the average cost of the DDG(X) at $3.3 billion, roughly 65 percent higher than the Navy's projection. CBO's current estimate is slightly lower than its estimate of $3.4 billion under the 2013 plan; that difference is the result of increased production rates for the DDG(X) in

28. As a point of comparison, the Navy's first Flight IIA ship—the DDG-79, which incorporated such changes as a helicopter hangar and a larger displacement—cost about 20 percent more than the DDG-78. The transition from the Flight IIA to Flight III ships is expected to involve more extensive changes than the transition from the Flight I/II to Flight IIA ships.

29. Press reports indicate that some Navy officials do not agree with the DDG-51 Flight III strategy and would prefer to build Flight IIAs a little longer while designing an entirely new destroyer that would allow for greater growth potential in all respects. See Christopher Cavas, "U.S. Navy Weighs Halving LCS Order," *Defense News* (March 17, 2013), http://tinyurl.com/kbey7qp.

30. That retirement date is based on the Navy's assumption that all DDG-51 Flight IIAs will be modernized midway through their service life and will operate for 40 years.

the 2014 plan, which lower overhead costs per ship and also lower direct production costs through greater learning. Over the 2014–2043 period, CBO estimates, the Navy would have to spend $108 billion for this part of its shipbuilding program—$44 billion (or about 70 percent) more than the Navy's estimate of $64 billion.

Littoral Combat Ships

In the 2014 plan, the Navy envisions building a force of 52 small surface combatants called littoral combat ships (LCSs) by 2026. The first LCS was authorized in 2005, and the Navy already has 16 ships either in its fleet or under construction. Because those ships are assumed to have a service life of 25 years, the Navy would need to begin procuring their replacements in 2030. Therefore, the Navy plans to purchase 36 more LCSs through 2026 and 30 next-generation ships, called LCS(X)s, between 2030 and 2043.

The LCS differs from past and present U.S. warships in that its production program is divided into two components—the sea frame (the ship itself) and mission packages (the main combat systems). The sea frame is being designed and built so that mission packages can be switched on a given ship over time as the ship's mission changes. Currently, the Navy expects to use three types of mission packages—one each for countering mines, submarines, and surface ships. It also expects that the LCS will be able to perform maritime security operations while equipped with any of those mission packages. In all, the service plans to buy 64 mission packages for the 52 ships to be purchased by 2026.[31]

The Navy wants the LCS to be cheaper than other surface combatants. Originally, each sea frame was expected to cost, on average, $297 million in 2013 dollars (or $220 million in 2005 dollars, the original goal). The first 4 LCSs, which were purchased between 2005 and 2009, cost more than double that amount and were built by 2 different contractors using different designs. In light of that cost growth, the Navy revised its acquisition strategy for the ships several times. Ultimately, the service organized a competition between the two contractors and received lower-than-expected bids for the ships. As authorized by the Congress in 2010, the service accepted bids to buy 10 ships from each of the contractors, subject to annual appropriations by the Congress. Today, 12 of those 20 LCSs are under construction or are on order, and the remaining 8 will be ordered in 2014 and 2015.[32] Thus, by 2015, the Navy intends to have purchased 12 ships of each LCS design, for a total of 24.

The Navy has not determined its acquisition strategy for the remaining 28 of the 52 ships it intends to purchase through 2026. Notably, the 2014 plan removed the language from the 2013 plan that stated the Navy would keep both designs in production through 2026. In fact, the Navy has several options to consider for the LCS starting in 2016: It could change the number of ships it plans to purchase once it has more experience with the two designs; it could select one design for the remainder of the program or hold another competition that included both designs; or it could end the program altogether if it decided that both designs no longer met its future needs and that a more direct replacement for the Navy's frigates was necessary. For now, the Navy plans to see how well the existing shipyards perform in executing their contracts before it decides whether or how to acquire the rest of the ships.

In the 2014 Future Years Defense Program, the Navy estimated the average cost of the LCS at about $420 million per ship over the next five years, including the 6 ships (2 per year) to be bought in 2016 through 2018, after the end of the two 10-ship contracts. That figure is well below the Congressionally mandated cost cap for the LCS program of $515 million per ship (adjusted for inflation).[33] Overall, the Navy estimated that the 36 LCSs to be purchased by 2026 would cost about $446 million per ship, on average.

The key to the future cost of the littoral combat ships will be how well each shipbuilder can execute its current 10-ship contract. If the shipyards build the ships without

31. Department of the Navy, *Report to Congress: Littoral Combat Ship Mission Packages* (May 2009).

32. For a discussion of issues involved with this request, see Congressional Budget Office, letter to the Honorable John McCain about the cost implications of the Navy's plans for acquiring littoral combat ships (December 10, 2010), www.cbo.gov/publication/21968.

33. The National Defense Authorization Act for Fiscal Year 2010, which set the LCS cost cap to apply to ships purchased in fiscal year 2010 and beyond, gave the Secretary of the Navy authority to waive compliance with the cap if doing so was considered in "the best interest of the United States," if the ship was "affordable, within the context of the annual naval vessel construction plan," or in other specific circumstances.

major delays or cost overruns, which seems to be the case so far, then the Navy could obtain future prices (adjusted for inflation) that are similar to the ones it negotiated in the recent competition. However, if one or both shipyards find it difficult to build the ships for the prices to which they agreed under the 10-ship contracts, then the prices for ships purchased after 2015 would probably be higher. Selecting a single design and one shipyard to build that design would economize on overhead costs but would sacrifice the competitive pressure that could help hold down costs for future ship purchases. By contrast, continuing to purchase two types of the ships would maintain more competitive pressure but at the expense of a lower production rate in each shipyard, thus incurring higher average overhead costs. Another disadvantage of the latter approach is that the Navy would face higher costs to support training and maintenance programs for both of the ship designs.

Since its analysis of the Navy's 2012 plan two years ago, CBO lowered its estimate for the cost of the LCSs purchased between 2010 and 2015 to reflect the contract prices and terms to which the Navy and the two shipyards agreed. However, CBO expects that the Navy will pay slightly higher prices for the ships purchased after 2015, in part because the annual procurement quantities planned for those years are lower than in previous years. Therefore, CBO estimates the average per-ship cost of the 36 LCSs in the plan at about $500 million.

Under the 2014 plan, the Navy would also buy 30 next-generation littoral combat ships—called LCS(X)s—beginning in 2030. The Navy's cost estimate for the LCS(X) is $433 million (or slightly less than the average cost of the original LCS), which is consistent with its estimate in the 2013 plan. In contrast, CBO estimates the average cost of the LCS(X) at about $600 million per ship, which is consistent with its estimate under the 2013 plan.

Amphibious Warfare Ships

The Navy's current goal for amphibious ships is 33, compared with approximately 32 last year. The proposed force would consist of 11 LHA or LHD amphibious assault ships, 11 LPD amphibious transport docks, and 11 replacements for the Navy's LSD dock landing ships. In pursuit of that force, the 2014 plan calls for buying 6 LHA-6s, at a rate of 1 every four or seven years, to replace LHD-1 class amphibious assault ships as they are retired.[34] The plan envisions buying 11 LX(R)s (the designator for the replacement for LSDs), 1 every other year between 2019 and 2027 and then 1 per year until 2033, to replace existing dock landing ships in the LSD-41 and LSD-49 classes. Under the 2014 plan, the LX(R) would enter the fleet beginning one year later than under the 2013 plan. The 2014 plan would also start replacing the LPD-17 class with a new class in the early 2040s, buying 1 ship in 2040 and 1 in 2042. With that procurement schedule, the total number of amphibious warfare ships would be at or above the goal of 33 ships for about half of the 30-year period covered by the plan (see Figure 4 on page 10). One way in which the Navy plans to achieve that force level is to keep the existing class of LHD-1 amphibious assault ships in service for 43 to 45 years; that expectation, which also appeared in the 2013 plan, is an increase relative to the 40-year service life incorporated in the 2012 plan.

The Navy's cost estimates for amphibious warfare ships have not changed significantly since the 2013 plan. In the 2014 plan, the Navy appears to assume that the LX(R) will be about the same size as existing LSDs—that is, with a displacement of about 16,000 tons. Consequently, the Navy estimates the cost of the LX(R) at $1.4 billion per ship. CBO puts the figure at $1.6 billion.

The Navy estimates that the LHA-6 class amphibious assault ships will cost $3.6 billion apiece. CBO's estimate for those ships is higher: an average of $4.3 billion per ship. Both CBO and the Navy assumed that the LHA-6 class ship authorized in 2016 and all subsequent amphibious assault ships would include well decks, necessitating some redesign to the LHA-6 class—and thus additional costs. (Well decks are large floodable areas in the sterns of most amphibious warfare ships that allow amphibious vehicles and craft to be launched directly from the ships.) The cost of that redesign is included in both the Navy's and CBO's estimates.

34. There is a seven-year gap between the ship purchased in 2017 and the next one purchased in 2024. After that, however, the LHA class is purchased at a rate of 1 every four years.

List of Tables and Figures

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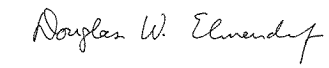
About This Document

The Congressional Budget Office's (CBO's) report *An Analysis of the Navy's Fiscal Year 2014 Shipbuilding Plan*, which was released on October 18, 2013, was prepared as required by the National Defense Authorization Act for Fiscal Year 2012 (Public Law 112-81). In accordance with CBO's mandate to provide objective, impartial analysis, the report makes no recommendations.

Eric J. Labs of CBO's National Security Division prepared the report with guidance from David E. Mosher and Matthew Goldberg. Raymond Hall of CBO's Budget Analysis Division produced the cost estimates with guidance from Sarah Jennings. Derek Trunkey of CBO provided helpful comments on the report, as did Scott Truver of Gryphon Technologies and Tim Colton of Maritime Memos. (The assistance of external reviewers implies no responsibility for the final product, which rests solely with CBO.) Jeanine Rees edited the report and prepared it for publication.

This testimony reprises the report released last week. Electronic versions of both the report and the testimony are available on CBO's Web site (www.cbo.gov/publication/44655 and www.cbo.gov/publication/44660, respectively).



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NOT FOR PUBLICATION
UNTIL RELEASED BY
HOUSE ARMED SERVICES COMMITTEE

STATEMENT OF

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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

NOT FOR PUBLICATION
UNTIL RELEASED BY
HOUSE ARMED SERVICES COMMITTEE

Chairman Forbes, Ranking Member McIntyre, distinguished members of the subcommittee, thank you for the opportunity to appear before you today to discuss the Navy's FY2014 30-year shipbuilding plan.

Strategic Considerations

As an opening comment, it can be noted that in discussing the 30-year plan, it is possible to lose the forest for the trees—to focus on details of ship numbers and procurement costs so much that one loses track of what is at stake strategically. Strategic considerations that help form the context for considering the 30-year plan include, among other things, the U.S. strategic rebalancing toward the Asia-Pacific region,[1] China's modernization of its maritime military capabilities,[2] and requests from U.S. regional combatant commanders for forward-deployed U.S. naval forces that would require a Navy of more than 500 ships to fully meet.[3]

More broadly, it can be noted 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, one so ubiquitous and longstanding that it can be easy to overlook or take for granted.

Given the current debate over the future of the federal budget and resulting choices for policymakers regarding U.S. strategy and the military forces for supporting it, strategic considerations such as these can be important to keep in mind when discussing the 30-year plan. The **appendix** at the end of this statement contains some additional comments relating U.S. naval forces to national strategy.

Major points of discussion about the 30-year plan, particularly the affordability challenge it poses, are now so well established, and repeated so often, that discussion of the plan is now at some risk of becoming stale and unproductive. Accordingly, the remainder of this statement is intended to offer some potential new perspectives on the plan, so as to refresh the discussion and make it potentially more valuable to Congress as its carries out its oversight of Navy shipbuilding programs and the Navy's budget in general.

Affordability of 30-Year Shipbuilding Plan

In a situation of reduced levels of defense spending, such as what would occur if defense spending were to remain constrained to the revised cap levels in the Budget Control Act, the affordability challenge posed by the 30-year shipbuilding plan would be intensified. Even then, however, the current 30-year shipbuilding plan would not necessarily become unaffordable.

