[H.A.S.C. No. 115–13]

AN INDEPENDENT FLEET ASSESSMENT OF THE U.S. NAVY

HEARING

BEFORE THE

SUBCOMMITTEE ON SEAPOWER AND PROJECTION FORCES

OF THE

COMMITTEE ON ARMED SERVICES
HOUSE OF REPRESENTATIVES

ONE HUNDRED FIFTEENTH CONGRESS

FIRST SESSION

HEARING HELD
MARCH 8, 2017

U.S. GOVERNMENT PUBLISHING OFFICE
25–045 WASHINGTON : 2018

SUBCOMMITTEE ON SEAPOWER AND PROJECTION FORCES

ROBERT J. WITTMAN, Virginia, *Chairman*

K. MICHAEL CONAWAY, Texas
VICKY HARTZLER, Missouri
BRADLEY BYRNE, Alabama, *Vice Chair*
SCOTT DESJARLAIS, Tennessee
MIKE GALLAGHER, Wisconsin
DUNCAN HUNTER, California
PAUL COOK, California
JIM BRIDENSTINE, Oklahoma
STEPHEN KNIGHT, California
RALPH LEE ABRAHAM, Louisiana

JOE COURTNEY, Connecticut
SUSAN A. DAVIS, California
JAMES R. LANGEVIN, Rhode Island
MADELEINE Z. BORDALLO, Guam
JOHN GARAMENDI, California
DONALD NORCROSS, New Jersey
SETH MOULTON, Massachusetts
COLLEEN HANABUSA, Hawaii
A. DONALD MCEACHIN, Virginia

DAVE SIENICKI, *Professional Staff Member*
PHIL MACNAUGHTON, *Professional Staff Member*
JODI BRIGNOLA, *Clerk*

CONTENTS

AN INDEPENDENT FLEET ASSESSMENT OF THE U.S. NAVY

HOUSE OF REPRESENTATIVES,
COMMITTEE ON ARMED SERVICES,
SUBCOMMITTEE ON SEAPOWER AND PROJECTION FORCES,
Washington, DC, Wednesday, March 8, 2017.

The subcommittee met, pursuant to call, at 3:42 p.m., in room 2118, Rayburn House Office Building, Hon. Robert J. Wittman (chairman of the subcommittee) presiding.

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

Mr. WITTMAN. I call to order the Subcommittee on Seapower and Projection Forces of the House Armed Services Committee.

I want to thank all of our witnesses for being here today for the Seapower and Projection Forces Subcommittee hearing.

As this is our first subcommittee hearing, I just want to say that I look forward to engaging all of our members on what I believe is the bipartisan committee in Congress, and I especially look forward to working with my ranking member, colleague, Joe Courtney, and plotting a path forward to meet the requirements for our armed services, so Joe, thanks again. Thanks for your service, and thanks for your leadership. I really appreciate that.

Two weeks ago we held a classified briefing with Rear Admiral Wilson in regard to the Navy's 2016 Force Structure Assessment. The Force Structure Assessment assumed that the future plans for the Navy in ship types and numbers of ships would continue with ships of similar capacity that serve in the fleet today. This afternoon we transition from looking at the Navy's Force Structure Assessment to considering three separate future fleet architecture studies. These three studies were directed by Congress and completed in recent months. These three fleet architecture studies take a different tact and consider what the composition of the fleet could be in the future. Some of their proposals include new ship classes, increased usage of unmanned vehicles, and redesigned ship configurations, just to name a few.

We turn to three independent experts to provide more details on alternatives to the Navy's proposed force structure. I hope during the course of this hearing we can discuss options that Congress could pursue to meet those Navy requirements. I think there is broad agreement with the Navy and the three independent studies on several themes.

First of all, the Navy today is insufficient to address the challenges of tomorrow. I think everyone would agree that the 274

ships of the Navy fleet today are insufficient for a variety of reasons and lead to a variety of bad alternatives, including most prominently, aircraft carrier gaps.

I also believe there is general agreement that the future conflict will reside in a contested environment requiring additional large surface combatants in more robust weapons. Advancements in naval gunfire with the electromagnetic railgun and hypervelocity projectile are essential to getting on the right side of the cost curve. I also believe that all the studies agree that the United States has an asymmetrical advantage in the undersea domain. Maintaining this advantage will require increasing the build rate of the *Virginia* attack submarine and introducing the *Virginia* payload module into the next block of attack submarines.

While I believe the research and development community has done a great job with developing unmanned underwater vehicles, I also think it is time to down-select to specific systems and rapidly deploy these capabilities throughout the fleet.

As to small surface combatants, I believe that there is general agreement on expanding the capabilities associated with a littoral combat ship. The Navy concluded a small surface combatant task force that determined the requirements for the frigate. However, I believe that we need to take a closer look at these requirements. I look forward to better understanding capabilities that our witnesses believe should be incorporated into the frigate.

I also see our amphibious force with its complement of Marines as vital to the ability of our Nation to deter aggression. As we look to rebuild our Navy, we must ensure that our Marine Corps also remains a large part of our plans. I look forward to hearing how the L-class ships that make up our amphibious readiness groups, our ARGs, can be used in the future.

As to our preeminent strike capability, the aircraft carrier, I believe that there is general agreement that we need to expand this capability but continue to reduce costs associated with the *Ford*-class aircraft carrier. I do not believe any members of this subcommittee are willing to accept an almost $13 billion unit cost for the USS *Gerald R. Ford,* and efforts need to be taken to reduce overall costs. I look forward to options that our witnesses could offer to make the *Ford*-class more affordable, and finally, I look forward to our witnesses better describing the communications challenges that are expected in a contested environment and options to address these concerns.

I would like to welcome all of our members in the distinguished panel of experts we have with us today. This afternoon we have with us Rear Admiral Jesse Wilson, Jr., Director, Assessment Division, OPNAV N81; Mr. Charles Werchado, Deputy Director, Assessment Division, OPNAV N81B; Bryan Clark, Center for Strategic and Budgetary Assessments; and Dr. Sunoy Banerjee, MITRE Corporation.

Thank you all for testifying today, and we look forward to your thoughts and insights on the fleet, architecture alternatives, and other critical pieces of information.

I would now like to turn to our ranking member, Joe Courtney, for any remarks that he may have.

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

STATEMENT OF HON. JOE COURTNEY, A REPRESENTATIVE FROM CONNECTICUT, RANKING MEMBER, SUBCOMMITTEE ON SEAPOWER AND PROJECTION FORCES

Mr. COURTNEY. Thank you, Mr. Chairman, and again congratulations on your selection as chairman of this committee, which again is a great committee. We have really made a difference over the years. Your long years of work on the committee, as well as your command of the subject, I think really make you the right guy for the job, and I look forward to working with you as well.

I think we have a great team on both sides of the aisle, and obviously this could be a real sort of historic year given the topic that we are going to discuss this afternoon. It is the question of the day, obviously the Force Structure Assessment that was produced last year and obviously all the force architecture work that these witnesses were involved in.

So in an effort to sort of get to the heart of the matter, I have opening remarks which is in writing. I am going to ask that it be submitted for the record, and, again, let's just jump right into it and hear from our great witnesses.

[The prepared statement of Mr. Courtney can be found in the Appendix on page 36.]

Mr. WITTMAN. Very good. Thank you, Mr. Courtney. We will now go to our witnesses. Begin with Rear Admiral Wilson.

STATEMENT OF RADM JESSE WILSON, JR., USN, DIRECTOR, ASSESSMENT DIVISION (OPNAV N81)

Admiral WILSON. Good afternoon.

Mr. Chairman, Ranking Member Courtney, and distinguished members of the subcommittee, I appreciate the opportunity to testify on the future fleet architecture studies that were conducted in accordance with the fiscal year 2016 National Defense Authorization Act, or the NDAA.

Three independent studies for a future fleet architecture in the 2030 timeframe were conducted, and the leads of each team are here today to brief the findings of their studies. The Navy-led project team, MITRE's National Security Engineering Center, and the Center for Strategic and Budgetary Assessments. These studies are a starting point in the analysis that the Navy will use to develop our future fleet architecture and design.

None of them, including the Navy project team study, has been endorsed by the Chief of Naval Operations as a comprehensive solution set to focus our future fleet development. We will continue to incorporate what we have learned from them into our ongoing research and development and rapid fielding, our war-gaming, experiments, concept development, and strategic thinking. They will contribute to the high-velocity learning that is necessary to strengthen our naval power to outpace our pure competitors and future threats.

All three studies were based on a 2030 strategic environment defined by the reemergence of great power competition and the growing availability of high-end warfighting capabilities designed to

counter U.S. military advantages. While each entity conducted its study independently, generated its own assumptions, and performed its own analysis, several common themes emerge across the three studies. We are examining these themes and ideas thoroughly.

Some of the recommendations in the studies will be acted upon or acted upon more quickly than was already being planned. Some recommendations show promise and will need further analysis and exploration. These studies are part of a larger effort to inform and focus our future fleet development efforts in order to identify the most promising insights from each study for inclusion in our future force plans and capability decisions.

Further analysis will need to be conducted, informed by both the studies and future operational concepts, to determine optimum fleet size, mix, and required resourcing over time. The Navy looks forward to working with the Congress and others to achieve the maritime superiority the Nation needs today and in the future in order to defend the American people and promote global security and prosperity.

Thank you and I welcome your questions.

[The prepared statement of Admiral Wilson can be found in the Appendix on page 38.]

Mr. WITTMAN. Thank you, Rear Admiral Wilson. Thanks so much for your opening statement.

Mr. Werchado.

STATEMENT OF CHARLES P. WERCHADO, DEPUTY DIRECTOR, ASSESSMENT DIVISION (OPNAV N81B)

Mr. WERCHADO. Thank you, Mr. Chairman, Senior Ranking Member Courtney, and distinguished members of the panel.

I appreciate the opportunity to testify on the results of the Navy project team future fleet architecture study. I led the project team with participants from across the Navy as the senior Navy analyst and not as the Deputy of the Assessment Division. This is not an official Navy study. It was independent by design and does not represent an official Navy position.

Although this study is focused on the architecture of a future fleet, it also explores how that fleet might be used, including alternative concepts of operations. The study was conducted with the goal of defeating a near-peer competitor with a robust anti-surface capability, while also deterring another threat actor in any theater. The project team designed a distributed fleet architecture which would allow the Navy of the future to accomplish its missions, providing strong and sustained forward presence to influence geopolitical events, respond to crises, reassure allies, and deter potential aggressors.

The distributed fleet was conceived to deliver decisive combat power as part of a joint force to defeat U.S. adversaries if deterrence fails. It was developed as an asymmetric response to adversaries increasing reconnaissance strike capabilities that can find, track, and target our centers of gravity, including large naval formations. By distributing our firepower, we challenged the enemy with up to 10 times the number of combat nodes that can strike them and attack axis against which they have to defend.

The distributed fleet would encompass a widely dispersed, robust network of air, surface, and sub-surface platforms capable of delivering both kinetic and nonkinetic effects employing three mutually supporting concepts of operations: Distributed Fleet Lethality, Electromagnetic Maneuver Warfare, and Distributed Agile Logistics. The distributed fleet would enable a greater reliance on strikes from combat nodes beyond the carrier strike group freeing more carrier air wing assets to focus on surveillance, targeting, and electronic attack.

The robust information sharing environment enables us to engage enemy platforms before they can attack, reducing defensive weapons requirements and allowing more offensive weapons to be deployed. Priority was given to long-range weapons for sea control in a contested area as well as multi-mode weapons capable of striking a variety of targets to maximize mission flexibility and ship loading. The concept would deploy unmanned air vehicles extensively on platforms to give ships the ability to conduct organic targeting at long-range employing advanced weapons, something the current fleet cannot do. It would also call for the development and fielding of armed, unmanned surface vehicles transported by and deployed from ships that have well decks to further distribute shooters within the theater.

Additionally, the concept would expand the use of unmanned underwater vehicles to provide theater commanders with the ability to deploy sensors and weapons into areas that are currently denied.

Accelerating development and fielding the capabilities for electromagnetic maneuver warfare allow the future Navy to deliver the assured communications that is required to net the fleet and enable kill chains while reducing our dependence on military satellites. It will also accelerate the fielding of key capabilities to counter adversaries' surveillance and targeting systems, improving fleet survivability, and deliver improved electronic warfare systems to better protect both ships and aircraft.

Finally, distributed agile logistics enables the distributed fleet by sustaining combat operations in a contested environment. The U.S. Navy has not had to do this since World War II. It shifts reliance from vulnerable shore bases to more survivable afloat and expeditionary hubs. It would also improve the Navy's ability to conduct maintenance and reload weapons at sea.

Given the service life of today's ships and aircraft, 75 percent of the fleet today will still be operating in the year 2030. Adding to the years or even decades required to design, build, and field new platforms, the Navy must look beyond fleet architecture to new operational concepts to rapidly address and defeat emerging threats. Implementing the distributed fleet represents a far greater opportunity to effect change. Increasing lethality can be achieved by distributing strike forces, including unmanned.

Maneuver warfare provides an assured network and communications system able to provide robust kill chains while denying the enemy their targeting. These distributed lethal nodes make every platform a sensor, shooter, or communicator, or some combination of the three.

The Navy meets current and anticipates future threats and will continue to innovate, adapt, fight and win. This study developed a

new concept, the distributed fleet, as a fleet design architecture to beat the future threat.

I welcome your questions.

[The prepared statement of Mr. Werchado can be found in the Appendix on page 44.]

Mr. WITTMAN. Thank you, Mr. Werchado. Now we will go to Mr. Clark.

STATEMENT OF BRYAN CLARK, SENIOR FELLOW, CENTER FOR STRATEGIC AND BUDGETARY ASSESSMENTS

Mr. CLARK. Chairman Wittman, Ranking Member Courtney, and distinguished members of the committee, thank you very much for having us here today to testify on this very important and timely subject, as you mentioned.

I wanted to make five main points regarding the fleet architecture study that we conducted at CSBA. First, as Admiral Wilson mentioned, great power competition is going to be the defining feature of the security environment that we are looking at here, which is the 2030s. China and Russia already have the desire to pursue objectives in their near abroad and accrete influence and territory, and in that timeframe they are likely to have the capabilities to be able to pursue those objectives with a pretty high degree of aggression.

We are also going to face regional powers that have the ability to use the capabilities that great powers might convey to them like long-range missiles and long-range surveillance systems and exploit their geographic advantage, so you think about a country like Iran or a country like a North Korea. Their geographic position combined with longer range weapons and sensors enables them to punch above their weight, if you will.

The second is the emergence of this great power competition is going to put the onus on us to deter conflict with those great powers. A great power war, if we think about historically, could have damaging and potentially catastrophic consequences for ourselves and for the global economy, as well as our allies. So we are going to have to think about deterring those kinds of conflicts and not just fighting them. If we get into a position of having to fight a China or fight a Russia in a large-scale conflict, then we have probably signed ourselves up for a very damaging set of consequences.

The fleet architecture that you would need to deter those potential adversaries is a little bit different potentially than what you might use if you were simply looking to fight them in some kind of scenario that we had developed arbitrarily in advance. So we have got to think about how a fleet architecture is prepared to deter conflict and then if deterrence fails, shift to be able to actually fight that conflict. And those might be two different things, so we need to carefully think about that.

The third main point is because of this and because the objectives of these adversaries, if you think about the Baltics for Russia, or Taiwan for China, or the Senkaku Islands for China, they are all relatively close to those countries. They are all relatively close at hand, and it wouldn't take very long for them to begin an act of aggression against them and even culminate it before U.S. forces and those of our allies would be able to arrive to stop them.

So our forces, our naval forces in particular, are going to have to be able to persist, survive, and then fight in these highly contested environments near the adversaries' territory, thinking about the South and East China Seas when it comes to China or potentially the Baltic or certainly the North Atlantic when it comes to Russia.

This is going to drive us, and that is my fourth point, to new operational concepts and new capabilities that enable our forces to be able to survive in these high-threat environments. This gets to ideas like Mr. Werchado brought up of distributed forces, new concepts for electromagnetic maneuver warfare, and undersea warfare that enable us to operate inside environments where the adversary can find us relatively easily and certainly attack us with large salvos of missiles. The new concepts are necessary for that, and we need to equip the force to be able to conduct those operational concepts, and that is in large part what our study was designed to do, is describe that.

Our force packages that emerged from those operating concepts are designed to be able to combine manned and unmanned systems, autonomous unmanned systems, and those in manned platforms to be able to conduct long-range sensing or counter-ISR [intelligence, surveilliance, and reconnaissance] operations, and conduct long-range strike with a distributed force that allows a force with a large number of distributed platforms to be able to have the same kind of firepower as we would get from a traditional carrier strike group for example.

The fifth point I want to bring up is that this more improved fleet and the fleet that is capable of deterring great power conflict in the 2030s is going to be larger than today's fleet and more expensive. Our study found that the 340- to 380-ship Navy we believe we need is going to cost 15 to 20 percent more to buy, to maintain and operate, and to man than today's fleet. So we need to be prepared for the fact that entering into a great power competition and being able to win or at least sustain an advantage in that competition is going to be more expensive.

