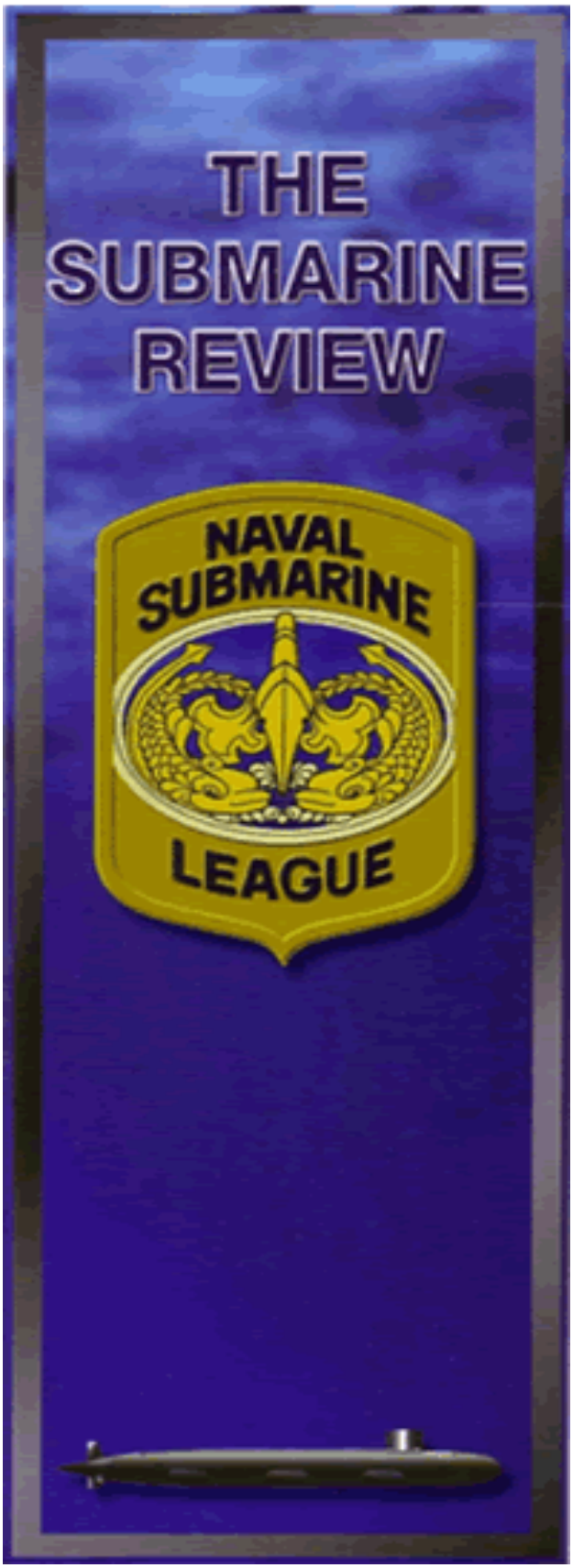


DECEMBER 2015

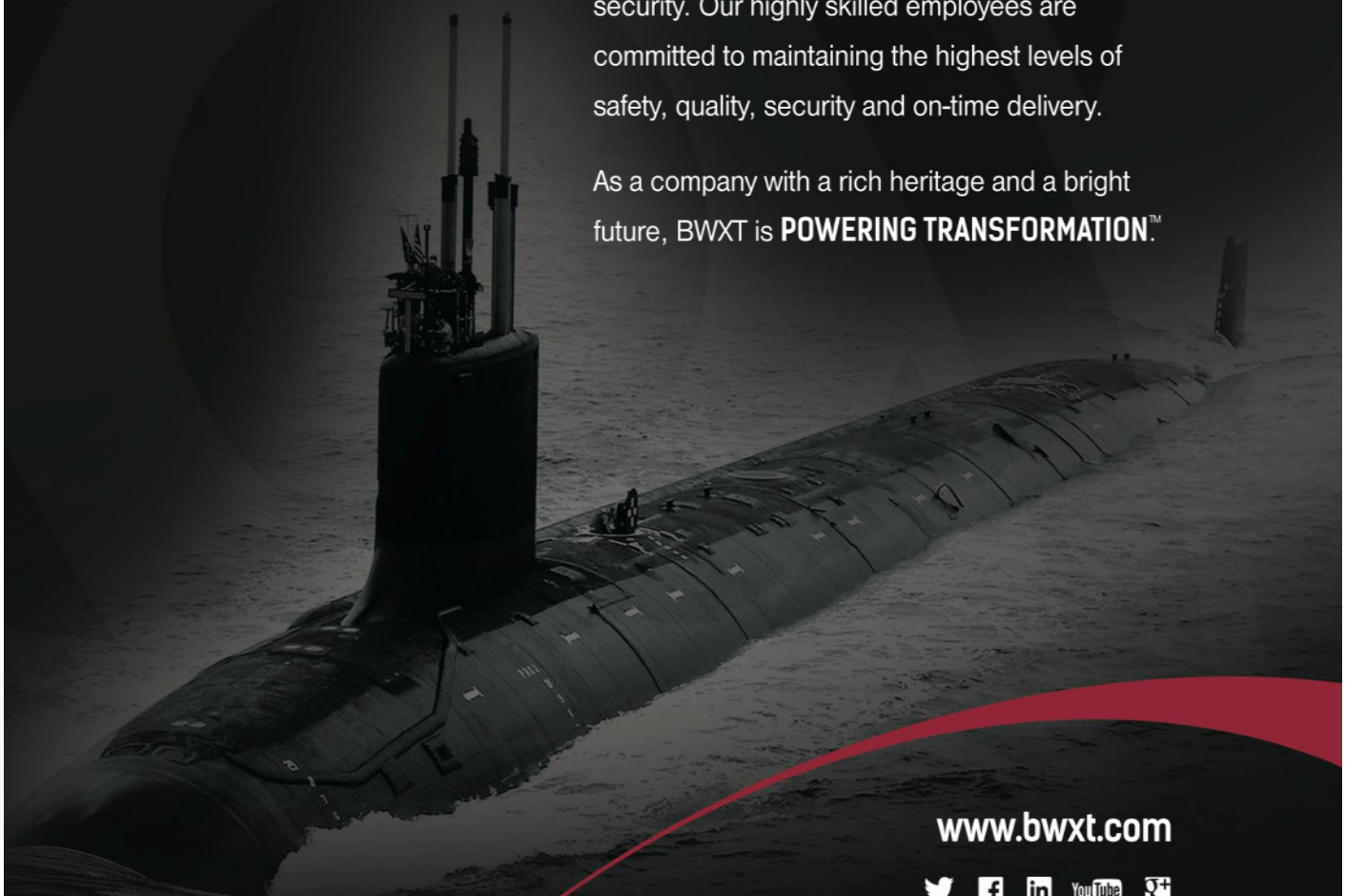
BWXT™

BWX Technologies, Inc.

NUCLEAR POWERED

BWX Technologies, Inc. (BWXT), formerly B&W, is a respected supplier of specialized services and nuclear products for the U.S. government and private industry that are critical to our nation's security. Our highly skilled employees are committed to maintaining the highest levels of safety, quality, security and on-time delivery.

As a company with a rich heritage and a bright future, BWXT is **POWERING TRANSFORMATION**™



www.bwxt.com

EDITOR'S COMMENTS

This issue of The Submarine Review differs significantly from the usual in that, with the exception of excerpts from a Congressional Research Service report to Congress about the VIRGINIA class Attack Submarine program, the bulk of the issue is devoted to the presentations given by the Submarine Force leadership at the Annual Symposium in October 2015. The point here is to demonstrate the scope of effort being applied by the submarine community to meeting the challenges of the world wide security environment.

The Submarine Force is recognized by the nation's military leadership as a *critical force,* which needs strengthening, in meeting those challenges. There is ample evidence that decision-level legislators in Congress see the need and support efforts to provide the necessary funding. Translating higher military and appropriate legislative support into further shipbuilding action, however, is a long and arduous task. The knowledgeable support of the American public is of vital importance to getting that difficult task accomplished. That is why this magazine attempts to present the scope and breadth of effort being exerted. Over the long period which this effort has taken, and will take in the near to mid future, this written record of opinion, technological innovation, strategy implementation and all the rest is intended to give lasting witness to what is being said and done to keep the Submarine Force out in front in meeting the challenges faced by America.

Of the many instances of innovation and technical expertise covered in these pages, one should take particular notice of the presentation by Vice Admiral Terry Benedict, the Director of the Strategic Systems Programs. The work being done to upgrade the ballistic missile system currently in use aboard the OHIO class SSBN fleet to long term use in the new OHIO Replacement class is especially impressive and illustrates the care taken with improving an existing system and the concern for financial responsibility in re-using an existing system.

Another facet of the work being done is illustrated by Vice Admiral Willy Hilarides, commander of the Navy's Sea Systems Command in his description of the cyber security precautions being taken for ships' **control** systems. This is a different matter altogether from the more familiar Info technology problems recently getting public attention.

Mr. Ron O'Rourke, of the Congressional Research Service, in one of the annual reports to Congress about programs of special interest, has summarized the history, and current status, of the VIRGINIA class SSN. The process of Congressional action regarding major acquisition programs is complex and is worth going through the explanations and history in order to better understand what is really going on a program most of us know something about.

Enjoy this special issue. Spread the word about the Submarine programs. With the next issue we will return to the world of general interest items; at least partially.

Jim Hay
Editor

FROM THE PRESIDENT

The cold of winter still covers much of the United States, particularly here in New England, but the promise of spring stimulates thoughts of warm weather and the glorious colors, aromas, and sounds of spring. *March Madness* permeates men's college basket ball without a clear favorite (the University of Connecticut women look pretty solid). Steph Curry and the Golden State Warriors delight basketball fans. Spring Training and baseball fans invade Florida and the Southwest. And the Future Year Defense Plan (FYDP) associated with the Fiscal Year (FY) 17 President's Budget submission includes nearly $12B to support the OHIO Replacement Program while sequestration remains the nemesis that will not go away. It is a time of great expectation, substantial trepidation, and myriad challenges in an unpredictable national and international environment. And there will be national elections in the United States in the fall.

"May you live in interesting times", indeed.

The Chief of Naval Operations, ADM John Richardson, promulgated *A Design for Maintaining Maritime Superiority* in January 2016, affirming Integrity, Accountability, Initiative and Toughness as Core Attributes within our Navy. Building upon Alfred Thayer Mahan's vision at the end of the 19th Century, this guiding document directs the Navy's behaviors and investments in the 21st Century to strengthen Naval Power at and from sea, to achieve Velocity Learning at every level, to strengthen our Navy Team for the future, and to expand the Navy's network of partners.

The Submarine Force Senior Leadership VADM Joe Tofalo (COMSUBFOR), RADM Fritz Roegge (COMSUBPAC), and RADM Chas Richard (OPNAV N97) promulgated a similarly focused *Commander's Intent for the United States Submarine Force and Supporting Organizations*, aligning the "Undersea Dominance Campaign Plan and Vision 2025" and the "Integrated

Undersea Future Investment Strategy", while incorporating national strategic guidance. This "Commander's Intent" consolidates the Submarine Force's efforts to sustain Undersea Dominance and affirms that the Submarine Force foundation is solid, the Submarine Force traditions reinforce the right attributes, and that Submarine Force performance remains stellar.

These documents reinforce the notion that the Navy has a clear vision concerning the capability and capacity needed to achieve Maritime Superiority and our submariners demonstrate, on a daily basis and around the world, that they are an integral and essential element sustaining this superiority.

Testimony before Congress regarding the President's Budget for FY17 has been uniformly supportive of Navy programs and force structure, and, in particular, submarines, favoring the sustainment of strong Naval Forces as an essential element of our nation's defense. Much has been made of the critical impact forward deployed, combat ready Naval Forces provide, maintaining stability in a dynamic world. And Congress has listened. The value of this forward deployed Naval Force and the investment needed to sustain it are well understood and appreciated by our elected officials, however, significant budget issues remain to be resolved.

And US Submarine Force performance, day in and day out, around the world, confirms the wisdom of prior investment in the finest submarines in the world.

The VIRGINIA Class Submarine Program, delivering two ships every year, remains the Department of Defense model for acquisition program performance and the VIRGINIA Payload Module will add substantial additional combat capability to an already superbly capable ship at minimal additional cost.

The value and return on investment provided by the OHIO Replacement Program are reflected in the full funding within the 2017 FYDP supporting construction start in 2021. These ships will provide a stable sea based strategic deterrent that will relieve our current Trident Force and provide security well into the late 21st Century as the only survivable leg of our strategic Triad.

Looking ahead, 2016 is certain to be a year of change and

challenge and the Naval Submarine League will work to keep its membership engaged and the public informed of the value provided by the world's finest Submarine Force in the world's finest Navy.

I am privileged to work with the superb men and women who are the essence of our support and ensure that the Naval Submarine League remains a strong advocate for a strong US Submarine Force. I thank you all and I encourage you to recommend membership to your colleagues, shipmates and friends.

And, as always, in closing, please keep our nation's service members in your prayers as they defend our freedom in a dangerous world.

John B. Padgett, III
President

THE SUBMARINE REVIEW IS A PUBLICATION OF THE NAVAL SUBMARINE LEAGUE

OFFICE STAFF
Executive Director: CAPT Tim Oliver, USN, Ret.
Membership Coordinator: Mrs. Deb Del Rossi **Event Coordinator:** Mrs. Kristin Bernacchi
Admin Assistants: Mrs. Ellen Brunk Mrs. Julie Iriondo Mrs. Martha Richardson Mrs. Patty Weeks
NAVAL SUBMARINE LEAGUE – 5025D Backlick Road, VA 22003-6044
PH:(703) 256-0891 Toll Free (877) 280-7827 Fax: (703) 642-5815 E-mail: subleague@navalsubleague.org
Web Page: www.navalsubleague.org

REPORT TO CONGRESS RE: SUBMARINE PROGRAMS

NAVY VIRGINIA (SSN-774) CLASS ATTACK SUBMARINE PROCUREMENT: FOR CONGRESS (Excerpts)

By Mr. Ronald O'Rourke
Specialist in Naval Affairs
Congressional Research Service
November 5, 2015

Summary

The Navy has been procuring Virginia (SSN-774) class nuclear-powered attack submarines since FY1998. The two Virginia-class boats requested for procurement in FY2016 are to be the 23rd and 24th boats in the class. The 10 Virginia-class boats programmed for procurement in FY2014- FY2018 (two per year for five years) are being procured under a multiyear-procurement (MYP) contract.

The Navy estimates the combined procurement cost of the two Virginia-class boats requested for procurement in FY2016 at $5,376.9 million or an average of $2,688.4 million each. The boats have received a total of $1,613.5 million in prior-year advance procurement (AP) funding and $416.9 million in prior-year Economic Order Quantity (EOQ) funding. The Navy's proposed FY2016 budget requests the remaining $3,346.4 million needed to complete the boats' estimated combined procurement cost. The Navy's proposed FY2016 budget also requests $1,663.8 million in AP funding and $330.0 million in EOQ funding for Virginia-class boats to be procured in future fiscal years, bringing the total FY2016 funding request for the program (excluding outfitting and post-delivery costs) to $5,340.1 million.

The Navy's proposed FY2016 budget also requests $167.7 million in research and development funding for the Virginia Payload Module (VPM). The funding is contained in Program Element (PE) 0604580N, entitled Virginia Payload Module (VPM), which is line 123 in the Navy's FY2016 research and development account.

The Navy plans to build Virginia-class boats procured in FY2019 and subsequent years with an additional mid-body section, called the Virginia Payload Module (VPM), that contains four large diameter, vertical launch tubes that the boats would use to store and fire additional Tomahawk cruise missiles or other payloads, such as large-diameter unmanned underwater vehicles (UUVs). The Navy estimates that building Virginia-class boats with the VPM might increase their unit procurement costs by about 13%. It would increase the total number of torpedo-sized weapons (such as Tomahawks) that they could carry by about 76%. The Navy's FY2016 shipbuilding plan calls for building one of the two Virginia-class boats to be procured in FY2019, and one of the two Virginia-class boats to be procured in FY2020, with the VPM.

The Navy's FY2016 30-year SSN procurement plan, if implemented, would not be sufficient to maintain a force of 48 SSNs consistently over the long run. The Navy projects under that plan the SSN force would fall below 48 boats starting in FY2025, reach a minimum of 41 boats in FY2029, and remain below 48 boats through FY2036.

Potential issues for Congress regarding the Virginia-class program include the Virginia-class procurement rate in coming years, particularly in the context of the SSN shortfall projected for FY2025-FY2034 and the larger debate over future U.S. defense strategy and defense spending.

U.S. Navy Submarines

The U.S. Navy operates three types of submarines—nuclear-powered ballistic missile submarines (SSBNs), nuclear-powered cruise missile and special operations forces (SOF) submarines (SSGNs), and nuclear-powered attack submarines (SSNs). The SSNs are general-purpose submarines that can (when appropriately equipped and armed) perform a variety of peacetime and wartime missions, including the following:

- covert intelligence, surveillance, and reconnaissance (ISR), much of it done for national-level (as opposed to purely Navy) purposes;
- covert insertion and recovery of SOF (on a smaller scale than possible with the SSGNs);
- covert strikes against land targets with the Tomahawk cruise missiles (again on a smaller scale than possible with the SSGNs);
- covert offensive and defensive mine warfare;
- anti-submarine warfare (ASW); and
- anti-surface ship warfare.

During the Cold War, ASW against the Soviet submarine force was the primary stated mission of U.S. SSNs, although covert ISR and covert SOF insertion/recovery operations were reportedly important on a day-to-day basis as well. In the post-Cold War era, although anti-submarine warfare remains a mission, the SSN force has focused more on performing the other missions noted on the list above.

Attack Submarine Force Levels

Force-Level Goal

The Navy wants to achieve and maintain a fleet in coming years of 306 ships, including 48 SSNs. For a review of SSN force level goals since the Reagan Administration, see **Appendix A**.

Force Level at End of FY2014

The SSN force included more than 90 boats during most of the 1980s, when plans called for achieving a 600-ship Navy including 100 SSNs. The number of SSNs peaked at 98 boats at the end of FY1987 and has declined since then in a manner that has roughly paralleled the decline in the total size of the Navy over the same time period. The 55 SSNs in service at the end of FY2014 included the following:

- 41 Los Angeles (SSN-688) class boats;
- 3 Seawolf (SSN-21) class boats; and
- 11 Virginia (SSN-774) class boats.

Los Angeles- and Seawolf-Class Boats

A total of 62 Los Angeles-class submarines, commonly called 688s, were procured between FY1970 and FY1990 and entered service between 1976 and 1996. They are equipped with four 21-inch diameter torpedo tubes and can carry a total of 26 torpedoes or Tomahawk cruise missiles in their torpedo tubes and internal magazines. The final 31 boats in the class (SSN-719 and higher) are equipped with an additional 12 vertical launch system (VLS) tubes in their bows for carrying and launching another 12 Tomahawk cruise missiles. The final 23 boats in the class (SSN-751 and higher) incorporate further improvements and are referred to as Improved Los Angeles class boats or 688Is. As of the end of FY2014, 21 of the 62 boats in the class had been retired.

The Seawolf class was originally intended to include about 30 boats, but Seawolf-class procurement was stopped after three boats as a result of the end of the Cold War and associated changes in military requirements. The three Seawolf-class submarines are the SEAWOLF (SSN-21), the CONNECTICUT (SSN-22), and the JIMMY CARTER (SSN-23). SSN-21 and SSN-22 were procured in FY1989 and FY1991 and entered service in 1997 and 1998, respectively. SSN-23 was originally procured in FY1992. Its procurement was suspended in 1992 and then reinstated in FY1996. It entered service in 2005. Seawolf-class submarines are larger than Los Angeles-class boats or previous U.S. Navy SSNs. They are equipped with eight 30-inch-diameter torpedo tubes and can carry a total of 50 torpedoes or cruise missiles. SSN-23 was built to a lengthened configuration compared to the other two ships in the class.