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[1] For more on the strategic rebalancing, see CRS Report R42146, *In Brief: Assessing the January 2012 Defense Strategic Guidance (DSG)*, by Catherine Dale and Pat Towell; and CRS Report R42448, *Pivot to the Pacific? The Obama Administration's "Rebalancing" Toward Asia*, by Mark E. Manyin, Coordinator.

[2] 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 Ronald O'Rourke.

[3] For examples of U.S. Navy testimony on this point, see Appendix A of CRS Report RL32665, *Navy Force Structure and Shipbuilding Plans: Background and Issues for Congress*, by Ronald O'Rourke.

The Navy estimates that, in constant FY2013 dollars, fully implementing the current 30-year shipbuilding plan would require an average of $16.8 billion in annual funding for new-construction ships, compared to an historic average of $12 billion to $14 billion provided for this purpose.[4] The required increase in average annual funding of $2.8 billion to $4.8 billion per year equates to less than 1% of DOD's annual budget under the revised caps of the Budget Control Act. The Congressional Budget Office estimates that, in constant FY2013 dollars, fully implementing the current 30-year shipbuilding plan would require an average of $19.3 billion in annual funding for new-construction ships, or $2.5 billion per year more than the Navy estimates.[5] This would make the required increase in average annual funding $5.3 billion to $7.3 billion per year, which equates to roughly 1.1% to 1.5% of DOD's annual budget under the revised caps of the Budget Control Act.

Some observers, noting the U.S. strategic rebalancing toward the Asia-Pacific region, have advocated shifting a greater share of the DOD budget to the Navy and Air Force, on the grounds that the Asia-Pacific region is primarily a maritime and aerospace theater for DOD. In discussing the idea of shifting a greater share of the DOD budget to the Navy and Air Force, some of these observers refer to breaking the so-called "one-third, one-third, one-third" division of resources among the three military departments—a shorthand term sometimes used to refer to the more-or-less stable division of resources between the three military departments that existed for the three decades between the end of U.S. participation in the Vietnam War in 1973 and the start of the Iraq War in 2003.[6] In a context of breaking the "one-third, one-third, one-third" allocation with an aim of better aligning defense spending with the strategic rebalancing, shifting 1.5% or less of DOD's budget into the Navy's shipbuilding account would appear to be quite feasible.

More broadly, if defense spending were to remain constrained to the revised cap levels in the Budget Control Act, then fully funding the Department of the Navy's total budget at the levels shown in the current Future Years Defense Plan (FYDP) would require increasing the Department of the Navy's share of the non-Defense-Wide part of the DOD budget to about 41%, compared to about 36% in the FY2014 budget and an average of about 37% for the three-decade period between the Vietnam and Iraq wars.[7] While shifting 4% or 5% of DOD's budget to the Department of the Navy would be a more ambitious reallocation than shifting 1.5% or less of the DOD budget to the Navy's shipbuilding account, similarly large reallocations have occurred in the past:

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[4] See *Report to Congress on the Annual Long-Range Plan for Construction of Naval Vessels for FY2014*, May 2013, p. 18.

[5] Congressional Budget Office, *An Analysis of the Navy's Fiscal Year 2014 Shipbuilding Plan*, October 2013, Table 3 (page 13).

[6] The "one-third, one-third, one-third" terminology, though convenient, is not entirely accurate—the military departments' shares of the DOD budget, while more or less stable during this period, were not exactly one-third each: the average share for the Department of the Army was about 26%, the average share for the Department of the Navy (which includes both the Navy and Marine Corps) was about 32%, the average share for the Department of the Air Force was about 30%, and the average share for Defense-Wide (the fourth major category of DOD spending) was about 12%. Excluding the Defense-Wide category, which has grown over time, the shares for the three military departments of the remainder of DOD's budget during this period become about 29% for the Department of the Army, about 37% for the Department of the Navy, and about 34% for the Department of the Air Force.

[7] Since the Defense-Wide portion of the budget has grown from just a few percent in the 1950s and 1960s to about 15% in more recent years, including the Defense-Wide category of spending in the calculation can lead to military department shares of the budget in the 1950s and 1960s that are somewhat more elevated compared to those in more recent years, making it more complex to compare the military departments' shares across the entire period of time since the end of the World War II. For this reason, military department shares of the DOD budget cited in this statement are calculated after excluding the Defense-Wide category. The points made in this statement, however, can still made on the basis of a calculation that includes the Defense-Wide category.

- From the mid-1950s to the mid-1960s, reflecting a U.S. defense strategy at the time that placed a strong reliance on the deterrent value of nuclear weapons, the Department of the Air Force's share of the non-Defense-Wide DOD budget increased by several percentage points. The Department of the Air Force's share averaged about 45% for the 10-year period FY1956-FY1965, and peaked at more than 47% in FY1957-FY1959.

- For the 11-year period FY2003-FY2013, as a consequence of combat operations in Iraq and Afghanistan, the Department of the Army's share of the non-Defense-Wide DOD budget increased by roughly ten percentage points. The Department of the Army's share during this period averaged about 39%, and peaked at more than 43% in FY2008. U.S. combat operations in Iraq and Afghanistan during this period reflected the implementation of U.S. national strategy as interpreted by policymakers during those years.

The point here is not to argue whether it would be right or wrong to shift more of the DOD budget to the Navy's shipbuilding account or to the Department of the Navy's budget generally. Doing that would require reducing funding for other DOD programs, and policymakers would need to weigh the resulting net impact on overall DOD capabilities. The point, rather, is to note that the allocation of DOD resources is not written in stone, that aligning DOD spending with U.S. strategy in coming years could involve changing the allocation by more than a very marginal amount, and that such a changed allocation could provide the funding needed to implement the current 30-year shipbuilding plan. The alternative of assuming at the outset that there is no potential for making anything more than very marginal shifts in the allocation of DOD resources could unnecessarily constrain options available to policymakers and prevent the allocation of DOD resources from being aligned optimally with U.S. strategy.

As an alternative or supplement to the option of altering the allocation of DOD resources among the military departments, the 30-year shipbuilding plan could also become more affordable by taking actions beyond those now being implemented by DOD to control military personnel pay and benefits and reduce what some observers refer to as DOD's overhead or back-office costs. Multiple organizations have made recommendations for such actions in recent years. The Defense Business Board, for example, estimated that at least $200 billion of DOD's enacted budget for FY2010 constituted overhead costs. The board stated that "There has been an explosion of overhead work because the Department has failed to establish adequate controls to keep it in line relative to the size of the warfight," and that "In order to accomplish that work, the Department has applied ever more personnel to those tasks which has added immensely to costs." The board stated further that "Whether it's improving the tooth-to-tail ratio; increasing the 'bang for the buck', or converting overhead to combat, Congress and DoD must significantly change their approach," and that DOD "Must use the numerous world-class business practices and proven business operations that are applicable to DoD's overhead."[8]

One potential way to interpret the affordability challenge posed by the Navy's 30-year shipbuilding plan is to view it as an invitation by the Navy for policymakers to consider matters such as the alignment between U.S. strategy and the division of DOD resources among the military departments, and the potential for taking actions beyond those now being implemented by DOD to control military personnel

[8] Defense Business Board briefing, "Reducing Overhead and Improving Business Operations, Initial Observations," July 22, 2010, slides 15, 5, and 6, posted online at: http://www.govexec.com/pdfs/072210rb1.pdf. See also Defense Business Board, *Modernizing the Military Retirement System*, Report to the Secretary of Defense, Report FY11-05, posted online at: http://dbb.defense.gov/Portals/35/Documents/Reports/2011/FY11-5_Modernizing_The_Military_Retirement_System_2011-7.pdf; and Defense Business Board, *Corporate Downsizing Applications for DoD*, Report to the Secretary of Defense, Report FY11-08, posted online at: http://dbb.defense.gov/Portals/35/Documents/Reports/2011/FY11-8_Corporate_Downsizing_Applications_for_DoD_2011-7.pdf.

pay and benefits and reduce DOD overhead and back-office costs. The Navy's prepared statement for the September 18 hearing before the full committee on planning for sequestration in FY2014 and the perspectives of the military services on the Strategic Choices and Management Review (SCMR) provides a number of details about reductions in Navy force structure and acquisition programs that could result from constraining DOD's budget to the revised cap levels in the Budget Control Act.[9] These potential reductions do not appear to reflect any substantial shift in the allocation of DOD resources among the military departments, or the taking of actions beyond those already being implemented by DOD to control DOD personnel pay and benefits and reduce DOD overhead and back-office costs. The fact that the Navy in its prepared statement did not choose to discuss the possibility of a changed allocation of DOD resources among the military departments or additional actions to control DOD personnel pay and benefits and reduce DOD overhead and back-office costs does not prevent Congress from considering such possibilities.

Avoiding Procurement Cost Growth vs. Minimizing Procurement Costs

The affordability challenge posed by the Navy's 30-year shipbuilding plan tends to 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.

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[9] Statement of Admiral Jonathan Greenert, U.S. Navy, Chief of Naval Operations, Before the House Armed Services Committee on Planning for Sequestration in FY 2014 and Perspectives of the Military Services on the Strategic Choices and Management Review, September 18, 2013, pp. 6-10.

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.

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 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 Congress to appropriate additional funds 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 some amount of cost growth might need to be accepted as part of 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.

Fixed Price Contracts

In response to instances of cost growth on DOD acquisition programs, including programs in the 30-year shipbuilding plan, there is now a strong focus on encouraging DOD to use fixed price contracts as much as possible. Fixed price contracts help shift the risk of cost growth from the government to the contractor, and are an important tool for constraining procurement costs. At the same time, there are some cautionary notes regarding fixed price contracts that are worth bearing in mind:

- In writing the terms of a fixed price contract, the devil can be in the details. A fixed price contract could include provisions for adjusting costs that could, in the aggregate, make the contract operate more like a cost-type contract. Such a contract might be termed a Fixed Price In Name Only (FPINO) contract.

- The contractor, in fulfilling the terms of a fixed price contract, may choose to do the work exactly as described in the contract—and not a single thing more, even if doing that single thing more would have made sense in terms of value delivered to the government. In writing fixed price contracts, DOD needs to understand its requirements well, so as to avoid instances in which it would have benefited from having the contractor perform work items that were not included in the terms of the contract.

- Depending on the bargaining leverage available to DOD in its negotiation with the contractor, the contractor, in return for agreeing to the use of a fixed price contract (particularly a Firm Fixed Price contract), might demand a high price for the item to be built. Such a price could be close to Point D from the discussion in the previous section, which would mean that the contract, while avoiding cost growth, could create an increased risk for DOD of paying more for the item than was necessary.

- When the government is in a largely closed relationship with the contractor—that is, when the contractor is largely dependent on the government for its business, and the government in turn must rely on that contractor as the source for at least some of what that contractor provides to the government—then it is not clear what fixed-price contracts are accomplishing in the long run in terms of insulating the government from the risk of cost growth. Use of fixed price contracts can translate cost growth into losses for the contractor. In a largely closed relationship between the government and the contractor, the contractor could seek to recover those losses by charging higher prices for future work it does for the government. Alternatively, the contractor could simply absorb (i.e., "eat") the losses, which could weaken the contractor financially, reducing its ability invest in its work force and modernize its capital plant, which in turn could increase the cost of work that the contractor performs for the government in the future.[10] Either way, the cost growth on the earlier contract could, in the long run, be effectively shifted back to the government. The potential implications of a largely closed relationship between the government and a contractor are potentially important to bear in mind for shipbuilding, because one of the government's principal shipbuilders, Huntington Ingalls Industries (HII), can be viewed as being in a largely closed relationship with the government: HII derives substantially all its revenues from work it does for the U.S. government (primarily the Navy),[11] and HII in turn is the Navy's sole source for building aircraft carriers and the only builder of certain parts of each Virginia-class submarine.

The points above are made not to argue against using fixed price contracts—as mentioned above, fixed price contracts are an important tool for constraining procurement costs. Even in a situation where the government is in a largely closed relationship with the contractor, fixed price contracts can, at a minimum, help make cost developments in a program more immediately visible to policymakers, which can be of value in maintaining oversight of the program. The point, rather, is to provide some perspective

[10] Another option for the contractor, at least in theory, would be to stop (or threaten to stop) work on the contract unless the government agrees to renegotiate the terms of the contract or agrees to provide a payment to cover the contractor's losses (i.e., a "bailout"), as the government, for example, has done in the past under the terms of P.L. 85-804 of August 28, 1958 (72 Stat. 972).