And so I look forward to your questions. Thank you very much.

[The prepared statement of Mr. Clark can be found in the Appendix on page 50.]

Mr. WITTMAN. Thank you, Mr. Clark.

Dr. Banerjee, I want to welcome you here today. I know that your wife and your mother has accompanied you today. I want to welcome you all, too——

Dr. BANERJEE. Mother-in-law.

Mr. WITTMAN. Mother-in-law. I am sorry; mother-in-law, got you. We will get it straight. My apologies.

Dr. Banerjee, thank you so much for joining us today, and welcome, and we look forward to your testimony.

STATEMENT OF DR. SUNOY BANERJEE, THE MITRE CORPORATION

Dr. BANERJEE. Thank you.

Chairman Wittman, Ranking Member Courtney, and distinguished members of the committee, I appreciate the opportunity to testify on the findings and recommendations of The MITRE's fu-

ture fleet architecture. Congress directed the Secretary of Defense to perform three independent studies of alternative fleet——

Mr. WITTMAN. Dr. Banerjee, if I could get you to move the mike just a little bit closer to you. It is a big room; we want to make sure everybody can hear you.

Dr. BANERJEE. Sorry.

Mr. WITTMAN. Thank you. No problem.

Dr. BANERJEE [continuing]. Alternative future fleet platform architectures for the Navy in the 2030 timeframe. The MITRE Corporation's National Security Engineering Center and FFRDC [federally funded research and development center] was asked to deliver one of the three studies. MITRE conducted the study over a 4-month period and delivered the final report consisting of a 70-page unclassified report and a 30-page classified annex on July 1, 2016.

MITRE recommended a 322-ship fleet in 2030 built around three major themes. The first, improving missile defense capabilities through the fielding of the hypervelocity projectile in the existing 5-inch deck guns in the surface force and an aerial layer missile system to be deployed within the carrier air wings to deal with more advanced missile threats. Our preliminary campaign modeling suggests these two innovations significantly improve the survivability of the naval force.

Second, improving the long-range strike through fielding of new supersonic cruise missiles and ballistic missile capabilities into the surface and submarine force. These capabilities enable the naval force to project power while the carrier force is maneuvering into striking range for the carrier air wing.

Third, increase force size while controlling costs via a high-low mix of platforms. The MITRE analysis recommended a missile defense innovations to improve the effectiveness of the existing surface force through a mix of Aegis surface combatants, which is the high end, a new fast frigate design built around the hypervelocity projectile in the 5-inch deck guns. That is the medium-end capability. And the low end is a magazine ship, so this is a container ship that has large numbers of VLS [vertical launching system] cells to augment the existing magazines and capacity of the surface force.

The cost savings from these alternative mixes of platforms were used to buy an additional 5 *Virginia*-class nuclear attack submarines, which is a high-end capability, and 14 air-independent propulsion attack submarines, which would be a conventional submarine that would be a medium-end capability to significantly increase the size of the surface force—or of the submarine force.

The study tasking emphasized the numbers and types of ships and submarines needed by the future force. However, this force also requires new sets of weapons, sufficient number of modern aircraft, resilient C4I [command, control, communications, computers, and intelligence] systems, integration of both kinetic and nonkinetic effects and undersea enablers to be effective. A balanced investment across not only shipbuilding but all these other additional factors is required for the naval force to improve both its capacity and its capability to deter aggression in the future.

Thank you, and I look forward to your questions.

[The prepared statement of Dr. Banerjee can be found in the Appendix on page 59.]

Mr. WITTMAN. Thank you, Dr. Banerjee. We will now go to Mr. Courtney to begin our questions.

Mr. COURTNEY. Thank you, Mr. Chairman. And thank you to all the witnesses for your testimony this afternoon.

Again, obviously there is a lot of overlap in terms of the different studies that all of you conducted, as well as Admiral Richardson's Force Structure Assessment. And, you know, obviously we live in a different sort of realm in terms of increments of 1-year budget cycles and 2-year terms.

And so when we are looking at a target of 2030 to get to the numbers which—again, let's just sort of stipulate you all have the same number at the end of the day—if you were sort of advising Congress in terms of a short-term to-do list, mid-term, middle-term, medium-term to-do list, and a long-term, as far as, you know, how we get there, and I just sort of in terms of where we focus our authorizations and appropriations, I think that would be very helpful for the members here to just kind of, like I said, focus it in terms of the task ahead in terms of the Congress.

And, again, if anyone wants to jump in first or just go right across the table, whatever you are comfortable with.

Admiral WILSON. Ranking Member Courtney, I will start.

Let me first say that we have already talked about the Force Structure Assessment and the 355-ship Navy that that directed or the results of that study resulted in. To accelerate to a point that we feel we need to get to, and the future fleet architecture three studies, are the results from them, there are ongoing efforts right now to build a path to accelerate with existing industrial-based capacity that we know we can already ramp up with. And that information will be coming out soon.

So we know we need to grow the force. We know we need to grow it to 355 right now with existing platforms and ways of fighting. So to get the rudder over, so to speak, we will start building a path to start ramping up as rapidly as we can where we know we can get started right away.

Mr. WERCHADO. Thank you. Ranking Member Courtney and Mr. Chairman, in the interest of domestic harmony, I would like to point out that my lovely wife is here as well.

Sir, my recommendation would be to go for a capability over platform. Naval weapons have gotten so long range, so precise, and so lethal, that in hundreds of studies that Admiral Wilson and I run a year for the Navy, what really comes out strongly is that it is the battle of the first salvo.

Naval forces by their nature are mobile, and therefore they have to be targeted to be hit. And so whichever side completes that targeting kill chain first and fires first almost always wins. So I would make my investments in counter-C4ISR. Where is our decoy ship? Where is our electronic warfare to create false targets? Let's make us hard to find while we make ourselves more capable of finding them.

I think if we make the investments in the counter-C4ISR realm, there are going to be higher payoff first. We have lots of cruise missiles. We can use them. We have lots of VLS cells on the combat-

ants, but we need to be able to complete the targeting chain to make them effective.

Mr. CLARK. Congressman, a couple of things I would say in the near term are, just like Mr. Werchado was saying, we need to invest in the unmanned vehicles that are going to be the things that carry around these payloads of counter-C4ISR systems or sensors to be able to enable things like distributed lethality.

So investing in and buying new extra-large unmanned undersea vehicles, buying new large unmanned surface vehicles, the common USV and also the extra-large USV which may be a variant of the DARPA [Defense Advanced Research Projects Agency] Sea Hunter program. Those would be the platforms that carry around some of these sensor packages and some of the jammers and decoys that we are going to need to deploy in order to keep platforms inside these highly contested environments.

The other thing we can do in the near term is to accelerate construction of those ships that are already in construction where there is additional margin available. So accelerating LXR, as the Congress is already moving toward, accelerating perhaps the next LHA; and then in addition to that, we are going to have to make some investments in the shipyards in order to enable them to further increase production. In particular, if you think about Electric Boat up in Connecticut, they are largely going to be maxed out in terms of their near-term industrial capacity with the *Columbia* class and if we tried to do two attack submarines.

But they have workforce limitations that are going to keep them from growing further. There are some facilities constraints that just over time that have grown and need to be addressed. So putting some money into facilities and a training infrastructure so that the shipyards are going to be able to bring on the workforce they need to grow in order to start doing the construction at the rate that we would need to get to a 350-ship or so Navy.

And then in the mid term, I think the key will be to facilitate in the Navy being able to create the kind of network infrastructure it is going to need for these unmanned vehicles with the sensors and the countersensors to be able to talk to each other and then also talk back to their manned platforms that are controlling them.

And so investments in some of the new line-of-site data links, improvements to Link 16 that are currently making their way into the program of record, those are going to be essential in order for us to make our forces able to talk to one another in an environment where it is going to be highly contested, lots of jamming, loss of GPS [Global Positioning Satellite] is likely.

So Link 16 in particular I think is a capability we need to continue to enhance, and there is more room to grow for it.

Dr. BANERJEE. I would just like to elaborate on what Mr. Werchado said. I think that in the past it has always been the one who strikes first does the most damage. One of the things we were looking at is the hypervelocity projectile, railgun, and aerial-layer missile system to provide us the capability to actually absorb that first hit, minimize the damage to the force, and then enable us to have a counterstrike that is both powerful and can deliver a powerful blow to the adversary.

So in terms of things that can be done in the near term, further maturation of the hypervelocity projectile, integrating new seeker heads into that. If we are looking at actually deploying railguns on ships when we think about new ship designs, how do we get the 24 megajoules of wall plug power so you can fire that thing continuously as opposed to having to charge it off of a capacitor. Development and maturation of the aerial-layer missile system that can be deployed on either an F–18 or the new F–35Cs, or even the Marine Corps F–35 Bravos, to be able to provide a long-range ability to intercept really advanced hypersonic threats that are coming in towards the naval force. That also is going to require an ability to target those types of weapons and systems at range and the battle management capability to be able to coordinate those types of engagements.

I think in the mid term, building platforms that can actually hold those capabilities and operate them in the manner we think we are going to have to fight would be the second piece. And to the extent that we can leverage work that has already been done, if there are designs that are available that other navies have that we can quickly leverage and deploy, or leverage existing designs for AIP [air-independent propulsion] submarines that we can license and then actually build here at U.S. shipyards to get the numbers and the capacity that we need in the mid term.

Mr. WITTMAN. Thank you, Mr. Courtney.

Mr. Conaway.

Mr. CONAWAY. Thank you, Mr. Chairman.

All of you have mentioned many of the same things as a part of your studies, whether it is weapons and/or connectivity or command and control or whatever it might be.

Where are the long poles in the tent for getting all of that done? The 2030 array of 240, 340, whatever the number of ships you have got, assume a rational progression across all those lines of things to be developed. Where are the ones that are most likely to give us the most head-scratching or the most trouble trying to keep up with all the other things? You can put the hulls in or the keels down; you can do that pretty mechanically. But all the other stuff you are talking about, what are the choke points across that array of stuff?

Mr. CLARK. So, I will jump in there. One thing in particular we are finding trouble with is battle management. So you can have great data links to be able to communicate with all your unmanned vehicles, and they can be off sensing the environment, and you can have all these weapons, but the problem is that the speed of conflict is going to happen so quickly that I need something autonomous to be able to look at a threat, decide what it is, decide what the best weapon is to address it, and then where that weapon is, be able to send it from that platform to address the threat.

Or on the other side, attack a target that maybe is amenable to a particular kind of weapon but not other kinds of weapons. But having the battle management to be able to coordinate all that information coming in and then be able to make a decision as to what to do about it autonomously is a key capability that there has been lots of projects going individually on, but there has not been anything that has totally cracked that nut.

Mr. CONAWAY. So if you can't do that, then you have to have more ships because you have to have losses associated with—unable to do that. Where is the break point? Your assessment assumes that gets done. And if it doesn't happen, how many more ships do you have to have?

Mr. CLARK. So in our assessment, we were pretty conservative with regard to our ability to do autonomous battle management. So our fleet in some respects reflects the fact that you are going to need more manned platforms to control unmanned systems that are operating somewhat independently of you.

If you could get more autonomy in your battle management system—you think about Aegis system that automatically does decision making for you—if you had that and were able to apply it across the whole force, you might be able to reduce the number of manned platforms significantly down from 350 to somewhere in the lower 300s range.

Mr. CONAWAY. What about the weapons side, the railguns, directed energy, those things, where is the——

Mr. WERCHADO. Sir, that one, if I can talk to that, we are really taking a two-track approach. Right now there is over 100 barrels in the fleet that can fire an HVP [hypervelocity projectile], and Dahlgren is working together with the Army, and they are coming along well on the testing. That one could be fielded very quickly.

Railgun is going to be a lot longer. We have to solve a lot of problems: barrel wear, the repetitive rate, you mentioned the recharge. So I think the low-hanging fruit is to get HVP out as fast as we can. It does really well against cruise missiles. It probably doesn't take down a ballistic missile, but it would be a huge benefit to us to be able to have an interzone cruise missile defense.

One thing Bryan alluded to is the command and control. We have to assume that every time we go out we are going to get jammed. We might have people take out our satellites. It is always going to be a contested environment. At a minimum there will be cyberattacks against our unclass networks. So we should only train in areas where we can fight through a limited data. So bringing UAVs [unmanned aerial vehicles] to do our own COMMs [communications] links, do our own surveillance. Doing that organically is going to be huge.

Mr. CONAWAY. Dr. Banerjee, are there other things that are just wishes that are still in the development process?

Dr. BANERJEE. I agree, I mean, the battle management to be able to sort out and make the target weapon pairing, and I think the challenge is how do you do that in a highly contested environment. And I guess I would say the cyber threat, I think there are ways of getting around the jamming, and depending on how denied space is through line-of-site relays and other capabilities, I think the long pole in the tent is how to do that in a highly contested cyber environment.

I think that was a big concern that we had when we were doing the study, and part of the reason we had the classified annex to talk to what were some of the threats, and how do you actually build a resilient architecture to try to deal with some of those threats.

Mr. CONAWAY. Chairman—yes sir, Admiral Wilson.

Admiral WILSON. Yes, sir. I do want to mention an effort that is ongoing as we speak. So right now at the Center of Naval Analyses, we have a war-gaming tabletop exercise ongoing, and it incorporates representatives from all three study teams, the Marine Corps, and several other key stakeholders, to really look at what are the long poles in the tent, as we look across these three future fleet architecture studies, and also to identify those key enablers that we will need to fight in various scenarios and theaters as it relates to each separate study. And we are going to be doing some red-teaming. And several of the people here will also be in the room as well.

And so yesterday was the first day, and so we got a clear indication of the cooperation and kind of the open-mindedness that we have in discussing these types of issues, and we think we are going to get a lot of fruit out of that. We will be able to come back and tell you the results.

Mr. CONAWAY. I look forward to that. Sounds great. Thank you. I yield back.

Mr. WITTMAN. Thank you, Mr. Conaway.

We will now go to Mrs. Davis.

Mrs. DAVIS. Thank you. Thank you, Mr. Chairman. Thank you to all of you for being here.

I have been dealing more in personnel these last number of years, so this is very interesting, but it just takes a while to get it all, and I wanted to thank you for speaking English for most of the time. I appreciate it.

I think, Mr. Werchado, you made the statement, I believe, something to the effect that the Navy would have written this differently, perhaps focused on different things, and Admiral you might speak to this as well. How? In what way? I mean, do you think that your experiences are lending a different—these reports are lending a whole different view to what is required and what kind of capacity we have to deal with it today versus down the line?

Mr. WERCHADO. Thank you, ma'am. I appreciate the question.

I would say that the only difference would have been because I was, and my team, we were given intellectual freedom to look at the range of possibilities. And we aren't geniuses. Distributed lethality was proposed by SURFOR [U.S. Navy Surface Forces] 2 years ago. We just expanded it to all the fleet versus just the surface ships.

I think what would have happened if it was an official Navy study is it would have been chopped by the surface community, the submarine community, the aviators, the Marines, and everybody would have said I don't play enough in it. So we had the freedom to not vet it. I don't think there was any new, brilliant ideas that came out of it, but we were able to say what is the most effective force to fight a high-end threat, not what is the balanced, equal opportunity force.

Mrs. DAVIS. Yeah, and part of it too is the parochialism which sometimes tends to seep into the discussion. Admiral, yes? You smiled when I said that.

Admiral WILSON. No. I agree with what Mr. Werchado said. Now although he had representatives across all those resource sponsors,

I think the nature of the culture that he developed in the study team is that, hey, leave your badge at the door, and we are going to be open-minded about this.

And not only that, the NDAA specified that they weren't, you know, encumbered to anchor themselves on programs of record, so they didn't have to incorporate any——

Mrs. DAVIS. Yeah. How confident are you then that as we move forward, that those kinds of recommendations will come forward as opposed to having people fall back on some of the other ways?

Admiral WILSON. No, ma'am. I am very comfortable that we will get kind of the honest assessment. As a matter of fact, in the assessments division, that is kind of our job to be the honest brokers on how things should be assessed throughout the building cycle of how the Navy resources.

Mrs. DAVIS. All right. Anyone else want to comment on that?

Mr. CLARK. Well, as a former employee of the N81 Assessments Division, I can attest they do very good work in there, but in some ways in the Navy you are constrained by what it is that the Secretary of Defense is going to use to grade your homework.

So when you send your recommendations up in terms of the budget, they have a set of scenarios and objectives that they are going to grade that against. And so if we as a department have established a set of requirements that are maybe not reflective of what the future might really hold, then we may be going down the wrong path in terms of our force structure decisions, and so by doing it this way, you sort of freed the teams to come up with their own assessment of what we think the future operating environment is going to be and what may be required of naval forces.

So at least you get a better idea of what I guess the operating space might be, like how big a fleet, what kind of fleet, what mix of fleet, might be necessary to address the future operating environment.

Mrs. DAVIS. Do you think that how we prioritize the ships and capabilities would be different under that? I mean, there is such a range that we are talking about, and we obviously don't have unlimited funds.