Virginia (SSN-774) Class Program

General

The Virginia-class attack submarine (see **Figure 1**) was designed to be less expensive and better optimized for post-Cold War submarine missions than the Seawolf-class design. The Virginia class design is slightly larger than the Los Angeles-class design, but incorporates newer technologies. Virginia-class boats

currently cost about $2.8 billion each to procure. The first Virginia-class boat entered service in October 2004.

Past and Projected Annual Procurement Quantities

Table 1 shows annual numbers of Virginia-class boats procured from FY1998 (the lead boat) through FY2014, and numbers scheduled for procurement under the FY2016-FY2020 Future Years Defense Plan (FYDP).

Table I. Annual Numbers of Virginia-Class Boats Procured or Projected for Procurement

FY98	FY99	FY00	FY01	FY02	FY03	FY04	FY05	FY06	FY07	FY08	FY09
1	1	0	1	1	1	1	1	1	1	1	1
FY10	FY11	FY12	FY13	FY14	FY15	FY16	FY17	FY18	FY19	FY20	
1	2	2	2	2	2	2	2	2	2	2	

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

Multiyear Procurement (MYP)

The 10 Virginia-class boats shown in **Table 1** for the period FY2014-FY2018 (referred to as the Block IV boats) are being procured under a multiyear procurement (MYP) contract that was approved by Congress as part of its action on the FY2013 budget, and awarded by the Navy on April 28, 2014. The eight Virginia-class boats procured in FY2009-FY2013 (the Block III boats) were procured under a previous MYP contract, and the five Virginia-class boats procured in FY2004-FY2008 (the Block II boats) were procured under a still-earlier MYP contract. The four boats procured in FY1998-FY2002 (the Block I boats) were procured under a block buy contract, which is an arrangement somewhat similar to an MYP contract. The boat procured in FY2003 fell between the FY1998-FY2002 block buy contract and the FY2004-FY2008 MYP arrangement, and was contracted for separately.

Joint Production Arrangement

Virginia-class boats are built jointly by General Dynamics' Electric Boat Division (GD/EB) of Groton, CT, and Quonset

Point, RI, and Newport News Shipbuilding (NNS), of Newport News, VA, which forms part of Huntington Ingalls Industries (HII). Under the arrangement, GD/EB builds certain parts of each boat, NNS builds certain other parts of each boat, and the yards take turns building the reactor compartments and performing final assembly of the boats. GD/EB is building the reactor compartments and performing final assembly on boats 1, 3, and so on, while NNS is doing so on boats 2, 4, and so on. The arrangement results in a roughly 50-50 division of Virginia-class profits between the two yards and preserves both yards' ability to build submarine reactor compartments (a key capability for a submarine-construction yard) and perform submarine final-assembly work.

Cost-Reduction Effort

The Navy states that it achieved a goal of reducing the procurement cost of Virginia-class submarines so that two boats could be procured in FY2012 for a combined cost of $4.0 billion in constant FY2005 dollars—a goal referred to as "2 for 4 in 12." Achieving this goal involved removing about $400 million (in constant FY2005 dollars) from the cost of each submarine. (The Navy calculates that the unit target cost of $2.0 billion in constant FY2005 dollars for each submarine translates into about $2.6 billion for a boat procured in FY2012.)

Virginia Payload Module (VPM)

The Navy plans to build Virginia-class boats procured in FY2019 and subsequent years (i.e., the anticipated Block V and beyond boats) with an additional mid-body section, called the Virginia Payload Module (VPM). The VPM, reportedly about 70 feet in length (earlier design concepts for the VPM were reportedly about 94 feet in length), contains four large-diameter, vertical launch tubes that would be used to store and fire additional Tomahawk cruise missiles or other payloads, such as large-diameter unmanned underwater vehicles (UUVs).

The four additional launch tubes in the VPM could carry a total of 28 additional Tomahawk cruise missiles (7 per tube),

which would increase the total number of torpedo-sized weapons (such as Tomahawks) carried by the Virginia class design from about 37 to about 65—an increase of about 76%. The Navy wants to start building Virginia-class boats with the VPM in FY2019. The Navy's FY2016 five-year shipbuilding plan calls for building one of the two Virginia-class boats to be procured in FY2019, and one of the two Virginia-class boats to be procured in FY2020, with the VPM.

Building Virginia-class boats with the VPM would compensate for a sharp loss in Submarine Force weapon-carrying capacity that will occur with the retirement in FY2026-FY2028 of the Navy's four Ohio-class cruise missile/special operations forces support submarines (SSGNs). Each SSGN is equipped with 24 large-diameter vertical launch tubes, of which 22 can be used to carry up to 7 Tomahawks each, for a maximum of 154 vertically launched Tomahawks per boat, or 616 vertically launched Tomahawks for the four boats. Twenty-two Virginia-class boats built with VPMs could carry 616 Tomahawks in their VPMs.

The Navy in 2013 estimated that adding the VPM would increase the procurement cost of the Virginia-class design by $350 million in current dollars, or by about 13%.

The joint explanatory statement for the FY2014 DOD Appropriations Act (Division C of H.R. 3547/P.L. 113-76 of January 17, 2014) requires the Navy to submit biannual reports to the congressional defense committees describing the actions the Navy is taking to minimize costs for the VPM. The first such report, dated July 2014, is reprinted in **Appendix C**.

At a February 25, 2015, hearing before the Seapower and Projection Forces subcommittee of the House Armed Services Committee, Sean Stackley, the Assistant Secretary of the Navy for Research, Development, and Acquisition (i.e., the Navy's acquisition executive), stated that the Navy is examining the feasibility of accelerating the procurement of the first VPM-equipped Virginia-class boat from FY2019 to an earlier year.

FY2016 Funding Request

The Navy estimates the combined procurement cost of the two Virginia-class boats requested for procurement in FY2016 at $5,376.9 million or an average of $2,688.4 million each. The boats have received a total of $1,613.5 million in prior-year advance procurement (AP) funding and $416.9 million in prior-year Economic Order Quantity (EOQ) funding. The Navy's proposed FY2016 budget requests the remaining $3,346.4 million needed to complete the boats' estimated combined procurement cost. The Navy's proposed FY2016 budget also requests $1,663.8 million in AP funding and $330.0 million in EOQ funding for Virginia-class boats to be procured in future fiscal years, bringing the total FY2016 funding request for the program (excluding outfitting and post-delivery costs) to $5,340.1 million.

The Navy's proposed FY2016 budget also requests $167.7 million in research and development funding for the Virginia Payload Module (VPM). The funding is contained in Program Element (PE) 0604580N, entitled Virginia Payload Module (VPM), which is line 123 in the Navy's FY2016 research and development account.

Submarine Construction Industrial Base

In addition to GD/EB and NNS, the submarine construction industrial base includes scores of supplier firms, as well as laboratories and research facilities, in numerous states. Much of the total material procured from supplier firms for the construction of submarines comes from single or sole source suppliers. Observers in recent years have expressed concern for the continued survival of many of these firms. For nuclear-propulsion component suppliers, an additional source of stabilizing work is the Navy's nuclear-powered aircraft carrier construction program. In terms of work provided to these firms, a carrier nuclear propulsion plant is roughly equivalent to five submarine propulsion plants.

Much of the design and engineering portion of the submarine construction industrial base is resident at GD/EB. Smaller portions are resident at NNS and some of the component makers. Several

years ago, some observers expressed concern about the Navy's plans for sustaining the design and engineering portion of the submarine construction industrial base. These concerns appear to have receded, in large part because of the Navy's plan to design and procure a next generation ballistic missile submarine called the Ohio Replacement Program or SSBN(X).

Projected SSN Shortfall

Size and Timing of Shortfall

The Navy's FY2016 30-year SSN procurement plan, if implemented, would not be sufficient to maintain a force of 48 SSNs consistently over the long run. As shown in **Table 2**, the Navy projects under the plan that the SSN force would fall below 48 boats starting in FY2025, reach a minimum of 41 boats in FY2029, and remain below 48 boats through FY2036. Since the Navy plans to retire the four SSGNs by 2028 without procuring any replacements for them, no SSGNs would be available in 2028 and subsequent years to help compensate for a drop in SSN force level below 48 boats.

The projected SSN shortfall was first identified by CRS in 1995 and has been discussed in CRS reports and testimony every year since then.

Table 2. Projected SSN Shortfall As Shown in Navy's FY2016 30-Year (FY2016-FY2045) Shipbuilding Plan

Fiscal year	Annual procurement quantity	Projected number of SSNs	Shortfall relative to 48-boat goal	
			Number of ships	Percent
16	2	53		
17	2	50		
18	2	52		
19	2	50		
20	2	51		
21	1	51		
22	2	48		
23	2	49		
24	1	48		
25	2	47	-1	-2%
26	1	45	-3	-6%
27	1	44	-4	-8%
28	1	42	-6	-13%
29	1	41	-7	-15%
30	1	42	-6	-13%
31	1	43	-5	-10%
32	1	43	-5	-10%
33	1	44	-4	-8%
34	1	45	-3	-6%
35	1	46	-2	-4%
36	2	47	-1	-2%
37	2	48		
38	2	47	-1	-2%
39	2	47	-1	-2%
40	1	47	-1	-2%
41	2	47	-1	-2%
42	1	49		
43	2	49		
44	1	50		
45	2	50		

2006 Navy Study on Options for Mitigating Projected Shortfall

The Navy in 2006 initiated a study on options for mitigating the projected SSN shortfall. The study was completed in early 2007 and briefed to CRS and the Congressional Budget Office

(CBO) on May 22, 2007. At the time of the study, the SSN force was projected to bottom out at 40 boats and then recover to 48 boats by the early 2030s. Principal points in the Navy study (which cite SSN force-level projections as understood at that time) include the following:

- The day-to-day requirement for deployed SSNs is 10.0, meaning that, on average, a total of 10 SSNs are to be deployed on a day-to-day basis.
- The peak projected wartime demand is about 35 SSNs deployed within a certain amount of time. This figure includes both the 10.0 SSNs that are to be deployed on a day-to-day basis and 25 additional SSNs surged from the United States within a certain amount of time.
- Reducing Virginia-class shipyard construction time to 60 months—something that the Navy already plans to do as part of its strategy for meeting the Virginia class cost-reduction goal (see earlier discussion on cost-reduction goal)—will increase the size of the SSN force by two boats, so that the force would bottom out at 42 boats rather than 40.
- If, in addition to reducing Virginia-class shipyard construction time to 60 months, the Navy also lengthens the service lives of 16 existing SSNs by periods ranging from 3 months to 24 months (with many falling in the range of 9 to 15 months), this would increase the size of the SSN force by another two boats, so that the force would bottom out at 44 boats rather than 40 boats. The total cost of extending the lives of the 16 boats would be roughly $500 million in constant FY2005 dollars.
- The resulting force that bottoms out at 44 boats could meet the 10.0 requirement for day-to-day deployed SSNs throughout the 2020-2033 period if, as an additional option, about 40 SSN deployments occurring in the eight-

year period 2025-2032 were lengthened from six months to seven months. These 40 or so lengthened deployments would represent about one-quarter of all the SSN deployments that would take place during the eight-year period.

- The resulting force that bottoms out at 44 boats could not meet the peak projected wartime demand of about 35 SSNs deployed within a certain amount of time. The force could generate a total deployment of 32 SSNs within the time in question—3 boats (or about 8.6%) less than the 35-boat figure. Lengthening SSN deployments from six months to seven months would not improve the force's ability to meet the peak projected wartime demand of about 35 SSNs deployed within a certain amount of time.
- To meet the 35-boat figure, an additional four SSNs beyond those planned by the Navy would need to be procured. Procuring four additional SSNs would permit the resulting 48-boat force to surge an additional three SSNs within the time in question, so that the force could meet the peak projected wartime demand of about 35 SSNs deployed within a certain amount of time.
- Procuring one to four additional SSNs could also reduce the number of seven month deployments that would be required to meet the 10.0 requirement for day-to-day deployed SSNs during the period 2025-2032. Procuring one additional SSN would reduce the number of seven-month deployments during this period to about 29; procuring two additional SSNs would reduce it to about 17, procuring three additional SSNs would reduce it to about 7, and procuring four additional SSNs would reduce it to 2.

The Navy added a number of caveats to these results, including but not limited to the following:

- The requirement for 10.0 SSNs deployed on a day-to-day basis is a current requirement that could change in the future.
- The peak projected wartime demand of about 35 SSNs deployed within a certain amount of time is an internal

Navy figure that reflects recent analyses of potential future wartime requirements for SSNs. Subsequent analyses of this issue could result in a different figure.

- The identification of 19 SSNs as candidates for service life extension reflects current evaluations of the material condition of these boats and projected use rates for their nuclear fuel cores. If the material condition of these boats years from now turns out to be worse than the Navy currently projects, some of them might no longer be suitable for service life extension. In addition, if world conditions over the next several years require these submarines to use up their nuclear fuel cores more quickly than the Navy now projects, then the amounts of time that their service lives might be extended could be reduced partially, to zero, or to less than zero (i.e., the service lives of the boats, rather than being extended, might need to be shortened).
- The analysis does not take into account potential rare events, such as accidents, that might force the removal an SSN from service before the end of its expected service life.
- Seven-month deployments might affect retention rates for submarine personnel.

Issues for Congress

Virginia-Class Procurement Rate More Generally in Coming Years

One potential issue for Congress concerns the Virginia-class procurement rate in coming years, particularly in the context of the SSN shortfall projected for FY2025-FY2036 shown in **Table 2** and the larger debate over future U.S. defense strategy and defense spending.

Mitigating Projected SSN Shortfall

In addition to lengthening SSN deployments to 7 months and extending the service lives of existing SSNs by periods ranging from 3 months to 24 months (see "2006 Navy Study on Options

for Mitigating Projected Shortfall" above), options for more fully mitigating the projected SSN shortfall include

- refueling a small number of (perhaps one to five) existing SSNs and extending their service lives by 10 years or more, and
- putting additional Virginia-class boats into the 30-year shipbuilding plan.

It is not clear whether it would be feasible or cost-effective to refuel existing SSNs and extend their service lives by 10 or more years, given factors such as limits on submarine pressure hull life.

Larger Debate on Defense Strategy and Defense Spending

Some observers—particularly those who propose reducing U.S. defense spending as part of an effort to reduce the federal budget deficit—have recommended that the SSN force-level goal be reduced to something less than 48 boats, and/or that Virginia-class procurement be reduced. A June 2010 report from a group called the Sustainable Defense Task Force recommends a Navy of 230 ships, including 37 SSNs, and a September 2010 report from the Cato Institute recommends a Navy of 241 ships, including 40 SSNs. Both reports recommend limiting Virginia-class procurement to one boat per year, as does a September 2010 report from the Center for American Progress. A November 2010 report from a group called the Debt Reduction Task Force recommends *deferring* Virginia-class procurement. The November 2010 draft recommendations of the co-chairs of the Fiscal Commission include recommendations for reducing procurement of certain weapon systems; the Virginia-class program is not among them.

Other observers have recommended that the SSN force-level goal should be increased to something higher than 48 boats, particularly in light of Chinese naval modernization. The July

2010 report of an independent panel that assessed the 2010 Quadrennial Defense Review (QDR)—an assessment that is required by the law governing QDRs (10 U.S.C. 118)—recommends a Navy of 346 ships, including 55 SSNs. An April 2010 report from the Heritage Foundation recommends a Navy of 309 ships, including 55 SSNs.

Factors to consider in assessing whether to maintain, increase, or reduce the SSN force-level goal and/or planned Virginia-class procurement include but are not limited to the federal budget and debt situation, the value of SSNs in defending U.S. interests and implementing U.S. national security strategy, and potential effects on the submarine industrial base.

As discussed earlier, Virginia-class boats scheduled for procurement in FY2014 are covered under an MYP contract for the period FY2014-FY2018. This MYP contract includes the procurement of two Virginia-class boats in FY2016. If fewer than two boats were procured in FY2016, the Navy might need to terminate the MYP contract and pay a cancellation penalty to the contractor.

Procurement of VPM-Equipped Virginia-Class Boats

Another issue for Congress concerns procurement of VPM-equipped Virginia-class boats. As discussed above, the Navy testified on February 25, 2015, that it is examining the feasibility of accelerating the procurement of the first VPM-equipped Virginia-class boat from FY2019 to an earlier year. Independent of that option, Navy submarine officials have stated that they would like all Virginia-class boats procured in FY2019 and subsequent years (not just every other such boat) to be equipped with VPM, but will need to verify that doing so would not negatively impact construction of both Virginia-class boats and Ohio replacement (SSBN[X]) ballistic missile submarines. Either of these two options—particularly the second one—would accelerate the date by which VPM-equipped Virginia-class boats would fully offset the loss of strike capability that will occur when the Navy's four converted Ohio-class cruise missile submarines (SSGNs) retire from service in the late 2020s.

Appendix A. Past SSN Force-Level Goals

This appendix summarizes attack submarine force-level goals since the Reagan Administration (1981-1989).

The Reagan-era plan for a 600-ship Navy included an objective of achieving and maintaining a force of 100 SSNs.

The George H. W. Bush Administration's proposed Base Force plan of 1991-1992 originally called for a Navy of more than 400 ships, including 80 SSNs. In 1992, however, the SSN goal was reduced to about 55 boats as a result of a 1992 Joint Staff force-level requirement study (updated in 1993) that called for a force of 51 to 67 SSNs, including 10 to 12 with Seawolf-level acoustic quieting, by the year 2012.

The Clinton Administration, as part of its 1993 Bottom-Up Review (BUR) of U.S. defense policy, established a goal of maintaining a Navy of about 346 ships, including 45 to 55 SSNs. The Clinton Administration's 1997 QDR supported a requirement for a Navy of about 305 ships and established a tentative SSN force-level goal of 50 boats, "contingent on a reevaluation of peacetime operational requirements." The Clinton Administration later amended the SSN figure to 55 boats (and therefore a total of about 310 ships).

The reevaluation called for in the 1997 QDR was carried out as part of a Joint Chiefs of Staff (JCS) study on future requirements for SSNs that was completed in December 1999. The study had three main conclusions:

- "that a force structure below 55 SSNs in the 2015 [time frame] and 62 [SSNs] in the 2025 time frame would leave the CINC's [the regional military commanders-in-chief] with insufficient capability to respond to urgent crucial demands without gapping other requirements of higher national interest. Additionally, this force structure [55 SSNs in 2015 and 62 in 2025] would be sufficient to meet the modeled war fighting requirements";
- "that to counter the technologically pacing threat would require 18 Virginia class SSNs in the 2015 time frame"; and
- "that 68 SSNs in the 2015 [time frame] and 76 [SSNs] in the 2025 time frame would meet all of the CINCs' and national intelligence community's highest operational and collection requirements."

The conclusions of the 1999 JCS study were mentioned in discussions of required SSN force levels, but the figures of 68 and

76 submarines were not translated into official Department of Defense (DOD) force-level goals.

The George W. Bush Administration's report on the 2001 QDR revalidated the amended requirement from the 1997 QDR for a fleet of about 310 ships, including 55 SSNs. In revalidating this and other U.S. military force-structure goals, the report cautioned that as DOD's "transformation effort matures—and as it produces significantly higher output of military value from each element of the force—DOD will explore additional opportunities to restructure and reorganize the Armed Forces."

DOD and the Navy conducted studies on undersea warfare requirements in 2003-2004. One of the Navy studies—an internal Navy study done in 2004—reportedly recommended reducing the attack submarine force level requirement to as few as 37 boats. The study reportedly recommended homeporting a total of nine attack submarines at Guam and using satellites and unmanned underwater vehicles (UUVs) to perform ISR missions now performed by attack submarines.

In March 2005, the Navy submitted to Congress a report projecting Navy force levels out to FY2035. The report presented two alternatives for FY2035—a 260-ship fleet including 37 SSNs and 4 SSGNs, and a 325-ship fleet including 41 SSNs and 4 SSGNs.

In May 2005, it was reported that a newly completed DOD study on attack submarine requirements called for maintaining a force of 45 to 50 boats.

In February 2006, the Navy proposed to maintain in coming years a fleet of 313 ships, including 48 SSNs. Some of the Navy's ship force-level goals have changed since 2006, and the goals now add up to a desired fleet of 328 ships. The figure of 48 SSNs, however, remains unchanged from 2006.