[11] HII states in its annual report for 2012 (page 5) that "Revenues from the U.S. Government accounted for substantially all of our revenues in 2012, 2011 and 2010. In 2012, 2011 and 2010, approximately 96%, 97% and 97%, respectively, of our revenues were generated from the U.S. Navy and approximately 4%, 3% and 3%, respectively, were generated from the U.S. Coast Guard."

on what can be accomplished through the use of fixed-price contracts in helping to make the 30-year shipbuilding plan more affordable.

Multiyear Procurement (MYP) and Block Buy Contracting

The Navy is now using multiyear procurement (MYP) or block buy contracting for all three of its year-to-year shipbuilding programs—the Virginia-class submarine program, the DDG-51 destroyer program, and the Littoral Combat Ship (LCS) program.[12] The Navy's shift in recent years, with congressional approval, to such an extensive use of MYP and block buy contracting in its shipbuilding programs constitutes a very significant (if largely unheralded) change in Navy ship acquisition—some observers might call it a quiet revolution. The expanded use of MYP and block buy contracting in Navy shipbuilding has required, among other things, accepting a reduction in Navy and congressional flexibility for making year-to-year changes in shipbuilding programs in response to changed budgetary or strategic circumstances. In return, these contracts are, by Navy estimates, substantially reducing costs for Virginia-class submarines, DDG-51 destroyers, and LCSs compared to the standard alternative of annual contracting.

In a situation of reduced levels of defense spending, such as what would occur if defense spending were to remain constrained to the revised cap levels in the Budget Control Act, there could be arguments both for and against making further use of MYP and block buy contracting in implementing the 30-year shipbuilding plan. A potential argument against making further use of MYP and block buy contracting could be that, with reduced amounts of funding available, the Navy and Congress would need to protect their remaining flexibility for making year-to-year changes in shipbuilding programs in response to changed budgetary or strategic circumstances. A potential argument in favor of making further use of MYP and block buy contracting would be that, with reduced amounts of funding available, it would be more important than ever to take advantage of the savings that can be generated by MYP and block buy contracting.

If policymakers decide that it would make sense to make increased use of MYP and block buy contracting in implementing the 30-year shipbuilding plan, candidate programs not currently covered by such contracts would include the Ford (CVN-78) class aircraft carrier program, the TAO(X) oiler program, the LX(R) amphibious ship program, and the Ohio Replacement (SSBN[X]) ballistic missile submarine program. Below are some additional comments about the use of block buy contracting in the CVN-78 program and the Virginia-class and Ohio Replacement submarine programs.

CVN-78 Program

In my CRS report on the CVN-78 program,[13] I discuss the option of using a block buy contract for CVN-79 and CVN-80. The Navy has not pursued this option; it has instead focused on developing an efficient build plan for CVN-79, and on negotiating the details of the contract for building CVN-79. The Navy has expressed an openness to using a block buy contract for CVN-80 and CVN-81. Compared to this option, using a block buy contract for CVN-79 and CVN-80 could begin generating block buy-associated savings in the CVN-78 class program years earlier. At this point, it is very late in the game to consider the option of using a block buy contract for CVN-79 and CVN-80. Following the signing of the contract for CVN-79, however, industry might be open to the possibility of converting that contract into a block buy

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[12] For more on MYP and block buy contracting, 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.

[13] CRS Report RS20643, *Navy Ford (CVN-78) Class Aircraft Carrier Program: Background and Issues for Congress*, by Ronald O'Rourke.

contract for both CVN-79 and CVN-80. This option, if feasible, might reduce costs not only for CVN-80, but for parts of CVN-79 as well.

Virginia-Class and Ohio Replacement Submarine Programs

Thinking more expansively about MYP and block buy contracting, some observers have raised the possibility of procuring both Virginia-class attack submarines and Ohio replacement ballistic missile submarines under a joint block buy contract covering both classes of ships. Such a contract—which, like all block buy contracts, would require special legislative authority—might generate savings greater than what would be possible under separate multiyear contracts for each class. Extending this thinking even further, a potential additional option in implementing a joint, cross-class block buy contract for Virginia-class and Ohio replacement boats would be to modify the current division of shipyard work for building Virginia-class boats as needed to ensure an optimal joint strategy for building both classes.

The current division of shipyard work for building Virginia-class boats is set forth in the General Dynamics-HII joint teaming agreement for the Virginia-class. As a consequence, the division of Virginia-class shipyard work is in effect a fixed factor, while the allocation of Ohio replacement shipyard work is yet to be determined and is a variable that can be optimized.

The Navy can "tune" the division of Ohio replacement work in the context of the fixed Virginia-class division of work to arrive at a good overall approach for building both classes. The resulting approach, however, might not be as efficient as a solution in which Navy treated the division of work for both classes as variables, and then optimized the build strategy for both classes together. The Navy, moreover, has testified recently that the Ohio replacement program is the service's top program priority,[14] and that if sufficient funding is not made available for all Navy shipbuilding programs, the Navy would continue to fully fund the Ohio replacement program while reducing planned procurement of other ship types, including Virginia class submarines.[15] Particularly in that circumstance, it might make sense to "tune" the Virginia class division of work so as to produce a solution that is better for building both classes not only in a situation of sufficient shipbuilding funding, but also in a situation where limits on shipbuilding funding lead to Virginia-class boats being dropped from the shipbuilding plan.

As mentioned above, the division of shipyard work for building Virginia-class boats is set forth in the joint teaming agreement for the Virginia-class. The terms of this agreement cannot be changed without the consent of both of the submarine builders. Given the success of the Virginia-class program as an acquisition effort, the Navy and the submarine builders may be averse to reopening the Virginia-class joint teaming agreement. The submarine builders might also be averse to reopening the agreement because a reallocation of the work might lead to a net loss of Virginia-class work for one of the builders. On the other hand, reopening the joint teaming agreement might enable a highly efficient approach for building both classes whose savings could help make possible the retention of a larger number of Virginia-class boats in the shipbuilding plan in a situation of constrained shipbuilding funding. In 1997, in the third year of a debate over the acquisition strategy for the Virginia class, the submarine builders and the Navy presented to Congress a creative proposal for building the class under a joint teaming

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[14] Statement of Admiral Jonathan Greenert, U.S. Navy, Chief of Naval Operations, Before the House Armed Services Committee on Planning for Sequestration in FY 2014 and Perspectives of the Military Services on the Strategic Choices and Management Review, September 18, 2013, p. 10.

[15] See the spoken testimony of Rear Admiral Richard Breckenridge at this subcommittee's hearing on September 12 on undersea warfare. The testimony in question appears in CRS Report R41129, *Navy Ohio Replacement (SSBN[X]) Ballistic Missile Submarine Program: Background and Issues for Congress*, by Ronald O'Rourke. (See section entitled "September 2013 Navy Testimony.")

agreement. In light of the Navy's expanded use of MYP and block buy contracting, there might be a new opportunity for the submarine builders and the Navy to modify the division of Virginia-class work under that agreement as part of a creative effort to arrive at the best possible approach for building both Virginia-class and Ohio replacement-class boats.

Procurement Cost vs. Life-Cycle Operation and Support (O&S) Cost

The 30-year shipbuilding plan, like the defense budget submission in general, tends to highlight platform procurement costs while putting platform life-cycle operating and support (O&S) costs into the background. In addressing the affordability challenge posted by the 30-year shipbuilding plan, it is important to bear in mind that certain potential measures for reducing the procurement costs of ships can increase their life-cycle O&S costs, perhaps to the point where total ownership cost (TOC), which includes both procurement cost and life-cycle O&S cost, goes up. It is possible, for example, to build ships using materials that are less expensive but also less durable or more maintenance-intensive, or to build ships with propulsion equipment that is less expensive but also less fuel-efficient, or to reduce the size of a ship by reducing access space around various pieces of equipment, even though that can make it more difficult and expensive to carry out maintenance on that equipment over the ship's lifetime. As the subcommittee tracks Navy efforts to reduce the procurement costs of ship designs, it may also consider asking the Navy to explain the impact, if any, that these actions might have for life-cycle O&S costs that Congress would also eventually need to fund.

Technology As a Potential Cost-Reducer, Not Just a Source of Risk

Discussion in recent years of DOD acquisition programs, including Navy shipbuilding programs, often treats new technology primarily as a source of cost, schedule, and technical risk. New technology is certainly a source of such risk in defense acquisition, but what can be lost as a result of a focus on technology primarily as a source of risk is that technology can also present opportunities for reducing procurement and life-cycle O&S costs. Technology can bring about ship components that are smaller, lighter, easier to fabricate and assemble, more energy efficient, less maintenance-intensive, and longer lasting. New technology can also lead to more efficient shipyard processes for building ships and maintaining them over their lifetimes. A sustained, singular focus on technology primarily as a source of program risk could lead to shipbuilding programs that experience fewer execution problems and are less controversial, but also more expensive than necessary. As Congress addresses the affordability challenge posed by the 30-year shipbuilding plan, it may consider looking into how technology acts not only as a source of program risk, but as a potential means for reducing procurement and life-cycle O&S costs. In recent years, there have been very few congressional hearings focused on this theme, and the Navy in recent years has rarely been asked to show an integrated path for using new technology to reduce ship procurement and life-cycle O&S costs.

Criticisms of Past Navy Surface Ship Acquisition Programs

In the midst of criticisms of certain Navy surface ship acquisition programs in the 30-year shipbuilding plan, such as the LCS and CVN-78 programs, on issues such as cost growth, ship capabilities, construction-quality, and testing of combat system equipment, it can be helpful to recall, as a matter of providing some historical context, that a number of earlier Navy surface combatant acquisition programs—including some, like the DDG-51 program, that are today considered acquisition success stories—were themselves criticized on one or more of these grounds. Examples include the following:

- **The Spruance (DD-963) class destroyer program** was a subject of oversight for cost growth, construction delays, and limitations on the capabilities of ships as initially delivered to the

Navy.[16] The ship was criticized as being underarmed for its size—for having something like a frigate's worth of combat systems on a destroyer hull.[17] The criticism arose in part from a Navy decision to make the ship more affordable to procure: The ship was originally designed with both a full-capability ASW system and a full-capability AAW system (which, in those pre-Aegis days, was the digital Tartar/SM-2 system). To reduce the ship's procurement cost, the Navy decided that the most important mission need to be met by the ship was ASW. Accordingly, the ship's full-capability ASW system was retained while its AAW system was de-scoped to a less-capable and less-expensive point-defense system. While this contributed to criticism that the ship was underarmed for its size, a decision to retain the full-capability AAW system might well have led to a different criticism—that the ship was insufficiently affordable for the shipbuilding budgets of the day. The de-scoping of the ship's AAW system, as it turned out, left the ship with ample growth margin, which the Navy years later used to install a 61-cell vertical launch system (VLS) on 24 of the 31 DD-963s, giving those ships an additional mission of acting as Tomahawk strike platforms—a mission not originally contemplated for the ships, and one that contributed to the ship's cost effectiveness in their later years of service.[18]

- **The Oliver Hazard Perry (FFG-7) class frigate** was a subject of oversight in connection with cost growth, changes to the design of the ship's stern, the capabilities of the ship's hull-mounted sonar (which some critics disparaged as a "fish finder"), the ship's limited growth margin, the adequacy of the ship's crew size for operating and maintaining the ship, and the ship's survivability features.[19] The ship was characterized as having capabilities that did not fit well with the fleet's day-to-day operational needs (i.e., of being a "square peg in a round hole").[20] Following the May 1987 Iraqi missile attack on one of the ships in the class, the Stark (FFG-31),

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[16] See, for example, General Accounting Office, *General Purpose Amphibious Assault Ship and the DD-963 Antisubmarine Warfare Destroyer Shipbuilding Program*, Staff Study, February 1975, 57 pp.