Mr. CLARK. I think the priorities would be different, but I think that there is a fairly limited range of fleet architectures that make sense given the great power competition we are going to face. And it all comes down to specifics with regard to am I looking to deter a certain kind of conflict or fight a different kind of conflict, so it kind of comes down to exactly what the instantiation of that future threat might be, but there is bounds on it.

Mrs. DAVIS. I wonder, Doctor, do you see the flexibility in what we are looking at as well because we never can quite predict that next war?

Dr. BANERJEE. Yeah. As Bryan said, that is always the challenge. And I think that is also compounded by the fact that with ships they are 30- to 50-year hulls. So even though we are looking out to 2030, and I think Mr. Werchado mentioned this at the kickoff of the war game, that about 75 percent of the force that is going to be there in 2030 is kind of the same ships and hulls that we have today.

So the challenge is how do you adapt that force over time to meet these advanced threats and these new challenges within the constraints of the fact that the vast majority of the force you are going to have in the future is very similar to what you have today. So it is a complex problem.

Mrs. DAVIS. Yeah. Admiral, quickly.

Admiral WILSON. Yes, ma'am. I did want to add one additional point. Although there were three separate studies across the table here, there is not a lot of difference in the DNA of the groups here. Bryan even mentioned he used to be in 81, and so although we are getting different kind of opinions in ways of fighting, we are also casting a wider net to what else is out there. There are things that didn't show up in any of the three studies, new technologies that we get from industry or from academia, that may be beneficial and help us as well, so we are looking at those things also.

Mrs. DAVIS. Okay. Thank you. Thank you, Mr. Chairman.

Mr. WITTMAN. Thank you, Mrs. Davis. We will now go to Mr. Knight.

Mr. KNIGHT. Thank you, Mr. Chairman.

I am going to go back a little bit. I sit on Science, Space and Technology. We talk about a couple of these things, but one of them is hypersonic weapons. And we have been talking about hypersonic for about 65 years in America. And we seem to start a program, stop a program, start a program, stop a program, collect data, give data to somebody else, wait for the Chinese to steal it, and then that is kind of where we are. I would like that to stop, and I know that the Navy, we have had several admirals in here before that have talked about hypersonic weapons and what kind of a game changer that would be. I understand HVP is helping quite a bit, but that doesn't get us to moving somebody way away because you are now going 4,800 miles an hour.

So give me an idea, and I know that we have problems with the railgun, and I think that we will continue to have problems with the railgun for a very long time just because of the nature of what we are working there, and maybe we are just not quite smart enough to get through the physics of what the railgun brings to us.

So give me an idea of where we are, what that would mean to our fleets. I think I know what that would mean to the Air Force, but I also know that that would probably bring a greater issue to the Navy than any of the four services, so I will start with the Admiral.

Admiral WILSON. Yes, sir, I concur with your comments.

I particularly kind of locked on how we talk in open forum, and one of the key words that we talked about at the very beginning was this is a competition. And when you are in high-level competition, you are very careful as to what information you give your adversary. And so we do need to think more about how we do that in the future and not talk about what we can't do and what we cannot do and let the adversaries know kind of where we are at.

Mr. WERCHADO. Sir, I would like to address a particular aspect. You mentioned the different weapons and their capabilities. Radar resources plays a huge part. I think everybody here is aware of the Navy's effort for AMDR, advanced missile defense radar, on the Flight III DDG [guided-missile destroyer]. I appreciate all the sup-

port that program has gotten to date, and we look toward to using that against future threats, including hypersonic.

Mr. CLARK. So I would add to that that one thing that U.S. naval forces have as an advantage potentially is that you are co-locating your missile defenses with the target. So if the hypersonic weapon is coming at you and you are on the ship and you have got some defensive systems, you can still shoot at it because it has still got to eventually come to you.

And so the fact that the hypersonic weapon is going mach 5 or beyond is somewhat mitigated by the fact that it has to eventually arrive at your location. So some of these missile defense capabilities that might be very difficult to use in defense of somebody else are somewhat effective when you are dealing with getting shot at yourself.

The other thing we have to think about is us using hypersonic weapons against the enemy, and there has been a lot of work going on in the development of new hypersonic weapons that U.S. forces could use. And so that is where I think we should be investing more time and effort, because clearly if we are worried about the threat coming from Russia or China, there is no reason why we wouldn't be able to develop our own hypersonic threat, whether it is air launched or potentially even surface launched, ship launched.

Dr. BANERJEE. Thank you, Bryan. That is exactly where I was going to go. In the MITRE study, we recommended an aerial-layer missile system, so that was actually a hypersonic terminal seeker to be able to deal with some of the hypersonic threats that are coming in and try and engage them at range and potentially even at longer range engage those platforms that are going to be launching large numbers of antiship cruise missiles and other things coming at us.

So our report talked about how through the aerial layer, and then also we talked about a Pershing 3 variant, so the [Chinese] DF–21 missile is based off of the Pershing 2. You know that is an example of where they have taken our design and used it against us. The thought here is to have a Pershing 3 variant that could be launched from a ship so we could still comply with the INF [Intermediate-Range Nuclear Forces] Treaty. But that would be now something that they would have to deal with, and now they will have to build defensive systems to try to figure out how they are going to save their light holes in the South China Sea or their ships.

Mr. KNIGHT. Thank you, Mr. Chair. I yield back.

Mr. WITTMAN. Very good. Thank you, Mr. Knight. We are just looking. There is a vote that has been called, so we are going to try to get through a few more questions here.

Mr. KNIGHT. That is why I was fast.

Mr. WITTMAN. Okay. Thank you. Thank you. We are going to go to Mr. Garamendi.

Mr. GARAMENDI. Thank you, Mr. Chairman, and for the witnesses, a big thank you. Like Ms. Davis, a lot of this is new. I have been on other subcommittees, mostly on strategic arms. Some of it seems to intersect here.

Of particular interest to me is the unmanned vehicles of various kind, underwater, surface, and the like. Mr. Werchado, you seem

to be enamored by these. I would like you to explain more completely why and how they fit into the battlefield. And also in this context, maybe all of you would like to comment on the near term, all of which, of which all of you seem to comment on requires defense, electromagnetic defenses, cyber warfare, and the like.

So if you can hit both of those, it would be helpful to me.

Mr. WERCHADO. Yes, sir, I would be glad to. It was not a pleasant moment, but I had an IPR, a [interim] progress report, with our mutual boss, Admiral Richardson, and I used that comment about 75 percent of the force still being here in 2030, and he said only if I keep buying the same things. And he challenged us to see how different we could make our force by 2030. And you know what, you really can't do that through just manned systems. If you want to build things quickly, they have to be affordable, and unmanned is a great way to get there.

So we said if we opened the aperture, what could we do? So we gave ourselves some constraints. We couldn't invent a new unmanned platform that didn't exist. It had to be either in development or based on a current manned platform.

So we said what do we need to do? We need to have a backup to satellites, so we said what kind of surveillance could we provide? And we looked at what DARPA was working on, they had TERN [Tactically Exploited Reconnaissance Node], excellent capability, so we put that on the surface combatants. We wanted to make ourselves more offensive, so we looked at the Mark 6 patrol boat. We said easy to make that into a robot boat. Can put four cruise missiles on it without exceeding its displacement. So now we have four times the strike capability.

So we went for niche unmanned capabilities where we needed it. We wanted to have the decoy. I don't want a manned ship to be the decoy because it will get shot. I used unmanned surface vehicles for the decoys so we went after niche capability where unmanned was better than manned, and the technology supported it.

Mr. CLARK. I would say, sir, in addition to what Mr. Werchado just talked about, we looked at using unmanned systems as an adjunct to manned systems because they are going to be able to give you that longer reach and that greater persistence, and operate in environments where you may need to depend on them to be your eyes and ears, if you will.

So large unmanned vehicles like Mr. Werchado talked about were essential. A couple of limitations that we found, in the work we have been doing with DARPA, one is the sensor capability that an unmanned vehicle has is usually pretty limited compared to a manned platform, because we want these unmanned vehicles to be relatively small and relatively inexpensive, so we don't put the very sophisticated sensors on them. That means that the brains in them, the autonomy, isn't necessarily always going to be able to make the right decision because it may not be able to see what is going on around it. So you got to network them together to have one maybe one with a really good sensor and others that will be able to talk to it but that means you have to have these communications that are sometimes highly contested in those environments.

And then the other thing with unmanned vehicles, when you think about deterrence and in peacetime how you might use them, is they don't necessarily provide the deterrent effect that you are looking for in terms of preventing conflict. Not necessarily because people don't respect them because there is no people on them, but more so because they can't defend themselves. So if you are driving around the South China Sea and you run up against an unmanned Mark 6 patrol boat, you can't have it just start shooting at people that happen to wander up to it because in peacetime that is not appropriate.

So it limits your ability to deter conflict in peacetime if you depend entirely on an unmanned solution.

Dr. BANERJEE. I think all three reports, MITRE report agreed that unmanned, I think, has a huge role on the undersea side, and we were all for having unmanned underwater vehicles as a critical enabler. I think our report differed from the others in the sense that we deemphasized the role of unmanned on the surface and on the air side. I think there is a role for it in the air wing that needs to be worked out, but our concerns were again from a counter-C4ISR perspective and a counter-space perspective, to what degree are you going to be able to actually network these types of platforms together and use them effectively.

And then our other concern was from a cyber perspective, how well are these platforms going to work in a highly contested cyber environment. So MITRE made a conscious decision to kind of deemphasize the unmanned on the surface and the air side to some extent in our report.

Mr. GARAMENDI. [Audio malfunction in hearing room.]

Mr. WITTMAN. Thank you, Mr. Garamendi. I am going to go to Mr. DesJarlais.

Mr. DESJARLAIS. I know we just have a minute before we have to leave for votes. I have a quick question, and I will start with Dr. Werchado.

Mr. WITTMAN. Go ahead and take your full 5 minutes. We are going to have some folks coming back so we are going to keep the hearing going. So please take your time.

Mr. DESJARLAIS. Gotcha, okay. Some advocates have indicated a high-low mix of attack submarine assets to include diesel submarines. What are the pros and cons associated with a high-low mix of attack submarines?

Mr. WERCHADO. Thank you, sir. Excellent question. I had the fortune to be on the *Virginia*-class analysis of alternatives back in the 1990s and we did look at diesels. The problem is we don't have the luxury of fighting close to our shore. We play an away game. And if I was a country like China, I would buy a lot of diesels because I know you are going to come and fight me near home. We have to deploy, and the only way to deploy is to bring your own fuel with you.

When we buy a *Virginia,* it comes with a lifetime of fuel. And so I have nothing against diesel submarines, but you have to say I am going to be fighting within a few hundred miles of where I based them, or else now I have to buy extra oilers. I am going to make them vulnerable when I refuel them. They are going to have to

snorkel. They are going to become vulnerable. It is just not an option for us as long as we have to be a global navy.

Mr. DESJARLAIS. Anybody else have a comment? Doctor.

Dr. BANERJEE. I will take that. So MITRE put that into the report. Our concern was on the capacity side and actually bringing up the number of attack submarines, I think Mr. Werchado pointed out that the diesels are going to have issues with the speed of advance and magazine depth. They don't have the magazine depth that you are going to have with the *Virginia* and the VPM [*Virginia* payload module]. But our thought was base them forward. Base them in Guam and Japan or the Baltics and so they are close to the fight.

And then when the balloon goes up, flush them out early because it is going to take them a while to get there and the *Virginia*s and the nuclear submarines that are deploying from CONUS [continental United States] or from other locations can speed into the AOR [area of responsibility] and get on station very quickly.

Once they are on station, there is something that the adversary is going to have to worry about, and so this is a way of actually increasing the size of the submarine force relatively cheaply because you can buy, you know, our back of the envelope math suggests that you can get three diesels for the cost of one *Virginia,* so it is a way of increasing it quickly to try to overcome a loss of the *Los Angeles* class as they retire out of the force.

Mr. DESJARLAIS. Thank you. That is all I have. I yield back.

Mr. WITTMAN. Thank you, Mr. DesJarlais.

Okay. We are going to go to a very brief recess. We have sent some members off to vote. They are going to come back. Mr. Conaway will take the chair as we head off to vote, so we will be back and continue the hearing, so just hang in there with us for a few minutes. We are trying to navigate these votes.

So we will recess briefly.

[Recess.]

Mr. CONAWAY [presiding]. The Chair recognizes Mr. Gallagher for 5 minutes.

Mr. GALLAGHER. Thank you, Mr. Chairman. There has been a lot of talk, by all of you, about the concept of distributed lethality, and to quote a fellow Wisconsinite, Rear Admiral Fanta, if it floats, it fights, and Mr. Werchado, your study goes particularly far in sort of incorporating this concept into a distributive fleet, and you sort of claim this with an increased independent units capable of offensive operations tenfold over the current force.

In your study, the small surface combatant fleet would be 20 percent higher than the current 30-year shipbuilding plan, 48 vessels versus—48 vessels versus 40 vessels. The LCS [littoral combat ship], we make it in Wisconsin. I would just be interested in your thoughts on the LCS, in terms of supporting the concept of distributed lethality in the future.

Mr. WERCHADO. Thank you, sir. Admiral Fanta was at—chairing a meeting I was at this morning. I think there is a distinction to be made in our force structure. So we have 28 LCS. We need those. We use those for mine countermeasure missions and antisubmarine warfare missions. We don't trade those against other ships. We also

have 20 small surface combatants. We need those ships. Those would be doing part of the antisurface battle network.

So we have requirement for 48 small combatants. Twenty-eight, which is the number that we have currently under contract for LCS, we need every one of those. We also see a need for 20 more of the small surface combatant to extend our distributed lethal network. So I just wanted—it is not 48 of the same ship.

Mr. GALLAGHER. Uh-huh. Well, on that point, Mr. Clark, I would ask you to talk about this. Is there a need for a more survivable and lethal frigate than is now being considered by the Navy acquisition strategy, or what requirements need to be built in that don't currently exist in the LCS program as we look towards a frigate of the future?

Mr. CLARK. Yes. Thanks, Congressman. So I think we definitely recommended a larger, more survivable, and more lethal frigate going forward. So in our fleet architecture, we recommended that the Navy continue to build the LCS and the frigate version of the LCS unless that design is ready to be built, which we anticipate it not happening until the 2020 timeframe, and then we would transition to that frigate.

We think the essential capabilities needed in that frigate are the ability to do air defense for another ship so it could do an escort mission, which we saw in our analysis as being an increasingly important mission for a situation in which our logistics forces and civilian convoys and noncombatant ships are going to be at risk of being attacked by an enemy that is willing to go all out and attack civilians as well as attacking just strictly military ships.

So we saw the need to have the ability to do air defense of another ship as being essential. The other thing it has to be able to do is antisubmarine warfare, and in particular, using new antisubmarine warfare [ASW] concepts that will leverage things like the variable depth sonar that the LCS mission package has, and the medium—or the multifunction towed array, which the LCS mission package has as well.

What those capabilities do is allow us to transition from having a strictly, you know, man-on-man or single-ship-on-submarine kind of ASW to now do multi-static ASW where multiple ships can look for multiple submarines, and then we need standoff weapons to be able to engage those submarines rapidly, which could be from a TERN type of unmanned vehicle that an LCS or a frigate could deploy.

But those capabilities that we need in that frigate end up requiring a ship that is larger than the LCSs that we currently are building.

Mr. GALLAGHER. And Dr. Banerjee, you seem to—is it fair to say you disagree kind of with both those approaches. Your report argues for the cancellation of the program. Have you done any analysis of what that would do to the defense industrial base, because I am sure you know this isn't sort of turn it off and turn the spigot on somewhere else. I mean, this is years of developing a skilled workforce and improvements and efficiencies that happen every single day to make it more affordable.

Dr. BANERJEE. Roger that. To the first part of the question that we agree with CSBA, I think we agree that it has to be a larger

frigate, larger size. We did look—and we were looking, again, at an area of air defense, antisurface warfare capability that was built around the hypervelocity projectile, launched out of a 5-inch gun, I mean, the first part of analysis that we did was to look at, okay, what kind of frigate designs do that. It turns out there was a *Garcia*-class, you know frigate, you know back in the 1980s that was a 35, a 100 ton, so it is about LCS size that had two 5-inch deck guns. The naval architect that was on our team didn't think that that was something that was—although it was done back then, that it was something that was doable today.

So we actually recommended something that was a larger size. I think we looked at a German, you know, F–125, which is a 7,200-ton, you know, frigate design that had the two deck guns, could get you some VLS cells as well as EW [electronic warfare] capabilities and decoys and things you would need to make that a much more robust and survivable ship within this particular threat environment.

Now, the question in terms of whether or not that could be built in those shipyards and whether those yards could be expanded to handle a larger ship size——

Mr. GALLAGHER. Uh-huh.

Dr. BANERJEE [continuing]. That wasn't something that we looked at. What we did think about was whether it would be possible to actually potentially license a design to try to actually get something built sooner. If it is a design that could be licensed and then manufactured at, you know, either or both of the existing LCS shipyards and what modifications that they would have to do at the yards to be able to do that, we didn't actually look at that.