Appendix B. Options for Funding SSNs

This appendix presents information on some alternatives for funding SSNs that was originally incorporated into this report during discussions in earlier years on potential options for Virginia class procurement. Alternative methods of funding the

procurement of SSNs include but are not necessarily limited to the following:

- **two years of advance procurement funding followed by full funding**—the traditional approach, under which there are two years of advance procurement funding for the SSN's long-lead time components, followed by the remainder of the boat's procurement funding in the year of procurement;
- **one year of advance procurement funding followed by full funding**—one year of advance procurement funding for the SSN's long-lead time components, followed by the remainder of the boat's procurement funding in the year of procurement;
- **full funding with no advance procurement funding (single-year full funding)**—full funding of the SSN in the year of procurement, with no advance procurement funding in prior years;
- **incremental funding**—partial funding of the SSN in the year of procurement, followed by one or more years of additional funding increments needed to complete the procurement cost of the ship; and
- **advance appropriations**—a form of full funding that can be viewed as a legislatively locked in form of incremental funding.
- Navy testimony to Congress in early 2007, when Congress was considering the FY2008 budget, suggested that two years of advance procurement funding are required to fund the procurement of an SSN, and consequently that additional SSNs could not be procured until FY2010 at the earliest. This testimony understated Congress's options regarding the procurement of additional SSNs in the near term. Although SSNs are normally procured with two years of advance procurement funding (which is used primarily for financing long-lead time nuclear propulsion components), Congress can procure an SSN without prior-year advance procurement funding, or with only one year

of advance procurement funding. Consequently, Congress at that time had option of procuring an additional SSN in FY2009 and/or FY2010.

- Single-year full funding has been used in the past by Congress to procure nuclear-powered ships for which no prior-year advance procurement funding had been provided. Specifically, Congress used single-year full funding in FY1980 to procure the nuclear-powered aircraft carrier CVN-71, and again in FY1988 to procure the CVNs 74 and 75. In the case of the FY1988 procurement, under the Administration's proposed FY1988 budget, CVNs 74 and 75 were to be procured in FY1990 and FY1993, respectively, and the FY1988 budget was to make the initial advance procurement payment for CVN-74. Congress, in acting on the FY1988 budget, decided to accelerate the procurement of both ships to FY1988, and fully funded the two ships that year at a combined cost of $6.325 billion. The ships entered service in 1995 and 1998, respectively.
- The existence in both FY1980 and FY1988 of a spare set of Nimitz-class reactor components was not what made it possible for Congress to fund CVNs 71, 74, and 75 with single-year full funding; it simply permitted the ships to be built more quickly. What made it possible for Congress to fund the carriers with single-year full funding was Congress's constitutional authority to appropriate funding for that purpose.
- Procuring an SSN with one year of advance procurement funding or no advance procurement funding would not materially change the way the SSN would be built—the process would still encompass about two years of advance work on long-lead time components, and an additional six years or so of construction work on the ship itself. The outlay rate for the SSN could be slower, as outlays for construction of the ship itself would begin one or two years later than normal.

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

Appendix C. July 2014 Navy Report to Congress on Virginia Payload Module (VPM)

The joint explanatory statement for the FY2014 DoD appropriations Act (Division C of H.R. 3547/P.L. 113-76 of January 17, 2014) requires the Navy to submit biannual reports to the congressional defense committees describing the actions the navy is taking to minimize costs for the VPM. This appendix reprints the first of these reports, which is dated July 2014.

Executive Summary

In the mid-2020s, the Navy's four guided missile submarines (SSGNs) will begin to decommission. These SSGNs provide the navy and the Nation with unmatched undersea conventional strike capability and capacity, with each SSGN carrying up to 154 tomahawk land attack cruise missiles. The Navy's current fleet of attack submarines (SSNs) can carry 12 Tomahawks each. The loss of the SSGNs will result in an over 60 percent drop in undersea strike capacity.

The Department of Defense's Office of Cost and Program Evaluation (CAPE) conducted a review of the potential undersea strike alternatives to determine the optimal materiel solution to recapitalize the SSGNs' strike capacity. CAPE certified to the Office of the Under Secretary of Defense (Acquisition, Technology and Logistics) (AT&L) that the Navy studies in conjunction with CAPE's independent review and the naval Sea Systems

Command's (NAVSEA) Cost Engineering and Industrial Cost Engineering and Industrial Analysis's (05C) cost estimate met the requirements of an Analysis of Alternatives (AoA), and CAPE did not recommend performing an AoA for undersea strike. The review determined that the VIRGINIA Payload Module (VPM), a hull insert with four large-diameter tubes inserted aft of the sail, each tube capable of carrying seven Tomahawks, represented the best materiel solution to mitigate the loss of undersea strike capacity given near-term budget constraints. To minimize cost, schedule, and technical risks, VPM will reuse operationally proven systems and will not require the development of any new technology. For example, the missile tubes that will be used in VPM are nearly identical to the multiple all-up-round canister (MAC) tubes that are currently deployed on the SSGNs.

In December 2013, the Joint Requirement Oversight Council (JROC) approved the Capability Development Document (CDD) establishing the requirements and Key Performance Parameters (KPPs) for VPM. The CDD set clear KPPs for cost, schedule, and strike capacity. By placing cost on equal footing as capability, the CDD ensures the Navy will leverage its best practices and lessons learned from previous submarine research and development, acquisition, and modernization efforts to deliver the required capability within the strict cost targets.

Alteration to the design of any weapon system in full rate production has the potential to introduce justifiable concern associated with the possible erosion of program cost performance and production. The navy recognizes these risks as they apply to implementation of VPM during block V construction and intends to employ a full range of management techniques to mitigate them, commencing early in the design phase. The Navy has a proven record of developing and executing similarly scaled efforts such as the Block III design for affordability effort including the redesigned bow. These techniques are well established and embedded in the current submarine acquisition community culture, developed during NSSN [the New Attack Submarine Program – the precursor to the VIRGINIA Class] program inception and

evolved through the successful VIRGINIA Class Block IV construction contract award.

The Navy's disciplined engineering and acquisition management approach for VPM, in conjunction with treating cost and capability as equally important requirements, will minimize the potential for cost performance degradation and program disruption. The key actions the Navy is taking to minimize costs are: continue proven management techniques used from program inception through Block IV award; implementation of Integrated product and Process Development (IPPD) in conjunction with execution of existing build plans; ensure stable requirements; high design completion at construction start; risk mitigation; and cost reporting.

1. Background

The VIRGINIA class Submarine program was the first major defense program to implement the tenets of the October 1994 Under Secretary of Defense for Acquisition and Technology memorandum, "Implementation of Integrated Product and Process Development (IPPD) in DoD Acquisition Programs." The VIRGINIA Class program has continuously implemented the use of Commercial off-the-Shelf (COTS) components, open systems standards, acquisition streamlining, total ownership cost (TOC) driven decision making, Lean 6 sigma assessments of all processes, and recent should cost/will cost and Better Buying Power initiatives to improve the program as it has matured.

1.1 Block I – IPPD Design/Build Genesis (SSNs 774-777)

From inception, the VIRGINIA Class Submarine program was strikingly different from past fast attack programs, in part due to advances in technology, but mostly due to revolutionary changes in the design/build, business, and acquisition processes. The Navy, General Dynamics Electric Boat (GDEB) and their major subcontractor, Huntington Ingalls Industries – Newport News Shipbuilding (HII-NNS), embraced the IPPI) concept and established multi-disciplined teams to collabora-

tively design and build the submarine. Inherent in the definition of IPPD, both products and processes derived benefit from structured and hierarchical integration of the cross-functional teams. The IPPD approach holistically linked operational performance, construction techniques, test methods, and life-cycle supportability into an up-front *single-pass* design effort. IPPD enabled the shipbuilder to expand the use of modular construction and off-hull module assembly techniques beyond that of previous submarine programs and erect the entire submarine from 10 major sections. While the IPPD approach was exceedingly effective, the introduction of a new, sophisticated Computer Aided Three-dimensional Interactive application (CATIA) also greatly enhanced the design/build process and programmatic business efficiency. The CATIA software design tool replaced traditional drawings and hand crafted wooden models with 3-D manipulative color graphics dispersed to integrated Product Team members to facilitate timely and efficient, visual design collaboration. CATIA also established the single shipbuilding construction and procurement database, linking design with production and business operations. CATIA also provided a higher fidelity design release forecast which in turn supported the establishment of a more accurate budget baseline from which to conduct cost analysis.

1.2 Block II – Continuous Improvement via Capital Expenditure (SSNs 778-783)

As the program began construction on the block II submarines, the Navy set about to improve construction efficiencies beginning with USS NEW HAMPSHIRE (SSN 778), the first submarine in the Block II contract. Recognizing construction span time reduction held the most immediate promise for lowering cost and accelerating delivery of the warships, focus was directed at determining what could be done to improve industrial efficiency without compromise to quality or performance. Teaming for success, the navy and shipbuilders agreed that facility investment was need-

ed, and a strategy to incorporate an innovative Capital Expenditure (CAPEX) incentive clause was devised and incorporated in the Block II contract. Of the 10 Block II CAPEX funded projects, the transportation system upgrades provide the most visible evidence of reduced span time by allowing a shift from the Block I 10 module build plan to a plan entailing only four *super* modules to undergo final assembly at the delivery shipyard. Block II CAPEX projects have produced a seven to one return on investment.

1.3 Block III – Design for Affordability (DFA) (SSNs 784-791)

The VIRGINIA Class cost reduction program began in earnest in late 2005, when the Chief of Naval Operations (CNO) issued a challenge to the VIRGINIA Class Program to reduce the acquisition cost of each submarine to $2 billion (in FY 2005 dollars) by 2012 as a condition of increasing the procurement rate from one to two submarines per year. This challenge represented a 20 percent decrease in unit cost.

1.4 Block IV – Reduced Total Ownership Cost (RTOC) (SSNs 792-801)

Having optimized the construction process via targeted capital investment and DFA, the program concentrated on creating more operational value from each submarine by increasing the time between major maintenance availabilities. The goal was to alter the established life cycle maintenance plan from 72-month operating cycles, with 14 deployments and four major depot availabilities, to 96-month operating cycles, with 15 deployments and only three major depot availabilities. The challenge once again was to identify which design changes offered the highest Reduction of Total Ownership Cost (RTOC) return on investment from a limited design budget – assessing maintenance drivers and factors that determine the aggregate operating cycle. By eliminating one depot availability per hull, the program will avoid approximately $120 mil-

lion (FY 2010 dollars) in Operating and Support costs per submarine. By enabling an additional deployment rom each subsequent Block IV and beyond hull, an operational availability equivalent to one submarine will be realized following delivery of SSN 805.

2.0 Block V – VPM Concept Origination

The VPM concept was introduced to address the eventual loss of submarine guided missile (SSGN) strike capabilities in the mid-2020s when the Navy's four SSGNs retire, reducing Navy-wide undersea strike volume by almost two-thirds. The SSGNs' retirement also coincides with a historically low attack class Submarine Force structure.

In a 2013 review of undersea strike alternatives conducted by CAPE, VPM was identified to be the optimal materiel solution to recapitalize undersea strike without substantially changing a mature and stable submarine design. CAPE certified to AT&L that the review met the requirements of an AoA, and an AoA was not required. VIRGINIA class submarines with VPM would retain all existing mission capability, while providing approximately 94 percent of the current undersea strike volume.

In December 2013, the JROC approved the CDD establishing the requirements and KPPs for VPM. The CDD sets clear KPPs for strike capacity, schedule, and cost. The strike KPP increases the missile capacity from 12 to 40. For schedule, the VPM's Initial Operating Capability (IOC) threshold and objectives dates are no later than 2nd quarter FY 2028 and no later than 4th quarter FY 2026, respectively.

The cost KPP included criteria for design, lead ship, and follow ship thresholds and objectives requiring a disciplined approach to balance capabilities within the established cost parameters. Based on the NAVSEA 05C current estimate, the VPM cost estimate is below the CDD's cost objectives.

Cost – CY10$ ($M)				Cost – TYS ($M)			
	Threshold	Objective	Current Est.		Threshold	Objective	Current Est.
NRE:	800	750	744	NRE:	994	931	924
Lead Ship:	475	425	423	Lead Ship:	633	567	564
Follow on ships	350	325	318	Follow on ships	567	527	515

Note: CDD Cost values are for 20 VPM modules and start of construction in FY 19

The Navy/Industry team is focused on controlling VPM program costs, while minimizing baseline ship impacts, and maintaining the established VIRGINIA class build plan cadence. As a result of the VIRGNIA Class modular design, inherent design features make the insertion of a hull section less of an impact on the build plan. The VPM design is modeled after other successful VIRGINIA Class programs, which have lowered costs through a proven cost reduction framework.

3.0 FY 2014 VPM Design Funding and Cost Control Management Requirements

The Consolidated Appropriations Act, 2014 (Public law 113-76) appropriated $59.1 million for the development of VPM. Division C of the Joint Explanatory Statement accompanying the Consolidated Appropriations Act, 2014, directed the creation of a separate budget line item to enable additional congressional oversight and increase transparency into the cost of the VPM. The Navy established Navy PE: 0604580N VIRGINIA Payload Module (VPM) to fulfill this requirement. The Joint Explanatory Statement also stipulated the withholding of $20 million in funding until the first submission of a bi-annual report to the congressional defense committees describing the actions the Navy

plans to take to minimize costs. The following sections of this report are intended to fulfill this requirement.

4.0 Cost Containment Strategy for the Block V VPM Design

The strategy to design and seamlessly insert VPM into the construction sequence within the established budget is to employ the full spectrum of proven management techniques used from program inception through Block IV contract award. Specifically:

- Incorporate key tenets of the USD (AT&L) Better Buying Power 2.0 approach to defense acquisition such as affordability targets and innovative contract incentives.
- Applying overarching IPPD practices and implement design/build teams (Block I and III lessons learned).
- Identify capital investment opportunities with high return on investment potential (Block II and III lessons learned).
- Develop design focused on affordability (Block III lessons learned) and life cycle maintenance costs (Block IV lessons learned).
- Explore and establish ship and component level acquisition strategies to yield a higher confidence/lower cost construction cost (Block III and IV lessons learned).
- Utilize an incentive structure that specifically details required cost reductions in design, construction, and operations and support.

These techniques have guided the VIRGINIA Class Program and will be used throughout the VPM effort.

4.1 Implementation of IPPD in conjunction with execution of existing build plan

The IPPD approach that was utilized as part of the successful Block III bow redesign effort provided the program with the experience and the strategy that can be leveraged for VPM during ongoing production. This will ensure the VPM design is strategically coordinated with construction and will not disrupt the established four-module build plan or construction cadence. This, in turn, requires an increase in the Advance Procurement funding

profile for Block V to enable the completion of VPM during the fabrication and assembly phase at the same time as the other module components. A detailed Integrated Master Schedule (IMS) and Module Build Plan will be completed in December 2014, providing the comprehensive IPPD roadmap to minimize baseline ship impacts and maintain the established VIRGINIA Class construction cadence. In addition, the design team will evaluate capital investment opportunities to lower construction costs.

4.2 Stable requirements

The CDD sets clear KPPs for cost, strike capacity, and schedule based on table requirements. These KPPs promote stability in the Program, providing the Navy and Shipbuilders with fixed, tangible, and measurable objectives. By placing cost on equal footing as capability, the CDD ensures the Navy will leverage its best practices and lessons learned from previous submarine research and development, acquisition, and modernization efforts to deliver the required capability within the strict cost targets. The ship specification process will further define the requirements in strict accordance with the KPPs.

4.3 Design completion

The current VPM design concept does not require the development of any new technology to satisfy the CDD requirements. By relying on proven operational systems, the Navy avoids the unnecessary risk new technology poses. Similarly, *like* systems and components already utilized or proven elsewhere in the submarine enterprise will be leveraged, scaled, or reused to an extensive degree. The most obvious example of this strategy pertains to replication of the tubes and scaling of the launch control electronics from the bow of the Block III design. The collective sum of the re-use strategy tied to the VIRGINIA Payload Tubes (VPTs), Submarine Warfare Federated Tactical System (SWFTS) combat system, Ship Service Hydraulic Plant, Electronic Auxiliary Fresh Water Plant, and other Hull, Mechanical and Electrical subsystems results in a high Technology Readiness Level (TRL) for the VPM effort. This equates to an

achievable goal of having the VPM design 80 percent complete prior to construction start, adding confidence to completing the design within budget and minimizing construction costs.

4.4 Risk Mitigation

The VPM cost reduction program will employ a low-risk technical approach, with a goal of having the VPM design 80 percent complete prior to construction start. This will ensure that design errors do not create issues during the construction phase, thereby avoiding unforeseen costs later in the program. With no new technology and significant design and component reuse, the VPM design has a high TRL, thus low risk to the shipbuilder. The program will continue to evaluate and mitigate construction and design risk. For example, the program will benefit when the land based VPT test site is completed at Naval Undersea Warfare Center (NUWC) Newport this fall. Manufactured at Quonset Point and installed by Electric Boat, this collaborative Navy/shipbuilder test facility will support early electronic testing to mitigate VPM risk, and lower shipbuilding construction risk.

The shipbuilding industrial base is well positioned to simultaneously design both VPM and OHIO Replacement as the completion of the VIGINIA Block III and Moored Training Ship design efforts allow or sufficient General Dynamics Electric Boat (GDEB) resources to support both designs.

The VIRGINIA Program is collaborating with the OHIO Replacement Program to ensure commonality among select ship components and design features which will benefit the acquisition and life-cycle costs for both programs. Where possible, the programs will utilize common equipment designs such as Ship Control system hardware, and Command, Control, Communications, and Intelligence (C31) systems. The two programs will utilize best manufacturing processes and practices to ensure cost savings across both classes.

4.5 Cost reporting

The VPM program will continue to use the established best practices that enabled previous cost reduction. The program has an

effective and established metrics/performance measurement system to manage cost, schedule and risk. A key and essential factor governing effectiveness is the accuracy of the underlying work scope comprising the budget baselines being tracked. The CATIA design application has remained in use since Block I and provides this essential fidelity. Cost analysis data, combined shipbuilder and Navy estimates at completion (EACs), formal risk management program outputs, and quarterly design reviews will all be utilized to assess the VPM program health. To promote specific transparency into cost, as directed, a separate Research, Development, Test and Evaluation (RDT&E) Program Element (PE: 060458ON) was developed for VPM funding. This new PE is reflected in the 2015 budget submission to Congress and ensures VPM costs are separate and distinct from the program's overall RDT&E budget. Consistent with the program's history of monitoring cost, cost estimates for VPM design will be reviewed quarterly and refined by the VPM design team and the program has developed action plus (based on estimates of cost-at-completion) to track cost reporting.

5.0 Conclusion

This report provides a baseline understanding of VPM and the cost reduction and containment strategies employed by the Navy throughout the VIRIGNIA Class Program to include the early efforts on VPM.

Subsequent bi-annual reports will provide additional specific metrics for VPM as its acquisition, design, and construction strategies are developed and refined. Products such as design curves, manning ramp-up plans, design drawings, and progress on ship specifications will be provided with future reports as they become available.

ANNUAL SYMPOSIUM PRESENTATIONS

2015 ANNUAL SYMPOSIUM
NAVAL SUBMARINE LEAGUE

CONGRESSMAN JOE COURTNEY, D-CONN
BANQUET SPEAKER
OCTOBER 22, 2015

Thank you for the invitation to be here. Anytime I can be in a room with more people than my margin of victory that's a good time for me.

The first thing I did when I came in was I checked with Tim Oliver. It looks like I'm the last thing standing between you and dinner, so I'm going to try and obviously respect that because that's not a good place to be when people are hungry and you've worked hard with the symposium the last couple of days. I did see the news clips and it sounds like there have been some really good exchanges of ideas.

Admiral Caldwell, it's good to see you again. I know you are off to a great start at NAVSEA 08. I see your predecessor there, Admiral Donald, who took me on my first submarine underway, under the ice, a number of years ago it seems like.

I had never been on a submarine before that trip. Mike Bernacchi, I think his wife has helped organize this event, was there to greet us. We flew up to Alaska and then met the sub. We were in the control room, as we were descending, and I was doing my best to get out of the way of everybody in the room. I'll never forget, I was standing there as we were submerging, and all of a sudden I started to feel these drops of water hitting me on the head.