[17] One blog post states: "Spruance class destroyers (IOC 1975) were criticized as bit [sic] 7,900 ton "destroyers" possessing only two five-inch guns and an ASROC [antisubmarine rocket] launcher. They were hardly more capable than the still-in service World War II-era destroyers upgraded as part of the Fleet Rehabilitation and Modernization (FRAM) program. But the ships' critics conveniently ignored other key facts that the Spruance-class was also helicopter capable, equipped with NATO Sea Sparrow Self Defense Missiles, and boasted a powerful bow mounted sonar. At the time, criticism of the Spruance ships was loud, strident and frequent." (Robert D. Holzer, "Birthing Ships is Never Easy; Give LCS A Break," BreakingDefense.com, June 7, 2013, posted at: http://breakingdefense.com/2013/06/07/birthing-ships-is-never-easy-give-lcs-a-break/.

[18] Four copies of the original version of the DD-963 destroyer design—the version with a full-capability AAW system as well as a full-capability ASW system—were ordered by Iran, which was then a U.S. security partner ruled by the Shah of Iran. (The four ships included some relatively minor design modifications for improving their ability to perform in the environmental conditions of the Persian Gulf.) Following the revolution that deposed the Shah of Iran, these four ships were purchased back from Iran while still under construction. Following their completion, the ships were commissioned into U.S. Navy service, becoming the Kidd (DDG-993) class destroyers. Because of their digital Tartar/SM-2 AAW systems, the ships had less growth margin than the Navy's DD-963s and less AAW capability than the Navy's Aegis cruisers and destroyers. This may have contributed to the Navy's decision to retire the four ships in 1998-1999 at an average age of about 17 years. The DD-963s, by comparison, were kept in service longer: The DD-963 with the shortest service life was kept in service for 18.3 years, and 25 of the 31 ships in the class served into their twenties.

[19] See United States General Accounting Office, Statement of Jerome H. Stolarow, Director, Procurement and Systems Acquisition Division, before the Subcommittee on Priorities and Economy in Government, Joint Economic Committee on The Navy's FFG-7 Class Frigate Shipbuilding Program, and Other Ship Program Issues, January 3, 1979, 16 pp. See also General Accounting Office, *Logistics Concerns Over Navy's Guided Missile Frigate FFG-7 Class*, PLRD-81-34, July 7, 1981, 56 pp.

[20] See Bruce R. Linder, "Square Pegs?" *U.S. Naval Institute Proceedings*, June 1983.

questions were raised about the effectiveness of the FFG-7's AAW system and the ship's survivability features.[21]

- **The Ticonderoga (CG-47) class Aegis cruiser** was a subject of oversight for whether the ship was top heavy and likely to tip over if it made a tight turn at high speed.[22] Cost growth and construction delays were later raised as an additional issue.[23] The fifth ship in the class (CG-51) was built with a misaligned bow.[24]

- **The Arleigh Burke (DDG-51) class Aegis destroyer** was criticized for being too expensive and dependent on advanced technology,[25] and for lacking (in the Flight I/II design) a helicopter hangar for better supporting ASW and other helicopter-assisted missions. The program became a

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[21] Regarding the ship's AAW system, see, for example, United Press International, "Frigate Similar to Stark Is Said To Fail Test Against Missile Attack," *Washington Post*, May 28, 1987: A26; William Matthews, "GAO Probes Sensors Used Aboard Stark," *Navy Times*, March 28, 1988: 1; Molly Moore, "GAO Questions Frigates' Missile Defenses," *Washington Post*, February 2, 1989: A20; Andrew Rosenthal, "House Panel to Hold Hearings On Ships' Anti-Missile System," *New York Times*, February 2, 1989: A22; Anne Rumsey, "Test Flaws Found In Ship Defenses," *Defense Week*, February 6, 1989: 7; Caleb Baker, "Subcommittee to Investigate Ability of Navy Frigates to Detect Missiles," *Defense News*, February 6, 1989: 10; "Hearings To Be Held On FFG-7 Self-Protection Sufficiency," *Navy News & Undersea Technology*, February 6, 1989: 4; and William Matthews, "GAO Doubts Defense Capabilities of Frigates," *Navy Times*, February 13, 1989: 26.

Regarding the ship's survivability features, see, for example, Hugh Lucas, "Stark Design Questioned After Iraqi Attack," *Jane's Defence Weekly*, May 30, 19and 87: 1040; Otto Kreisher, "Navy Experience In Persian Gulf Bares Ship Design Flaws," *San Diego Union*, October 18, 1987: 2; William Matthews, "Naval Expert Doubts FFG-7's Survivability," *Navy Times*, February 1, 1988: 31. One blog post, summarizing criticisms of the FFG-7, states: "The Perry class frigates (IOC 1977), much admired [today] by many LCS critics, were unfavorably branded by as 'square pegs' when they were first deployed. Criticism of the Perrys was fierce, including such charges as the ships had only a single shaft and were not survivable and suffered from the lack of main propulsion redundancy; they were problem-prone and had unreliable ship's service diesel generators; a power-limited 'fish finder' high-frequency sonar; and the Oto Malera 76mm was derided as a 'pop gun' rather than a 'proper' 5-inch gun. On top of all that, the critics said and the crew was too small and was unable to operate and maintain the ships properly." (Robert D. Holzer, "Birthing Ships is Never Easy; Give LCS A Break," BreakingDefense.com, June 7, 2013, posted at: http://breakingdefense.com/2013/06/07/birthing-ships-is-never-easy-give-lcs-a-break/.)

[22] See the unclassified digest of the classified GAO report, *Status of the CG-47 Cruiser and DDG-51 Destroyer Shipbuilding Programs*, GAO/C-MASAD-83-11, February 22, 1983, 3 pp. See also Richard Bernard, "CG-47: Overweight and 'Ineffectual," *Defense Week*, August 16, 1982: 1, which stated: "The new CG-47 Ticonderoga guided missile cruiser—designed to be a fast, maneuverable, smart warship able to shoot down several Soviet cruise missiles simultaneously—has evolved into an obese, $1-billion walrus of the high seas with potentially dangerous stability problems. The ship is so overweight, according to investigators of the House Appropriations Committee, that the Navy is stripping vinyl tile off the ship's decks and substituting light honeycomb panels for aluminum plating in some parts of the superstructure. The Ticonderoga has become so burdened with technological lard that it cannot keep up with other warships of the Navy's carrier battle groups. And unless drastic weight-slashing is accomplished, the investigators assert, the huge warship 'will be ineffectual' in attempts to perform its primary task: air defense." See also Associated Press, "Report Says New Cruiser May Be Top-Heavy, Too Slow," *Baltimore Sun*, August 18, 1982: 6; United Press International, "Weinberger Says Report False, New Cruiser Is Not Unstable," *Washington Post*, August 19, 1982: 2; Storer Rowley, "Newest Missile Cruiser Has Grown 'Tipsy,' Navy Officials Fear," *Chicago Tribune*, January 23, 1983: 14; Alan Jarvis, "Navy Denies Aegis Cruiser Defects," *Navy Times*, August 30, 1982: 23; Robert C. Staiman, "Aegis Cruiser Weight Reduction and Control," *Naval Engineers Journal*, May 1987: 190.

[23] Paul Bedard, "Cost Overruns Plague Bath's Cruiser Work," *Defense Week*, November 24, 1986: 1; Paul Bedard, "Bath Aegis Cruisers Will Be Late," *Defense Week*, December 15, 1986: 16.

[24] "Navy Awaits Outcome of Sea Trials Before Fixing Cruiser's Crooked Prow," *Defense News*, April 14, 1986: 26.

[25] See, for example, George C. Wilson, "The Wrong Destroyer? The Navy's Billion-Dollar Hole in the Water," *Washington Post*, August 10, 1986: B5.

subject of oversight for construction delays and cost growth on the lead ship.[26] In response to delays in the construction of initial DDG-51s, Congress suspended DDG-51 procurement for a year in FY1988 and substituted procurement of additional CG-47s. An additional oversight issue was the delivery of the second through sixth ships in the DDG-51 program without their hull-mounted sonars, due to delays in producing the sonars.[27]

- **The Aegis combat system being installed on CG-47 cruisers and DDG-51 destroyers** was a subject of oversight in the early 1980s—as CG-47 procurement was continuing and DDG-51 procurement was starting—for whether it had been adequately tested against threats such as

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[26] See, for example, Anne Rumsey, "Bath Losing Money On Arleigh Burke As Delays, Cost Overrun Hit Destroyer," *Defense Week*, May 8, 1989: 3; Doug Rekenthaler Jr., "Shipyards Swarming With Claims, Speculation, Backbiting," *Navy News & Undersea Technology*, August 21, 1989: 4; John J. Fialka, "Warship Ordered Under Navy Program To Control Costs Is late and Over Budget," *Wall Street Journal*, September 15, 1989: A12; George C. Wilson, "$1 Billion Navy's Destroyer Cost Is Making Waves," *Washington Post*, September 15, 1989: A13; Rowan Scarborough, "Dingell Scowls at Launch of Destroyer," *Washington Times*, September 15, 1989: A1; Timothy McCune, "Dingell Raps Navy For Destroyer," *Defense Week*, September 18, 1990: 2; Timothy McCune, "Bath Iron Works Begs Off Meeting With GAO," *Defense Week*, September 25, 1989: 14; Timothy McCune, "Dingell Wants To See Navy's Aegis Paperwork," *Defense Week*, October 2, 1989; Rowan Scarborough, "House Panel: Navy 'Bailed Out' Shipbuilder," *Washington Times*, December 7, 1989: 3; "Dingell Says Congress 'Hoodwinked' In $75-$90-Million Bailout of DDG-51 Destroyer," *Inside the Navy*, December 11, 1989: 9; "Congress To Investigate Navy and Bath on DDG-51 Program," *Navy News & Undersea Technology*, December 11, 1989: 1; Eric Rosenberg, "Navy Sharply Rejects Dingell's Bail-Out Charge," *Defense Week*, January 8, 1990: 11; Navy Rebuts Congressman's Criticism of DDDG-51," *Navy News & Undersea Technology*, January 8, 1990: 8.

On January 17, 1990, GAO released a report on cost and schedule problems in the DDG-51 program which recommended "that the Secretary of Defense ensure sufficient information exists to justify the award of contracts for follow ships beyond the seven now under contract." (General Accounting Office, *Navy Shipbuilding[:]Cost and Schedule Problems on the DDG-51 AEGIS Destroyer Program*, GAO/NSIAD-90-84, January 1990, 60 pp.) On January 24, 1990, the Seapower and Strategic and Critical Materials subcommittee of the House Armed Services Committee held a hearing on the DDG-51 program, at which GAO provided testimony based on its report, and the Navy and Bath Iron Works defended their work on the program. (See General Accounting Office, *Navy Shipbuilding: Cost and Schedule Problems on the DDG-51 AEGIS Destroyer Program, Statement of Martin M Ferber, Director, National Security and International Affairs Division, Before the Subcommittee on Seapower and Strategic and Critical Materials, Committee on Armed Services, House of Representatives*, January 24, 1990, GAO-T-NSIAD-90-14, 7 pp.; Statement of The Honorable H. Lawrence Garrett, III, Secretary of the Navy, Before the Subcommittee on Seapower and Strategic and Critical Materials, Committee on Armed Services, United States House of Representatives, on the DDG-51 ARLEIGH BURKE Class AEGIS Destroyer, no date on cover, 25 pp.; and Statement of William E. Haggett, Chairman and Chief Executive Officer, Bath Iron Works Corporation, Before the Subcommittee on Seapower and Strategic and Critical Materials, Committee on Armed Services, House of Representatives, on the DDG 51 Aegis Destroyer Program, January 24, 1990, 29 pp.

Oversight of cost issues on the program continued in 1990-1992. See, for example, General Accounting Office, *Navy Ships: Status of SSN-21 and DDG-51 Programs*, Statement of Martin M Ferber, Director, National Security and International Affairs Division, Before the Subcommittee on Projection Forces and Regional Defense, Committee on Armed Services, U.S. Senate, GAO-T-NSIAD-90-44, May 22, 1990, 12 pp. plus appendices; General Accounting Office, *Navy Shipbuilding[:] Allegations of Mischarging at Bath Iron Works*, GAO/NSIAD-91-85, July 1991, 44 pp.; Peter G. Gosselin, "US Probing Overcharges At Shipyard," Boston Globe, May 6, 1990: 1; Eric Rosenberg, "GAO Drops Bath Subpoena Threat," Defense Week, May 29, 1990: 131; "GAO Investigating If DDG-51 Mischarge Was Intentional: Dingell," *Defense Daily*, June 26, 1990: 1; and Eric Rosenberg and Tony Capaccio, "DDG-51 Will Cost Millions More Than Anticipated," *Defense Week*, May 11, 1992: 1.