The other potential option—I mean, we did also talk about a couple of different alternatives for the amphibious force. One of that would be, you know, an option to build a smaller—a number of smaller platforms for the new dock ship. Now, I know since the study came out, there—I think there has been a decision as to what that design is going to be, but if the Navy and Marine Corps wanted to go down that road, then that could potentially be another ship that is built within the existing shipyards and facilities.

Mr. GALLAGHER. Thank you, gentlemen, for your work. Mr. Chairman, I yield back.

Mr. CONAWAY. The gentleman's time is expired.

Mr. Norcross, 5 minutes.

Mr. NORCROSS. Thank you, Chairman, and hopefully you didn't address this while I was gone voting, but I hear more diverse, spread our risk out, hidden, unmanned. Tell me how our aircraft carriers fit into this new world and new vision that you have been talking about? So start right with the admiral, work our way down.

Admiral WILSON. Well, sir, I would like to defer to the study team leads and let them explain how they incorporated our existing carriers and how they are planning on using either an *America* class or some alternate carrier in the future force.

Mr. NORCROSS. Thank you.

Mr. WERCHADO. Thank you, Admiral. I think one of the key parts of our study that really hasn't gotten the visibility is the synergy that you can have between a large aircraft carrier like a *Nimitz* or a *Ford* and a big deck amphib. One thing that doesn't get pub-

licized too well is the Marines are far ahead of the Navy in terms of fielding fifth gen fighters.

The F–35 Bravo will be out in numbers before the F–35 Charlie is, so the big deck amphib, which can host up to 23, 35 Bravos, you probably wouldn't want to deploy that many for operational reasons, but it could host say 20, it could go to sea and provide 2 extra squadrons of fifth gen fighters which the Navy couldn't field until 2026 at current acquisition plans.

However, it can't carry AEW, advanced early warning, airborne early warning, it can't have electronic attack, so you wouldn't want it to be out by itself. But if you put it out with the big deck carrier, there is a win-win because now the carrier air wing has fifth gen squadrons earlier and the L-class ship affords the protection from the E–2s and the Growlers that are on the big carrier.

So when we said we had so many more combat nodes, when we deploy for combat, we send carriers out in twos. The reason for that is you have to have 24/7 flight ops and you have to have down time on the flight deck. So if I have to send my carriers out in twos, I can cut the number of strike groups in half that I can send to war. If I pair them up with big deck amphibs, I am back to each carrier can be a strike group with an L-class ship next to it.

Mr. NORCROSS. But the point I am trying to make is they are larger, you are not going to hide them. If it does break out, what are the chances of that surviving the first 10 minutes of any conflict?

Mr. WERCHADO. It is large, sir, and it is hard to hide, but it also hard to find. Remember, it is mobile. And so, big Pacific Ocean. I can know a carrier is there, but I have to get its location within the acquisition circle of my missile, and I have to transmit that data to a firing unit before that circle grows. You know, at 30 knots, I know where your carrier is right now, go call the missile shot, get them to shoot something. Every minute that circle is growing area of uncertainty because the carrier is doing 30 knots.

And so what you really want to do is say you may know I have a carrier there but you can't solve the firing solution and you can't launch on it, and so all those things we have been talking about, the decoys, electronic warfare, the cyber, that is to keep the uncertainty. They may know we have a carrier out there, but unless they can put a weapon on it, it doesn't help.

Mr. NORCROSS. Thank you.

Mr. CLARK. So one thing I would say in addition to that is it also depends on how you use your carrier. If you use your carrier as the front line of defense and deterrence, then you are putting it into an environment where it is much more likely to be found, targeted, and shot at. And what we found in our analysis is not so much that the carrier gets sunk, is that its operations get suppressed because it is driving around trying to avoid being shot and it is not able to launch aircraft, and therefore, it is not really doing its job.

So what we did in our fleet architecture study is we took the carriers, which are very good at delivering combat power at moderate levels for a really long period of time, and moving them outside that immediate area of the conflict where things might start. So you think about the South and East China Seas in the Western Pacific, and we put the distributed forces that we have been talking

about inside that area because they have missile-based fires that are much faster and can be delivered in high volume for a short period.

So in a war, these distributed forces we are talking about are likely to use up all their weapons relatively quickly. So within a few days, they might be out of ammunition and have to sort of withdraw, or they get attacked and sunk. So we need somebody to be able to flow in behind them to be able to continue the fight once those distributed forces have to start withdrawing, and that is what the carrier strike groups are able to do.

One, they are a little bit farther away as they are able to maneuver and take advantage of the larger space they have at their disposal, so they are harder to find, and they are also then coming in at a point where we maybe started to attrite the enemy a little bit and reduced his ability to launch large salvos at the carrier.

So separating the force into these forward forces and this larger carrier-based force enables you to take advantage of what both do really well and minimize the chance that the carrier will be suppressed.

Mr. NORCROSS. But you also have to keep them outside of the range so that they are not going—they are going to stay out in the North Atlantic in case the Balkans—are particularly when we are dealing down there.

Mr. CLARK. Right. So they stay outside the immediate area of the conflict so they could still be attacked by some small number of very, very long-range weapons, but you don't put them in the place where necessarily they are going to be able to be hit by large numbers of shorter range weapons.

Dr. BANERJEE. In the MITRE study, we talked about using the hypervelocity projectile to deal—you know, basically use the surface combatants to protect the carrier from the cruise missile threats, and we also talk about an aerial air missile system to try to engage the more capable hypersonic threats, as well as trying to actually shoot down the bombers and the strategic aircraft that they are going to launch those things off of at range.

So we use that to try to protect the carrier and provide kind of a layered defense that is more robust and can be layered on top of the existing standard missile systems and the existing point defense systems within the strike group.

To get to the unmanned question, I think the interesting question there is if you are on a combat air patrol where you are trying to perform this mission, that is actually a fairly nice role to actually have for an unmanned system because they can stay up there for a long period of time and it is a relatively boring job for a fighter jock to do, but then actually slave the fire control for that system back to either the E–2D or back to an Aegis combatant to actually perform—you know, put that cap up while you are not conducting large-scale flight operations. It is an interesting potential role for unmanned systems for a carrier defense.

Mr. NORCROSS. Thank you. Yield back.

Mr. WITTMAN [presiding]. Very good. Thank you, Mr. Norcross. We now go to Ms. Hanabusa.

Ms. HANABUSA. Thank you, Mr. Chairman. Thank you, gentlemen, and if I ask any of the same questions, please excuse me. I am coming from a vote.

So this is for Rear Admiral as well as Mr. Werchado. I am sort of confused as to what the right number is for you for the Navy because the FSA [Force Structure Assessment] in December 2016 said 355 and some of you are concurring or nodding to 355; but in your report, you seem to go to a total of force, 57; manned, 321, which is a force of 355, that number; and unmanned, 136. So what is the number? What is Navy's position?

Admiral WILSON. Yes, ma'am. Let me clarify a little bit, and I mentioned this earlier, but as you mentioned, you may not have been in the room then. Three fifty-five was the results of the Force Structure Assessment.

Ms. HANABUSA. Uh-huh.

Admiral WILSON. And that relates to current programs of record, current platforms that the Navy has using current warfighting concepts and keeping things fixed such as our strategic laydown that we currently have.

Now, that is the foundation and the baseline for where we need to go in the future. So right now that number is 355, but as we look to future fleet architectures, different concepts of fighting, different platforms, so within that 355 number, there are no unmanned platforms.

So if you look at how you are fighting in a more distributed fashion, how your forces are more netted and integrated, now you can, you have an opportunity to replace some manned platforms with some unmanned platforms, for example, and some other things that are—have different technologies, and then you are going to fight those things a different way. So that number will look different.

One of the things that drives us to do a Force Structure Assessment is change in strategy, change—a significant change in programmatics. This is one example if you are going to a more unmanned kind of centric force, and significant changes in the threat, and that is what drove the 2016, significant changes in the threat and there was a change in the strategy, that is what drove the increase of the number. Any of those changes that happen in the future, it will change the number again. We will do another Force Structure Assessment, and it will reflect what a future force would need to look like.

Ms. HANABUSA. I understand that, but the problem with doing that is that if you—we can't, and then basically the industrial base can't switch that simply. So for example, one of the things that I noticed, which is dear to Hawaii, is the fact that where everyone else seems to agree that the *Virginia*-class attack sub should be around 66, one of you is higher than 66, you are not, and in terms of the Navy system is not.

The FSA is at 66, and we are also at the same number, I believe, in the *Columbia*-class subs, so it seems to me that one of things that I would like to know, first of all, is who do you—who do you perceive to be the, quote, enemy that you have to fight? Because if it is Russia and China, as many of you allude to or actually state, then we shouldn't have this kind of a discrepancy in my mind.

We should have some understanding of, one, where is that force going to be? Is it going to be in the Pacific? Is it going to be under the Arctic? Or is it going to be in the Atlantic? So if you could—one of you could answer that.

Mr. WERCHADO. Yes, ma'am. I think there is an apparent disconnect that isn't. So Admiral Wilson said he looked at manned platforms in the Force Structure Assessment. He gets 66. MITRE looked at a mixture of nuke and diesel and if you add the two. We had 53 SSNs [nuclear attack submarines], but we also had 48 large displacement UUVs [unmanned underwater vehicles], so whether you do it all through manned, through manned nuke and manned diesel or manned nuke and unmanned diesel, I think what you are really talking about is a capability.

And I love the fact that you went from asking about the total force structure number to the individual submarine number. Inside the Pentagon, we never say 313, 325, 355 because it is a not meaningful number. We say how many carriers do I need, how many amphibs do I need, how many submarines do I need. That is where the discussion really should take place. Thank you, ma'am.

Ms. HANABUSA. So what about my question about where is the threat? I assume all of this is driven by where is the threat? So it has got to be some assessment on all of your parts as to who or where is that threat.

Mr. WERCHADO. In order to keep it unclassified, we specified we would take—be able to handle a high-end threat with large anti-access capability. My colleague named two countries that I wouldn't disagree with.

Ms. HANABUSA. Somebody named them. I read it.

Mr. WERCHADO. Yes, ma'am. I can. But while doing that, deter anyone else. So that could be the next level tier of country. So if you can handle one of the big ones, you should be able to handle one of the medium ones and keep them deterred. That is [inaudible] our construct.

Ms. HANABUSA. Thank you, Mr. Chair.

Mr. WITTMAN. Thank you, Ms. Hanabusa.

We will now go to Mr. McEachin.

Mr. MCEACHIN. Thank you, Mr. Chairman. Up until December 31, I was just a small-town lawyer trying to make good, and now I am trying to learn all these newfangled concepts, and Admiral, you and I had a discussion the other day and I went and did a little research and it turns out that I think we are working under the assumption that we have to fight at least two—we need to be prepared to fight two significant conflicts, maybe with a non-state actor, maybe one with a state actor, and that is what drives our preparedness numbers, and that what drives presumably this 355 number with some variation.

And then I see my President propose this $54 billion to be added in investment to defense, and then he flies down to the south side of my district into Newport News, stands on a carrier and starts talking about how wonderful this amount of money is for building up our, presumably, our Navy. That is certainly the implication.

And then I start hearing all these whispers about, well, the $54 billion really isn't all for the Navy. It is for, you know, most of it, quite frankly, is going to the Department of Energy for our nuclear

weapons systems. I don't know if any of that is true. I don't want to deal with alternative facts. If anybody at this table knows, how much of that $54 billion would actually be going to building ships, hopefully, out of Newport News and Connecticut and maybe elsewhere, too, but how much of that $54 billion will actually be going to building ships?

Admiral WILSON. Yes, sir. I can't comment on specifically how much money would be going towards building ships, but some of that money will go towards making the current force whole, and some of it will go towards ramping up and building the ships; but specific dollar figure, I can't give you here.

Mr. MCEACHIN. I appreciate that, and thank you for gently chiding me in that fashion. To the extent that you can comment, does any part of that $54 billion put us on track to get to that 355-ship level, because I have got a whole bunch of folks who are looking for work in Virginia, in Virginia's Fourth Congressional District, and they are mighty excited. But I am hearing things to say we need to slow down, we are not going to get there too quickly with that number.

Admiral WILSON. No, absolutely. Congressman, we will be—well, there is efforts ongoing right now to see what we can do to ramp up in the industrial base where we can and start moving quickly to that 355 number for platforms that we know we are going to need.

Mr. WERCHADO. Yes, sir. Also, the Secretary of Defense indicated his priority would be first restoring readiness, fixing holes in the programs, and then growing force structure. I would just point out that a lot of restoring readiness means Norfolk Naval Shipyard because we do have to do the repairs to those ships to get them back out, so I would expect a lot of the investment would be going to increase the rate of overhauls and the capacity to do overhauls.

Mr. CLARK. Also keep in mind that the ship maintenance industrial base would benefit from some of this money going into readiness because right now all of our surface combatants, all of our amphibious ships get maintained at private shipyards. There is a bunch at Norfolk, there is a bunch along the East Coast, and so there is a lot of workers that are going to be brought in to help with that because that is where a lot of our expansion volume is, if you will, in the ship maintenance industrial base.

Mr. MCEACHIN. If you care to comment. You don't need to feel compelled.

Dr. BANERJEE. No. I don't know where that $54 billion is going. I don't have anything to say on that.

Mr. MCEACHIN. Thank you, Mr. Chairman. I yield back.

Mr. WITTMAN. Thank you, Mr. McEachin. I just wanted to let you know, too, we have asked the Congressional Budget Office to outline for us the pathway to get to 355 ships in a 15-, 20-, 25- and 30-year scenario. So we will have some additional information for the committee as far as the pathway there so it will give you a little more information to go on.

Mr. MCEACHIN. Thank you, Mr. Chairman.

Mr. WITTMAN. Thank you. Thank you. We will now go to Mr. Langevin.

Mr. LANGEVIN. Thank you, Mr. Chairman. I want to thank the panel for your testimony here today. Admiral, thank you for your service and all of you, good work that you do in behalf of our Nation. Thank you for your work.

Admiral Wilson, Mr. Werchado, so I am a long-term member of this subcommittee, and I am very proud to represent Rhode Island's Second District where we begin the build process for our Nation's submarine fleet. So I—I have to, say, though, I am frustrated that such a dramatic increase to our naval fleet from 274 to 355 ships in the future was announced so quickly it seemed without very little conversation.

So can you discuss with the subcommittee the decision-making process that took place prior to this announcement and what factors were most heavily weighted, and how are you preparing to move forward now with this plan? I think it caught a lot of people off guard that it happened so quickly, and I have been around here for awhile, and to see that kind of a dramatic shift so quickly was surprising, so——

Admiral WILSON. Yes, sir. I think you are referring to the announcement of the 355-ship Navy?

Mr. LANGEVIN. Yeah.

Admiral WILSON. I would answer that by saying that our study was complete, and we had briefed leadership, and so once you have a completed study and you brief leadership, leadership then has—it is their prerogative on whether they want to go public with it or not, and the Secretary of the Navy chose to go public with that information, which was complete at the time.

Mr. LANGEVIN. Thank you. Mr. Werchado, do you want to add anything?

Mr. WERCHADO. No, I think that covered it. I would just point out that the work for the FSA actually started under Admiral Wilson's predecessor, Admiral Mercado. It took us about almost a year, so we had to go out to all the fleet component commanders and the COCOMs [combatant commanders] and find out what their demand signal was, we compared it to the results of our campaign modeling the analysis we do for the war plan, so it was an involved process. It may have seemed overnight based on the speed of the roll-out, but again, that was SECNAV [Secretary of the Navy] determined. We had been working pretty much since last January on it.

Mr. LANGEVIN. Okay. All right. Thank you. Dr. Banerjee, so I—I see that the MITRE study included the addition of an electromagnetic railgun onboard a new frigate and supplemental platforms.

So I have been a long-time advocate for things like directed energy and high-velocity projectile technologies, and I understand that high-velocity projectiles have been discussed today already, but did you evaluate directed energy technologies outside of railgun in your study? If not, why not.

Dr. BANERJEE. No, we didn't look at things like the solid state laser technology maturation [SSLTM] program and some of the other systems that are out there. I think our thought, those are interesting technologies, technologies we should continue to invest in. I think that there is still that capability there potentially from—a counter-C4ISR perspective, but our thought was that the hyper-

velocity projectile was further along and something that was, at least when launched from a 5-inch deck gun, could be deployed within the existing force.

In terms of the railgun, our thought was, if practical, if you could put the power plant in to be able to operate it in the new frigate design, that would be great. The other option that we had put forward was potentially in the magazine ship concept, if you are actually going to put VLS cells and other capabilities into a commercial hull, in a commercial hull, you can buy containerized power plants that could deliver that type of power for a railgun and you could drop them in and that might be the quickest way to actually get something like that to the fleet.

We were focused on what could be done in the next 10 to 15 years, and I think our concern is, although I know SSLTM and other capabilities are moving forward, we just weren't sure you were going to get the power level out of those systems to have effects against the types of systems that we are worried about.