So I was standing there going, is that supposed to be doing that? One of the sailors, who was standing behind me, took a lot of pleasure in informing me that it was condensation. Anyway, that was my welcoming to the great work that people do on submarines.

What I thought I'd do really quickly this evening is talk a little bit about a view from the Hill in terms of where the priorities are that you've been discussing here these days. When I first came to Congress—now that I'm ranking member on Seapower, I discovered that guys on my staff work and talk to a lot of you.

The Virginia-class program, as John Padgett alluded to, was kind of limping along at one sub a year at that point. It was a pretty daunting challenge to be involved as a freshman trying to boost the build rate up to two subs a year. We checked our notes on the way over here and if you looked at the budget for Virginia-class in what was submitted for 2008, it was $2.7 billion for one sub a year.

There was no advance procurement money. We were looking at 2012 before we were going to be at two a year. There were zero dollars in terms of any design work for a new class of submarines. That was the first time in 50 years that had actually been the case. Again, there was certainly some design and engineering work being done on existing Virginia programs, but nothing in terms of a new class of submarines.

We were successful in terms of kick-starting that process in that first year with Congressmen Taylor and Jack Murtha who came up and visited. We had good bipartisan support from Bill Young and Roscoe Bartlett and others. But if you fast forward to where we are today in terms of the National Defense Authorization Act that cleared through conference—and it's got a bit of a bumpy ride as we know in terms of the Overseas Contingency Operations issue—but in terms of the submarine piece, which has zero controversy in today's politics, it's $5.3 billion in terms of Virginia-class for two subs a year. We got a very healthy number for design work for Ohio Replacement. It's well over a billion dollars. Virginia payload has the amount that we know we need to hit to try and get that critical—keep that critical program going.

Rather than having members of Congress come up to me and say, what do we need submarines for, now it's a pretty much a consensus issue in terms of the fact that this is a priority that people understand better. A good sort of measuring stick of that is that when we were doing both the Defense Authorization Bill and

the Defense Appropriations Bill, we actually had some votes in the House on the push to try and create a separate account for the Ohio Replacement Program, which again is an issue that has been sort of bubbling up in front of the committee for a number of years. Looking at the Navy's shipbuilding plan and the clear spike in cost that the Ohio Replacement is going to create, and the pressure that's going to put on all of the rest of shipbuilding, including Virginia-class, a lot of us believe that this is a mechanism that has clear precedent in the past and is a smart way to protect Navy shipbuilding.

So there was a floor vote to basically strip that program from the Defense Authorization Bill, which was brought by a member of Congress from Oregon. The vote total was 375 opposed and 43 in favor of that measure. A few weeks later there was an amendment that Randy Forbes, the Chairman of the Seapower Committee, as many of you know a Republican from Virginia, and myself brought to the floor to protect that program when we were doing the defense spending bill.

And again, number one, an amendment to the defense bill is a bit of an uphill battle, particularly when authorizers are bringing it and you're running into the catechism of the appropriators. Again, the Submarine Caucus, the Shipbuilding Caucus, really lit up the emails. The vote total on that was 321 in favor of protecting the ORP account, and only 111 opposed. Again, there's kind of an interesting story about the balance of power between authorizing committees and appropriating committees in terms of what has happened to the degeneration of the budget process and how that, in a sort of interesting way, has pushed up the significance of authorizers.

What I think is even more interesting is that if you look at those vote totals and the breakdown—and Neal kind of checked it out afterwards—if you look at the two caucuses the vote breakdown was 74 percent in terms of the prevailing side in the Republican Caucus and 74 percent in the Democratic Caucus in favor of the prevailing side. I mean, you don't see that very often in Washington these days. Anyone watching TV today got a pretty good taste of the sort of scorched Earth environment that this is all

happening inside of. So I think that's a pretty impressive little factoid for people to sort of think about in terms of the work of this symposium and really how in Congress right now we're in a pretty good place in terms of trying to not have to start from scratch in terms of educating people regarding the priorities of these programs.

But obviously, there's a lot more work that lies ahead. The conference report that came out did pretty well preserve the structure of the ORP account. But as Robert Work said when he was up in Groton a couple of weeks ago, there's still a high degree of skepticism within the administration about trying to actually fund that account.

We gave it, I think, some good tools on incremental funding, which we know is a really smart way to run these programs. But the challenge in terms of trying to deal with a priority that everybody from Secretary Gates to now Secretary Carter has admitted and stated repeatedly is the number one priority of this country in terms of a sea-based deterrent that fits into the New START Treaty, is if we don't do this there are just so many repercussions in terms of our national defense. But, that still begs the question of how do you pay for it and whether or not the rest of shipbuilding is going to take the hit in terms of absorbing that cost? So that certainly is going to require a consistent, diligent, vigilant effort by all of us to keep reminding people on the Hill that this is something that is just going to be a real challenge over the next 10 or 15 years or so.

The second, and I know this was in the press today, is that there's obviously a lot of new initiatives to try and extend the strength of our undersea force with unmanned developments and ideas, which again frankly, I think a lot of members aren't well-versed in right now. I think the job is to educate people, particularly on what's happening in the Asia-Pacific and now with a resurgent Russia. Even with the two a year build rate we're still going to see an undersea force that is going to dip in the next 10 years or so. Trying to get a force multiplier with these new ideas is really critical in terms of maintaining what I think is something

that is so important, which is to maintain our domination of the undersea domain.

Again, we are so lucky to have some of the people in this room here. I see my friends from southeastern Connecticut that are here, and a lot of good friends from the Navy that are here. I even have a few friends from Virginia, these days.

But again, I'm very bullish on our submarine programs. I think the threats that are out there right now are such that on a bipartisan level they really raise people's curiosity and concern about these challenges. Obviously maintaining this incredibly important advantage that we have in the world today generates a real appetite and a receptivity to members of Congress.

But we can't do it alone, obviously, not even Two Sub Joe. We need to really work together as a team and settle our issues amongst ourselves and then really pivot from there to the incredibly competitive environment that still exists in Washington with the Budget Control Act and other challenges. But again, I think that at the end of the day the merits of the argument are so incredibly strong that I think we're going to prevail and obviously our country is going to benefit from it.

So thank you very much and have a great dinner this evening. The door is wide open if you're ever up on the Hill. Thank you very much.

ADM. PADGETT: Just as an aside, this week marks the 100th anniversary of submarines coming up the Thames River to the base at Groton. So southeast Connecticut is very, very pleased with that as well.

2015 ANNUAL SYMPOSIUM
NAVAL SUBMARINE LEAGUE

ADM CECIL HANEY, USN
COMMANDER,
UNITED STATES STRATEGIC COMMAND

OCTOBER 22, 2015

Well, it's great to be here, and thank you, Admiral Mies for such a warm introduction. It's sort of neat, [in] so many jobs I've had, in which Admiral Mies has been there to provide me sage advice. It's sort of neat he's also my chair of the Strategic Advisory Group that supports U.S. Strategic Command, so I can't thank him enough in terms of things. It's really an honor to be here today in the company of so many submariners, dedicated professionals, to our silent service, the best Submarine Force in the world.

As a submarine sailor it's sort of interesting being stationed in the heartland of America many, many miles away from the ocean. It's about as far as you can get and be in the United States. So it's great to be a lot closer, about 1,400 miles closer to the ocean, so I feel better already.

I mentioned Admiral Mies and thanked him for introducing me, but also again for a world-class event, just looking at the agenda and knowing the good work that's going on here at this Submarine League forum. But it's also great to see the full power lineup of submarine leaders that are also here that have been quite frankly mentors for me throughout my career. Admiral Giambastiani, Admiral Kirk Donald (I don't see him – there he is), and of course, Admiral Skip Bowman

It is neat to have that much talent here in the same room. I know they know stories about me, so I hope those are top secret (and they keep a cover on it) so after that great introduction that Admiral Mies provided, you won't think less of me.

But we all grew up somewhere and we all have to learn and go through training and what have you, and it's just great, as I say, to have that full power lineup. There are just so many of you here, if I went through the roster of all of you that have touched Cecil Haney, we would be here about three hours, so I won't do that. But I just want to give a shout out and thank you all, each of you, who have touched me in some way, shape or form throughout my journey.

To the Submarine League, it's my sincere gratitude to you for both hosting this event, (quite frankly) and also your outstanding publication, THE SUBMARINE REVIEW. I've used it throughout my career after I was first introduced to it. And I would really say, those of you that aren't familiar with it, it's something I would say is neat to look at for the history and everything else that that periodical provides. If you're not familiar with it, Google it and get onboard, that would be my comment.

But also, there are lots of spouses out here today and I would be remiss if I didn't give a shout-out for all the wonderful work you do for the Submarine Force, quite frankly. And Ms. Bonny would kick my butt if I didn't ask you to stand up and be recognized today.

We all know we can't get what we get done without your love and support in so many different ways. And finally, I want to salute the submarine veterans. There are many of you out there, but I want to highlight Captain Max Duncan. Where are you, sir?

He conducted patrols there in the famed USS BARB. As most of you know, that crew did some great work. They were sinking more enemy tonnage than any other submarine during World War II, disrupted Japanese shipping routes, and were the first submarine crew to fire a ballistic missile at an adversary target during the war.

It was great listening to Captain Duncan this morning, hearing it firsthand. So I hope many of you have had an opportunity to stop by and listen to his sage wisdom, but particularly about innovation, which we are about, we have always been about, as a Submarine Force. But to hear his incredible stories and not just read about them. So it was my first time meeting with you, thank

you, sir, for all you have done and continue to do and the submarine vets you represent.

This Symposium is honoring two Distinguished Submariners, Vice Admiral Carr and Vice Admiral Nicholson. Your legacies both included tours on the pre-commissioning unit of the USS NAUTILUS and onward to illustrious service within our Submarine Force and Navy, so a lot of respect for all you have done and the legacy you leave as well.

The theme of this year's symposium, *Accelerating Innovation and Meeting the Undersea Capability and Capacity Challenges of the Future*, could not be more relevant. I'm thrilled to be here to offer you some of my perspectives as the Commander of U.S. Strategic Command. It is amazing to consider the pace at which the geopolitical landscape has changed in just the past two years since I took command of U.S. Strategic Command.

I would argue that much of that change has been enabled by how readily available and relevant information has become. Take a look at Navy.mil or search the Internet for submarines, and you'll see that the silent service isn't as silent as it once was. I'm not just talking about news and commentary about our submarines and our forces, but also about those other nations, other partners, as well as our potential adversaries.

A few short years ago, although many in this room were thinking and talking about Russia, as a nation we were not. Today, not only has the context shifted considerably, but the sheer amount of air time devoted to news and commentary about Russia today is staggering. Russia is modernizing its nuclear deterrent forces and they've been very vocal about it.

Its strategic bombers routinely penetrate the United States and our allied air defense and notification zones. We have coverage on a number of destabilizing actions associated with Syria, Ukraine and Crimea, as well as the Russian violation of the Intermediate Nuclear Forces (INF) Treaty and other international norms and accords. Russia has also put a number of new classes of submarines to sea.

But it's not just Russia. China is re-engineering its long-range ballistic missiles to carry multiple warheads. At the same time,

China continues with its aggressive activities in the East and South China Seas.

To say North Korea's behavior over the past sixty years has been problematic is, of course, an understatement. Under Kim Jong-un, North Korea continues heightening tensions by coupling provocative statements and actions with advancements in strategic capabilities, claims of miniaturized warheads, and developments in both road-mobile and submarine-launched ballistic missile technology.

In space, many nations have developed jammers and lasers that can disrupt key operations. Russia and China have recently demonstrated their ability to perform complex maneuvers in space, and both have acknowledged they are developing counter space capabilities. As such, our resiliency in space matters.

Similar to outer space, the cyberspace domain is also facing growing threats from a variety of different actors. Russia is establishing its own cyber command that is responsible for conducting offensive cyber activities. And China also has been extremely busy in cyber, as you know.

Secretary Work recently testified that, "Chinese cyber espionage continues to target a broad range of U.S. interests ranging from national security information to sensitive economic data and intellectual property". We must be diligent in making our architecture and our operators more resilient, associated with cyber space. I could go on, but I think you get the picture.

Given that backdrop, though, let me offer a few of my thoughts in three areas associated with how we are addressing these challenges now and into the future. In particular, I will focus on readiness as it relates to hardware, the budget, and our most vital assets, our people. However, before I do that, let me see a show of hands of those of you that have in fact been to the heartland of America and visited U.S. Strategic Command headquarters.

This is an above average crowd.

Most of the time I ask that in settings, I get a few hands. So I will go over and give you an overview with that backdrop of what my priorities are, associated with my missions. U.S. Strategic

Command provides an array of global strategic capabilities to our joint forces through nine unified command plan assigned missions. And while each of these missions are unique, when considered as a whole they are complementary and they are also synergetic. These global strategic capabilities under U.S. Strategic Command are what allow us to address, I would say, 21st century deterrence in a very connected and holistic manner.

My six command priorities reflect these missions. At the top is deterring strategic attack against the United States and providing assurance to our allies. This, of course, requires us to have a safe, secure, effective and ready nuclear deterrent force. However, we can't deter and assure on our own. Building enduring partnerships and relationships with other organizations to confront the broad range of global challenges allows us to work together to synchronize as a military component with our whole of government approach. U.S. Strategic Command has hosted many allies over the past couple of years, but it was also fantastic getting to visit the French and the United Kingdom's strategic submarine forces earlier this year as part of our commitment to supporting regional and global security objectives.

My fourth and fifth priorities are addressing challenges in space, building cyber space capability and capacity, and last but not least is anticipating change and confronting uncertainty with agility and innovation. That's why I need you, sir, Captain Duncan, on my staff, given that earlier discussion we had. While my remarks will largely emphasize the first two priorities, understand that our ability to conduct strategic deterrence requires more than just platforms and weapons that comprise our visible triad of intercontinental ballistic missiles, our nuclear-capable B-2 and B-52 bombers and tankers that refuel them, and of course the ballistic missile submarines that I know this audience is well familiar with.

As important as these weapons systems are, they are not enough. To have a safe, secure and effective ready nuclear deterrent, we must also have appropriate intelligence and sensing capabilities to give the indications and warnings of incoming

threats. Our submarines, the SSNs and SSGNs play an important role in helping us with some of that.

We must have reliable warheads. And assured national nuclear command and control and communications connect our senior leaders and enable message transmissions from the President all the way down to the Warfighters, regardless of what depth they're at. A credible missile defense is also a part of that solution. And above all else, our people must be trained and ready to maintain and operate and defend those weapons systems.

Readiness, then, is critical for credible strategic deterrence and assurance. Whether it's USS WYOMING making its port visit in Faslane, Scotland here recently, or B-52s conducting a 44-hour mission with the Royal Australian Air Force, or yesterday's successful intercontinental ballistic missile test, all demonstrate our readiness and commitment to deterrence and assurance. Although I will emphasize the hardware and capabilities needed for the submarine ballistic missile force, realize two things:

First, much remains to be done to sustain, recapitalize or replace our strategic deterrent forces, including the triad of delivery vehicles, their associated weapons and the weapons infrastructure, but also the national nuclear command and control and communications networks. Each has unique requirements but all are aging, and we are sustaining most of them years beyond their original service life. All require significant investments.

Second, as we decrease the number of platforms and warheads, as we look at the New START Treaty, the value of our safe, secure and effective nuclear deterrent becomes even more important, both in terms of the assurance we provide our allies and partners, and our ability to support nonproliferation efforts. Today, we maintain 14 SSBNs. As the Ohio-class submarines continue to mature, their upkeep increasingly challenges our sailors and maintenance personnel to meet my operational availability requirements.

The Ohio-class will be operating for an unprecedented 42 years, six years longer than USS KAMEHAMEHA, previously our longest operating submarine. Some of you likely have served on her. I saw USS KAMEHAMEHA before she was decommis-

sioned. Even though I wasn't a crew member I can tell you she required a lot of care and attention. Her extended service, and that of our current fleet, is testimony to the efforts and ingenuity of our predecessors, especially those designers, engineers and maintainers. It also highlights the importance of maintaining those 14 Ohio-class submarines to continue meeting our nation's strategic deterrent requirements.

So let me talk about the Ohio Replacement Program, which is also supporting the United Kingdom's Successor SSBN program with a common missile compartment. While I salute the remarkable success of the Virginia-class program, I count on all of you involved in the submarine construction process to not only match that success, but to do better. That's a hard thing to do, I know, but we need to do it.

To meet my deterrence requirements Ohio Replacement must remain on track for its first deterrent patrol in 2031. It's on schedule to start the engineering and manufacturing development phase at the end of fiscal year 2016, but there is no margin left to avoid delay in replacing the Ohio-class submarines. Just as our platforms need updating, though, so too do our weapons.

As some of you know, the Trident II D-5 missiles have been serving our Ohio-class submarines for more than 25 years. An aggressive testing program has proven them to be extremely reliable. I salute the SSP team who recently celebrated their 60th birthday. Thanks to all the Navy's technical upgrades and other life extension efforts, this missile will serve on the Ohio Replacement platform out to about 2042. Similar to the Ohio Replacement, delaying the development and building of this missile replacement will also create risks with our strategic deterrent capability.

Some of our warhead industrial facilities have been around since World War II. In fact, I was just at Savannah River National Lab early this week. The stockpile is the oldest it has ever been. Its average age is 27 years and growing. It is the oldest it has ever been, quite frankly, in the history of this business. The critical infrastructure that supports it requires investment. So I would

surmise that overall we're out of time, sustainment is a must, and recapitalization is a requirement.

I know all of you in here are fairly aware of our budget situation. For the seventh straight year the U.S. has again been operating under a Continuing Resolution, making it difficult for future planning. I agree with Secretary of Defense Carter's comments that an extended Continuing Resolution or cuts from sequestration would cause us to make, quote, "irresponsible reductions when our choices should be considered carefully and strategically," end-quote.

Our budget has a deterrent value, I would say, all of its own, and reflects our nation's commitment to our deterrence strategy. We must have a synchronized campaign of investments supporting the full range of military operations that secure our national security objectives across the globe.

I voiced my support for the fiscal year '16 president's budget that's still being debated. It provides key capabilities for our Department of Defense strategy, including the areas that I lead in nuclear, space and cyber space. But, it leaves no margin to absorb new risks.

To meet the undersea capability and capacity challenges of the future, we must look for innovative solutions from the ground up. We have to repurpose capabilities and put them together in ways we've never envisioned before. We also need new solutions, looking at the Virginia-class, including Virginia payload module, sonar solutions and unmanned developments.

We know, as submariners, how to do this. Developing common technology in sub components in particular, with the Replacement Ballistic Missile, can benefit both the Air Force and the Navy, and is just one example of innovation that I'm going to count on in the future to help us cut costs. I challenge each of you to search for more areas where together we can and will make a difference for the future.

This brings me to my final point, education. In much the same way we sustain and modernize our platforms and weapons, we must also sustain and modernize our workforce. Deterrence isn't easy. It requires a comprehensive understanding and perception of

the strategic environment from an adversary's point of view. It's about communicating capability and intent, and convincing adversaries that they cannot escalate their way out of failed conflict. Our adversaries must know without a doubt that restraint is a better option.

Our people have to be strategic warriors capable of conducting integrated and combined operations and planning activities. We can't just look at military doctrine and order of battle to determine how an adversary thinks or what his next action will be. To deter, we must be able to think through the unthinkable scenarios and have a deep, deep understanding of potential adversaries.

As history has shown, we can get strategic prediction wrong. This means having the right people in the right jobs at the right time with the right background and the right education. It means investing in the future of our professionals, both civilian and military, officer and enlisted, who operate, plan, maintain, secure, engineer and support our nuclear enterprise. It means developing the next generations of engineers, physicists, mathematicians, space operators, nuclear weapons, reactors, propulsion experts, and multi-dimensional strategic thinkers. In other words, we must enable and inspire and nurture the next William Raborn or Henry Kissinger.

At U.S. Strategic Command we've established an academic alliance program focused on developing a community of interest for deterrence and assurance in the context of national security. We're now in partnership with some 17 universities and military institutions, and are looking for more to join us. Our scholars program at the National Defense University allows students to tailor their electives to focus on strategic policy and deterrence issues; and, of course, to come out to the heartland of America to visit with us.