[27] See Eric Rosenberg, "Arleigh Burkes To Arrive Without Sonars," *Defense Week*, June 4, 1990: 9; Eric Rosenberg, "Navy Denies GAO Report Of Sonar Trouble," *Defense Week*, June 11, 1990: 15. One blog post, summarizing criticisms of the DDG-51, states: "The Arleigh Burke class guided missile destroyers didn't face as much criticism as its predecessors, but it was still roundly derided for having only a helicopter "lily pad" without an onboard hangar. Its engineering spaces with their low overheads bulged with pipes and cables. It was also said that the first ship, Arleigh Burke, was rebuilt three times over before final delivery because of an immature design, problems with sharing software between shipyards, and the late addition of "stealth" features." (Robert D. Holzer, "Birthing Ships is Never Easy; Give LCS A Break," BreakingDefense.com, June 7, 2013, posted at: http://breakingdefense.com/2013/06/07/birthing-ships-is-never-easy-give-lcs-a-break/.)

supersonic, sea-skimming anti-ship cruise missiles (ASCMs).[28] In 1990, questions were raised about the ability of Aegis cruisers and destroyers to counter anti-radiation missiles (ARMs) that could home in on the energy emitted by the Aegis system's SPY-1 radar.[29]

In addition to these cases, other Navy shipbuilding programs in recent years have been subjects of oversight for issues of one kind or another. For example, the San Antonio (LPD-17) class amphibious ship program was a subject of oversight for cost growth and construction-quality problems; testing of the Seawolf (SSN-21) class attack submarine revealed certain design issues that became subjects of oversight; and the Virginia-class attack submarine program experienced initial cost growth and years later became a subject of oversight in connection with the reliability of certain onboard equipment.

The argument here is not that Congress, viewing this record, should adopt an attitude of complacency about issues such as cost growth, design and construction challenges, and ship capabilities, but rather to note that criticisms of current shipbuilding programs on issues such as these do not necessarily make these current programs outliers in the track record of Navy shipbuilding, and that ships that are well regarded today were themselves criticized in earlier years on various grounds.

Shipbuilding Lessons-Learned Center

Ships are expensive and high-profile procurement items. Problems in building them consequently are likely to become the focus of intense oversight and criticism. Given the long history of the Navy encountering and addressing challenges in Navy shipbuilding programs, one option for identifying, recording, and transmitting to future generations the lessons learned from past shipbuilding programs, and thereby improving the ability to fully implement the 30-year shipbuilding plan in a situation of finite resources, would be to establish a Navy shipbuilding lessons-learned center roughly analogous to the combat operations lessons-learned centers operated by the military services. Such a center might, for example, help prevent instances similar to the use of design/construction concurrency in the sea frame portion of the LCS program—something that the Navy did even though design/construction concurrency is a well-known source of cost and schedule risk in defense acquisition programs, and that the Navy later acknowledged was a cause of substantial cost growth on LCS sea frames.

Cruiser-Destroyer Roadmap

On November 1, 2001, the Navy announced that it was launching a Future Surface Combatant Program aimed at acquiring a family of next-generation surface combatants. This new family of surface combatants, the Navy stated, would include three new classes of ships: a destroyer called the DD(X)—later redesignated the DDG-1000—for the precision long-range strike and naval gunfire mission; a cruiser called the CG(X) for the air defense and ballistic missile mission, and a smaller combatant called the Littoral Combat Ship (LCS) to counter submarines, small surface attack craft, and mines in heavily contested littoral (near-shore) areas. Two of the elements in this plan were subsequently stopped: the DDG-1000 was truncated to a total three ships in 2009 in favor of resumed procurement of DDG-51

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[28] See CRS Report 84-180 F, *The Aegis Anti-Air Warfare System: Its Principal Components, Its Installation on the CG-47 and DDG-51 Class Ships, and Its Effectiveness*, October 24, 1984, pp. 10-18. (Out of print and available directly from the author.) See also the unclassified digest of the classified GAO report, *Status of the CG-47 Cruiser and DDG-521 Destroyer Shipbuilding Programs*, GAO/C-MASAD-83-11, February 22, 1983, 3 pp.

[29] Rob Holzer and George Leopold, "Aegis Ability to Defeat ARMs Questioned; Navy Insists System Can Guard Ships From Antiradiation Missile," *Defense News*, February 26, 1990: 4. See also Eric Rosenberg, "Dingell Fires Another Shot Across DDG-51's Bow," *Defense Week*, April 2, 1990: 15.

destroyers, and the CG(X) program was terminated in 2010. The resumed DDG-51 program has now effectively replaced both the CG(X) and DDG-1000 programs.

Compared to the earlier plan to acquire DDG-1000s and CG(X)s, the resumed DDG-51 program reduces ship-design costs and unit procurement cost and mitigates technical and schedule risk while introducing a key new capability—the Air and Missile Defense Radar (AMDR). The replacement of the CG(X) and DDG-100 programs with resumed DDG-51 procurement, however, leaves the Navy without a clear roadmap in the 30-year shipbuilding plan for accomplishing certain other things for the cruiser-destroyer force that were to have been accomplished by the CG(X) and DDG-1000 programs, including but not limited to the following:

- restoring ship growth margin for accommodating future capabilities;
- introducing integrated electric drive technology, particularly for supporting future high-power electrical weapons such as high-power lasers; and
- substantially reducing ship life-cycle O&S costs by, among other things, reducing crew size.

In managing its surface combatant acquisition efforts, the Navy in recent years has focused on near-term priorities of stabilizing the LCS program, implementing the shift from DDG-1000 procurement to resumed DDG-51 procurement, and preparing to shift, within the DDG-51 program, from the current Flight IIA design to the new, AMDR-equipped Flight III design. The three issues identified in the bullet points above, by comparison, are not immediately urgent. If left unaddressed, however, they could eventually produce a surface combatant force with less capability than what might be needed, and higher O&S costs than are necessary. Given that cruisers and destroyers are to constitute about 29% of the ships in the future fleet (88 out of 306), operating a cruiser-destroyer force with higher rather than lower O&S costs could significantly complicate the Navy's ability to fund other program priorities, including the procurement of new ships in the 30-year shipbuilding plan.

The three issues identified above could be addressed through either additional modification of the DDG-51 design or through the design of a new destroyer. Technical risk on a new-design destroyer could be mitigated by having the initial version of the ship be equipped with a combat system that is essentially the same as on the Flight III DDG-51. Work on a further modification of the DDG-51 design or a new-design destroyer could be initiated after some number of Flight III DDG-51s are procured. One option for the subcommittee would be to ask the Navy for a roadmap that shows how the Navy plans to eventually restore ship growth margin, introduce integrated electric drive, and substantially reduce life-cycle O&S costs in the Navy's cruiser-destroyer force.

LCS Program

On September 2, 2013, it was reported that, as part of an ALT POM (alternative Program Objective Memorandum) budget-planning scenario in which DOD spending remains constrained to the revised cap levels in the Budget Control Act, the Office of the Secretary of Defense (OSD) favors truncating the LCS program to a total of 24 ships—the number that would be reached upon completion of the two current LCS block buy contracts in FY2015—and placing a top priority on fielding the LCS mine countermeasures (MCM) module. The Navy, according to the report, countered with proposals for higher numbers of LCSs, and strongly advocated a total of at least 32 ships. The article quotes a Navy spokesperson as stating: "We remain committed to a 52-ship LCS program—this number accurately and

appropriately captures the requirement for capacity and capabilities."[30] A September 13, 2013, press report quoted Secretary of the Navy Ray Mabus as stating: "We're absolutely committed to building the whole class of 52 ships of this class."[31]

If the LCS program were truncated to 24 ships or some other number well short of 52, a potential key issue for the subcommittee would be the operational implications for the Navy of potentially not having sufficient capacity to fully perform the LCS's three core missions of countering mines, small boats, and diesel submarines, particularly in littoral waters. In an ALT POM budget-planning scenario, DOD would likely face potential reduction in numerous other DOD programs. Consequently, the operational implications of potentially not having enough capacity to fully perform the LCS's three core missions would likely be considered in a context of DOD facing potential capability or capacity shortfalls in other missions as well.

Force Size and Homeporting Arrangements

If constraints on Navy funding lead to reductions in the 30-year shipbuilding plan and the planned size of the fleet, recent Navy testimony suggests that the Navy would attempt, as much as possible, to maintain its overseas presence with that smaller fleet. The Navy would have various options for doing this, including lengthening deployments, making greater use of crew rotation, and making more use of overseas homeporting and/or overseas stationing of ships. The last of these measures could, at the margin at least, result in a greater reduction in the number of ships homeported in the continental United States (CONUS) than would be suggested solely by the reduction in the total size of the fleet.

Debate on Fleet Architecture

As a final point regarding the 30-year shipbuilding plan, it is worth noting that there is a debate currently underway within the broader U.S. community of those who study naval forces about whether the U.S. Navy should shift from its current fleet architecture to a more-distributed architecture that would include fewer large ships (such as aircraft carriers and large surface combatants) and greater numbers of smaller ships (such as smaller aircraft carriers and small surface combatants). Advocates of a more-distributed fleet architecture—who appear to include, among others, analysts working at the Naval Postgraduate School—argue that a more-distributed architecture would offer benefits in terms of fleet affordability and effectiveness in countering adversaries who field capable maritime anti-access/area-denial (A2/AD) systems.[32] The Navy and other supporters of the Navy's current fleet architecture disagree on both of these points.

Participants on the two sides of this debate appear to proceed from differing or even contradictory views on underlying factors such as the likely effectiveness of adversary A2/AD weapons, the likely effectiveness of U.S. Navy systems for countering them, the resulting likely survivability of Navy surface ships to attack from such weapons, and how the survivability of a ship changes as a function of ship size.

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[30] Christopher P. Cavas, "Sources: Pentagon Backs Cutting LCS to 24 Ships," *DefenseNews.com*, September 2, 2013.

[31] Nathan Phelps, "US Navy Secretary Says He's Committed to LCS," *DefenseNews.com*, September 13, 2013.

[32] See, for example, 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.; Timothy C. Hanifen, "At the Point of Inflection," *U.S. Naval Institute Proceedings*, December 2011: 24-31; David C. Gompert, *Sea Power and American Interests in the Western Pacific*, RAND, Santa Monica (CA), 2013, 193 pp. (RR-151-OSD); and John Harvey Jr., Wayne Hughes Jr., Jeffrey Kline, and Zachary Schwartz, "Sustaining American Maritime Influence," *U.S. Naval Institute Proceedings*, September 13, 2013: 46-51.

Due to differences on matters such as these, it can sometimes appear as if the two groups are almost talking past one another.

One option for the subcommittee would be to attempt to understand why the two groups have come to such differing views on these underlying issues. More generally, the subcommittee may wish to monitor this debate closely, because its outcome could have significant implications for the planned size and structure of the fleet, and for the types and numbers of ships included in the 30-year shipbuilding plan.

Mr. Chairman, this concludes my statement. I will pleased to respond to any questions the subcommittee may have.

Appendix: U.S. Naval Forces and National Strategy

In addition to the strategic considerations mentioned at the beginning of this statement, an additional point to note in relating U.S. naval forces to 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 deny the United States access to some of the other hemisphere's resources and economic activity. Although U.S. policymakers do not often state 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.

The 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 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, significant numbers of Air Force long-range bombers, long-range surveillance aircraft, long-range airlift aircraft, and aerial refueling tankers, and significant numbers of Navy 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 designs 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 is, 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, where the action is, and consequently instead spend their defense money on forces that are tailored largely for influencing events in their own neighborhood.