Mr. LANGEVIN. Okay. All right. And I would just point out that the—we do have a 30-kilowatt laser right now on the USS *Ponce* that is in theater. We don't have a railgun in theater yet. I know it is only 30-kilowatt, but we are certainly experimenting with an actual platform.

Dr. BANERJEE. Yeah. So for that, I mean, to go against a FAC/FIAC [fast attack craft/fast inshore attack craft] type threat or small boat threat, or a UAV threat, I think you can get away with it.

I mean, the question is though when we are talking about the South China Sea and dealing with those type—the types of platforms that they are going to launch out at us and the ranges that we are going to be operating at is that what impact is it going to have in that particular fight.

Mr. LANGEVIN. Okay. Did you want to add something?

Mr. CLARK. Yeah, Congressman, I will rise in defense of directed energy. But we included in our study both solid state laser, because in the 2030 timeframe it is completely realistic to think that you could have a 150- to 300-kilowatt laser that you could use.

And then also, high-powered radio frequency or high-powered microwave could be an effective technology in that timeframe, so we included both in our study.

Mr. LANGEVIN. Thank you. I have another question I would like to submit for the record, but I know my time is expired, so I will yield back.

Mr. WITTMAN. Thank you, Mr. Langevin. We appreciate our witnesses here.

We do have to get down to the floor and vote on fiscal year 2017 Department of Defense appropriations, so I think we want to make sure we get down there and do that.

So I want to thank our witnesses for joining us today. We deeply appreciate your perspectives, and we will continue the conversation about future fleet architecture.

Thanks again, and we are adjourned.

[Whereupon, at 5:10 p.m., the subcommittee was adjourned.]

A P P E N D I X

MARCH 8, 2017

PREPARED STATEMENTS SUBMITTED FOR THE RECORD

MARCH 8, 2017

Statement of the Honorable Robert J. Wittman
Chairman, Seapower and Projection Forces Subcommittee
"An Independent Fleet Assessment of the U.S. Navy"
March 8, 2017

Thank you all for being here today for our Seapower and Projection Forces subcommittee hearing. As this is our first subcommittee hearing, I just want to say that I look forward to engaging all of our members on what I believe is the bipartisan committee in Congress. I especially look forward to working with my Ranking Member Joe Courtney and plotting a path to meet the requirements of our Armed Services.

Two weeks ago, we held a classified briefing with Rear Admiral Wilson in regard to the Navy's 2016 Force Structure Assessment. The Force Structure Assessment assumed that the future plans for the Navy, in ship types and numbers of ships, would continue with ships of similar capacity that serve in the fleet today.

This afternoon, we transition from looking at the Navy's Force Structure Assessment to considering 3 separate Future Fleet Architecture studies. These 3 studies were directed by Congress and completed in recent months. These 3 Future Fleet Architecture studies take a different tack and consider what the composition of the Fleet could be in the future. Some of their proposals include new ship classes, increased usage of unmanned vehicles, and redesigned ship configurations, just to name a few. We turn to three independent experts to provide more details on alternatives to the Navy's proposed force structure. I hope during the course of this hearing we can discuss options that Congress could pursue to meet those Navy requirements.

I think there is broad agreement with the Navy and the three independent studies on several themes. First of all, the Navy of today is insufficient to address the challenges of tomorrow. I think everyone would agree that the 274 ships of the Navy fleet today are insufficient for a variety of reasons and lead to a variety of bad alternatives including most prominently aircraft carrier gaps.

I also believe there is general agreement that future conflict will reside in a contested environment requiring additional large surface combatants and more robust weapons. Advancements in naval gunfire with the electromagnetic rail gun and hypervelocity projectile are essential to getting on the right side of the cost curve.

I also believe that all the studies agreed that the United States has an asymmetrical advantage in the undersea domain. Maintaining this advantage will require increasing the build rate of the Virginia attack submarine and

introducing the Virginia Payload Module with the next block of attack submarines. While I believe the Research and Development community has done a good job with developing Unmanned Underwater Vehicles, I also think it is time to downselect to specific systems and rapidly deploy these capabilities throughout the fleet.

As to small surface combatants, I believe that there is general agreement on expanding the capabilities associated with the Littoral Combat Ship. The Navy concluded a Small Surface Combatant Task Force that determined the requirements for the Frigate. However, I believe that we need to take a closer look at these requirements. I look forward to better understanding capabilities that our witnesses believe should be incorporated into the Frigate.

I see our amphibious force, with its complement of Marines, as vital to our ability to deter aggression. As we look to rebuild our Navy, we must ensure that our Marine Corps also remains a large part of our plans. I look forward to hearing how the L-class ships that make up our Amphibious Readiness Groups (ARGs) can be used in the future.

As to our preeminent strike capability, the aircraft carrier, I believe that there is general agreement that we need to expand this capability but continue to reduce costs associated with the Ford-class aircraft carrier. I do not believe any members of this subcommittee are willing to accept an almost $13 billion unit cost for the USS Gerald R. Ford and efforts need to be taken to reduce overall costs. I look forward to options that our witnesses could offer to make the Ford class more affordable.

Finally, I look forward to our witnesses better describing the communication challenges that are expected in a contested environment and options to address these concerns.

I would like to welcome all of our members and the distinguished panel of expert witnesses today.

This afternoon we have with us:

Rear Admiral Jesse Wilson, Jr.
Director, Assessment Division (OPNAV N81)

Mr. Charles P. Werchado
Deputy Director, Assessment Division (OPNAV N81B)

Mr. Bryan Clark
Center for Strategic and Budgetary Assessments

Dr. Sunoy Banerjee
MITRE Corporation

Thank you all for testifying today and we look forward to your thoughts and insights on the fleet architecture alternatives.

I would now like to turn to our Ranking Member Joe Courtney, for any remarks he may have.

Ranking Member Joe Courtney
Opening Remark for House Armed Services Subcommittee on Seapower and Projection Forces Hearing on
An Independent Fleet Assessment of the U.S. Navy
March 8, 2017

Mr. Chairman, thank you for calling today's hearing on "An Independent Fleet Assessment of the U.S. Navy". Since this is our panel's first public hearing in the 115th Congress, I want to also congratulate my friend Rob Wittman for earning our panel's gavel, as well as welcome our new and returning members.

One of the primary focuses of our subcommittee has been ensuring that the Navy and Marine Corps are properly sized and equipped to meet their critical and growing requirements around the globe. I am most proud that we have worked year after year to reverse a steady decline in the fleet and in shipbuilding rates. In the last eight years, we helped to double the number of ships under contract compared to the prior eight years – arresting a steady decline the fleet and putting us on a path to grow our Navy. I think it speaks volumes to the work that we do here that the 2017 defense funding bill we will vote on today adopts many of the changes this panel first proposed last year.

Even with this work, we know that our sea services have grown increasingly strained through repeated deployments, high operational tempos, and shortfalls in maintenance. With all that they do each day around the world, it has long been clear that a larger fleet is ultimately needed to keep pace with the demands that the nation places on our forces on, below, and above the seas.

Last year, the Navy concluded a nearly yearlong re-assessment of its force structure needs that came to that same conclusion. Among other things, the new Force Structure Assessment, or FSA, increased the total fleet requirement from 308 ships in their 2014 plan to 355. In particular, it bumped up requirements in key areas like submarines and large surface combatants, among others. The updated fleet goal reflects the hard reality that our sea services will only see demand for their presence and capabilities increase as we look to the current and projected challenges we face around the world.

While the new FSA serves a new benchmark for the Navy and Congress to strive to meet, it leaves many key elements needed to achieve the larger fleet unanswered. For instance, we recently heard testimony in the full committee that the Navy continues to face significant challenges in meeting repair and maintenance requirements on its ships and submarines today. Given that shipbuilding is a "long game" and the first new ships under the FSA will not come online for several years, it is crucial that we maintain the fleet we have today even as we add new capabilities and platforms in the future.

Additionally, we need to be mindful that achieving and sustaining the 355-ship Navy will be an effort beyond any single budget year, session of Congress, or presidential administration. Even in the most optimistic of projections, this effort will be marked in decades, not years. We cannot simply build more of the ships we need in 2017 and expect that they will meet the needs of the 2030s. Instead, we need to build a fleet that can evolve and adapt, embracing new capabilities and concepts. We need to lay a thoughtful foundation that will guide future decisions not just in how many ships we build, but also in how we support and sustain them.

That is where the independent assessments we will hear about today will be useful to guide this critical discussion. Congress, through its oversight role, directed the Navy to conduct three distinct studies on future fleet architectures independent of the FSA. This independent analysis is advantageous to both the Navy and Congress' understanding of the long-term strategic investment that will be required to build up and recapitalize the fleet. As important, they provide new ideas and concepts that should guide the Navy's continued planning for the future fleet.

Neither the FSA nor the studies presented here today, however, lay out a detailed "how to" guide on how Congress should move towards the larger 355-ship fleet. How we allocate resources to ship maintenance, updated capabilities and new construction will have a profound impact on our Navy and Marine Corps team, and our industrial base for decades to come. It is a weighty challenge – but with the expertise of our subcommittee, and the input of witnesses like those here today, I am confident that we can hit the ground running in the weeks and months ahead.

I want to thank the Chairman for holding this hearing today and to the witnesses for appearing here today. I look forward to their comments.

NOT FOR PUBLICATION UNTIL
RELEASED BY THE HOUSE ARMED
SERVICES COMMITTEE

STATEMENT OF

REAR ADMIRAL JESSE A. WILSON

U.S. NAVY

DIRECTOR, ASSESSMENTS DIVISION FOR CHIEF OF NAVAL OPERATIONS

BEFORE THE

HOUSE ARMED SERVICES SEAPOWER SUB-COMMITTEE

ON

FUTURE FLEET ARCHITECTURE STUDIES

MARCH 8, 2017

NOT FOR PUBLICATION UNTIL
RELEASED BY THE HOUSE ARMED
SERVICES COMMITTEE

Mr. Chairman, Ranking Member Courtney, and distinguished members of the Sub-Committee, I appreciate the opportunity to testify on the Future Fleet Architecture Studies that were conducted in accordance with the FY16 National Defense Authorization Act (NDAA). Section 1067 of the NDAA directed the Secretary of Defense to conduct three independent studies of a future fleet architecture in the 2030 timeframe. The three studies were conducted by: (1) Department of the Navy (DON), which was comprised of a Navy-led Project Team with participation from the Office of Net Assessment within the Office of the Secretary of Defense and the Naval Surface Warfare Center Dahlgren Division; (2) MITRE's National Security Engineering Center – a federally funded research and development center (FFRDC); (3) Center for Strategic and Budgetary Assessments (CSBA) – an independent, non-governmental 501c3 non-profit institute.

These studies are a starting point in the analysis that the Navy will use to develop our future fleet architecture and design. None of them, including the Navy Project Team study, has been endorsed by the Chief of Naval Operations as a comprehensive solution set to focus our future fleet development. We will continue to incorporate what we learn from them into our ongoing research and development and rapid fielding, concept development, and strategic thinking. They will contribute to the high velocity learning that is necessary to strengthen our naval power to outpace our peer competitors and future threats.

All three studies were based on a 2030 strategic environment defined by the re-emergence of great power competition and the growing availability of high-end warfighting capabilities designed to counter U.S. military advantages. The NDAA did not define the initial conditions of the study so all three research groups defined their own starting conditions. The NDAA guidance did direct that each study consider the same baseline Intelligence threat assessment, U.S. National Security Strategy, potential threats to the U.S. in the 2030 timeframe, and traditional and alternative roles and missions of U.S. forces. The study teams each utilized other government and non-government analyses to inform study assumptions. Evolving technology was taken into account, including unmanned technology, and each looked for opportunities to reduce operation and sustainment costs. The studies were not limited to a specific scenario or constrained by current or projected fleet platform architecture, although current and projected capabilities of our forces, employment of forces, including forward presence, and the effects of force structure on capability and capacity requirements, were taken into consideration.

While each entity conducted its study independently, generated its own assumptions and performed its own analysis, several common themes emerged across the three studies. All three studies determined that U.S technological advantage is being challenged, and in some cases surpassed. They determined that our naval forces will need to be more maneuverable, integrated and agile, in an increasingly contested information environment where potential adversaries will attempt to deny our forces freedom of action in multiple domains (sea, air, land, cyberspace). They found the need for naval forces to operate in a more distributed manner and that demand will remain high for mobile, resilient forward-deployed naval forces, and indicated that we must consider the potential contributions and cost effectiveness of directed energy weapons, both offensive and defensive, and the potential of unmanned surface, undersea and air systems. The studies suggest that improvements in sensors and networks will allow the Navy to operate more distributed, and improvements in logistics, force protection and fire power of ships forward will improve our ability to deliver combat effects. We are examining these ideas thoroughly. Some of the recommendations in the studies will be acted upon, or acted upon more quickly than was already being planned. Some recommendations show promise but will need further analysis and exploration.

As these studies progressed, the Navy took steps to clarify our organizational structure and terminology, and better integrate the activities informing our thinking about future fleet design and architecture. We now define "fleet design" as how the fleet fights and wins, as expressed through concepts, doctrine, and tactics, techniques and procedures. We use the term "fleet architecture" to refer to those activities that support the fleet design, to include presence, surge forces, and force packages; the processes through which forces are prepared for and recover from deployment; bases and facilities that support or host material components of the fleet; and material components of the fleet, such as ships, aircraft, unmanned vehicles, personnel, weapons, and sensors.

To guide our fleet design and architecture for the near-, mid-, and far-terms we identified leads to take stock of the myriad ongoing activities across the Navy that inform our thinking about fleet design and architecture. They are responsible for aggregating the inputs from studies, wargames, experiments, and other exploratory activities into strategies, concepts of operations, requirements, or additional study both within and across time frames.

These studies are part of a larger effort to inform and focus our future fleet development efforts and increase our warfighting advantage over current and future adversaries. Recently, U.S. Fleet Forces Command promulgated a Fleet Design concept paper that outlines how the

Navy will accomplish the imperative of strengthening naval power at and from the sea in the face of rising maritime threats and the rapidly changing nature of conflict. It will serve as a stimulus for developing, refining and testing new operating concepts and capabilities, and central to this concept is implementing integration, distribution and maneuver principles to all naval missions. Furthermore, the Chief of Naval Operations established a Fleet Design Advisory Panel to review each of the three studies and their recommendations, and derive a set of criteria against which any proposed fleet design and architecture could be assessed. These efforts will be supported by a robust program of studies and analysis, wargames, experiments, technology demonstrations, and prototyping with visibility and participation from a wide spectrum of key stakeholders, in order to identify the most promising insights from each study for inclusion in our future force plans and capability decisions.

The Future Fleet Architecture studies were three independent studies that were conducted to recommend potential alternatives to future Navy fleet architectures in the 2030 timeframe. They are intended to guide considerations to shape a future fleet, not a specific path for the Navy to take. Designing and developing the Navy's Fleet is a continuum of three separate, but related efforts. The Force Structure Assessment uses today's operational demands on the Fleet to project the size and composition of the Fleet in the near- to mid-term. We will conduct further analysis of the study recommendations to identify the most promising insights from each study for inclusion in our future force plans and capability decisions. Finally, the Navy's ongoing 2045 Future Fleet Design and Architecture (FFDA) effort considers the future operational environment, technological developments and expected threats to describe the Fleet over the long term.

Collectively, the studies validated our need for a larger battle fleet size than is currently planned. Further analysis will need to be conducted -- informed by both the studies and future operational concepts -- to determine optimum fleet size, mix, and required resourcing over time. The Navy looks forward to working with the Congress and others to achieve the maritime superiority the nation needs, today and in the future.

Summary

In conclusion, the three Future Fleet Architecture studies provided a range of insights and perspectives that both validated, but also informed, the Navy's current thinking on fleet architecture and design. None of them is an end all, be all solution. They are just the starting point, but they will play a crucial foundational role in the process of designing a future fleet in alignment with CNO strategic priorities as laid out in the Navy's Design for Maintaining Maritime Superiority, which calls for exploration of alternative fleet designs.

As these studies progressed, the Navy took steps to clarify our organizational structure and terminology to better integrate the activities informing our thinking about future fleet design and architecture. To guide our fleet design and architecture for the near-, mid-, and far-terms are taking stock of the myriad operational, logistical, administrative, research and development, and other activities taking place across the force. These findings will be aggregated with studies, war games, experiments, and other exploratory activities into strategies, concepts of operations and requirements, or referred for additional study.

The Navy is at a point of strategic inflection. The maritime environment is becoming more stressed, contested and congested, and the pace of change is accelerating in almost every area. We must continue to outpace our peer competitors and future threats. To meet these challenges, we must ensure that future fleet development is thoughtful, informed, agile and focused. These studies will help the Navy determine optimum fleet size and mix, over time. We appreciate the opportunity to learn from them. This is a complicated process, as much art as science, and while more work remains, the Navy is dedicated to working with Congress to meet current, emerging and future threats and will continue to innovate, adapt, fight and win – as it has for hundreds of years and as it will continue to do in the future – in order to defend the American people and promote global security and prosperity. Thank you.