The recently implemented Striker Trident exchange program enables Navy and Air Force strategic nuclear officers to gain an expanded view of the nuclear triad, as well as each leg's respective role in our strategic deterrent mission. Commanders associated with that program have given me glowing reports of how well that's going. There are a number of other initiatives, but we should

always ask, are we doing enough to stimulate interest? Are we preparing our next generation to think about deterrence and escalation control and complex scenarios, scenarios involving conflicts extending simultaneously across multiple domains: nuclear, space and cyber space? Are we learning enough about escalation control in this 21st century?

As I've traveled and met with many of our Sailors, Soldiers, Airmen, Marines and civilians, I know they are eager to learn and eager to be a part of our deterrence equation. This is why it's so great to see that we have, for example, the junior officer panel that will take place this afternoon. That should be exciting. And I'm also thrilled to know—I think that there are a number of midshipmen here today. I know I saw some. Where are you at? Would you stand up and be recognized?

Thank you for coming. I know I met one of you that had a submarine ambition. I hope all of you do, and I hope the audience here will engage with you in meaningful conversation.

I was thrilled to meet, just recently, the award winners. Having talked to them briefly, I'm confident that our Submarine Force and our country's future are in great hands. I can't thank them enough for all they do and what they represent.

For 70 years our credible, safe, secure, effective and ready forces have enabled the world to be without major war between great powers. To ensure strategic stability, our adversaries and potential adversaries must know we are a ready force.

So I ask the following of you, as I wrap up here. One, understand that operational excellence and readiness matters. Your day-to-day professional operations are what I want countries like Russia and North Korea, etcetera, to have on their radar scope. Two, make the most out of our precious resources. Three, recognize the big picture and appreciate all the parts that make up our strategic deterrent. Four, be an active voice, spread the word on why strategic deterrence is important. Five, please take the time to salute and thank our strategic warriors.

2015 ANNUAL SYMPOSIUM
NAVAL SUBMARINE LEAGUE

COMSUBFOR PRESENTATION
VADM JOE TOFALO, USN

PRESENTATION GIVEN BY
RADM FREDERICK ROEGGE, USN
COMSUBPAC

OCTOBER 22, 2015

My purpose is to share some insight, to share with you some vision of where your new Submarine Force leadership: Admiral Richard, myself, Admiral Tofalo, are intending to direct the Force. As Admiral Padgett mentioned, I'm not presuming to speak for SUBFOR, but I was asked by SUBFOR to come and share this vision.

It is truly a joint vision. It's something that he and I, with Admiral Richard, began working on even before we took command but after Senate confirmation, because you would never want to presume Senate confirmation. I think those of you who are familiar with us, with some of our existing strategic documents, will find that there are a lot of things that are very, very familiar.

Before I get into that, though, let me reiterate something that Admiral Richard had to say, which was that this really is an awfully exciting time to be a submariner. It's certainly exciting because of the tremendous capabilities and platforms and systems that we have to operate. It's exciting because of the operations themselves that we have that are absolutely eye-watering and, as Admiral Richard alluded to, we love to talk about in greater detail in classified fora. It's exciting because of the incredible people that we have, with outstanding talent manning those ships and taking them to sea and supported by their families, and frankly, supported by all of you.

As for the Commander's Intent that I'm going to share with you, I want to be sure that everybody realizes you are part of the

audience for this document, for this vision. We are all partners in enabling our Submarine Force to accomplish the things that the nation needs done. And that, finally, is the thing that makes this the most exciting time to be a submariner. It's because the nation really expects and demands great things from our Navy. And the Navy expects and demands great things from the Submarine Force because of the things the Submarine Force is uniquely capable of doing.

Before I go on any further, let me also again segue off of something Admiral Richard said. He commented on the great leadership from which the Submarine Force is profiting. And by extension, and really the amplification there, is the leadership of all of you in the room who have set us up for this kind of success right now. Certainly during yesterday's presentations, during the social last night, and looking around the room today, I see an awful lot of Submarine Force heroes, friends, mentors, people who have set us up for success. So I give you my thanks for giving me the opportunity now to participate in this exciting time to be a submariner.

The product I'm going to share with you is still a draft, let me emphasize, and foot stomp that first. It's a draft. It's going to change, I guarantee. It has already evolved considerably since we began. It has been informed not just by the three of us, but by our staffs, our major commanders, our CMCs, etcetera.

The next steps will get us to actually publishing it, probably first and foremost we have benefited from sort of a sneak preview from a draft of Admiral Richardson, our new CNO's, campaign design. I think it's probably prudent and appropriate for us to make sure that we understand what direction, guidance and vision the CNO has for us and make sure that we are in sync. So far I've seen nothing which indicates we're not, but again, as prudent mariners, we will likely wait and see what the commander's intent is before we provide our own. And then we're going to have an opportunity for feedback with the submarine flag officer conference coming up this winter, so I'd expect sometime this winter we'd probably be in a position to be able to say that we're really done.

Admiral Richard already mentioned some of this in talking about the Integrated Undersea Future Investment Strategy. I would like to provide a little bit of a history lesson.

Back in 2012, SUBLANT and SUBPAC and N97, Admirals Richardson, Caldwell and Bruner, issued the Design for Undersea Warfare which in November of '12 was update number one. It identified a vision and lines of effort and focus areas and the metrics by which we would evaluate success. Then last year, SUBLANT and SUBPAC, Admirals Connor and Sawyer, issued their Commander's Guidance. That was a series of letters that was just that, guidance to a range of different levels in the chain of command. Admiral Richard already mentioned the undersea investment strategy which really is primarily focused towards our industry partners and across DOD. It is designed to be able to provide insight into the direction, programmatically, that we the Submarine Force, through N97, are going, so that you can help us be as effective and as cost-efficient as we possibly can be in a constrained resource environment while achieving our aims.

There is a separate brief that speaks to the undersea dominance campaign plan. The themes I'll touch on again here are familiar, grow longer arms, get faster. We'll skip the basic entry level course and get to at least the intermediate level here.

In surveying the landscape and doing what we did in first trying to sample the environment, talking to sailors and understanding how they're currently utilizing the guidance, we realized there were some questions in this kind of sequence of events with folks just wanting to be sure they understood what it is that's currently effective. We didn't have a list of effective pages as we do with the RPM changes that made it clear for the publications petty officer to go back and validate. And as I mentioned, the great work in the undersea dominance campaign plan is a PowerPoint. I mean, these are great concepts and ideas that we are marching off with, but we've never really formally promulgated them.

We saw this as an opportunity and so our intention here, with this vision, is to, in fact, integrate, consolidate and where necessary update them. So I think what you'll find is, again, the themes are going to be very familiar. We've taken the editorial

privilege of putting our own imprint on some of the concepts based on our own experiences and priorities. But I think you'll find that our ideas are very similar to those of our previous leaders.

The most important thing I want to emphasize is that we're not in extremis. These are not back emergency and right full rudder. These are come right, steer course 173. Going down the Thames River, and just in order to try and make sure that we remain center channel. The last thing I wanted to mention is, this is also consistent with the core competencies that are in the Navy CNO's cooperative strategy for the 21st century.

As I mentioned right up front, we are all the intended audience here. It's certainly intended to speak to the Submarine Force and the Navy organizations that support us. But there are supporting organizations that are not in uniform. Certainly the Submarine Force's supporting organization, our industry partners, all are included here.

So we've tried to make sure that thematically this is guidance that will be of assistance to all of you in your support of us. It's also recognizing that primarily we're speaking first and foremost to submarine crews and to their leaders. But again, it runs across the spectrum of active duty, reserve component, our government civilians, and as I said, our industry partners. The folks we expect to benefit from this are clearly those sailors in uniform, on submarines, but everybody in those supporting organizations and the family members who are supporting our sailors as well, we expect to benefit from this.

The other thing I want to clarify is that although SUBFOR has been tasked by CNO with responsibility to represent the undersea domain, with this document we are not presuming to speak for or provide direction to the forces for which we're not the resource sponsor or the forces not under our command and control. So we certainly recognize that undersea forces, things that will influence and affect our success in the undersea domain, includes operational forces such as MPRA and fixed systems and CRUDES and ASW helicopters and all the systems that operate from those platforms. We are not discounting them as part of the undersea

team, we're just not trying to speak to them. So it's, again, a Submarine Force perspective.

We've characterized this as a Commander's Intent. Again, it could be a vision, it could be a mission. It has lots of different elements to it. But we decided to structure this as a Commander's Intent, a joint pub sort of doctrine.

Why is that? Well, we in the Submarine Force are not always big believers in doctrinal purity, but there is a certain simplicity that comes from trying to organize along those principles. I was always struck by listening to Admiral Gortney when he was first Fleet Forces Command and now is the commander of NORTHCOM. Every time I heard him talk to a group he would emphasize that the two most important things to get right are the command and control and the Commander's Intent. If you can get those two things right then everything else will take care of itself.

When you think about it, if all you provide is the Commander's Intent and have clear command and control, if you've clearly stated what is the purpose you're trying to accomplish, what is the end-state that you're trying to achieve, then you're enabling your commanders to do what submariners have always done, which is to be successful conducting sustained, distant, far-forward, independent operations. That is certainly part of our culture. It is part of our history. It's what we are designed to do and do very well. And as Admiral Richard alluded to, and as I'm going to talk about more this afternoon with respect to the operating environment, that's part of the future in which we are going to be operating. The ability to operate independently, without sustained reach back and distant support, is going to be a key element in our ability to be successful.

I'm going to talk more about these different elements. Elements of the Commander's Intent, let's talk about why we're doing this.

First and foremost this has to do with the strategic environment in which we're operating. The world continues to evolve. It's a dynamic place.

There are organizations, nation states, etcetera out there whose interests don't always align with our own, and not just speaking on

behalf of the United States but in terms of our allies, our partners, our friends overseas as well. There are a number of nations, I'll list a few, that are expanding their defense budgets and spending, expanding the scope and nature of their operations, expanding their capabilities. And again, it's not my place, intention or purpose to surmise what their intentions are with those capabilities, but as military professionals we need to understand those capabilities and make sure that we are manned, trained and equipped in order to be able to deter and defeat them.

Certainly the recent history of naval operations, in particular for the Submarine Force, we have been projecting power from very secure, uncontested sanctuaries in the littorals with long distance Tomahawk missiles and other such capabilities. That's what the nation has demanded of us and we have done that very well. I don't feel we have ever taken our eye off of basic submarine core competencies of undersea warfare and anti-submarine warfare.

But the fact is, I expect that what the nation is going to demand of us more in these next 10 to 15 years is going to be much more blue water than brown water, much more ship-to-ship or sub-to-sub, than power projection. What that means for us then is to ensure that we are always providing forces to the combatant commanders that are going to be prepared to win, or at least to have the capability that will successfully deter not just strategic conflict but even conventional conflict.

Certainly what the nation expects of us is continuing to evolve as well. As a result of New START we can see that the seaborne leg of the triad is going to become ever more important, and therefore much, much more important for us to ensure that we can safeguard it and that they're capable of executing their mission. And as well, the nature of the threat environment also includes many, many more threats that make it much, much harder for the rest of the joint force and for the rest of the Navy to be able to operate in places where we may be required to operate.

So anti-access and area denial threats are things that significantly impact the concept of operations for the majority of the joint force. For us, with the ability to remain concealed under

water, obviously we need to be able to exploit our stealth in order to enable the joint force so they can get done the things they need to get done. And we need to be able to hold the adversary at risk and make sure that he is aware that we are able to hold him at risk.

And then as to purpose, again, these are not new themes. Through our ability to operate stealthily, to go where we want when we want, we need to continue to be able to deliver those elements of access, collect intelligence and deter conflict and always be ready to fight and win should deterrence fail. So the nation is expecting more of the Navy and the Navy is expecting more of us.

How are we going to do this? Well, as I mentioned, stealthy, independent, forward operations. Certainly we need to be able to integrate with the joint force and deliver combat power when required. In the initial phases, the phase zero plus and on up, the nation is going to expect us to be able to go in harm's way and accomplish what needs to be done. I won't read you the list, but obviously these are basic core competencies, again, of what stealth provides us.

The undersea environment is a vast maneuver space in which we can operate without creating provocation but be in position to do what needs to be done. The ability to penetrate defenses means you can deny safe haven to adversaries. Certainly it gives us opportunities that we can exploit for our own benefit or for the joint force. That very uncertainty creates ambiguity in the adversary's calculus that makes him inefficient. It's a cost-imposing strategy for us to impose on him.

Admiral Richard talked about the operational readiness and material. We'll all talk more here later as well—trying to get our boats in and out of their availabilities on time is hugely important, certainly in terms of delivering the capabilities we owe the Combatant Commanders. It's usually important for the health and welfare of our sailors as well. That work which is done in the yards is vitally important. It's key to the life cycle sustainability of our boats. It's not always what every submarine sailor signed up for on every given day.

And then ultimately we need to be sure that we are developing sailors that are capable of exercising and demonstrating these kinds of traits. It's the kind of capabilities which are going to take the world's most capable platforms and systems and operate them successfully. I had the privilege in the O-5 command of taking what was then the Navy's newest submarine at that time, the USS CONNECTICUT, the second Seawolf, and frequently found myself reminding the crew that we have to be on-step, on our game, the most proficient submariners possible every given day. Although we had what was then the world's most capable submarine, we could lose an engagement because of a personal error, or lose the ship because of some problem with a tag-out or Subsafe paperwork. Every day every submariner has to be at their very best in order to enable the capabilities which our industry partners are providing us.

So, who does what? These lines of effort really are largely the same as what you read in the Design for Undersea Warfare. Providing ready forces, so we're talking here about the day-to-day kinds of tasks that go to the waterfront; conducting maintenance and getting it done on time; individual training and development of both teams and of individual sailors; logistics; the force protection that ensures not just the physical security of ships and sailors, but the cyber security and security in the electromagnetic environment. A couple of the focus areas we highlight here again are continuing to make sure that we're paying attention to operational safety and force improvement; and ultimately, again, making sure that at the deck plate and waterfront levels, we're delivering combat ready forces.

Line of Effort Number Two goes up an echelon, that's factually imprecise, but up the hierarchy. We're really talking here about the headquarter staffs who need to employ the Force effectively. So on a day-to-day basis it's the deployment orders, the mission tasking, the global force management aspects, the tactical development.

So this is everything associated with providing ready forces, the most ready forces, to the Combatant Commanders. Again, that's shipyard and depot level maintenance, making sure that

we're getting in and out of availabilities on time, that the boats are getting modernized with the kinds of capabilities that they need. Then making sure that in an ever more challenging ASW environment that we're improving and continuing to develop our tactics, our tools, to be able to improve our ability to hold the enemy at risk. And again, as we go through here you'll see—I hope you'll see—there's something in here for everybody to be able to contribute to.

Number three, developing future capability. This is basically what Admiral Richard just recounted for you. In fact, he is the guy that Admiral Tofalo and I are going to hold responsible and accountable for delivering on these future capability requirements. Again, in summary, it's everything associated with identifying the requirements and delivering the capabilities that we're going to need to support high-end combat should it come to that; and hopefully, by having those capabilities, be able to deter it.

And then finally, and this one is new, this was not a line of effort that appeared in the previous documents. But as I kind of recounted from my story onboard USS CONNECTICUT, we are nothing without our people. We've always acknowledged that and we've always demonstrated that understanding through our actions as well as our words, we just had never really quite codified it. So line of effort four is about empowering our people, recognizing that they are the foundation of our strength.

This really is intended to be a task to everybody who is a leader in our Submarine Force. When you consider the different levels of leadership, certainly supervisors, peer leadership, subordinate leadership, it's really intended to speak to everybody because everybody in the Submarine Force is a leader. And not just on the submarine, but again, in all of our supporting organizations with all of our industry partners, and for the benefit of our sailors on the tip of the spear on our submarine crews and their families.

This has to do a lot with trying to make sure that we're attacking and addressing the things that are the sources of destructive behaviors of individual sailors, trying to reduce the unplanned losses where we create a personnel readiness gap because of a

sailor's inability to go to sea with the ship. And it's also about trying to not only meet the numbers in our requirements, meet our quantity requirements, but to try and challenge ourselves to do a better job of recognizing the quality within our quantity. What is also part of this process, are the metrics. So if you're going to task us with things to do, then good submariners are going to want to know how we're going to assess the results of the training plan. That is work that is embedded beneath here. There's more than I can go into right now. And as I said, it continues to be a work in progress.

Let me spend just a little bit of time going briefly over the end-states. What is it that we hope to get out of this? And again, most of this really is not new, but let me just emphasize a couple of things.

Owning the best. Our focus, as we've talked about this, has typically been about platforms and ships. That certainly is an important, probably the most important part of it. But it's more than just platforms. Owning the best has to do with making sure that we're not just building but we're maintaining and modernizing with the capabilities that are required. And again, it's not just about the submarines themselves, but it's all the systems, the devices, the tools, the weapons, everything associated with successful submarine operations.

And, of course, in this environment the implied task is to be able to do so in a manner that lives within our budget constraints. So we're going to have to be cost effective because there's never going to be as much money as we would like for all the things that we really need. Well, there will always be enough for what we really need, there will never be as much for what we really want.

Okay, grow longer arms. Again, similarly, we tend to always think about this in terms of the maximum range of our weapons, but it's really more than weapons.

Getting longer arms certainly includes being able to cover a greater geographic area with longer range. It also has to do with the breadth of the effects, the kinds of things we're able to deliver. It has to do with the kinds of domains in which we can influence

events: certainly undersea, but on land, in the air, on the surface and in the electromagnetic spectrum.

Longer arms also talks about the influence that we're able to achieve simply through the kinetic effect, but it affects the decision-making of a potential adversary. So it's developing and building not just the tools, the sensors, but it's really the entire spectrum of things to which we can contribute a positive effect.

Next is beating the adversary's systems. Again, this is not new. This has always been something that submariners have challenged themselves to able to accomplish. The counterpoint to that is all those things that we are trying to protect of our own in the U.S. order of battle are things which, when they belong to the adversary, are things that we need to be able to hold at risk and want to be able to threaten.

Getting on the same page, again, has to do with alignment, making sure that between the strategic and the operational and the tactical, between the White House and the Pentagon and out in industry, making sure that we are on the same page and working towards the same thing. The very fact that if you were to compare Admiral Richard's slides with my own, when you consider the fact that this is not just Admiral Tofalo's vision, it is our vision, and he has perhaps dubiously entrusted me to represent it for him, we are aligned. We are in sync certainly within the Submarine Force, the uniformed, the leadership. I hope through our discussion here today to make sure that we are aligned with you as well.

Getting faster, again this certainly includes acquisition but is about more than acquisition. It has to do with our decision-making at all levels. Again, it is about also eliminating the kinds of distractions and processes that don't allow us to be as agile as we need to in a world that's changing very, very quickly around us.

And I want to foot stomp again that being faster is not blindly valuing speed over quality or over impact. We need to be bold but we can't be reckless. We just don't have the resources to be inefficient.

Following up on that Line of Effort Four on people, not only is it important to have, to own the best, but we have to <u>be</u> the best. As I mentioned, we all know that we are blessed in the Submarine

Force to have the very finest sons and daughters our nation has to offer. We are privileged with the opportunity to lead them. The challenge here, in addition to trying to avoid attrition, the unproductive or destructive behaviors, has to do with making sure that we're equally devoting time and attention and resources to the professional development, the helping of our sailors to achieve their goals and helping them to be the very best they can be.

One of the things about us nukes in general, submariners in particular, we're always really, really good, very, very prompt at pointing out deficiencies. We're not always quite so good at recognizing our successes and certainly rewarding and recognizing them.

All those things above we are attempting to consolidate and condense into guidance letters. The three of us kind of began with the—I guess I'd call it either hubris or naivete of thinking we speak uniquely and with a unique voice, and we need to start from scratch and in that way we'll have something that truly embodies our priorities.

We did that and had a couple of things that we were really pretty proud of. As we kind of socialized them we got a lot of feedback that said that doesn't look at all like the last set of guidance we got. We said, no, no, it's good, right? It's better, right? Well, if you say so, admiral.