The fact that the United States designs 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 one sees the U.S. military compared with those of other nations. When observers, for example, question why the U.S. Navy has 11 aircraft carriers, pointing out that other countries do not have anything like that number, it would appear they are overlooking or downplaying this basic point. 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.

A variation on this argument by comparison to other countries is that U.S. naval forces are clearly sufficient—or excessive—because they are equal in tonnage to the next dozen or more navies combined, most of which are the navies of 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 a lot 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.) Again, it would appear that observers who make this cross-national comparison are overlooking or downplaying this point.

Countries have differing needs for naval and other military forces, and the United States, as a country located in the Western Hemisphere with 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.

As a final comment, it can be noted that the point made at the beginning of this statement about U.S. naval forces giving the United States the ability to convert the world's oceans into a medium of maneuver and operations for projecting U.S. power ashore and otherwise defending U.S. interests would be less important if less of the world were covered by water, or if the oceans were carved into territorial blocks, as is the land. But most of the world is covered by water, and most of those waters are international waters, where naval forces can operate freely. So the point 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.

Ronald O'Rourke

Mr. O'Rourke is a Phi Beta Kappa graduate of the Johns Hopkins University, from which he received his B.A. in international studies, and a valedictorian graduate of the University's Paul Nitze School of Advanced International Studies, where he received his M.A. in the same field.

Since 1984, Mr. O'Rourke has worked as a naval analyst for the Congressional Research Service of the Library of Congress. He has written numerous reports for Congress on various issues relating to the Navy. He regularly briefs Members of Congress and Congressional staffers, and has testified before Congressional committees on several occasions.

In 1996, Mr. O'Rourke received a Distinguished Service Award from the Library of Congress for his service to Congress on naval issues.

Mr. O'Rourke is the author of several journal articles on naval issues, and is a past winner of the U.S. Naval Institute's Arleigh Burke essay contest. He has given presentations on Navy-related issues to a variety of audiences in government, industry, and academia.

WITNESS RESPONSES TO QUESTIONS ASKED DURING THE HEARING

OCTOBER 23, 2013

RESPONSE TO QUESTION SUBMITTED BY MR. HUNTER

Dr. LABS. Mr. Hunter asked what percentage of the Navy's budget is spent on shipbuilding, modernization, repair, and everything else that is needed to ensure that the current fleet lasts long enough to meet the Navy's service life goals.

Unfortunately, CBO does not have sufficient resources to analyze the Navy's budget line by line to determine all of the funding that provides for ship construction, modernization, and repair. [See page 10.]

QUESTIONS SUBMITTED BY MEMBERS POST HEARING

OCTOBER 23, 2013

QUESTIONS SUBMITTED BY MR. FORBES

Mr. FORBES. Using an historical average as a method to project the 30-year shipbuilding plan forward, can you provide an assessment as to your projection of number of ships that we should anticipate at the end of the 30-year shipbuilding plan?

Dr. LABS. If, over the next 30 years, the Navy receives the same amount of funding in its shipbuilding accounts that it received over the last 30 years after adjusting for inflation—which is about $16 billion per year in 2013 dollars—then the service would end up with a fleet in 2043 of 243 ships. That number assumes that the Navy would buy the same types of ships that it plans to buy in its 2014 shipbuilding plan but would buy proportionately fewer numbers of each type, and it incorporates CBO's estimates of the cost of building each type of ship. For the next 30 years as a whole, that amount of funding would be $160 billion less than CBO's estimate of the cost of the Navy's shipbuilding plan.

Mr. FORBES. Assuming a full sequester and your budget projections, how will the overall Navy force structure and 30-year shipbuilding plan be impacted?

Dr. LABS. Senior Navy officials have stated that sequestration of the Navy's shipbuilding accounts in fiscal year 2014 would result in the Navy's not buying an attack submarine, a littoral combat ship, and an afloat forward staging base. In addition, sequestration in 2014 would likely make it impossible for the Navy to complete the purchase of a third DDG–51 destroyer authorized by Congress in 2013.

Beyond 2014, the effect of the Budget Control Act of 2011 on the Navy's shipbuilding depends on choices made by lawmakers. During the past 15 years, the Department of the Navy has received about 30 percent of the Department of Defense's base budget and has devoted about 10 percent of its funding to shipbuilding. Going forward, if lawmakers chose to protect shipbuilding and ship maintenance at the expense of other defense programs, then any further effect on the Navy's force structure would be minimal. Alternatively, if lawmakers provided the Navy with the same percentage of DOD's budget during the coming decade as it has received in the past 15 years and the same percentage of the Navy's overall budget was devoted to ship construction as has been the case in the past 15 years, then the shipbuilding budget would be a little less than $13 billion per year from 2014 through 2021. That amount would be about $5 billion per year—or roughly 30 percent—below CBO's estimate of the amount required to carry out the Navy's latest shipbuilding plan. (According to CBO's estimates, the Navy's 2014 shipbuilding plan would cost about $140 billion between 2014 and 2021, while complying with the BCA's lower caps on defense funding with the historical allocation of funding would give the Navy about $102 billion for ship construction.) With that funding, if the Navy bought the same types of ships that it plans to buy in its 2014 shipbuilding plan but bought proportionately fewer numbers of each type, the Navy would buy 44 ships between 2014 and 2021, rather than 61 ships under the Navy's plan.

Mr. FORBES. In your report, you indicated that the Navy has traditionally been unsuccessful in obtaining the full service life of the surface combatants. How will the 30-year shipbuilding plan be impacted if the Navy cannot obtain the full service life of its ships? In your estimation, what is the greatest threat to the Navy that will impede the Navy from obtaining the full service life?

Dr. LABS. The Navy's 2014 shipbuilding plan, consistent with the plans the Navy has submitted to Congress over the last few years, assumes a 50-year service life for carriers; a 40-year service life for most surface combatants, amphibious ships, and logistics ships; a 42-year service life for ballistic missile submarines, a 33-year service life for attack submarines, and a 25-year service life for littoral combat ships. If the Navy cannot meet those goals for service life for large numbers of ships, then the result will either be a smaller fleet than the Navy is planning or a greater need for funding to buy more ships sooner than expected. The greatest risk to the intended service lives is probably with large surface combatants. The Navy has demonstrated, through the long service of the USS *Enterprise*, that it can operate nuclear-powered aircraft carriers for more than 50 years. Similarly, the Navy has successfully operated and retired a few amphibious ships at 40 years and *Los Angeles* class attack submarines at 33 years. However, the Navy is inexperienced at operating surface combatants for more than 30 years. The most likely reason why the

Navy might not achieve its service life goal for surface combatants would be insufficient investment in maintaining and modernizing those ships. The history of ship operations in the U.S. Navy and in other navies suggests that surface ships can operate for decades and their combat systems can be continually upgraded to respond to changes in the threat environment—if policymakers choose to do so and allocate the resources to do so.

Mr. FORBES. Given a stable funding stream, what is the greatest source of risk associated with projecting the Navy's force structure and 30-year shipbuilding plan?

Dr. LABS. 1If the Navy's funding stream for shipbuilding was relatively stable over time, there are still at least four significant risks involved in projecting the Navy's force structure and 30-year shipbuilding plan—and it is unclear which risk is the greatest.

- First, the Navy might make significant changes in the number or types of ships that it plans to buy. Such instability in the Navy's shipbuilding, particularly in the near term, would also make it difficult for the shipbuilding industry to optimize their workforce and their shipbuilding processes to build ships in the most efficient and cost-effective manner.
- Second, and related to the first risk, unexpected cost growth for ships could result in fewer ships being purchased than what the Navy proposes in its shipbuilding plan.
- Third, a change in the projected future threat environment such that major components of the Navy's shipbuilding plan would no longer be considered viable would make it difficult to project the Navy's future force structure. Such a change in the security environment could lead to decisions to design and purchase different types of ships in different quantities than what the Navy has previously expected.
- Fourth, the Navy's 30-year shipbuilding plan is not just a shipbuilding plan but also a ship retirement plan. If the Navy does not invest sufficiently in the existing fleet so that ships are not maintained properly and modernized as needed, then ships may be retired sooner than the Navy planned.

Mr. FORBES. The Navy has proposed retiring the four SSGN boats and replacing their strike capability with the *Virginia* Payload Module. The Navy has also forecast a reduced cost associated with this capability. In your estimate, what capability is provided by the *Virginia* Payload Module and what is the program and cost risk associated with developing this capability?

Dr. LABS. The *Virginia* Payload Module (VPM) provides a substantial increase in the capability of *Virginia* class attack submarines to conduct strike and special operations missions. The VPM inserts a new section in the *Virginia* class submarines that is composed of four multiple all-up round canisters (MACs), each of which can carry seven missiles, such as Tomahawk land-attack weapons. Alternatively, the canisters could carry other payloads associated with special operations or reconnaissance if the Navy chose to configure them for those missions. The 28 additional missiles provided by a VPM increases the number of weapons positions (missiles and torpedoes) on a *Virginia* class submarine from 39 to 67.

In light of the Navy's experience with modifying submarines to perform different missions than originally intended (such as changing the USS *Jimmy Carter* from an ordinary *Seawolf* attack submarine to one specialized for special operations, and converting ballistic missile submarines into cruise missile-carrying submarines), the technical challenges of designing VPM into the *Virginia* class seem relatively limited. CBO has not produced an independent cost estimate of VPM-modified submarines because the Navy has not incorporated that change in the class into its 30-year shipbuilding plan. However, the Navy has stated in briefings to CBO and the Congressional Research Service that designing the VPM into the *Virginia* class would increase the unit cost of those ships by 13 to 15 percent.

Mr. FORBES. How confident are you in the cost projection associated with the *Ford* class aircraft carrier that Navy has proposed? What elements cause the greatest risk to obtaining a *Ford* class aircraft carrier within the proposed budget?

Dr. LABS. The Navy currently estimates that the CVN–78 will cost $12.8 billion in nominal dollars, whereas CBO estimates that it will cost $13.5 billion in nominal dollars. The Navy's current estimate is 22 percent higher, after adjusting for inflation, than the service's estimate first published as part of the 2008 budget submission. The additional cost that CBO has built into its own estimate could come from at least three sources: contractor performance, the integration of major component systems as the ship enters the final 30 percent of construction, and problems that arise from the testing regime that will occur once the ship is completed. If contractor performance does not deteriorate from where it is today, if integration of the major systems on the ship runs smoothly, and if the test program reveals only minor problems, then the final cost of the CVN–78 will likely be less than CBO's

estimate (but not less than the Navy's current estimate). Conversely, if any one of those issues proves problematic in the final two years of construction, then the final cost of the CVN–78 will likely be higher than the Navy's estimate and higher than the Congressional cost cap for the ship of $12.9 billion in nominal dollars.

The next carrier to be built, the CVN–79, which was ordered in 2013, may also experience cost growth. The Navy estimates the cost of that ship at $11.3 billion in nominal dollars, and CBO estimates the cost at $12.0 billion. The Navy itself describes its estimate as an "aggressive but achievable target." Both the Navy and CBO assume that the contractor will improve its performance on the second ship of the class, as customarily occurs in ship construction program. But CBO does not expect that construction performance will improve as much as the Navy is expecting.

Mr. FORBES. During recent testimony, the Chief of Naval Operations indicated his intent to maintain the *Ohio* class replacement program as a priority acquisition. Navy projects that this program is expected to cost more than $80 billion. Considering your projections associated with 30-year shipbuilding plan and assuming an historical funding model, how will the overall fleet size be impacted if the Navy retains the current program of record associated with the *Ohio* class replacement?

Dr. LABS. During the past 30 years, the Department of the Navy has received about $16 billion, after adjusting for inflation, to fund all of the activities in its shipbuilding accounts. If lawmakers provided the Navy with those same (inflation-adjusted) resources in the future, and if the Navy bought the same types of ships that it plans to buy in its 2014 shipbuilding plan but bought proportionately fewer numbers of each type, the Navy would purchase 193 ships during the next 30 years and would finish that period with an inventory of 243 ships. (For comparison, the Navy's 30-year shipbuilding plan calls for the purchase of 266 ships and an inventory in 30-years' time of 306 ships. Under that scenario, nine ballistic missile submarines would be part of the 243-ship fleet. If, however, the Navy purchased the 12 ballistic missile submarines that are included in its latest plan and made further proportional reductions in its purchases of other ships, then it would purchase seven fewer ships of other types and have a fleet in 30 years that numbered 235 ships.