Rear Admiral Jesse A. Wilson, Jr.
Director, Assessment Division (OPNAV N81)

Rear Adm. Jesse A. Wilson Jr. is a native of California, Maryland, and the son of a retired Navy master chief petty officer. He received a Bachelor of Science in Mathematics from the United States Naval Academy in 1986. He also attended the U.S. Naval Postgraduate School, Monterey, California, earning a Master of Science in Operations Research in 1991, and is a graduate of the Naval War College in Newport, Rhode Island, where he received a Master of Arts in National Security and Strategic Studies in 2001.

At sea, he has served as main propulsion assistant and combat information center officer in USS Reasoner (FF 1063); engineer officer aboard USS Antrim (FFG 20); space examiner in the gas turbine branch of Commander In Chief, U.S. Atlantic Fleet's Propulsion Examining Board; and executive officer of USS Fitzgerald (DDG 62). As commanding officer of USS Higgins (DDG-76), he led Higgins during a 6- month Western Pacific deployment with the USS Nimitz Carrier Strike Group (CSG) as part of Operation Iraqi Freedom and Enduring Freedom. During his major command tour, he served as sea combat commander for the USS Nimitz Carrier Strike Group during the 2009-2010 Western Pacific deployment, and while in command of Destroyer Squadron (DESRON) 23 he also served as the mission commander for Pacific Partnership 2011, Commander, U.S. Pacific Fleet's annual humanitarian and civil assistance mission to Southeast Asia and Oceania.

Ashore, Wilson has served at the U.S. Naval Academy as the 27th company officer; as a joint warfighting analyst on the Joint Staff, J8-Force Application Assessment Division; campaign analyst Office of the Chief of Naval Operations (OPNAV) N81 Assessment Division; deputy executive assistant to two chiefs of Naval Operations; interim deputy director of the 21st Century Sailor Office; executive assistant to the Chief of Naval Operations and as the director, Joint Integrated Air and Missile Defense Organization (JIAMDO), Joint Staff, J8 during his first flag officer assignment.

Wilson most recently commanded, Carrier Strike Group 10, USS Dwight D. Eisenhower Carrier Strike Group during a combat deployment leading them during Operation Inherent Resolve, Operation Odyssey Resolve and Operation Oaken Steal in the Arabian Gulf and eastern Mediterranean Sea during spring/summer 2016.

Wilson is currently assigned as the director, Assessments Division (N81) on the OPNAV Staff. He assumed those duties Sept. 22, 2016.

Additionally, Wilson is a 2007-2008 Massachusetts Institute of Technology Seminar XXI Fellow and is a graduate of the Navy Corporate Business Course at UVA-Darden. His personal awards include the Defense Superior Service Medal, Legion of Merit with three gold stars, Defense Meritorious Service Medal, Meritorious Service Medal, Navy-Marine Corps Commendation Medal with four gold stars, Joint Service Achievement Medal and the Navy Achievement Medal with one gold star.

Updated: 26 January 2017

STATEMENT OF

MR. CHARLES P. WERCHADO

U.S. NAVY

DEPUTY DIRECTOR, ASSESSMENTS DIVISION FOR CHIEF OF NAVAL OPERATIONS

BEFORE THE

HOUSE ARMED SERVICES SEAPOWER SUB-COMMITTEE

ON

NAVY-LED FUTURE FLEET ARCHITECTURE STUDY

MARCH 8, 2017

NOT FOR PUBLICATION UNTIL
RELEASED BY THE HOUSE ARMED
SERVICES COMMITTEE

Mr. Chairman, Ranking Member Courtney, and distinguished members of the Sub-Committee, thank you for the opportunity to testify on the results of the Navy Project Team Future Fleet Architecture Study. In accordance with the 2016 National Defense Authorization Act, the Secretary of Defense directed three independent studies to examine the Future Fleet Architecture. One of them was an independent Navy-led study. I led the Navy's Project Team, which consisted of participants from throughout the Navy including the Naval Postgraduate School; the U.S. Naval War College; the Center for Naval Analyses; and other Navy Fleet and Headquarters equities, as well as the Naval Surface Warfare Center, Dahlgren Division and the Office of Net Assessment within the Office of the Secretary of Defense, as per the FY16 NDAA direction.

The Navy Project Team was given wide latitude within a fixed set of parameters to develop an analysis that was a distinct excursion not constrained by current Navy submissions. As such, the Project Team study does *not* represent any official Navy position, but is an independent and unconstrained approach to examining a potential future, against an expected future threat. Although this study is focused on the architecture of the future fleet, it also explores how that fleet will be used, including alternative concepts of operations.

To inform our study of the future fleet, the Navy Project Team developed a set of assumptions about the future security environment based on the threats and opportunities presented by: the increasingly utilized, stressed, and contested maritime environment in a more globalized world; the rise of the global information system and the increasing rate of technological change and adoption; our potential adversaries and their growing arsenals of high-end warfighting capabilities; and international terrorist groups like ISIS, who have demonstrated their resilience and adaptability, and who now pose a long-term threat to stability and security around the world. The study was also conducted in consideration of the requirement to defeat a near-peer competitor with a robust anti-surface capability, while deterring all other threats in any theater concurrently.

The Navy Project Team postulated that the U.S. will continue to provide strong and sustained leadership for a rules-based international order that promotes global security and prosperity through the 2030s. Accordingly, the Navy Project Team identified five key missions the U.S. Navy will perform in support of this leadership role: protecting the homeland, building security globally, establishing sea control, projecting power, and winning decisively.

Based on these projected circumstances and requirements, the Project Team designed a 'Distributed Fleet' architecture, which will allow the Navy of the future to accomplish the

missions required of it, providing the strong and sustained forward presence needed to influence geopolitical events, respond to crises, reassure allies and partners, and deter potential aggressors.

The Distributed Fleet was conceived to deliver decisive combat power, as part of a joint force, to defeat U.S. adversaries if deterrence were to fail. It was developed as an asymmetric response to adversaries' increasing reconnaissance-strike capabilities that can find, track and target our traditional centers of gravity - even mobile ones - and have the ability to overwhelm concentrated defenses. Furthermore, it would improve and expand battlespace awareness.

As envisioned by our Project Team, the Distributed Fleet would encompass a widely dispersed, intricate network of air, surface, and sub-surface platforms capable of delivering both kinetic and non-kinetic effects and supported by survivable logistics, employing three mutually-supporting concepts of operations (CONOPS): Distributed Fleet Lethality, Electromagnetic Maneuver Warfare, and Distributed Agile Logistics. Navy systems would be part of an assured, agile information-sharing environment that would present opportunities to engage enemy platforms before they could attack. The Distributed Fleet would focus on fleet-wide coordination and enable a greater reliance on strikes delivered from combat nodes beyond the carrier strike group, freeing more carrier air wing assets to focus on surveillance, targeting, and electronic attack.

Implementing the concept of Distributed Fleet would require increased investments in the quantity, quality and types of weapons required to strike adversary targets. Priority was given to next generation offensive surface warfare weapons for sea control within a contested maritime area, as well as multi-mode weapons capable of striking a variety of types of targets. The concept would employ unmanned air vehicles on as many platforms as possible to give ships the ability to conduct continuous, organic intelligence, surveillance, reconnaissance and tracking at sufficient ranges to employ advanced weapons available to the fleet – something the current fleet cannot do. It would also call for the development and fielding of armed unmanned surface vehicles, transported by and deployed from ships with well decks, to further distribute shooters within a given theater. Additionally, the concept would expand the use of unmanned underwater vehicles deployed from submarines, as well as independently deployable large unmanned underwater vehicles, to provide theater commanders with the ability to deploy sensors and weapons into highly contested, previously denied waterspace.

Accelerating development and fielding the capabilities to support the Electromagnetic Maneuver Warfare concept will allow our future Navy to deliver the assured communications

required to net the fleet and enable required kill chains. It will also accelerate the fielding of key capabilities to counter adversary surveillance and targeting systems, improving fleet survivability, and will deliver improved electronic warfare systems to better protect ships and aircraft and increase the range of warfighting effects.

Finally, Distributed Agile Logistics enables the Distributed Fleet by sustaining combat operations in a contested environment. The U.S. Navy has not been called upon to do this mission since World War II. It shifts reliance from vulnerable shore bases to more survivable afloat and ashore hubs. It would also improve the Navy's ability to conduct expeditionary maintenance and reload weapons in theater, including at sea.

The Navy demonstrated its ability to leverage new operational concepts during WWII when a changing environment demanded innovation. While no major new ship types were introduced during the first 18 months of the war, the Navy was able to utilize its existing platforms with great effectiveness by fundamentally changing their roles in the fleet: submarines went from screening the fleet to unrestricted warfare; carriers shifted from scouting into a main striking force; and battleships transitioned from a main striking force to amphibious fire support, an entirely new mission set.

In the future security environment, the Distributed Fleet would continue to deploy forces forward, both in support of warfighting requirements and enduring missions. The composition of the fleet would change by reducing legacy platforms, the functions of which would be fully or partially assumed by a larger number of unmanned platforms, and by divesting in capabilities not directly aligned to the Navy's core functions of deterrence, sea control, power projection, all domain access, and maritime security.

While timelines did not allow for a detailed performance assessment of the proposed fleet, the Navy Project Team combined existing concepts and used associated studies and analysis to inform its work. The next step in determining the effectiveness, risks and benefits of the Distributed Fleet platform architecture would be extensive CONOPS development, including a robust wargaming, analysis, experimentation, and exercise effort, as well as an evaluation of its potential contributions to the joint force.

Many of the technologies that enable the Distributed Fleet architecture require technical maturation. The Navy Project Team incorporated assumptions about the time required to develop and field new technologies to support a 2030 fleet, but the robustness of those assumptions is difficult to accurately evaluate. Finally, the Navy Project Team recognized that the naval industrial base would be impacted by implementing this architecture. The unmanned

vehicle industrial base would have to grow to supply more than 600 vehicles by 2030. Developing and delivering the required electromagnetic maneuver warfare capabilities, expeditionary logistics capabilities, and unmanned vehicle capacity likely would stress corresponding industrial capabilities as they attempt to meet expanding Navy, and probably concurrent DoD demands.

Summary

Given the service lives of today's surface ships and aircraft, 75% of our current fleet will still be operating in 2030. Adding to that the years or even decades required to design and construct a new platform, the Navy must look beyond fleet architecture – toward new operational concepts – to address and defeat emerging threats. Implementing the Distributed Fleet represents a far greater opportunity to effect change, specifically in the areas of Electromagnetic Maneuver Warfare and Counter-C4ISR, Distributed Lethality, and Distributed Logistics.

Ultimately, the study effort focused on how the fleet would organize, concepts of fleet operations and employment implications for fleet platforms (ships, subs and aircraft). It should be noted that this effort did not use a set of combatant commander presence demands to determine a required capacity. Increased lethality was achieved by distributing strike forces, including unmanned systems. Electro-Magnetic Maneuver Warfare provides an assured network and communications system able to unify the fleet into robust kill chains while denying the enemy targeting. These distributed lethal nodes make every fleet platform a sensor, communicator, or shooter, or some combination of the three.

The Navy is dedicated to meeting current, emerging and future threats and will continue to innovate, adapt, fight and win in the future. This study developed a new concept – the Distributed Fleet – supported by Distributed Fleet Lethality, Electromagnetic Maneuver Warfare, and Distributed Agile Logistics as a proposed Fleet Design Architecture to adapt to meet the future threat. I look forward to taking your questions.

Charles "Chuck" P. Werchado
Deputy Director, Assessment Division (N81B) Chief of Naval Operations

Mr. Werchado is the deputy director of the assessment division in the Office of the CNO (N81). As the Navy's senior operations analyst, he is responsible for management of the analytic agenda, process, and staff used both to provide the capability basis for informing CNO's resource allocation decisions, and to accurately represent Navy capabilities in the Joint analytic process.

From May 2011 to June 2014, Mr. Werchado served as the executive director, submarine forces where he was the principal advisor to the submarine force commander on all matters relating to undersea domain programs and requirements.

From April 2010 to May 2011, Mr. Werchado served as deputy director for warfare integration (N8F). He was responsible for management of the processes that assessed the relative warfighting systems' investment priorities and integrated the overall warfighting procurement budgets from the warfare sponsors. In addition, he developed and provided Congress with the Navy's long-range shipbuilding plan supporting ship procurement over the next 30 years.

In January 2003, he was appointed to the Senior Executive Service and served as the director, Naval forces division in the Office of the Secretary of Defense, Program Analysis and Evaluation. He led a team that assessed the Navy's program and recommended changes to the Secretary, issued analysis of alternative guidance, and conducted studies on future naval capability requirements.

From 1997 to 2002, he served on the staff of the Chief of Naval Operations in N81 as the simulation and analysis team leader and as a joint campaign analyst. In 1987, Mr. Werchado began his civilian career with the Navy as an undersea warfare analyst and scientific and technical intelligence liaison officer at the Naval Undersea Warfare Center (NUWC).

Mr. Werchado served on active duty for six years as a Naval Intelligence officer from 1981 to 1987. He separated from active duty as a Lieutenant, and continued to serve in the Naval Reserve until retiring as a Commander in 1999 (including three year's enlisted service while completing his Bachelor's degree).

Mr. Werchado graduated in 1980 from State University of New York with a Bachelor of Science. He earned a Master of Science in Operations Research Analysis while working as a civilian intelligence analyst at NUWC. He is also a distinguished graduate of the Naval War College, and has completed both the Harvard University Senior Executive Fellowship and the Massachusetts Institute of Technology Seminar XXI programs. His awards and decorations include the Exceptional Civilian Service Medal, Superior Civilian Service Medal, Meritorious Civilian Service Medal (2), and Joint Commendation Medal.

TESTIMONY

STATEMENT BEFORE THE HOUSE ARMED SERVICES COMMITTEE ON FUTURE FLEET ARCHITECTURE STUDIES

March 8, 2017

Statement by Bryan Clark
Senior Fellow, Center for Strategic and Budgetary Assessments

Chairman Wittman, Ranking Member Courtney, and distinguished members of the committee: thank you for inviting me to testify today on the architecture and operations of the future fleet. This subject is both important and timely. The U.S. Navy is at a crossroads, with each major ship type undergoing a transition over the next several years. After delays in construction and testing, the first *Ford*-class aircraft carrier and *Zumwalt*-class destroyer are finally joining the fleet. Programs for the *Virginia*-class submarine, *Burke*-class destroyer, *San Antonio*-class amphibious transport dock, and Littoral Combat Ship are all beginning new variants. The *Columbia*-class ballistic missile submarine (SSBN) is in development. And the Navy is fielding a host of new unmanned air, surface, and undersea vehicles and systems.

These changes come as the United States faces security challenges it has not encountered since the end of the Cold War. Great power competitors such as China and Russia improved their military capabilities over the last two decades and now appear willing to challenge the international order. They are likely to soon replace transnational terrorism as the primary concern of U.S. military planners. At the same time, regional powers Iran North Korea will continue to field capabilities acquired from great powers and exploit their advantageous locations to cause outsized effects.

The Navy should reevaluate the fleet's configuration before it misses the opportunities associated with this time of transition. Deterring increasingly capable great powers and countering more aggressive regional adversaries will take more than simply recapitalizing today's ships when they reach the end of their service lives. It will require new operational concepts, force packages, posture and basing, readiness cycles, and manned and unmanned platforms, as well as update sensors and weapons. The fleet architecture studies directed by the Congress in the 2016 NDAA were intended to address these needs for the fleet of 2030.

A New Strategic Approach

Since the Berlin Wall fell, naval force structure requirements reflected an expectation that America's main military challenges would come from regional powers that lacked the ability to rapidly defeat a U.S. ally or prevent American forces from coming to the ally's defense. Naval force structure investments, therefore, focused on efficiently maintaining a visible presence in important regions, rather than on what would be needed to fight a peer competitor. Even if forces on or near the scene were unable to stop an act of aggression, in-theater naval and other forces could enable the mobilization of a U.S. and allied response to reverse the adversary's gains, as in the 1991 Gulf War, or overthrow the adversary's regime, as in the wars in Kosovo, Afghanistan, or Iraq.

Potential great power adversaries such as China and Russia are improving their capabilities and making it less likely that the mere presence of U.S. forces will deter them. Most significantly, their long-range air defense and strike systems could prevent the United States and its allies from mobilizing a conventional response in an adjacent theater as was done in the lead-up to the wars in Kosovo, Afghanistan, and Iraq. Instead of responding to aggression after the fact, to deter increasingly revisionist great powers, U.S. forces will need the capabilities and operational concepts to deny them the objectives of their aggression or to punish them until the aggression stops.

This "deny-and-punish" approach to conventional deterrence is how the United States and its allies countered the Soviet threat during the Cold War, and it has significant implications for fleet architecture. This strategic approach will increase America's reliance on forward-postured forces—particularly naval forces—that could rapidly interdict aggression and conduct attacks on targets the enemy values to compel the aggression to stop.

New Operating Concepts

Denying rather than responding to aggression will require that U.S. naval forces be able to operate and fight in highly contested areas close to an aggressor's territory or near the likely objects of aggression. Surviving and stopping an enemy attack in these areas will require a range of new operating concepts to better defend U.S. forces and increase their lethality.