Actually the feedback we got was—because one of the things we had thought of doing was consolidating and rolling things up to be a little bit more strategic perhaps, the feedback we got was, "Hey, we really like the guidance that currently exists, with individual levels of tailored guidance to COs and COBs and squadron commanders, etcetera". As you see here, I had a number of my Commodores who said, "Admiral, I keep that letter on my desk. When I'm counseling my COs or when I'm trying to think of what is the most important thing for me to be doing every day, I go back and see what it is that you, SUBPAC, my predecessor, what you told me mattered to you".

So we said, okay. We stand corrected. So now instead of starting from scratch we're starting from the existing letters. And what we've found is that that guidance is pretty good. There's not

a whole lot that needs to be added. We'll put our own personal touch on it so we can feel like we added value, but the guidance that exists is really very well considered and very well thought out. So what we finally issue is going to look very similar.

2015 ANNUAL SYMPOSIUM
NAVAL SUBMARINE LEAGUE

VADM TERRY BENEDICT, USN
DIRECTOR, STRATEGIC SYSTEMS PROGRAMS

OCTOBER 22, 2015

Admiral Padgett, thank you, and thank you to the to the Navy Submarine League for the opportunity to speak today.

Strategic Systems Programs and Naval Reactors are truly the only two Navy organizations that own what I consider to be cradle-to-grave responsibility for their programs. As we enter the next phase in preparation for the Ohio replacement program, this philosophy of cradle-to-grave responsibility within one entity is proving to be very valuable. In that context, I make all decisions based on what we are doing on the current platform – Ohio, and then transitioning that as the baseline for Ohio Replacement.

That, in context with the authorities I have as the director SSP, where I am the only direct reporting program manager to ASN (RD&A) Mr. Stackley, as well as operationally reporting to the CNO as the echelon two commander responsible for all the deployed forces. I also have a new responsibility that I was recently assigned, and that is the Navy's Nuclear Deterrent Mission Regulator.

That is a vision that was started out of the investigations by Admiral Donald of the Navy and the Air Force situation back in the 2007-2008 timeframe. It has been a key point of Admiral Greenert, and now Admiral Richardson, to get SSP to this position of the Navy's Nuclear Deterrent Mission Regulator.

There is now one SECNAV and two OPNAV instructions that give me this authority. The last OPNAV instruction, 8120.2, was signed by Admiral Greenert the day before he left office and transferred responsibility to Admiral Richardson. Admiral Greenert kept this on his radar screen, right up to the end. It

assigns me as the Navy's Nuclear Deterrent Mission regulatory lead with three major responsibilities, those being to obtain inputs from all other applicable echelon one and two commanders.

With this new responsibility, I report quarterly to the CNO. I started this drum beat with the CNO to identify not only areas that we should be working on, but to also work with the echelon two command that are responsible to come up with solutions. To date, we're working primarily in two areas. The first one is the status and the correction of the TRIPER program as we find it today from that which was initially envisioned. The second is the status and corrections of the Navy's NC3 (Nuclear Command, Control and Communications) efforts to ensure that there is a viable path going forward as we build the next platform. We are also to conducting end-to-end assessments. Up to this point, we have been looking every other year at the Navy's nuclear weapons assessment process. I now take responsibility as the executive secretary to execute that, in addition to the comprehensive self-assessments that we do within SSP every other year. We are consolidating this information for use by Navy leadership.

So who is and how are they affected? Most all the echelon twos are in some way, shape or fashion responsible to support the Navy's Nuclear Deterrent mission. The submarine is the hub of the wheel because all efforts lead to the ability of an operational submarine to transition to the CTF and to go on alert. There are many moving pieces. What concerned the CNO most was that all those pieces were looked at as an entity and that they were delivered to the operational assets to ensure mission success.

As you can see, this include regulating myself. As the Director of SSP I play a huge role in ensuring the boat can go alert and deliver the mission as required. This process is what we are building now. I believe we have made great strides in the past year, but I don't grade my homework – the CNO does. I will tell you though, I believe they are pleased in the Pentagon with the progress we are making. The real customer, Admiral Connor and now Admiral Tofalo, has a huge input into this and I believe they see the benefits of what we're doing.

About two years ago we had a discussion with the former Commander of STRATCOM General Kehler. We discussed that we cannot lose the big perspective that there are three major players that must stay in sync as we move forward to deliver the Ohio Replacement Program, those being Naval Reactors, PEO Submarines, and Strategic Systems Programs. If we are going to deliver a capable asset to go on patrol, everyone's effort must stay in sync in order to deliver that platform to the end. What we are really talking about is budgets. As a result of that discussion with General Kehler, our budgets within that circle, or as we call it 'the bubble', were all identified as essential to deliver the Ohio Replacement Program.

Admiral Greenert was adamant that he had the final vote on those budget lines. Admiral Richardson is equally committed to do the same. This allows us to move forward as a single entity rather than three separate commands trying to fight for our place in the budget debates. This morning, I will discuss the status of the strategic weapons system. First though, I want to comment on the common missile compartment with the United Kingdom. Last week, I joined with staffers from the Senate Armed Services committee, as well as members from the House Armed Services committee – seven in all – in the United Kingdom reviewing their program as they move forward with Successor, a very successful program. The Common Missile Compartment Program is being executed under the Polaris Sales Agreement with the United Kingdom. We have very positive information from the United Kingdom as they move very quickly towards their main gate next spring, and I think somewhere prior to that you'll see a parliamentary vote that commits to building four UK successor platforms very shortly. Last week was a very positive interchange between the U.S. and the UK.

When it comes to the TRIDENT SWS, most people just think of the missile, and certainly we're focused on the missile. However, my commitment to Dave Johnson and PEO submarines is that every one of those functional subsystems will be life-extended prior to 2020 and will form the baseline Dave will incorporate in the Ohio Replacement. Today, every one of those

functional subsystems has either completed or has ongoing life extension efforts. That is a huge integration challenge we have within SSP. I will spend a lot of time talking about that. Facilities, specifically those at SWFLANT and SWFPAC, were plussed up in the budget $325 million for sustainment and recapitalization efforts. Leadership understood that there is no sense in building a new boat that will be in the water through 2080 if you do not have adequate strategic weapons facilities to service that platform, so, a huge investment by national leadership to ensure that SWFs will be viable through that timeframe.

We'll walk through all the efforts that are ongoing, the commitments that we have made and our execution to them. There are many ongoing efforts and commitments to execute this. I will start with Nuclear Weapons Security. We have a more robust and viable Nuclear Weapons Security posture at the two SWFs today than we have ever had. I count the support of the United States Coast Guard and the United States Marine Corps for that effort. We remain on schedule with treaty support. We have conducted two of the New START Treaty conversions on the Ohio platform. During the first conversion, the Russians actually came over and conducted their inspection at Kings Bay. That went well without any issues. Last week, we conducted the second conversion under the New START Treaty with no issues there either.

I will now spend some time discussing where we are in the flight systems, which are in yellow, and then I will transition to a very complex scenario that we have ongoing in shipboard systems.

To date in Mark 4 warhead refurbishment we have accepted more than 60 percent of the NNSA's delivery back to us of the converted W76 Mark 4 reentry body. They are delivering on schedule.

We have completed D5 LE development in terms of flight tests for certification. To date we are 50 percent complete and after DASO 26, which will happen within the next three weeks, we'll be 80 percent complete with that effort.

We are on track to have initial operating capability of the D5 LE suite in 2017 and that will begin with deployment throughout the fleet of our new guidance systems and missile electronics.

When I talk about D5 LE, I am talking about two elements. First, a brand new guidance system, the world's most advanced stellar inertial guidance system, re-architected from the original Mark 6 with new instruments and sensors. To date we have flown the guidance system three times, all successful. After DASO 26, we will add two more checkmarks and have one flight left to complete certification. On the missile hardware, there are four packages that we are refurbishing. The command sequencer and the inverters are complete in their certification and are ready to go. The interlocks in the flight control electronics assemblies fly as a suite. We have flown them successfully once. They met all the initial requirements. In DASO 26, we will fly that suite twice, so we will have two more checks and have one more flight remaining for certification for that hardware.

As I mentioned, the W76 is a complete life extension refurbishment of the smaller of the two warheads. We are ahead of schedule. Development is complete and production is at 60 percent and is supporting the Navy requirements as we support the Submarine Force.

We are also in the process of doing design and development of a new arming, fusing, and firing circuit on the Mark 5 – the larger of the two reentry bodies. This is a joint program with the U.S. States Air Force. They will be deployed in both the Navy reentry bodies, as well as the Air Force reentry vehicles. There are those that are common in the core, and they have some interface differences because the architecture of the ICBM and the SLBM is slightly different. There are also those that are unique to the missile itself. So a great step forward in this joint program. This is a unique joint program. I do not believe we have ever gone to this level of commonality. I am going to speak more about commonality in the past, but this is preceding the pace for a December 2019 IOC.

There is something that we have been working on for about two plus years with Navy leadership, NNSA, and the Department of Defense. In order to refurbish this reentry body, it needs to go back to the Pantex nuclear weapons assembly and disassembly facility. I've been advocating strongly that while the reentry body

is back at Pantex, we take the opportunity to refresh the conventional high explosives (CHE) in the nuclear explosive package. I was able to win that debate and the nuclear weapons council this year approved the CHE refresh. This is critically important, as it will make this weapon viable through the early 2040s. With the W88 Alt 370 effort and the W76 life extension the Navy has two viable weapons off the radar screen until the 2040's. That gives the DoE complex the flexibility and the agility to refurbish itself and get back on its feet and geared towards the next set of efforts that it will have to accomplish.

This will take the pressure off the complex and gives us two viable weapons out through the 2040s, which is critical since we now, within the Submarine Force, are 70 percent of this nation's strategic nuclear deterrent. This is a huge win for the Submarine Force.

We also have certified the alternate release assembly. This is an effort that we've been working for some time now. This is important because it allows me, at the Strategic Weapons Facilities to change the warhead on the missile in the tube without having to remove the missile and pull it back into the processing facilities. Based now on STRATCOM's requirements, I can convert a missile from a Mark 5 reentry body missile to a Mark 4 Alpha reentry body missile in the tube, and I can ensure that I minimize the operational readiness impact to the fleet, as well as minimize the amount of processing that I have to do back in the SWF facility. This too is a huge gain for the fleet and huge gain for the SWFs. This is now certified and deployed in the Fleet.

That's a quick run through for flight hardware. As you can see, there are a lot of moving pieces, but we remain on-track to the commitments. This becomes very complicated in shipboard systems. The reason it became very complicated is a discussion and a commitment to Admiral Conner to minimize A_O impacts to the fleet. We had to segment the shipboard systems work to fit within refit periods, and we have taken very complex adjustments in shipboard systems and cut them up into incremental pieces. As you see, there are, again, many moving pieces. We call this our Shipboard System Integration or SSI and we number it by

increments. Increment one is now complete. Increment one was a re-architecture of launcher and fire control, as well instrumentation to a total COTS base, COTS hardware, software. That is complete on all US boats, all UK boats, as well as all US and UK training facilities ashore. this was a huge effort by our industrial-government team, and we are not moving along smartly with increment two. We have completed the first install and will proceed to pace throughout this year.

Increment four is our change to instrumentation and to navigation. We anticipate a major change with the replacement of our electrostatic gyro navigators with IFOG technology. We must get the base correct, so that when we move towards that replacement, we have the right infrastructure in navigation and instrumentation. Increment eight is the actual ESGN replacement. That IFOG design development is proceeding on schedule. In fact, we will go to sea as a monitor in the third binnacle spot. In fiscal 2017 we will monitor the new IFOGs alongside the ESGNs to gain confidence, just like we did with the ESGN before we installed the ESGNs. Increment 11 is moving the gas generator in the launcher subsystem and convert it to laser initiation. The design and development is complete. Why is that important? This allows us to break the circuit with laser safely and allows us to perform maintenance on that tube. This is something we have never been able to do before without offloading a missile. This is another A_O improvement for the Fleet and the way that we have designed this, we will do the entire 24 tubes on the first boat. After that, we will do it tube-by-tube whenever we have the opportunity with an empty tube.

Finally, we have increment 13 which is also instrumentation in Navigation. When we complete that work, it becomes the baseline for Ohio Replacement. By 2020, SSP will have the baseline that I will turn over to Dave Johnson (PEO Subs) as architecture, and the Ohio and the Ohio Replacement, will be in the same configuration as we move forward. Again, many moving pieces here yet to go in shipboard systems. I cannot say enough about the government contractor team that is executing this and ensuring that we do this safely and we keep the two configurations synced up.

Regarding the common missile compartment, we find ourselves in the situation where the United Kingdom is actually ahead of us. I think everyone's aware of that when we slipped the Ohio Replacement two years. The United Kingdom will actually fire first in today's program of record. In order to mitigate that risk we developed what is called SWS Ashore, Strategic Weapons Systems Ashore. It is a facility where we will conduct initial proofing of the shipyard integrated test procedures and shipboard procedures, to ensure we mitigate the risk and minimize the amount of time that we are addressing these issue. We'll transfer this information to the United Kingdom and we'll support their shipyard integrated test procedures. That information will be transferred back and used as we go through the Ohio Replacement and construction efforts in our shipyards. You can see how this builds on one other and it starts with the Strategic Weapons System Ashore.

I want to talk to you about something that I've never done before. As Director of SSP, I'd like to say I'm a rocket scientist. Nowadays though, I worry a lot about concrete and rebar, and I'll show you why.

SWS Ashore is a government owned, government operated tactically representative facility – something we have never had in the program before. I think this is a real turning point in the way we think about this program as we move forward. This facility is being constructed down at the Cape in Florida at the Naval Ordnance Test Unit and believe this going to be a real game changer.

I want to commend Dave Johnson. I came to Dave a couple years ago and said, "We have to do this in order to get the UK Successor and ORP built, but let's look beyond that, and let's create a facility that, once those platforms are deployed, we can use for the remaining life of that platform." With Dave's concurrence, we set off on SWS Ashore, and we used all and every means available to get this in on budget and delivered as quickly as possible. This slide shows WSELBEF up at Electric Boat. We took the WSELBEF and cut it in half, as we needed those two Ohio missile tubes. After we cut it in half, we put it on a

barge and floated it down to the Cape. We then took it to, Complex 25, which we used in 1960 for a Polaris launcher. We took that infrastructure that still remained in the ground and with a $5 million input and investment from the state of Florida that allowed the Navy to not have to use MILCON, we jump started the construction process. We cleaned it up and built the building on top of the existing infrastructure. Earlier this year (2015), we took the two tubes and placed them in that infrastructure.

The superstructure has the two tubes landed in the vertical. That's one-half of the building and will represent the Ohio class platform. The other half of the building with one of the new Ohio Replacement tubes, will represent the Ohio Replacement platform. We'll have one platform with the common shipboard systems, launcher, fire control, and navigation in the middle, which will be able to support both the existing Ohio through 2042, and then the Ohio Replacement through the life of that platform.

When the structural and architectural elements are done and when we get delivery of the first Ohio Replacement tube, we will place that on the right-hand side. Today we have 17 Ohio Replacement tubes under contract. Twelve of those will go to the first UK Successor platform. Four will be used by Electric Boat to conduct first article proofing of the quad pack, and the last remaining tube will go to the SWS Ashore and be landed in this facility for us to do proofing of shipyard integrated test procedures.

(The following is the audio narration from a SWS Ashore video)

"Major site construction, installation, and outfitting at Complex 25 will be done in an orderly fashion over seven years following green building guidelines throughout. Site preparations were completed in 2013, allowing construction to begin. Facility infrastructure preparations will conclude by the end of 2014. In 2015, Test Bay One will receive the TRIDENT Two missile tubes, a superstructure, and strategic weapons support system components. Ships support services such as the chilled water system, and the high pressure air and hydraulic systems located in the hull, mechanical, and electrical building will complete interface testing

during early 2016. This will be followed by remaining work on Test Bay One, which will include the loading of an active, inert missile, operational checking of support system components, and systems level testing. The objective is to achieve initial operating capability for the Ohio / Vanguard SWS in June 2016, and subsequently support certification of a new missile service unit.

By the end of 2017, preparations for Test Bay Two to receive the Ohio Replacement missile tube will conclude, and the structure for the missile control center module will be installed in the control room. During 2018, the Ohio Replacement and UK Successor missile tube, with the lower environmental tank, will be installed in Test Bay Two, along with SWS and support system equipment. In 2019 the upper environmental tank will be installed. The environmental tanks simulate water temperatures throughout the submarine's operating range, and pressures throughout the launch depth band to validate the shipboard environmental conditioning system design. The Common Missile Compartment Missile Control Center Module will be finished. The support system components delivered, and the fire control system tested. By the end of 2019 the major portions of the SWS Ashore installation and outfitting will draw to a close. Additionally, in-tube conversion training will commence in Test Bay One.

In 2020 rigorous missile tube hatch testing will be conducted in Test Bay Two followed by loading a special test vehicle. During 2021, fire control system interface testing with the special test vehicle, and support system verification and validation testing will conclude. The shipyard installation test program will complete with a dockside op sequence test to proof the procedure through a simulated missile away event by the last quarter of 2022. All test procedure proofing will be completed, and a subsequent dockside op sequence test will validate that SWS Ashore is ready to provide lifecycle support by the end of 2023. Lifecycle operations at the SWS Ashore test facility will consist of fleet support, SPALT proofing, special weapons tests, and future system design development testing."

(End Video)

This shows you how all those pieces come together to minimize risk and to accelerate our confidence and our efforts to ensure that the UK shipyard, as well as U.S. shipyards are moving forward. I also want to just call attention to the support infrastructure being designed and developed, produced and delivered by Electric Boat. The partnership that SSP has with Electric Boat is further strengthened as we look at this whole concept in the middle, and Ohio Replacement support on either side of it.

I have another major construction project ongoing at China Lake, California. We did a cost analysis and technical analysis of how we were going to certify the launcher capability. That entire industrial infrastructure has been dormant for years. Of course, it is absolutely critical to the safety of the platform, as well as the success of the strategic weapons system. Rather than reconstitute Hunters Point, where we did underwater launches, we found it more economical and actually more efficient to build a land-based capability. In the center you have the large vertical structure. That actually comes apart. The top of it is an environmental structure. As we prepare for the test and conduct our instrumentation, we will do it in a temperature and humidity controlled environment.

That structure actually comes off and in there is a missile launch tube, which will eject, not a missile, but a shape. We went back to the old programs and we refurbished the existing concrete shapes we had. They're weighted, balanced, and are the same dimensions as a TRIDENT missile. We will conduct 47 tests at this facility to ensure all the materials, manufacturing, glues, the adhesives – everything that is absolutely critical to get that missile out of that tube in a quarter of a second and to a designated height above the waves – are ready to enter manufacturing and proceed to pace in order to support construction. The way we do this is with a mechanism called the crossflow winch. That is how we will put the crossflow vector on the missile. There will be a winch that will be attached to the tip of the missile so that we can operate in all the dynamics that we're required to in order to launch from an Ohio Replacement submarine. What happens next is we launch the shape up and it simply falls back down into the arrestment system, that's a fancy word for a big pit. You would think that would be

simple, but it is anything but that. I now know more about gravel, size, shape, density, than I ever wanted to know, because that's what that pit is going to be filled with, gravel. Next, we'll pick the shape up, refurbish it, and go through the 47 tests with the two cement shapes. The pit has been completed, which was quite an endeavor. Of course, the whole reason we're doing this is for data, so we have an extensive data array capture system and that comes with a lot of cabling. We've put a series of cameras around the facility in China Lake, and they take snapshots about every 15 minutes. You can see, that construction project is one that I get weekly reports on, and it's fascinating to see just how quickly a large project like that can proceed. This construction project runs about one year. In 2017, at the end of this fiscal year, we will commence testing of those launcher shapes out of that facility. This is a huge risk reduction tool and again, right on schedule, on budget, and on track to support Dave Johnson and the Ohio Replacement program.