Mr. FORBES. Assuming a full sequester and your budget projections, how will the overall Navy force structure and 30-year shipbuilding plan be impacted?

Mr. O'ROURKE. Overall Navy force structure and the 30-year shipbuilding plan will be affected in coming years not only by the future DOD budget top line as influenced by the Budget Control Act or other legislation, but also by additional factors, such as the allocation of the DOD budget top line among the military departments and by the portion of the DOD budget top line that is used for other expenses, including military pay and benefits and DOD's so-called overhead and back-office costs. Presentations from the Navy, CBO, GAO, or other sources on future Navy force structure and the 30-year shipbuilding plan sometimes appear to assume little or no change in these additional factors, perhaps because there is no specific basis that can be cited for assuming a particular change. The fact that other organizations choose to assume little or no change in these additional factors does not prevent Congress from considering such possibilities. The alternative of assuming at the outset that there is no potential for making anything more than very marginal changes in these additional factors could unnecessarily constrain options available to policymakers and prevent the allocation of DOD resources from being aligned optimally with U.S. strategy.

In a situation of reduced levels of defense spending, such as what would occur if defense spending were to remain constrained to the revised cap levels in the Budget Control Act, the affordability challenge posed by the 30-year shipbuilding plan would be intensified. Even then, however, the current 30-year shipbuilding plan would not necessarily become unaffordable.

The Navy estimates that, in constant FY2013 dollars, fully implementing the current 30-year shipbuilding plan would require an average of $16.8 billion in annual funding for new-construction ships, compared to an historic average of $12 billion to $14 billion provided for this purpose.[1] The required increase in average annual funding of $2.8 billion to $4.8 billion per year equates to less than 1% of DOD's annual budget under the revised caps of the Budget Control Act. The Congressional Budget Office estimates that, in constant FY2013 dollars, fully implementing the current 30-year shipbuilding plan would require an average of $19.3 billion in annual funding for new-construction ships, or $2.5 billion per year more than the Navy

[1] See Report to Congress on the Annual Long-Range Plan for Construction of Naval Vessels for FY2014, May 2013, p. 18.

estimates.[2] This would make the required increase in average annual funding $5.3 billion to $7.3 billion per year, which equates to roughly 1.1% to 1.5% of DOD's annual budget under the revised caps of the Budget Control Act.

Some observers, noting the U.S. strategic rebalancing toward the Asia-Pacific region, have advocated shifting a greater share of the DOD budget to the Navy and Air Force, on the grounds that the Asia-Pacific region is primarily a maritime and aerospace theater for DOD. In discussing the idea of shifting a greater share of the DOD budget to the Navy and Air Force, some of these observers refer to breaking the so-called "one-third, one-third, one-third" division of resources among the three military departments—a shorthand term sometimes used to refer to the more-or-less stable division of resources between the three military departments that existed for the three decades between the end of U.S. participation in the Vietnam War in 1973 and the start of the Iraq War in 2003.[3] In a context of breaking the "one-third, one-third, one-third" allocation with an aim of better aligning defense spending with the strategic rebalancing, shifting 1.5% or less of DOD's budget into the Navy's shipbuilding account would appear to be quite feasible.

More broadly, if defense spending were to remain constrained to the revised cap levels in the Budget Control Act, then fully funding the Department of the Navy's total budget at the levels shown in the current Future Years Defense Plan (FYDP) would require increasing the Department of the Navy's share of the non-Defense-Wide part of the DOD budget to about 41%, compared to about 36% in the FY2014 budget and an average of about 37% for the three-decade period between the Vietnam and Iraq wars.[4] While shifting 4% or 5% of DOD's budget to the Department of the Navy would be a more ambitious reallocation than shifting 1.5% or less of the DOD budget to the Navy's shipbuilding account, similarly large reallocations have occurred in the past:

- From the mid-1950s to the mid-1960s, reflecting a U.S. defense strategy at the time that placed a strong reliance on the deterrent value of nuclear weapons, the Department of the Air Force's share of the non-Defense-Wide DOD budget increased by several percentage points. The Department of the Air Force's share averaged about 45% for the 10-year period FY1956–FY1965, and peaked at more than 47% in FY1957–FY1959.
- For the 11-year period FY2003–FY2013, as a consequence of combat operations in Iraq and Afghanistan, the Department of the Army's share of the non-Defense-Wide DOD budget increased by roughly ten percentage points. The Department of the Army's share during this period averaged about 39%, and peaked at more than 43% in FY2008. U.S. combat operations in Iraq and Afghanistan during this period reflected the implementation of U.S. national strategy as interpreted by policymakers during those years.

The point here is not to argue whether it would be right or wrong to shift more of the DOD budget to the Navy's shipbuilding account or to the Department of the Navy's budget generally. Doing that would require reducing funding for other DOD programs, and policymakers would need to weigh the resulting net impact on overall DOD capabilities. The point, rather, is to note that the allocation of DOD resources is not written in stone, that aligning DOD spending with U.S. strategy in coming years could involve changing the allocation by more than a very marginal amount, and that such a changed allocation could provide the funding needed to implement the current 30-year shipbuilding plan.

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[2] Congressional Budget Office, An Analysis of the Navy's Fiscal Year 2014 Shipbuilding Plan, October 2013, Table 3 (page 13).

[3] The "one-third, one-third, one-third" terminology, though convenient, is not entirely accurate—the military departments' shares of the DOD budget, while more or less stable during this period, were not exactly one-third each: the average share for the Department of the Army was about 26%, the average share for the Department of the Navy (which includes both the Navy and Marine Corps) was about 32%, the average share for the Department of the Air Force was about 30%, and the average share for Defense-Wide (the fourth major category of DOD spending) was about 12%. Excluding the Defense-Wide category, which has grown over time, the shares for the three military departments of the remainder of DOD's budget during this period become about 29% for the Department of the Army, about 37% for the Department of the Navy, and about 34% for the Department of the Air Force.

[4] Since the Defense-Wide portion of the budget has grown from just a few percent in the 1950s and 1960s to about 15% in more recent years, including the Defense-Wide category of spending in the calculation can lead to military department shares of the budget in the 1950s and 1960s that are somewhat more elevated compared to those in more recent years, making it more complex to compare the military departments' shares across the entire period of time since the end of the World War II. For this reason, military department shares of the DOD budget cited in this statement are calculated after excluding the Defense-Wide category. The points made in this statement, however, can still made on the basis of a calculation that includes the Defense-Wide category.

As an alternative or supplement to the option of altering the allocation of DOD resources among the military departments, the 30-year shipbuilding plan could also become more affordable by taking actions beyond those now being implemented by DOD to control military personnel pay and benefits and reduce what some observers refer to as DOD's overhead or back-office costs. Multiple organizations have made recommendations for such actions in recent years. The Defense Business Board, for example, estimated that at least $200 billion of DOD's enacted budget for FY2010 constituted overhead costs. The board stated that "There has been an explosion of overhead work because the Department has failed to establish adequate controls to keep it in line relative to the size of the warfight," and that "In order to accomplish that work, the Department has applied ever more personnel to those tasks which has added immensely to costs." The board stated further that "Whether it's improving the tooth-to-tail ratio; increasing the 'bang for the buck', or converting overhead to combat, Congress and DOD must significantly change their approach," and that DOD "Must use the numerous world-class business practices and proven business operations that are applicable to DOD's overhead."[5]

One potential way to interpret the affordability challenge posed by the Navy's 30-year shipbuilding plan is to view it as an invitation by the Navy for policymakers to consider matters such as the alignment between U.S. strategy and the division of DOD resources among the military departments, and the potential for taking actions beyond those now being implemented by DOD to control military personnel pay and benefits and reduce DOD overhead and back-office costs. The Navy's prepared statement for the September 18 hearing before the full committee on planning for sequestration in FY2014 and the perspectives of the military services on the Strategic Choices and Management Review (SCMR) provides a number of details about reductions in Navy force structure and acquisition programs that could result from constraining DOD's budget to the revised cap levels in the Budget Control Act.[6] These potential reductions do not appear to reflect any substantial shift in the allocation of DOD resources among the military departments, or the taking of actions beyond those already being implemented by DOD to control DOD personnel pay and benefits and reduce DOD overhead and back-office costs.

Mr. FORBES. What is your sense as to the adequacy of the size of the current Navy fleet? Do you think the current "mix" of ships is correct?

Mr. O'ROURKE. The adequacy of the size of the Navy is best judged against U.S. strategic goals and the Navy's consequent assigned missions, including missions that the Navy performs on a day-to-day basis with forward-deployed Navy ships. Some press reports suggest that the extended forward deployments now being made by certain Navy ships may be taking a toll on Navy personnel and ships, and may not be sustainable over the long run.[7] If that is the case, the situation could be addressed by doing one or more of the following: reducing the Navy's assigned missions, making greater use of measures for maximizing forward-deployed presence (such as forward homeporting, forward stationing with crew rotation, and multiple crewing), and increasing fleet size.

Regarding the Navy's mix of ships, there is a debate currently underway within the broader U.S. community of those who study naval forces about whether the U.S. Navy should shift from its current fleet architecture to a more-distributed architecture that would include fewer large ships (such as aircraft carriers and large surface combatants) and greater numbers of smaller ships (such as smaller aircraft carriers and small surface combatants). Advocates of a more-distributed fleet architecture—

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[5] Defense Business Board briefing, "Reducing Overhead and Improving Business Operations, Initial Observations," July 22, 2010, slides 15, 5, and 6, posted online at: http://www.govexec.com/pdfs/072210rb1.pdf. See also Defense Business Board, Modernizing the Military Retirement System, Report to the Secretary of Defense, Report FY11–05, posted online at: http://dbb.defense.gov/Portals/35/Documents/Reports/2011/FY11-5_Modernizing_The_Military_Retirement_System_2011-7.pdf; and Defense Business Board, Corporate Downsizing Applications for DOD, Report to the Secretary of Defense, Report FY11–08, posted online at: http://dbb.defense.gov/Portals/35/Documents/Reports/2011/FY11-8_Corporate_Downsizing_Applications_for_DoD_2011-7.pdf.

[6] Statement of Admiral Jonathan Greenert, U.S. Navy, Chief of Naval Operations, Before the House Armed Services Committee on Planning for Sequestration in FY 2014 and Perspectives of the Military Services on the Strategic Choices and Management Review, September 18, 2013, pp. 6–10.

[7] See, for example, Dan Taylor, "Blake: Long Ship Deployments 'Unsustainable,' Prioritization Necessary," Inside the Navy, December 3, 2012; Sam Fellman, "CNO: High Op Tempo Straining Fleet," Navy Times, October 8, 2012: 19; Sam Fellman, "Pushing The Fleet Too Far?" Navy Times, March 12, 2012: 18; Mike McCarthy, "Admiral Warns Of 'Burning' Out Ships, Aircraft," Defense Daily, March 1, 2012: 4; William H. McMichael, "The New Norm: Longer Tours," Navy Times, December 5, 2011: 22–24; Sam Fellman and Joshua Stewart, "Torrid Operational Pace Taxes U.S. Navy," Defense News, April 11, 2011: 23.

who appear to include, among others, analysts working at the Naval Postgraduate School—argue that a more-distributed architecture would offer benefits in terms of fleet affordability and effectiveness in countering adversaries who field capable maritime anti-access/area-denial (A2/AD) systems.[8] The Navy and other supporters of the Navy's current fleet architecture disagree on both of these points.

Participants on the two sides of this debate appear to proceed from differing or even contradictory views on underlying factors such as the likely effectiveness of adversary A2/AD weapons, the likely effectiveness of U.S. Navy systems for countering them, the resulting likely survivability of Navy surface ships to attack from such weapons, and how the survivability of a ship changes as a function of ship size. Due to differences on matters such as these, it can sometimes appear as if the two groups are almost talking past one another.

One option for the subcommittee would be to attempt to understand why the two groups have come to such differing views on these underlying issues. More generally, the subcommittee may wish to monitor (and perhaps participate in) this debate, because its outcome could have significant implications for Navy proposals to Congress regarding the planned size and structure of the fleet, and for the types and numbers of ships included in the 30-year shipbuilding plan.