New operating concepts are the most important element of a new fleet architecture because they will guide the packaging of forces and the characteristics needed for the fleet's platforms, sensors, weapons, and networks. We assessed that an overarching requirement for all new concepts in the 2030s would be to remain viable in a highly-contested communications environment. This will likely increase the fleet's reliance on short-range low probability of intercept/low probability of detection (LPI/LPD) communications and individual commanders leading operations without higher-headquarters guidance.

New concepts for Air and Missile Defense (AMD) will be key to enabling offensive naval

operations inside contested areas. These new concepts will conduct air defense at shorter ranges to increase each ships' defensive capacity and posture naval forces in a more distributed manner to increase the number of targets the enemy must engage. Conducting air defense at 10 to 30 miles away, rather than 100 miles or more as is common today, allows naval forces to use higher capacity capabilities such as smaller, less expensive interceptors and electronic warfare systems instead of large, long-range interceptors. A shorter-range air defense concept would also enable ships to use new technologies such as laser, high-power microwave, or hypervelocity projectile weapons for air defense. To further increase the number of targets an enemy must engage, naval forces will need to adopt new approaches to electromagnetic spectrum (EMS) warfare that create many false decoy targets, degrade enemy sensors, and enable U.S. forces to find the enemy without being counter-detected.

Submarines are some of the most challenging missile launch platforms U.S. naval forces will face because they can approach undetected to within anti-ship missile range. As adversary submarine fleets continue to grow, U.S. forces will need to adopt new anti-submarine warfare (ASW) concepts that suppress enemy submarine operations instead of trying to find and destroy every enemy submarine. These new approaches could use active sonar to convince submarine crews they may have been detected and employ less-expensive air-launched or standoff weapons to attack each potential submarine detection to compel submarines to evade and lose the initiative.

To best exploit their own access to the undersea domain, U.S. forces will need to increasingly use unmanned vehicles and systems for offensive undersea operations in areas close to an adversary's coast. Although individual unmanned systems may not have the endurance, speed, sensor capability, and autonomy to replace submarines, they could attack ships in port and targets ashore, lay mines, conduct surveillance, or degrade enemy sensors. Networks of unmanned systems may be able to conduct more complex operations such as ASW or attacks on enemy warships. In these concepts, U.S. submarines will be used to provide command and control to undersea operations and conduct the most challenging surveillance and attack missions, rather than being a front-line force for all undersea operations.

By adopting a shorter-range AMD concept, U.S. naval forces should be able to devote more of their weapons capacity to offensive missions. Using concepts including Distributed Lethality, they could engage larger numbers of enemy targets with VLS-launched missiles, particularly in the initial days of conflict that will be most critical to denying or delaying aggression. Naval forces at sea should be complemented by amphibious forces ashore at expeditionary advance bases (EAB), which can conduct surface-to-air and surface-to-surface fires to further constrain enemy operations.

These concepts will employ unmanned systems to a larger degree than the current force for surveillance, targeting, countering enemy sensors, and delivering weapons. They do not, however, replace manned platforms with unmanned systems. Largely because of

the likely sensor and communication limitations of unmanned weapons platforms, manned platforms will be needed in the 2030s to manage unmanned vehicles and systems and provide the accountability to employ weapons. Moreover, the need for naval forces to focus on deterrence will reduce their ability to use unmanned systems for forward operations, since unmanned vehicles may not have the same deterrent effect as a manned platform and could more easily be tampered with or neutralized by an adversary.

Changing the Deployed Fleet

New operating concepts will give rise to a range of new force packages such as surface action groups (SAGs), ASW groups, unmanned vehicle squadrons, counter-C4ISR groups, and mining groups. These groups will combine manned and unmanned systems to specialize in the new operations needed to conduct survivable, high volume offensive operations in highly contested areas.

These force packages will likely need to be deployed differently in the 2030s than naval forces today. Given the short timelines in which aggression could occur and escalate against U.S. allies in East Asia, the Middle East, and Europe, the proximity and capabilities of deployed naval forces may make the difference between an adversary being deterred or perceiving an opportunity to act.

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

We propose dividing the deployed fleet into two main groups to achieve an effective posture: "Deterrence Forces" of surface, amphibious, and undersea forces that are organized into discrete regions rather than Combatant Commander (CCDR) areas of responsibility (AOR), and a "Maneuver Force" of two carrier strike groups (CSG) that is assigned broadly to the Indo-Asia-Pacific theater.

Separating the deployed fleet into these two main groups enables Deterrence Forces to be tailored to their region and improves their ability to influence, prepare for, and adapt to adversary advancements. And because Deterrence Forces will remain in their region, the Maneuver Force would be able to respond to tensions and conflict in any part of the Indo-Asia-Pacific theater, including the Middle East, without leaving an opening for opportunistic aggression by an adversary seeking to exploit a shift in U.S. focus to the area of conflict. In turn, because the Maneuver Force is not tied to a specific theater, it will be able to conduct concept development, experimentation, and exercises when on deployment.

Operationally, separating the deployed fleet into Deterrence Forces and the Maneuver Force enables commanders to align elements of the fleet with their likely operational needs. Deterrence Forces of surface combatants, submarines, and amphibious ships

could provide prompt, high-capacity fires to deter an adversary seeking a rapid *fait accompli,* such as China or Russia. The Maneuver Force of multiple CSGs would be able to relieve Deterrence Forces once conflict occurs to deliver sustained combat power at moderate levels over an indefinite period.

The Deterrence Force posture in each region is designed to provide the ability to promptly deny adversaries their likely objectives and attack targets the enemy would value. Although the characteristics of Deterrence Forces are focused on great powers such as China and Russia, they can also address strategically located regional powers such as Iran or North Korea. Because of their location, Deterrence Forces would conduct day-to-day operations such as maritime security and disaster response, particularly with the maritime forces of allies and partners. These less-stressing missions, however, do not drive the composition of Deterrence Forces.

Composition and Costs of the Proposed Fleet

The CSBA fleet architecture translates naval posture into an overall number of ships and aircraft required to carry out the strategy of deterring aggression through denial and punishment. In addition to supporting the rotational readiness cycle, the architecture includes additional ships to account for the time ships are in transit and the long-term maintenance that takes ships out of their readiness cycle. Further, the architecture assumes that, consistent with the Navy's current force structure assessment, the rotation base of non-deployed forces in the readiness cycle is sufficient for wartime surge requirements.

The table below depicts the proposed fleet architecture. It includes 382 manned ships, of which 340 fall under the Navy's battle force counting rules. The architecture also includes extra-large unmanned vehicles (XLUSV and XLUUV) and ground-based patrol aircraft. Shipborne aircraft such as CVW aircraft, Tactical Exploitable Reconnaissance Node (TERN) UAVs, and helicopters are assumed to be included with the ships on which they would deploy.

COMPOSITION OF THE PROPOSED FLEET[1]

	Total Fleet Required
CVN	12
CVL	10
DDG-1000	3
DDG	71

[1] The totals at the bottom of this chart use current counting rules or total number of manned ships. The current counting rules do not count ships that do not directly support combat operations, such as sealift ships or hospital ships. The current rules also do not include ships that are not able to move themselves to their deployed area and must instead be carried there by a lift ship, such as today's patrol coastal (PC) or the proposed patrol vessels. See Secretary of the Navy, *General Guidance for The Classification of Naval Vessels and Battle Force Ship Counting Procedures,* SECNAVINST 5030.8C (Washington, DC: Department of the Navy, June 14, 2016), p. 2.

FFG	71
Patrol Vessel	42
SSN	66
SSBN	12
Small Deck Amphibious Ships (LPD, LX(R))	29
Large Oiler (T-AOE)	26
Large Dry Stores Ship (T-AKE)	4
Unmanned Vehicle Support Vessel	14
Afloat Forward Staging Base	2
Large Dry Stores Transport Ship w/VLS	1
Tender	5
Salvage/Fleet Tug	6
Oceanographic Research Ship	5
Command Ship	3
Total Battle Force Ships (using current counting rules)	**340**
Total Fleet (including patrol vessels)	**382**
XLUSV	40
XLUUV	40
MQ-4 Detachment (3 A/C)	14
P-8 Detachment (3 A/C)	44
Unmanned Vehicle Squadron	6

Implementing the Proposed Fleet Architecture

We estimate that the CSBA architecture will likely cost about 15–20 percent more to build, operate, man, and sustain than the Navy's planned fleet of 308 ships.[2] The shipbuilding industrial base could reach the objective number for each ship type of the proposed fleet architecture in the 2030s, but additional investment will likely be needed in shipyards and the supplier industrial base to support increased production.

The alternative shipbuilding plan that delivers the proposed fleet architecture will cost an average of $23.2 billion per year, 18 percent more than the $19.7 billion annual cost of the draft 30-year shipbuilding plan associated with the President's Budget for FY 2017 (PB17).[3] If the Navy expands the CLF fleet to meet the wartime demands of the proposed fleet architecture, the average annual cost rises to $23.6 billion, 20 percent greater than the PB17 plan. The operations and maintenance (O&M) costs associated with the proposed fleet architecture plan will cost an average of $16.5 billion per year, 14 percent

[2] The Navy has not published any plans to build or sustain its new 355-ship requirement.

[3] Chief of Naval Operations (CNO), *Report to Congress on the Annual Long-Range Plan for Construction of Naval Vessels for Fiscal Year 2017* (Washington, DC: Department of the Navy, July 2016), p. 7.

more than the $14.6 billion associated with the PB17 budget.

The alternative shipbuilding plan balances the need to achieve the proposed architecture with the imperative to manage costs. For the new ship types proposed by the CSBA architecture, the plan assumes existing platforms, with modest modification, will support the new operational concepts of the proposed architecture. The plan replaces these platforms at the end of their service lives with new, purpose-built ships and aircraft designed for their missions in the new architecture.

Conclusion

Today's Navy emphasizes efficiency over effectiveness. This was a rational reaction to the presumed end of great power competition with the fall of the Soviet Union. In the decades that followed, the U.S. Navy developed a process to affordably maintain a continuous presence of deployed forces in each CCDR AOR. These forces may not be able to stop aggression by regional powers but could support an eventual response by follow-on forces as was done in Kosovo, Iraq, and Libya.

This approach to conventional deterrence will not likely work against the potential great power aggressors of the 2030s, who will have much greater military capabilities than past regional adversaries and probably seek a quick, decisive victory over their adversaries. Efforts to reverse the results of aggression after the fact would require a much larger conflict and would likely have global consequences that would create international pressure to reach a quick settlement.

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

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

Bryan Clark
Senior Fellow

SUMMARY OF QUALIFICATIONS
As a Senior Fellow at the Center for Strategic and Budgetary Assessments, Bryan Clark directs studies and analyses on the future of warfare, the implications of new technologies, and naval strategy and operations. He has led research sponsored by the Department of the Navy, Defense Advanced Research Products Agency (DARPA), and Office of the Secretary of Defense to help guide decisions on how the U.S. military should organize, train, and equip its forces. Mr. Clark has also published studies on the future of electronic and electromagnetic spectrum warfare, undersea warfare, naval surface warfare, strike operations, and air and missile defense.

CURRENT POSITION
Mr. Clark is a senior fellow at CSBA, an independent policy research institute established to promote innovative thinking about defense planning and investment strategies for the 21st century.

AREAS OF EXPERTISE
Strategy Development
Undersea Warfare
Electromagnetic Warfare
Force Planning
Long-Term Military Competition
Military Readiness

PREVIOUS PROFESSIONAL EXPERIENCE
Mr. Clark enlisted in the Navy in 1982, and following Recruit Training in Great Lakes, Illinois he entered the enlisted Naval Nuclear Propulsion Training pipeline as a Machinists Mate. At the end of enlisted nuclear training, he was selected for the Enlisted Commissioning Program (Nuclear Option) and majored in Chemistry and Philosophy at the University of Idaho, graduating in 1988. He then completed the officer Nuclear Propulsion Training pipeline and reported to USS ALABAMA (SSBN-731) (Gold) in November 1990.

While on ALABAMA, Mr. Clark served as Torpedo/Fire Control Officer, Chemistry and Radiological Controls Assistant, and Assistant Weapons Officer, contributing to ALABAMA's receiving the Battle Efficiency "E". He then served temporarily on USS ALEXANDER HAMILTON (SSN-617) before returning to ALABAMA to qualify as Engineer Officer and Weapons Officer. Mr. Clark transferred to shore duty at Trident Training Facility in Bangor, Maine in November 1993, where he was the Tactics Training Division Officer and led implementation of the Tactical Weapons Proficiency Phase 1 training program for Trident submarines.

Mr. Clark returned to sea in June 1996 as Engineer Officer of USS GEORGIA (SSBN-729) (GOLD), where he completed five patrols and the first-ever Trident submarine Extended Refit Period. Following GEORGIA, Mr. Clark relieved as Executive Officer in Moored Training Ship 635 (Ex-Sam Rayburn) at the Naval Nuclear Power Training Unit (NPTU) in Charleston, South Carolina. On MTS 635, he led the qualification of more than 2000 nuclear propulsion plant operators and implemented improvements that helped

establish NPTU as the standard for the nuclear fleet.

In August 2001, Mr. Clark relieved as the NPTU Operations Officer, where he oversaw Base Operations Support, including facilities and physical security. Following the terrorist attacks of September 11, 2001, he led improvements in physical security to protect the command's two nuclear powered ships and more than 1600 personnel, including increased manning, new shore infrastructure, and waterborne patrols.

Mr. Clark then transferred to the staff of the Chief of Naval Operations (Assessment Division), where he led studies in the Assessment Division and participated in the 2006 and 2010 Quadrennial Defense Reviews. His areas of emphasis were modeling and simulation, strategic planning, and institutional reform and governance. After graduating from the National War College in 2011, Mr. Clark was selected to be Special Assistant to the Chief of Naval Operations and Director of his Commander's Action Group, where he led development of Navy strategy and implemented new initiatives in electromagnetic spectrum operations, undersea warfare, expeditionary operations and personnel and readiness management. He came to CSBA in November 2013.

EDUCATION
Master of Science in National Security Studies
National War College

Bachelor of Science in Chemistry and Philosophy
University of Idaho

Recipient of the Department of the Navy Superior Service Medal and the Legion of Merit.

NOT FOR PUBLICATION UNTIL
RELEASED BY THE HOUSE ARMED
SERVICES COMMITTEE

STATEMENT OF

DR. SUNOY BANERJEE

THE MITRE CORPORATION

BEFORE THE

HOUSE ARMED SERVICES COMMITTEE,
SEAPOWER AND FORCE PROJECTION SUBCOMMITTEE

ON

FUTURE FLEET ARCHITECTURE

MARCH 8, 2017

Chairman Wittman, Ranking Member Courtney, and distinguished members of the Committee, I appreciate the opportunity to testify on the findings and recommendations from MITRE's recent Future Fleet Architecture (FFA) study. The FY16 National Defense Authorization Act Section 1067 directed the Secretary of Defense to perform three independent studies of alternative future fleet platform architectures for the Navy in the 2030 timeframe. In response, the Chief of Naval Operations Director of Assessment Division, OPNAV N81, asked the MITRE Corporation's National Security Engineering Center (NSEC), a Federally Funded Research and Development Center (FFRDC), to deliver one of the three studies. MITRE conducted the study over a four-month period and delivered the final report on July 1, 2016.

MITRE started by assessing the suitability of the planned naval force, within the context of today's national security environment, to gauge whether the planned force was sufficient. The current Defense Strategic Guidance (DSG) is based on a strategy to defeat one adversary while deterring, or holding, another and defending the homeland. Force structure analysis applies the DSG, using approved Defense Planning Guidance scenarios, evolving threats, planned capabilities, expected adversary force structure, etc. to set future U.S. force structure objectives. OPNAV N81 force structure assessments in 2012, with an update in 2014, determined the 2030 fleet warfighting requirements. After reviewing these analyses, MITRE assessed the force structure required for a more stressing scenario, using the same methodology and planning factors as OPNAV N81. This alternative force structure analysis resulted in a 2030 fleet size of 414 ships and submarines, as opposed to the 304 in the current shipbuilding plan.

A number of sources have focused on this 414 number from our report, but this is NOT the force level that MITRE is recommending. The purpose of this analysis was to understand whether a problem existed and, if so, roughly bound its size. The differential between the 414 ships from the alternative force structure analysis and the planned 304 ships in 2030 implies the planned force structure and capabilities are insufficient. MITRE does not believe it is feasible, either from a budget or U.S. shipbuilding capacity perspective, to produce another 110 ships over the next 10 to 15 years. Consequently, MITRE focused its analysis on understanding the underlying factors driving the higher ship numbers and recommending a set of solutions to improve the effectiveness of key platforms. Furthermore, since the average hull

life of a ship is 40 to 50 years and it takes time to build new classes of ships in sufficient number to make a difference, MITRE emphasized solutions to make existing ships and aircraft more effective, vice new platforms or ships with radically different designs. Put simply, we recommend modestly increasing the size of the Navy to 322 ships by 2030, while also improving the Fleet's survivability and effectiveness.