I want to discuss an initiative that I've been pressing for the five years since I've been the Director. This is commonality with the United States Air Force. I drew a concept graphic five and a half years ago with a pencil. Many people laughed at my graphic skills, but I will tell you that this concept is one that is now beginning to take legs within the Pentagon. I will explain what the graphic depicted. On the left-hand side of that graphic, at the bottom left-hand corner, is continuing life extensions. If we're not careful, that's where we're going to find the triad in the future – just continuing life extensions. It is easy in the sense that you can cut the triad up into small pieces and you can go after it crisis by crisis – but that is very costly. It prevents you from interjecting any new innovation and any lifecycle support reductions. When you just do life extensions, you're going to the same form, fit, and function just as we did in the TRIDENT II D5 LE. This prevents you from going to that next step of technology and innovation. If you come up that spectrum, there are service unique SLBMs or ICBMs. That's the way we've operated forever – C4, D5, Minuteman III, GBSD – each service does their thing, because that's the way they have always done it. You can see the inertia of

the system is, “let's do it the way we've always done it. Let's be in charge of what we are accountable for.” However, I think we need to apply effort and get across that apex, and have the evolution of looking at commonality between the two ballistic missiles in the triad. We have proven we can do that as I explained with the joint fuse. The question is, to what extent should we do that? As you continue all the way across, you could get yourself to the far right-hand corner, which is what I call the revolution – a common ballistic program. As the budgets shrink and as costs increase, if we're not careful, we could find ourselves there by default. Somewhere on that spectrum is the right answer. Commonality is not in an effort simply to reduce cost.

If we're going to go after commonality between the ICBMs and the SLBMs, then it needs to be an effort of intelligent commonality and it needs to be done from a technical perspective, not simply a cost perspective. It runs the whole spectrum. It runs from resource commonality such as where we get the propellants to be more closely aligned. We're 1.1 nitroglycerin-based while the Air Force is 1.3 ammonium perchlorate-based. Can we find something in the middle that would allow us to safely operate from a submarine and meet our mission in a constrained volume that would also meet the Air Force requirements? That's an example of the effort that's ongoing. You can go to manufacturing commonality, component commonality, subassemblies, and at the far right-hand side, deterrent commonality.

I have been pressing this pretty hard for the last five and a half years. I believe we made a major breakthrough this summer when I asked Mr. Stackley, the Navy's RDA, Mr. Plant, the Air Force's RDA, and Admiral Haney, to cosign a letter directing myself and Major General Scott, who's the PEO for ICBMs, to conduct a commonality study. We will report back to the three of them, as well as Mr. Kendall, by the end of the year. That effort has been ongoing since this summer. I believe we are making progress. What we have found, quite frankly, is you've need to look at commonality across that entire spectrum. You cannot blindly go in and say that any one thing should be common just because it can be. You need to look at it in terms of risk. Risk as in, if we do go

common, we now have the potential to affect two legs of the triad. We must address how we do that. I will tell you, we have just invested a significant amount of time and money in doing the LE projects that I have talked about. The Navy has a significant, amount of material and subsystems that are TRL level nine certified. When you examine things like our shipboard systems, and the weapons control system in the Air Force. When you think about things like our guidance system and the Air Force's need for a guidance system. When you think about the common components that could be used in our motor manufacturing, there are opportunities across that spectrum to reduce the cost of maintaining the triad in the form which I believe it should be, three legs, a viable ICBM force, a viable SLBM force, and a viable bomber force. That effort is ongoing. We are on track to report, by the end of the year, to Mr. Kendall.

Let me just remind you of where we are at and why this is so important. Today, TRIDENT, which is the top line, we are good for the near and midterm. However, we will be able to carry TRIDENT II D5 assets through 2084. There will be something after TRIDENT. Will it be LE2, which is the left-hand of my spectrum? Will it be E6? Those are all decisions that we are doing the analysis on and the technical evaluation to determine what the proposal will be to national leadership. On the bottom, you can see the W76 and the W88. At some point we will have to do something with those two reentry bodies. That is a potential ongoing effort with NNSA for the interoperable warhead and we are playing in that effort as well.

What you will see here is, if you line up the ICBMs and the Minuteman III, you can see how closely aligned we are, which leads me to my conclusion that, if we are that closely aligned, then why can't we share commonality across that spectrum, and pick the right points in which to do this? Today the GBSD is heading towards a milestone, a decision in the first quarter of the next calendar year. I'm trying to influence that to say there's been a huge investment in the United State Navy. What we have done is not directly applicable, however it is a viable starting point and a reduced NRE bill for the United States Air Force moving forward.

You can see on the bottom, they'll face the same issues with reentry bodies as we do, which is why I made such a push on the W76 and specifically on the W88 with the conventional high explosives to get us off that radar screen and reduce some of the pressure on NNSA and the nuclear weapons complex.

I believe I am accountable to drive this, since we are under the New START Treaty, 70 percent of this nation's strategic deterrents, and more importantly, as we just reported out to the staffers and to the congressional delegation last week, we are 100 percent of the United Kingdom's strategic nuclear deterrents. We carry a heavy burden of accountability to support both national directives.

During the first week of November 2015 we will conduct DASO 26. I have four major objectives for this operation. First, certify the submarine and the crew so that we can return her to the operational lineup and Admiral Haney's tasking. Second, as I pointed out, to launch two missiles on this DASO. They will be the first flight where we fly the new guidance system with all of the new missile electronics. We've flown them in various pieces and configurations up to date. This is the first time we will put that all together. Those two missiles will allow me to check two of those boxes. We move forward on the developmental JTA with NNSA. We will also fly the arming and fusing part of the Mark 5 Alt 370, the common fuse with the Air Force.

And then, finally, this is our third flight of a multi star experiment. When we built the new guidance system, we went to digital gyros, which allow me to slew and settle much faster than the old analogs, which allow me now, within the timelines I'm allotted, to shoot two stars. This gives me what I call technical management reserve as we move forward with the potential to get greater accuracy out of the system in the future. What it really does, and this is a hypothesis, but if we move forward, I believe that there's potential trade space to eliminate out of the strategic weapons system, the need for a strat navigator. And if we make improvements in the existing tactical navigator architecture, then there's the potential - and I'm going to underline potential, to move to a common navigator for shipped submarines and strategic, with the

potential to use a multi star to complement. That's all work in progress. That's a hypothesis, and we're going to go forward and see if can validate that. If we could, that's a huge win for the United States Navy.

2015 ANNUAL SYMPOSIUM
NAVAL SUBMARINE LEAGUE

VADM WILLIAM HILARIDES, USN
COMMANDER, NAVAL SEA SYSTEMS COMMAND

OCTOBER 21, 2015

I am going to talk about the shipyards. But before I do I'd like to really talk about the thing that's probably first and foremost on my mind and on the mind of my leadership team, and that is the cyber challenges which are associated with the control systems that NAVSEA is responsible for putting on all of our ships. And that's a little different context than what you read about in the newspaper. What you read about in the newspaper is almost all about information systems. The things that you get your email on and the place where you store your bank information. Those are really important, and those are getting most of the money and most of the attention as you look across the Navy and across the services of the Department of Defense. Well, what I'm going to be talking about is controls systems, and controls systems are different.

The National Institute of Standards laid this out pretty clearly- Information systems deliver information, and if the information's not there, it's a bad day. Controls systems control things like big machines, in our case, like guns and missiles and things that kill people. If those go wrong, there's a chance that people could die or really, really bad things would happen. And so controls systems are different in that context and you can't just do what you do for your IT systems on your controls systems.

Controls systems are a tremendous challenge for us and something that we've got to take on. I believe that it was serious enough, that the business plan that I wrote when I came into the job, I rewrote it, and reissued it with a whole pillar about cybersecurity. And cybersecurity, about the systems on board the

ship that NAVSEA is specifically responsible for, that's the controls side.

I am very interested in industries' input on this, because if we think about it, we realize that a lot of the companies that are represented here and many of the other companies, have things they're doing in this space, in the cybersecurity space, particularly related to controls systems. So we are having an industry day there at NAVSEA headquarters. And we've asked people who know things about controls systems, cybersecurity to come in, so we can lay out a broad plan that we've got in place and start to get some feedback from industry about that. This is a little different than buying a new network and making sure that network is cyber secure, because our controls systems are interweaved into everything we build. It's interwoven into the radar system and into the missile controls system. The electronic cut-outs for the guns, the primary logic controllers on the gas turbines and diesel generators. And because of that complexity, this isn't just for the IT companies.

I went through the invitation list for the cybersecurity industry day earlier and I asked where are my shipbuilders? My shipbuilders buy, in many cases, particularly in the services ships, buy the controls system off a commercial shelf for us. You all need to know where it is we're headed and how we're intending to do that. So you'll get a call, you shipbuilders out there, you'll get a call inviting you to come join us next Friday. I'm very, very interested in your inputs on that. And also, if you're in the combat system realm, which many of you are, that's another area where we specifically have to go at that. We have created a number of changes inside the NAVSEA life lines and address this.

First and foremost, I had to significantly up gun my CIO, my Chief Information Officer. That billet head had traditionally been a GS-15 and was about networks and was about keeping the Admiral's NMCI running. That was not good enough. We now have a senior executive as a CIO. We are hiring up. We are almost to our expected end strength, and that includes people capable of running major automated information system acquisitions. It turns out we have to go renew the scheduling and work control system

that we run our public shipyards with. You guys have gone through this, I know in the front row. It's 17-18 years old and it is not securable in any way. So we have lots of work to do on that.

Other changes we made, the Center of Excellence for Machinery Controls, of course, is what was formally NAVSSES Philly. NAVSSES Philly was a subordinate to the Naval Surface Warfare Center Carderock Division. We have moved Philadelphia back to Echelon IV. It is now Naval Surface Warfare Center Philadelphia Division. And it has a specific mission, to help us neck down the number of machinery control systems we have in the Navy and make those systems cyber securable; design in that cyber security from the beginning. So that transition took place on the 1st of October, and there's an advertisement out to select a senior executive as the executive director of Philadelphia. If you've never been to Philly, we have a mockup of the engine room of almost every surface combatant in the Force, with the machinery control system. Not a mockup, but an actual functioning control system. Our intent is to use that as our laboratory where we'll go check ourselves to make sure that our controls systems are secure and that when we need to patch, that we can test it on a functional system without having to test it on a system that's out operating. The worst of all worlds is you go patch your machinery control system, and the gas turbine shuts down, because you change some digit in the direction down towards the primary logic controllers.

Dahlgren has always been our center of excellence for AEGIS and surface weapons systems. Dahlgren will be the place you go to for surface combat systems security, and that includes both the AEGIS line, the SSDS line, and then the ultimate LCS combat system. NUWC, of course, for our submarine combat systems. And we've asked SSC Atlantic, which is a SPAWAR activity, to lead us in our navigation networks, which as it turns out, we created a network to do navigation onboard the ship. Whether we should've done that or not is a whole other question. But in order to help get it to the point where we can say it is notionally secure, there's a lot of work to be done. And that work will predominantly be done down at SSC LANT.

The cyber initiative that we got has a temporal part. The temporal part is that there's time involved and of course, money, which will, by definition, meter our level of effort. But I think of it in three pretty simple bins. The very first, and what most cyber experts will tell you, is that you can get 95% of your cybersecurity by just operating the system you've got the way it was supposed to. I call that cyber hygiene, it's very straight forward, right? If you have the default password, and the default admin name in, at the fifth level administrator, that's a really bad thing. But it turns out like 30% of them are set to the original factory delivered. So if you go buy the online hacker tools, that you can just go buy off the internet, it'll go test that first. And then even a hacker who doesn't know anything gets into your system. The other one is very, very simple things. An open USB port on a maintenance laptop. If that maintenance laptop is plugged into an outlet on the ship, and it's near a hatch or top-side, a Sailor will plug his phone in so he can get a text from his wife and charge his phone, it's guaranteed. That is an insider threat. That cell phone is a pathway directly into your machine control system. So that's cyber hygiene.

So get out your hot glue gun and fill that port with hot glue. That's a very cost effective solution to that sort of a problem. Yeah, sometimes it really is that simple. Another one is Sailor alterations or captain alterations. Every captain wants to have that display in his stateroom that's the combat system that shows up on the TV he watches his movie on. So there's that Ethernet cable that runs over the CO's door, plugs us both in. That is absolutely not acceptable anymore. That configuration of those electronic systems will have to be known, and we don't know it very well. We know it very well on some ships, we don't know it very well on others. And it has to be maintained and policed. That is absolutely low-cost, relatively easy to do, we just have to get on it.

So, first and foremost is a cyber hygiene initiative. And so we've issued our first, sort of cyber hygiene manual for sailors to use. Hey, when you're going around your ship, look for the following things. And you know, it goes down those lists. It also goes to my maintenance activities to go make sure that we're on alert for that.

The second area is really the far future. Some of you heard me say this. In 30 years, we can change everything about our Navy, and it's in the budget range. We build 10 ships a year, they last about 30 years. In 30 years, you completely replace the whole fleet, a couple of exceptions, maybe an aircraft carrier or two. But in the main, you can do it all. So start building today, cyber-securable ships. That means we've got to understand what that means. We've got to design a broad architecture, have a broad outline of how those systems will be laid out and what hooks need to be in them to make them cyber secure. We're in the business of doing that right now. We're writing a set of specs and standards with SPAWAR and NAVAIR to build it cyber secure, so then I can give you and your contracts the things that you're building for the future, the hooks necessary to make it cyber securable.

Broadly, to describe that philosophy I use the flooding analogy, some of you heard me do this one. It works for me, so I'll try it, see if it works for you. When we talk about flooding in submarines we talk about flooding and recoverability, right? You do everything you can to keep the water out, but then assume the water's coming in, and then you've got to be able to recover from it. So that thought process is very much like cybersecurity. If you think you're un-hackable, look inside your system, someone's in there running around, right? That's the sort of definition of this space. And so, you need protection and you need recoverability. The way we think to do that is to basically create water-tight compartments, cyber-tight compartments, create enclaves that have defined connection points, just a few connection points between the ship's LAN and the combat system, maybe only one, between the navigation system and combat, between machinery controls and navigation, those sort of things. Understand and control and only connect them if you absolutely have to, and connect them through a water-tight door for lack of a better word, a boundary defense capability. So we're out looking for those boundary defenses.

Now, it's not just a big check valve or a big gate valve, it's a valve that also looks both directions and says, is everything running right on that side? Is everything running right on that

side? So I can imagine a day when there'll be a threat to primary logic control of a gas turbine. And I'll get a note that'll say, set cyber zebra on all of the DDGs. And we'll signal those boundary defense capabilities and they'll lock down share controls from the rest of the ship. So now you've got to think about when you design the ship, machine controls have got to run standalone. And the ship's got to still be able to fight. Same things with the combat systems, got to be able to run standalone. It's got to still be able to fight. You want to connect them together to get the maximum war fighting effectiveness.

When you're in a cyber safe condition, everything's connected and it's all working. When you're under threat or you know you're under attack, you might have to set cyber zebra or something like a circle zebra, where you can only communicate every couple of hours or only under certain conditions. But that is the broad outline. So enclaves, securable enclaves, minimize the interconnection points, and control those interconnection points explicitly. That's the broad outlines of it, obviously there's a lot more work to be done on that.

We'll start to layout the thoughts on that strategy at our industry day. And of course, I'll hear from many of you as a result of this and I very much look forward to that conversation. So once we create that future state, then where do I spend the next dollar? On today's ships, right? So the 280 ships we got today have vulnerabilities. What is the first one you should address with the dollars I have? Building those boundary defenses where we've invested the initial dollars. Combat systems first, because they're the most important for keeping the ship fighting. But machinery controls is right behind it, because if there's no generators running, there's no combat system, right? If the screw stops turning, you're not going to be doing a lot of fighting. So those are sort of the first efforts, reducing the number of interconnection points, and controlling them very carefully, is really the other place where we're going to go and spend some money. And that's a pretty difficult set of conversations. Because we connected things because we could, not because we should.

I'll use an example. In the old days, you had two servos. You connect them with a twisted pair, and you know when you turn the wheel over, the rudder would move a corresponding amount. Well, we made this servo, has its own logic controller and thing on the bridge is just a rheostat that changes the voltage. Well, you can give them both IP addresses and connect them to a LAN, they find each other automatically. I don't need to run another piece of fiber. That means whatever's on that LAN can go mess with the rudder. That's really bad, right? So we should now run that twisted pair again. Let's run unique fiber. Those things are relatively easy when you're building a ship, and really not that expensive even when you're modernizing it. Go make those things explicit. Understand why we connect it. Make sure we connected things because we should, not because we could. And so that's the broad outlines of the cyber initiative. I know there'll likely be a couple of questions on it.

So now, I'll get into the shipyards. Get all settled in now, you can go and get your nap in. The Public shipyards are a very interesting beast. As I came into the job, I assessed that we were undermanned and it was pretty obvious as the schedules of all the availabilities we had were starting to creep right. And we started to impact aircraft carrier deployment schedules and made the newspapers. That was a particularly bad day for me. And we haven't delivered an SSN on time, other than in Portsmouth, in quite a while. And that's something we're going to work to fix. A couple of market forces got us to that point. We had a growing workload for our nuclear ships and we didn't recognize it. We didn't acknowledge to ourselves that we were coming into a period where we were refueling the Ohio Class and kind of got out of the refueling business. We started refueling Ohio and in about 2006 or 2007, we sort of achieved a steady stage 4 refuelings in the shipyards simultaneously.

The 688s, and remember, we hollowed out the beginnings of the 688 class with early decommissioning, we built them at three and four a year and they started coming into the yards in about 2010 in three and four per year for their second major availability. And now we're doing three and four of those a year. Those two

trend lines go on now through about 2020, and then we're done. The last Ohio refuels, the last 688 goes through EOH. And that workload drops back off. But that's a peak that is true. And until we actually said it out loud, there was some denial about it. And the last one is, we didn't achieve the 11 nuclear aircraft carrier force until the delivery of the BUSH. We were still building up the nuclear aircraft carrier force structure. So those drove the workload up. At the same time we got a lot of budget pressure as the 2011-2012 timeframe came. We're going to take some risk, we're going to assume some efficiency as workloads grow. So we are officially constrained, the hiring. And then we froze hiring as a result of the sequester, and didn't get rehiring again for about nine months. I was almost 3,000 people behind at that point. And since that moment when we started hiring again, almost 5,000 people into the public shipyards, which are only 33,000. That's a level of turnover we have not seen in a very, very long time in the public yards, and presents both a challenge and an opportunity.

I'm actually going to get to some innovation. If you can believe it, I'm going to get to innovation in the public shipyards. So the opportunities for innovation were both on training and really on technology. I'll take those in order. In the old days, an apprentice mechanic would go alongside a journeyman mechanic and stay with him for a couple of years. Eventually the journeyman mechanic would say the apprentice is good enough, and he'd be put on the line. And the guy would go to work. That's not just going to be adequate for that level of training that we set up ourselves for. And so we told the shipyards to innovate, go figure out ways to train better.

The best story, and some of you know my history with ASDS, this is actually my favorite one. I saw the ASDS a couple of weeks ago at Pearl Harbor Naval Shipyard. So the old hull, after the fire, was stripped down and painted white, and it sat around a while. Eventually it made it to the Defense Reutilization Office. The Pearl guys saw it and turned it into a rigging simulator. It's got four hatches, got a constrained space, they wired it with some cameras, put in some speakers and stuff, rigging points. They make the young apprentice riggers rig pumps and valves in and

across and around the ASDS. They let them do it by themselves. Got the cameras in there and safety people. That's real learning. They're turning apprentice riggers into journeyman riggers, very, very quickly with that kind of a thought process.

You go over to Portsmouth Naval Shipyard, they asked Puget Naval Shipyard if they had a couple of old tanks. They cut some old tanks out of a decommissioned ship and shipped them to Portsmouth. Portsmouth set them up as a training place. And a brand new painter goes in there and has to blast the tank clean, paint it, apply the coatings, and he can do that all, really without any supervision. Training people are there. In eight weeks, they're taking an apprentice painter and putting him on a ship, actually functioning as a qualified painter, really very, very impressive. Norfolk and Puget have a bigger problem, with a large apprentice school. There is a lot of innovation going on with the apprentice schools, I know I've seen it with the shipbuilders and that's going on in our shipyards as well.