Mr. FORBES. The Navy has proposed retiring the four SSGN boats and replacing their strike capability with the *Virginia* Payload Module. The Navy has also forecast a reduced cost associated with this capability. In your estimate, what capability is provided by the *Virginia* Payload Module and what is the program and cost risk associated with developing this capability?

Mr. O'ROURKE. Although the Navy often characterizes the *Virginia* Payload Module (VPM) in terms of the additional capacity it would provide for Tomahawk cruise missiles, the large-diameter launch tubes in the VPM could also be used for other payloads, including other types of missiles or large-diameter unmanned underwater vehicles (UUVs). The VPM would enhance the mission capability and capacity of the *Virginia*-class design by adding substantial payload volume and four flexible, large-diameter ocean interfaces.

Altering the *Virginia*-class design to accommodate the VPM would add technical and cost risk to the *Virginia*-class program. The Navy has already changed the *Virginia*-class design in various ways, perhaps most significantly in the bow area, where the design was changed to replace twelve smaller-diameter vertical launch tubes with two large-diameter vertical launch tubes. The Navy executed this and other design changes as part of a strategy for reducing the time and cost of building *Virginia*-class boats. The idea of lengthening the *Virginia*-class design to accommodate the VPM is broadly comparable to the Navy's earlier project to lengthen the *Jimmy Carter* (SSN–23), the third and final *Seawolf* (SSN–21) class submarine, to accommodate an additional section roughly 100 feet in length that provides that ship with additional mission capability. A review of the SSN–23 project might provide some perspective on the Navy's ability to manage the lengthening of the *Virginia*-class design to accommodate the VPM. The Navy reportedly examined several design concepts for the VPM and selected a concept that the Navy believes represents the lowest-cost approach.[9] The Navy states that among the concepts studied, the selected concept would require the "least amount of baseline ship disruption."[10]

Mr. FORBES. How confident are you in the cost projection associated with the *Ford* class aircraft carrier that Navy has proposed? What elements cause the greatest risk to obtaining a *Ford* class aircraft carrier within the proposed budget?

Mr. O'ROURKE. The Navy indicated in a briefing on the CVN–78 class program to CRS and CBO in May that there is a risk of further cost growth on the CVN–78 related to schedule and "unknowns" associated with the ship's shipboard test program. Potential sources of cost risk for CVN–79 include the impact of any changes that are incorporated into the ship's design; the ability to achieve the efficiencies targeted in the CVN–79 build plan, including efficiencies associated with improved

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[8] See, for example, 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.; Timothy C. Hanifen, "At the Point of Inflection," U.S. Naval Institute Proceedings, December 2011: 24–31; David C. Gompert, Sea Power and American Interests in the Western Pacific, RAND, Santa Monica (CA), 2013, 193 pp. (RR–151–OSD); and John Harvey Jr., Wayne Hughes Jr., Jeffrey Kline, and Zachary Schwartz, "Sustaining American Maritime Influence," U.S. Naval Institute Proceedings, September 13, 2013: 46–51.

[9] "Navy Selects Virginia Payload Module Design Concept," USNI News (http://news.usni.org), November 4, 2013.

[10] Briefing to Naval Submarine League Symposium, Rear Admiral David Johnson, Program Executive Officer, Submarines, 24 October 24, 2013, slide 6, entitled "VIRGINIA Payload Modules Under Review."

material purchasing and for achieving learning-curve effects "inside the ship" (i.e., learning that can occur in heel-to-toe production of CVN–79 modules that are similar to one another); material costs; and shipyard productivity. If the general pattern of past Navy shipbuilding programs holds in the CVN–78 class program, there may be less overall cost risk for CVN–79 than for CVN–78. The procurement cost of CVN–79 could be reduced by incorporating it into a block buy contract with either CVN–78 or CVN–80.

Mr. FORBES. The original capability development document (CDD), which defines requirements for the Littoral Combat Ship, states that LCS would be developed primarily for employment in major combat operations. It would address vital warfighting gaps, replacing the capabilities of decommissioning Frigates, Mine-Warfare ships, and Patrol Class ships. As stated in the original LCS Required Operational Capability/Projected Operational Environment (ROC/POE), "the LCS's mission is to operate offensively in a high density, multi-threat littoral environment independently or as an integral member of a Carrier-Strike Group, Expeditionary Strike Group, or Surface Action Group. However, at a National Press Club breakfast on April 12, 2013, Navy officials stated that "these are not large surface combatants that are going to sail into the South China Sea and challenge the Chinese military; that's not what they're made for" and that "I don't worry per se about its survivability where I would intend to send it, [because] you won't send it into an anti-access area." Will LCS ever be able to meet its original combat requirements of being able to operate offensively in a high-density, multi-threat littoral environment independently?

Mr. O'ROURKE. As a matter of parsing the ROC/POE language, it can be observed that "a high density, multi-threat littoral environment" might not necessarily be the same as a high-threat environment. High density can mean that the environment includes many other contacts, including civilian craft that may pose no threat to the ship. Multi-threat means more than one threat, or perhaps more than one type of threat. Those two factors can add up to a complex operating environment, but they need not necessarily add up to a high-threat environment. If the authors of ROC/POE had meant a high-threat environment, they might have simply used that term, rather than the more complex term "high density, multi-threat littoral environment."

The LCS program was initiated to address identified gaps in the Navy's littoral warfighting capabilities for countering mines, small boats, and diesel submarines. Accordingly, the three core missions of the LCS are to counter mines, small boats, and diesel submarines, particularly in littoral waters. In performing these three core missions, the LCS can contribute to the Navy's overall ability for countering littoral anti-access/area denial (A2/AD) capabilities of various kinds that have been fielded by countries such as Iran. The LCS was not designed to act as a primary platform for the Navy for performing other kinds of warfighting missions in littoral waters, such as area anti-air warfare (AAW), ballistic missile defense, or naval surface fire support. Missions such as these are to be performed in littoral waters primarily by other Navy platforms. If the operating environment does not pose threats other than the three kinds of threats the LCS is designed to counter, then the LCS might be able to operate independently. If the operating environment poses threats other than the three kinds of threats that the LCS is designed to counter, then the LCS would need to operate in conjunction with other Navy platforms. For example, in an environment where there is a significant threat posed by anti-ship cruise missiles, the LCS might operate in conjunction with Aegis cruisers or destroyers, which have an area AAW capability. Other types of Navy combatants, such as aircraft carriers, cruisers/destroyers, and frigates, might also need to operate in conjunction with other Navy platforms in certain operating environments.

If the Navy can successfully address LCS sea frame design issues and bring the LCS's mine countermeasures (MCM), surface warfare (SUW), and antisubmarine warfare (ASW) mission packages to IOC, the LCS would be in a position to perform its three core missions. In assessing the cost effectiveness of the LCS program and how many LCS sea frames and mission packages to procure, central questions include the following:

- Are the LCS's three core missions of countering mines, small boats, and diesel submarines, particularly in littoral waters, still valid?
- If the LCS's three core missions are still valid, does the LCS represent the most cost effective way for performing these three missions? (And if not, what other way would be more cost effective?)
- If the LCS represents the most cost effective way to perform these three missions, how many LCSs and LCS mission packages are needed to provide a sufficient capacity for performing them?

- In a situation of constrained defense resources, where does having capability and capacity for performing the LCS's three core missions stand in comparison to other defense spending priorities?

QUESTIONS SUBMITTED BY MR. LANGEVIN

Mr. LANGEVIN. The DDG–1000 class includes a number of key enabling technologies, such as advanced propulsion and power generation and distribution, increased ship automation, changes in shipbuilding processes, and large ship margins. These are very capable ships, and the Navy and the shipbuilders have invested a lot of time and resources into researching and developing the technologies they carry. What are the prospects for harvesting these investments across programs beyond the existing 3-ship buy?

Dr. LABS. Prior to the Navy's decision in 2010 to restart the DDG–51 program, the Navy had a clear plan to incorporate the new technologies of the DDG–1000 program into its surface combatant force. The Navy had planned to purchase 7 or more DDG–1000s, and then the main systems and hull form of that ship were intended to be the foundation on which the Navy would develop a new cruiser, designated at the time as the CG(X), that would ultimately replace the *Ticonderoga* class ships. With the restart of the DDG–51 program and the plan to develop an upgraded version of that ship, designated the DDG–51 Flight III, the Navy has not articulated a path for incorporating key technologies from the DDG–1000 program into the Navy's future surface combatant force. The new Flight III will have new, much more powerful radar and combat system as well as improved systems to support them, but the ship will not have an integrated power system and electric drive, an advanced gun system, or other new systems, nor will it incorporate technologies to reduce ship manning and operating costs. In addition, the Navy's 30-year shipbuilding plan describes the follow-on surface combatant to the Flight III as a DDG–51 Flight IV, with only a modest increase in the average cost per ship over the DDG–51 Flight III. That suggests that the Navy is not planning major changes to the follow-on design that would allow for incorporating the DDG–1000's technologies. However, this does not mean that the Navy could not develop a new design for a surface combatant that would include technologies from the DDG–1000 program. Alterations of this sort in the Navy's 30-year shipbuilding plans have occurred numerous times in the past.

Mr. LANGEVIN. Mr. Labs, you mention the *Virginia* Payload Module effort and that it will require additional as-yet-unbudgeted resources in order to offset the capability gap brought on by SSGN retirement. I and many of my colleagues believe that this investment is absolutely key in terms of enabling our Navy in future years—not just through land-attack capability, but also through the flexibility those tubes offer in terms of mission space. If those capabilities are not provided by VPM in the Block 5 and beyond *Virginia*s, where else could that capability come from and what might the costs be?

Dr. LABS. The only alternative to incorporating the *Virginia* Payload Module (VPM) into the *Virginia* class submarine that would gain the capability provided by the Navy's existing SSGNs would be to develop an SSGN replacement. CBO expects that the most cost-effective way to develop such a replacement would be to modify the *Ohio* Replacement class submarines to have VPM-like capabilities. To acquire the equivalent capability of the four in-service SSGNs or 20 *Virginia* class attack submarines with VPMs would require six modified *Ohio* Replacement class submarines. (Six new SSGNs would be required to replace the four existing SSGNs because the *Ohio* Replacement class submarines are expected to carry 16 launch tubes, whereas the existing *Ohio* class submarines carry 24 launch tubes.) The cost of designing and building those submarines would likely range from $30 billion to $35 billion in fiscal year 2013 dollars, based on CBO's latest estimate of the cost of building new SSBNs.

Mr. LANGEVIN. The DDG–1000 class includes a number of key enabling technologies, such as advanced propulsion and power generation and distribution, increased ship automation, changes in shipbuilding processes, and large ship margins. These are very capable ships, and the Navy and the shipbuilders have invested a lot of time and resources into researching and developing the technologies they carry. What are the prospects for harvesting these investments across programs beyond the existing 3-ship buy?

Mr. O'ROURKE. Prospects for implementing such technologies in the cruiser-destroyer force beyond the three DDG–1000 class ships are currently uncertain. The replacement of the CG(X) and DDG–100 programs with resumed DDG–51 procurement leaves the Navy without a clear roadmap in the 30-year shipbuilding plan for

accomplishing certain things for the cruiser-destroyer force that were to have been accomplished by the CG(X) and DDG–1000 programs, including but not limited to the following:

- restoring ship growth margin for accommodating future capabilities;
- introducing integrated electric drive technology into a large number of ships, particularly for supporting future high-power electrical weapons such as high-power lasers; and
- substantially reducing ship life-cycle O&S costs by, among other things, reducing crew size.

Accomplishing the above three items will depend to a large degree on when procurement of large surface combatants shifts from Flight III DDG–51s to some follow-on design, and on the features of that followon design. Options for the next large surface combatant after the Flight III DDG–51 include a further modification of the DDG–51 design (i.e., a Flight IV design, which might include a lengthening of the hull to accommodate new systems and restore growth margin), the current DDG–1000 design or a modified version of the DDG–1000 design, and a clean-sheet design that might be intermediate in size between the DDG–51 and DDG–1000 designs.

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