The number of surface combatants is the largest discrepancy between the planned force and the results from the alternate force structure analysis. The current planned number of surface combatants in 2030 is 135 ships, whereas the alternative force structure analysis calls for 206 ships. MITRE believes the primary driver for the larger number of surface combatants is the growing number of long-range, capable anti-ship cruise and ballistic missile systems being fielded by our potential adversaries.

MITRE proposed an alternative strategy for Integrated Air and Missile Defense (IAMD) that revolved around several innovations: 1) a hyper velocity projectile (HVP) fired from a Mark 45 5-inch gun to address cruise missiles, 2) an air-launched missile capable of intercepting advanced missile threats, and 3) HVP fired from a rail gun to address advanced missile threats. All existing AEGIS surface combatants have one or two Mark 45 5-inch deck guns and could employ HVP rounds to improve their cruise missile defense capabilities. Adding an air-launched missile – capable of engaging advanced missile threats or their launch platforms – enables the F-35s and F/A-18s in the carrier air wing to augment the missile defense capabilities of the AEGIS surface combatants. Obviously, both of these innovations can be employed from existing platforms and reloaded at sea from the existing Combat Logistics Force (CLF) ships, as is routinely done today for other consumables. These innovations also have the advantage of being less costly than the systems they are designed to defeat. Preliminary campaign modeling of these two innovations, with reasonable probabilities of kill against adversary missiles and with planned force levels, suggests a significant reduction in loss rates – thus reducing the need for more ships as suggested by MITRE's alternative force structure analysis.

The number of attack submarines accounts for the other significant difference between the planned force and the one prescribed by the alternate force structure analysis. The current shipbuilding plan calls for 42 nuclear attack submarines (SSNs) by 2030, whereas the

alternative force structure analysis calls for 72. At the peak of the Cold War in the 1980's, the Navy had an attack submarine force structure requirement of more than 100 SSNs. To increase the size of the submarine force, MITRE recommended continuing to build two additional *Virginia*-class nuclear attack submarines per year and augmenting them with air-independent propulsion (AIP) attack submarines. The AIP attack submarine design could be licensed from an ally, such as Germany or Japan, and built here by a U.S.-controlled subsidiary. MITRE estimates that three AIP attack submarines could be built at the same cost of one *Virginia*-class nuclear attack submarine. The AIP attack submarines have smaller magazines, significantly reduced speed of advance, etc. than their *Virginia*-class counterparts. However, AIP attack submarines can augment the existing submarine force to increase presence and are very capable when operating on station.

Given the very significant ranges of the current and emerging anti-ship missiles, it will take the naval force time to defeat them and maneuver into positions from which to unleash the offensive power of its aircraft carriers. If an adversary is able to achieve their objectives before the aircraft carriers are in a position to project power, then the U.S. will have lost the initiative. In MITRE's view, the fleet requires a long-range strike capability to dissuade, disrupt, and delay an adversary at 1,000 to 2,000 nautical miles to prevent them from achieving their objectives before the larger naval force is in a position to counter them. The Standard Missile does not have the necessary range and, while the Tomahawk Land Attack Missile (TLAM) has the range, it is too slow. Consequently, the surface and submarine force needs a supersonic replacement for the TLAM to enable force projection until the carrier air wing is within range. MITRE recommends the development of a supersonic missile that is compatible with existing vertical launch cells. In the 1980s, the U.S. Army had a long-range strike capability with the Pershing 2 missiles, which were decommissioned as part of the Intermediate-range Nuclear Forces (INF) treaty signed in 1988. However, the INF only covers ground-launched systems, not maritime missiles. MITRE also recommends the U.S. Navy develop a Pershing 3 variant, to be launched from a large surface combatant, to provide a long-range offensive capability. The broader strategy is to use a limited number of these systems to keep an adversary off balance until the carriers, and their air wings, maneuver into striking range.

A high-medium-low force structure mix increases capacity while maintaining affordability. In 1976, Admiral Elmo Zumwalt wrote: "In sum, an all-high Navy would be so

expensive that it would not have enough ships to control the seas. An all-low Navy would not have the capability to meet certain kinds of threats or perform certain kinds of missions. In order to have enough ships and good enough ships there had to be a mix of high and low." MITRE's high-medium-low mix recommendations for the future force are:

1) Surface Combatant Force:
   High: Existing AEGIS cruisers and destroyers;
   Medium: New fast frigate (FFX);
   MITRE recommended terminating Littoral Combat Ship production and accelerating the new fast frigate, to be built around gun-based defense, for improved IAMD.
   Low: New magazine ship.
   MITRE developed a concept for using a commercial hull with a combination of VLS cells as a cost-effective means of increasing the magazine size of existing AEGIS ships, using engage-on-remote capabilities. It is also possible to mount additional deck guns, rail guns or larger Pershing 3 missiles within the magazine ship concept.

2) Submarine Force.
   High: Existing *Virginia*-class nuclear attack submarines;
   Medium: New air-independent propulsion (AIP) attack submarines, and;
   Low: Unmanned underwater vehicles.

3) Carrier Air Wing. The high, medium, and low alternatives for tactical aircraft discussed are:
   High: F-35C;
   Medium: F/A-18 E/F, and
   Low: Unmanned air systems

4) Carrier Force:
   High: Existing nuclear aircraft carriers;
   Medium: A new, conventional aircraft carrier design with the same hull as a CVN,
   Low: A new, smaller conventional aircraft carrier design, potentially based on the *America*-class amphibious assault ship hull

5) Amphibious Force. Several options are discussed and force structure recommendations are based on one of them. The high, medium, and low alternatives discussed are:
   High: Existing amphibious assault ships;
   Medium: Existing landing dock ships, and
   Low: New class of landing ship dock

In conclusion, MITRE recommended a 322-ship fleet in 2030 built around the following major themes:

1) Improving IAMD capabilities through the development and fielding of HVP into existing deck guns and an aerial-layer missile into existing carrier air wings. Rail gun is also a game changer and should be deployed into new ship designs, at a minimum, or into existing hulls, if practicable.
2) Improving long-range strike through the development and fielding of new supersonic and ballistic missiles into the surface and submarine force. These capabilities enable the naval force to project power while the carrier force is maneuvering into the striking range of its air wings.
3) Increasing force size, while controlling costs, via a high-medium-low mix of platforms. The strategy behind MITRE's recommendations is to use the aforementioned IAMD innovations to improve the effectiveness of the existing surface force while using AIP submarines to significantly increase the size of the submarine force.

The study tasking emphasized the number and types of ships and submarines needed by the future force. However, this force also requires new sets of weapons, sufficient numbers of modern aircraft, resilient C4I systems, and concepts of operation for integrating both kinetic and non-kinetic effects. A balanced investment across all of these factors is required for the Naval Force to maintain and increase its ability to deter aggression.

Dr. Sunoy Banerjee

Sunoy Banerjee received a B.S in physics from the Rochester Institute of Technology in 1995 and a Ph.D. in physics from the University of Indiana–Bloomington in 2000. Shortly thereafter, he joined the Center for Naval Analyses (CNA) to research the performance of IT systems in the fleet and develop guidance on their employment for warfighting. Some of Dr. Banerjee's major accomplishments include: reconstructing how satellite communications resources were apportioned, allocated, and used by the fleet during Operation Iraqi Freedom; supporting the development of software to automatically collect, process, and display fleet bandwidth usage data in near real time; and developing a system that quantified the amount of humanitarian assistance/disaster relief supplies delivered by naval forces in the aftermath of the Southeast Asia tsunami in 2004. In 2006, Dr. Banerjee joined a science and technology functional team at Booz Allen Hamilton. He supported a number of DARPA programs while also continuing to work with the Navy with the development of the Bandwidth Management during Aggregated Operations Concept of Operations and assessing of the stability of fleet routing. Dr. Banerjee joined MITRE in 2008 and currently supports communications and networks programs at the Office of Naval Research (ONR). In addition to these responsibilities, he has been involved in assessing communications options for contested operations, quantifying the warfighting bandwidth requirements of the fleet, and developing a network command and control strategy for the Navy. Dr. Banerjee is currently MITRE's Portfolio Manager for Naval RDT&E.

QUESTIONS SUBMITTED BY MEMBERS POST HEARING

MARCH 8, 2017

QUESTIONS SUBMITTED BY MR. LANGEVIN

Mr. LANGEVIN. To all witnesses—I am concerned that parts of these studies seemed to take place without any regard to funding feasibility. Were budgetary realities used as a qualifier across your studies? And what do you recommend, or what would you implement, as far as cost-savings measures go so that we are ensuring our dollars are spent effectively without having to cut other critical programs across the Department as well as the whole of government?

Admiral WILSON. Each of the studies used their own base assumptions and were not directed to be constrained by current year budgetary realities. As we start to determine best practices from the study recommendations and other discoveries from our wargaming and experimentation exercises then these results will have to compete with other Navy programs within the Navy's TOA. Once we determine what our funding levels are then we will balance our acquisition strategy against acceptable risk to best meet warfighting demands.

Mr. LANGEVIN. To all witnesses—I am concerned that parts of these studies seemed to take place without any regard to funding feasibility. Were budgetary realities used as a qualifier across your studies? And what do you recommend, or what would you implement, as far as cost-savings measures go so that we are ensuring our dollars are spent effectively without having to cut other critical programs across the Department as well as the whole of government?

Mr. WERCHADO. The NDAA Language did not specify if the architectures were to be constrained or unconstrained fiscally. Our original analysis did place due regard on funding feasibility. We used current projected funding levels from the actual shipbuilding, aircraft and weapons funding account (SCN, APN and WPN) out to 2030 and then removed that funding, except for COLUMBIA Class SSBN, which was considered mandatory to fund. With those three accounts providing an asset, we funded our recommended concepts of operation—Distributed Fleet Lethality, Electromagnetic Maneuver Warfare, and Distributed Agile Logistics. After the enablers for warfighting were funded—the sensors, communication systems, and weapons—we assembled the manned and unmanned platforms to populate the fleet architecture with a focus on fighting a major conflict. Later, when we saw preliminary drafts of MITRE and CSBA's reports we realized that we need not constrain ourselves to accept that much risk, so we went back and added assets to the deterrence/presence force. The Navy FFA leverages emerging technologies and operating concepts, including unmanned systems, in accordance with the NDAA direction to consider "opportunities for reduced operation and sustainment costs" and the "role of evolving technology on future naval forces, including unmanned systems."

Mr. LANGEVIN. To all witnesses—I am concerned that parts of these studies seemed to take place without any regard to funding feasibility. Were budgetary realities used as a qualifier across your studies? And what do you recommend, or what would you implement, as far as cost-savings measures go so that we are ensuring our dollars are spent effectively without having to cut other critical programs across the Department as well as the whole of government?

Mr. CLARK. The tasking in the 2017 NDAA required the Navy conduct fleet architecture studies to idenitfy the required size and shape of the future fleet and develop a plan to implement it, including associated costs. The Fleet Architecture study conducted by the Center for Strategic and Budgetary Assessments did take funding into account. We built a shipbuilding plan to describe how the Navy could reach the fleet size and mix we recommend. Using models from the Navy and the Congressional Budget Office, we developed estimates for the shipbuilding and operations and maintenance costs associated with our shipbuilding plan and fleet architecture. We constrained the implementation of the future fleet by the capacity of the shipbuilding industrial base. To account for funding feasibility, we also established an upper limit of 20 percent for the increase in the shipbuilding and operations and maintenance costs associated iht the proposed fleet architecture. These two limitations resulted in the shipbuilding plan we proposed in our study. We did not incorporate two approaches into our study that the Navy should consider to reduce costs associated with growing the fleet. First, the Navy could procure and build ships faster to maintain the shipyards at a more efficient pace. For example the Navy re-

cently reported it could save tens of millions of dollars per ship by building two T–AO(X) oilers per year instead of only one. Similarly, Huntington Ingalls Industries assesses it could save hundreds of millions of dollars per ship if the Navy purchased aircraft carriers (CVN) at three-year intervals, rather than every 5 years as they are today. These cost savings result from the shipyard being able to maintain workers on the same job in the shipbuilding process for each ship. If ships are started less frequently, workers at the beginning of the shipbuilding process, such as shipwrights, will be idle between ships. During that interval they loose proficiency and need to be repurposed in other jobs for which they are not as well-trained. The other approach the Navy could use ot reduce costs is to expand the number of multi-year procurement (MYP) contracts it uses, even for larger ships not normally bought using this method. MYP contracts allow the Navy and shipbuilders to purchase materials and equipment in larger quantities for a group of ships, which normally results in savings of 10 percent or more per ship. The Navy could expand the use of MYP contracts to CVNs, amphibious assault ships (LHA/LHD), or the new amphibious transport dock (L(X)R). The Navy could also reduce its shipbuilding costs by keeping some ships in service longer to allow new construction to be reduced. For example, the Navy's guided missile cruiser (CG) phased modernization plan will keep CGs in the fleet until the 2030s and enable the Navy to reduce guided missile destroyer (DDG) construction. Some amphibious landing docks (LSD) that will start retiring in the next decade could also be modernized again and retained in active service to conduct lower end missions. Although this may not alleviate any new construction of more capable ships, these ships may enable the Navy to fill gaps in the current fleet to conduct missions such as training and maritime security. Overall, the Navy will need decades to reach the fleet size and mix it needs to address the emerging security environment. A larger fleet will cost more to procure and operate than today's fleet. How much more, ihowever, is dependent on how much money the government is able to allocate toward this priority. Because the fleet buildup will take 20–30 years, there will be ample opportunity for this Congress and Administration, as well as future ones, to adjust the pace of building in concert with the government's fiscal situation. The most important consideration now is to simply start the process of growing and evolving the fleet.

Mr. LANGEVIN. To all witnesses—I am concerned that parts of these studies seemed to take place without any regard to funding feasibility. Were budgetary realities used as a qualifier across your studies? And what do you recommend, or what would you implement, as far as cost-savings measures go so that we are ensuring our dollars are spent effectively without having to cut other critical programs across the Department as well as the whole of government?

Dr. BANERJEE. Budget instability forces the Navy to make acquisition decisions that undermine affordability initiatives. By the end of 2016, the national debt will be $20 trillion dollars—more than triple what it was on 11 September 2011—and for the last four years, the Navy has been operating under reduced top-lines and significant shortfalls. There will likely continue to be increasing pressure on the procurement accounts, which in turn threatens the near-term health of the defense industrial base.

The MITRE study assumed the Navy will receive historical levels of funding and will not be subjected to further Budget Control Act or sequestration actions. All cost estimates were based on analyses reported by the Congressional Budget Office, with rough extrapolations to estimate the cost of the new ship classes proposed. More detailed cost estimating is required for all options recommended by our study. Admiral Zumwalt outlined a high-low concept in 1962 that is still relevant today. The only means of achieving both effectiveness and capacity, within the constraints of expected budgets, is to build varying amounts of exquisite (i.e., high), capable (i.e., moderate), and expendable (i.e., low) platforms. MITRE's recommendations for the numbers, kinds, and sizes of ships leverages this high-medium-low force mix concept, with several focused investments, to deliver a force that is more effective, has increased capacity, yet is affordable.

QUESTIONS SUBMITTED BY MS. BORDALLO

Ms. BORDALLO. With a potential greater reliance on unmanned assets and networked defense playing a greater role there is a greater risk for cyber intrusion. Can you address how the Navy is working to ensure the command and control networks of these assets will be hardened against cyber intrusion while allowing communication with the Joint Force and potentially our allies?

Admiral WILSON. Navy understands the requirements for resilient communications pathways and the increasing dependence of that resilience on defense in cyber-

space. Navy continues to architect our systems—from platform sub-components up through Fleet Command and Control structures—to provide resilience. Navy's TENTH Fleet has engaged in active defense of our networks to date. In fact, Mr. Stackley and the VCNO have signed a Joint Memo recently mandating cyber standards to which all systems will be held accountable. From these experiences, Navy has aligned cyber defense of afloat missions, to include hardening of critical platform networks, defending key cyber terrain and the deployment of Service-aligned cyber protection teams. To assure mission success of current and planned unmanned vehicles, Navy is investing in specifically designed command and control architectures featuring multiple pathways, hardened communication designs and supported by cyber hardened platforms linked to active defense capabilities.

Ms. BORDALLO. With a potential greater reliance on unmanned assets and networked defense playing a greater role there is a greater risk for cyber intrusion. Can you address how the Navy is working to ensure the command and control networks of these assets will be hardened against cyber intrusion while allowing communication with the Joint Force and potentially our allies?

Mr. WERCHADO. Within the context of the Future Fleet Architecture, defense of unmanned vehicle (UV) command and control (C2) structures and against cyber intrusion are provided through orchestrated investment strategies (Assured C2 and Cyber Resiliency). These strategies harness multiple programs of record (PoRs) that allow for robust communication pathways to support necessary assets as well as defend our platforms in cyberspace. These strategies capitalize on investments in platform cyber defense to provide networked, automated defense capabilities which will permit active cyber defense measures that provide resilience for Navy C2.

○