Changing the way we train, talking to the educators. We used to send them first to get their trade, then we'd send them to school. We figured out they were failing out of school, that didn't work. Put them in school first, they weren't good enough trade. So there's lot of experimentation going on in the mix of trade training and classroom training, with the goal to have the apprentices on the deck helping within a few months of checking into the apprentice school. Of course, when you put your mind to doing something like that, you could make it happen. And that's going on in both places.

The last one I think is pretty good, is we used to bring on an apprentice and say, okay, what are you going to be? I want to be a pipefitter. Okay, you're a pipefitter. And you would try and fit that person into being a pipefitter, right? Didn't always work, didn't always have the physical skills. I think of this as, if any of your kids have ever read the Harry Potter books, the sorting hat, right? Okay, you're not going to be a pipefitter okay. You couldn't fit those pieces together. How about, let's try electrician, right. I teach you a little bit about electricity. Give you a welding torch, let you try some welding. Go work to find out what they're good at.

Interestingly, we're not getting as many kids that have, that come in with some physical skills that they got from their parents or they got from a job. So you actually have to do that kind of thought process about it.

The part I'm actually most excited about is our ability to our warfare centers to deliver new technologies to our shipyards. I'm running one of the largest industrial activities in the country, you know, 33,000 people doing ship repair, and not a dollar of R&D for innovation in the shipyards. So I looked around my world and I wondered whether OPNAV would give me any R&D. I assumed that was no. I told my warfare centers, my NAVSEA warfare centers to partner with a shipyard, use some of their R&D, because they're allowed to tax their R&D and use a little bit of it for their own innovative things. And they've gone out and done that. We've already transitioned a couple of things. The laser cladding stuff was where we got the idea. So most of the laser cladding work had been done at Keyport, transitioned into Pearl, and into Puget, now everybody's using the laser cladding rigs. Another one is additive manufacturing, and again this is one of the areas where Keyport's really exceptional. Additive manufacture a pump for training, a full pump with all the components so that the guys can train on a fake pump before they go down to the real pump. But have it be cheap, easy to produce, and you can always make another one. They messed that one up, just go and manufacture another one in the 3-D manufacturing. They're also used in the three-dimensional tools. Model at dry dock. Model the ship. Create the three-dimensional models with a printer, and let the team plan the dry docking with everything represented, including where the stern plane hits the sidewall and where the float goes and all this sort of stuff. They also did it with a sail. They took the SSBN sail. Modeled it with the three-dimensional tools, and then mapped out the best use of the cranes to get the sail depopulated. That's all going extremely well. And then Keyport can actually make a casting, make a mold from a three-dimensional model that can be given to a forge and turn it immediately into a forge.So you take a three-dimensional and turn it into a forge. I know that's going on some in the construction yards, but we've been able to

turn that on a repair, especially for something that's supposed to be on the shelf that's not. Pretty quick turn and you're in business.

The warfare centers have a long list of other things, some of you are involved in these. Terahertz imaging, to go look through the SHT, the Special Hull Treatment to see the steel, is there rust and is there cracks? And you can sign off all the URO 3 inspections and all the rust inspections. Actually, we're removing the SHT. Wouldn't that be nice? We'd stop taking that SHT off. When you do have to take the SHT off, there's a lot better ways than the chisel and the hammers that we've been using as it turns out. We have a couple of those ready to transition. One of the teams came up with a bio hat. So you need a tank watch. Put on the hat, you can monitor the heartbeat and the breathing and all the bio-metric parameters through a piece of wearable equipment as opposed to having to check on them every 10 minutes. It seems like there's something very good there.

I've seen some of this already.

Exoskeletons. So a skeleton that goes around your body and lets you hold a 60 pound tool for hours and hours and have it be exactly where you need it by just moving your wrist. Of course, we should be doing that. We haven't been. That's on its way in. This is one that probably makes everyone least comfortable. The guys from Indian Head came in and said, we can cut 2-inch HY80 with a shaped charge, we can have the hull cut out in about 10 minutes. They laid the charge around, they blew the charge, and the hull cut falls out of the pressure hull. Probably have some work to do on prep for the reinstallation.

My assessment is we still have a lot of work to do. We've got to get those 5,000 new hires at the shipyards on the decks and working. We have to do it fast. We've got to turn our productivity curve around from one that's been on the decline to one that's on an improving trend. We are seeing the initial indications that this is going to bear some fruit, but you'll judge me based on the delivery of those SSNs, and I hope to delight you in the future. But I think the table's set for us to produce as we're expected.

This is the Pearl Harbor Naval Shipyard Log. They took the idea of the paint trainer, and they gave the guy virtual reality

glasses and wired up his paint gun. And he actually paints virtually, and the machine tells him whether he got the right coating thickness and all that sort of thing. That kind of reps and sets will make a painter proficient very, very quickly without having to actually spend a lot of money. So that's Pearl Harbor Naval Shipyard. So you should be very proud of them.

Just in closing, let me say that in spite of the travails of the last couple of years, the Navy is in a pretty good place. I give the Navy leadership a lot of credit. The folks that fought for the budgets to get us the ships and get us the ship repair money necessary. Building the 10 ships and near where we need to be. We're working down the backlog of maintenance, both on surface ships, aircraft carriers, a little bit on submarines that we accumulated during the 10 or 12 years we overused the fleet in support of the two wars. So in spite of it all, we are pretty positive about where we are. Of course, there's another budget fight this year, and there'll be another one next year. I suspect we'll get through those. Exciting part of the next six months would be to see both FORD and ZUMWALT sail down a river near you. Those are both going to be pretty challenging ships. If you remember, we designed them and committed the technologies at the time where we thought there was going to be a lot of money. Now, of course, those technologies are coming to challenge us as we work to get those ships at sea. But I'm certain that you'll see them come down the river. And they will set the standard for technology for ships of the future.

I probably used up all my time. Thank you all very much.

2015 ANNUAL SYMPOSIUM
NAVAL SUBMARINE LEAGUE

MR. GEORGE DRAKELEY
EXECUTIVE DIRECTOR, PEO SUBMARINES

OCTOBER 22, 2015

Thank you Admiral Padgett for that kind introduction. Admirals, SESs, leaders of industry, colleagues, I want to thank you for this opportunity to address you about the program that PEO provides the resources for and we all work together on. But before I get started, I thought you might like to have more of an explanation of why you've got this civilian up here instead of one of the Admirals and Admiral Padgett alluded to it, but I'll provide a little more background. As many of you know, the Navy made a great decision back in the spring to nominate Admiral Johnson for his third star and to become the principal deputy for Secretary Stackley, a very smart move on the Navy's part if you ask me. But, his nomination has been held up in the Senate, he's not confirmed yet and we cannot move forward on him taking his new job until he's confirmed.

In the meantime, Admiral Jabaley has been ready to go, but being the gentleman and follower of the rules that he is, he's not presupposing to speak for the PEO until he's actually the PEO. So we had this situation and we've been planning ceremonies to do the turnover a couple of times assuming we would have a confirmation—we don't—and Admiral Johnson realized he needed to move on, give Admiral Jabaley his chance to lead, so Admiral Johnson now has orders to work as a special assistant to Admiral Hilarides and Admiral Jabaley and he will turn over, in some form, by the end of the month. Now you wonder why did we just finally decide that now after this whole summer of waiting and stuff and it came down to a very bureaucratic reason that many of you in the audience will understand: Admiral Johnson

realized that if he stayed past October 30th he had to do a whole other set of fit reps and he wasn't going to do that.

As you're all familiar with, in the military business, a lot of people like to talk about being at the tip of the spear and I want to say that I'm nowhere near the tip of the spear in the job I do, thankfully, but the sailors and officers who man our submarines and put them out on patrol are very much at the tip of the spear. They are out there in a very hostile environment doing some amazing things. I'm fortunate to have the job to provide them with the spears they need to do that, and we as a team—all of you in here—that's our mission and I want to say that you all have been doing a fantastic job and as I go through my talk you'll realize all the wonderful things that we as a team have accomplished to give those sailors and officers out at the tippy tip of the spear the right tools to survive. As Admiral Hilarides said yesterday, I get to have all the fun because I get to talk about the neat systems – at least I think it's neat – that you all produce and we provide to the warfighter.

First we'll be talking about the VIRGINIA, a very successful program. I've been fortunate to have been part of VIRGINIA early on, in the middle of working with Admiral Johnson and many other fine officers, and civilians, and industry members to get this program going. I just wanted to touch on a couple of things. The Virginia Payload Tube (VPT), was a brilliant idea by Electric Boat to actually reduce the cost of the submarines but it was an amazing capability we also got. Unfortunately, we're not taking advantage of it and one of my challenges to industry here is to develop the payload that takes advantage of this space that we have now. We don't have to wait for Virginia Payload Module (VPM), we have the VPT now, we're not using it when we need to.

The Block IV contract is the largest shipbuilding contract in history, and as Secretary of the Navy likes to say, we did so well teaming across the industry, not just the shipbuilders, but the suppliers on reducing the cost, that we were able to get ten submarines for the price of nine. He uses that in his speech all the time and it's kudos for us and it is good politics for us and in our mission. Then there's the VPM. As many of you were involved in it, Vice Admiral Hilarides talked about the SSGN, one of the more

successful ship's that we've ever had. The warfighters have come to love that platform. In my previous job, I was the director of submarine engineering and I can tell you for sure that those ships are getting used and used hard. We had many issues with the equipment being used up faster – shaft life and things like that. It's not just words, it's in action. The warfighters are really using those platforms and they'd like to have more of them if they could.

Now, the reason that's important is the VPM is the follow on, basically, for SSGNs and with the kind of support it has, its program is probably in pretty good shape. Right now the plan of record is to build one VPM a year starting in FY 19 through the shipbuilding plan. There is now support for the possibility after we start doing a Virginia VPM, whatever that is in FY 19, to make all Virginias VPM Virginias. I think that makes sense from a shipbuilding point of view and from a capability for the Navy.

When I talk about Virginias I'm talking about a lot of ships now. There are the 28 ships that are either under contract, under construction, or built and operating in the Navy. This is a good indicator of what a good year it's been for Virginia and a good history. As Admiral Caldwell said yesterday, we're busy, but it's a very good busy and you can see that we're getting close to running out of states to name our submarines after, which is a good problem to have. Some recent successes this year, we'll start with the NORTH DAKOTA, the first Block III ship. Because of the capability and the quality that Huntington Ingalls and Electric Boat team and all the suppliers of the equipment do in their jobs, these submarines come out at the highest quality. Every submarine delivered sets a new record for scoring from the Board of Inspection and Survey (INSURV) and, thus we're really delivering platforms out of delivery, ready to do their jobs, which is unique.

It used to be a submarine really wasn't ready. I remember in 688s and Ohio's that they really weren't ready until after Post Shakedown Availability (PSA) but NORTH DAKOTA is in PSA now and just came back from a real-world mission, highly classified, doing work, right out of the gate and supporting the warfighter and giving A_O back to the warfighter, which was a good thing. We just commissioned JOHN WARNER, the 785, and

just recently christened the ILLINOIS by the First Lady, who did a great job. Whether you're a republican or a democrat, you have to be proud of and supportive of how the First Lady is a sponsor for the submarine and how she's embraced the sailors and the military community. It's very exciting.

Okay, so now I'm moving on to the nation's most important acquisition program and one of the reasons I'm in this job to provide the continuity on this program. Admiral Johnson, about a year ago, realized that with the OHIO Replacement coming up and the increased work in the industrial base, and making sure that we do no harm to the Virginia program, realized that we had to have a plan. So he set up the team, which he called a SUBS team, which is the Submarine Unified Build Strategy, gave it to Captain – then Commander – Rucker to head up and they did work with the shipbuilders and industry. Many of you in industry probably had a visit from Captain Rucker and his team to understand how we would do this together. Admiral Johnson also tasked the two shipbuilders to come up with their plan and we've been spending this summer integrating our plans to make sure we do the best thing for this submarine program.

Here is the OHIO Replacement and the reason that we have the plan we have, as the OHIO's age out we need to replace them with OHIO Replacement. Vice Admiral Benedict mentioned the two year slip in the OHIO Replacement schedule; what we've done is we've taken away all of our margin now to keep the strategic asset there. I talk to people about this and we're talking about a submarine that doesn't go to sea until 2031 and people are kind of skeptical about "Why is that a tight schedule? How can you have problems meeting that date and it's so far into the future?" Yet when I get into my meetings with shipbuilders, especially when Will Lennon puts his slides up, I look at them and wonder how the heck are we going to get all that work done in the time we have? It is a very daunting challenge once you get into the details.

So, we're building a platform for the warfighter, for our strategic deterrents to have a sufficient payload to continue the mission and we're able to do that with sixteen missile tubes. The

biggest key, probably, to this platform is, as had been alluded, it's going to be around until 2084, long past most of us being around, and it has to be survivable. So stealth is one of the big things on this and that's led us to adding some changes to the submarine, like a large vertical array to help with the stealth. But we're working hard on that with the team, with all of you here and I think we're doing a good job in that area. We're maximizing the reuse of components, and as Admiral Benedict said, we're using commonality also to keep the cost down. So the lead ship construction must commence in 2021 which means long leads starting in 2019 which is when we have to have 83% of the design done, which is why we're gearing up – between the shipbuilders and the government – with so much effort to get that done. One of the biggest savings when you're talking to colleagues and members of Congress and talking about this program and everybody talks about how expensive it is, realize with the efforts of naval reactors to come up with a lifetime core, we're able to do the mission done by fourteen submarines now with just twelve and that's a savings of over $10 billion in the program right there because of the cost of submarines.

When I'm doing talks, I like to give people some insights into things that are not generally known but are certainly not classified or sensitive. Right now we're in a busy time of the program, we're getting ready to release an RFP for the design contract and this is going to be kind of a unique contract. We're following the model of the VIRGINIA, as we do on many things in this program, where they had the 1996 design build contract and so this contract we're going to be issuing an RFP for this year and hopefully signing sometime around now next year. We'll start the RFP with the SCN detail design only but the contract will also have CLINs in it for the construction of the first two ships, so this is a contract that will run from FY 16 until FY 31, we're talking about a fifteen year contract here and over $6 billion so it's a big deal. Being that it's such a big deal and a lot of money – and that's just the design part, the whole contract including ship construction will make this over a $22.3 billion contract when it's all said and done – we have to go through a Defense Acquisition Board and there's many steps along

the way. One of the things we'll be doing next week is what's called a Gate 4 and that's getting through the Navy leadership and the purpose of that is to set the technical baseline. We thought that we were past the issues of needing a Gate 4, but Secretary Stackley wants to have one because he wants to set the technical baseline. He's very adamant about controlling costs. He's a big supporter of the submarine community, he understands the good we do but he also wants to continue controlling costs, reducing costs and that's an emphasis of his. We have to set a technical baseline with the Gate 4 which means the Capability Development Document and the specs and developing a process for change because he feels change in programs is a big cost driver and he's going to minimize that to the greatest extent possible. And then after that, we'll have a Defense Acquisition Board for the request for proposal and those of you working for the Pentagon know that means a whole bunch of meetings and briefings before we get to that. But many of you may not know that Secretary Kendall is a very detail man and he invests the time in it. The last time we briefed Secretary Kendall on this program, we started on a Friday afternoon in December at about three o'clock and we finished a little before eight o'clock so he gets into details and he will probably do the same thing here as we go through the program with him.

So, the theme for this submarine league symposium is innovation – in fact it's *Accelerating innovation, meeting the undersea capability and capacity challenges* – and if any program is accelerating innovation to meet the challenges of the future, and given the capability, it's the Ohio Replacement and I just want to touch on some of the areas where we have innovation.

This ship is a blend of reuse, commonality, and innovation as necessary. We're reusing many of the components that we can from the Virginia class and we are also leveraging some commonality with the rest of the submarine fleet and I'll touch on a few. In the innovation we have the x-stern, those of you that have been around a long time know we had an x-stern a long time ago on the first submarine with the new hull shapes that we put on the ALBACORE. So it's an old technology but also innovative

because we haven't done that before. One of the things that it gets us for the OHIO Replacement that you might not realize but it helps with the turning. Those of you who have been on the submarines or driven the VIRGINIAs know that with the propulser you get the good quieting but you also get lousy turning radius and the submarine isn't nearly as maneuverable. The x-stern will get us better turning, especially on the surface, with increased rudder size without impacting the undersea operation. And it provides good stability in the undersea realm and makes the submarine operating envelope much more benign.

Everybody's heard about the E drive, again, an old technology that's coming back as a new innovation, this time with permanent magnets and a much more sophisticated design. The thing that naval reactors likes to point out, though, is this is not experimental, we're not doing a new technology, we're innovating on a current technology and it's an engineering issue and we will be very successful with that with the work being done now and in Philadelphia at the Compatibility Test Facility so that's very exciting. But, again, it's an innovation needed to meet the acoustic goals. We have the integrated tube and hull construction that Electric Boat has advanced, again, a very innovative thing. This is a ship that needs a longer shaft life, that's learning from the work to keep the SSGNs at sea and new research down in Key West. Atmosphere control and handling, we're going to have a new way to handle CO2 in the atmosphere and that's very innovative. One of the biggest innovations I've already mentioned before, the life of the ship core, we don't have to do a refueling. That's an amazing cost savings across the whole program and on each ship. Forty-two year operational life is building off of what the Ohio is doing.

In the area of commonality, we're going to use the same combat system as the rest of the submarine fleet, and I'll talk some more about SWTFS later, but that's a big one there where we're not developing individual components but using the same across the Navy and it's saved lots of money. And the modular construction that EB has done is very innovative.

Some of the accomplishments in the program, Admiral Benedict talked about some on the SP side, on the ship side we set the ship length and we completed the ship specifications so we've set the bounds of what it is we're going to build and now the shipbuilders and the sub component vendors know what they need to do and we're going forward and designing the ship and starting to build it now. We did some VIRGINIA payload testing that will support our ship, it actually started – Missile tube construction, Electric Boat this year issues contracts to three different vendors to build missile tubes for the first article quad pack and the first UK boat. So, think about that, right now, today, in 2015 we have vendors who are bending steel and welding it and that steel is going to go into the first submarine and it will be out and operating at sea until 2070. So we're building the ship now and we've got a lot of work to do.

Electric Boat and the government team has been planning this work for a while, almost ten years now actually, and there's been a lot of innovation on Electric Boat's part in construction. The manufacturing of the first article quad pack, where they're taking the concepts that started with Quonset Point building parts for the Trident submarines – the hull sections through the development of outfitting and modularity, and the work on VIRGINIA and they're taking it to the next level of a very innovative approach.

You have a movie that I'm stealing from Electric Boat that will show you the innovative manufacturing here, the fixtures and stuff going into building and Electric Boat is building right now. So it starts with the missile tubes coming into this facility, into – as you can see – the rotisserie fixture there. And this fixture allows the missile tubes to be worked on and outfitted out in the shop environment putting on the different packages of cooling and electrical systems and the like. As you can imagine, that's much more efficient and a large labor saving from working on the tubes in the vertical position in the hull after they've been installed. And these tubes come with a section of the hull as part of the tube, and so the next fixture here is where they put four tubes together to build a quad pack and it's the E fixture and nobody could think of a cool name like rotisserie to designate what the fixture would so

we went in alphabetical order, Electric Boat did, in alphabetical order here. You take four tubes – and they all have a section of the hull unique to them – and you weld those together and it creates four missiles joined and a section of the hull. Now they're loading in the robotic welding that will be used for when the rest of the hull section is built around these four tubes, and to do that they take it over to the F fixture. If somebody can come up with a cool name for any of these fixtures, I'm sure Electric Boat would be happy to modify this video and use those.

So then you come into the fixture where they've built the remaining part of the submarine hull, and holding the tolerances is obviously a very daunting challenge and this has taken a lot of engineering development and Electric Boat has done a lot of good work on this. This is where they weld the four tubes and the hull together. Those are the robotic welders that are welding the seam down at the bottom there that no human would be able to do, we couldn't build this way without robotic welding. And then they finish putting the section together, there's the robot welders coming out after their job is done. There you have a quad pack, part of the submarine ready for outfitting and then you put it in the vertical position and stack them together and you have a missile compartment.

And thank you, Electric Boat, for letting me use your movie. So next is a Submarine Warfare Federated Tactical System, SWFTS. This is the main commonality, the brilliant idea that the combat system people and submarines put together of a federated system of systems that allows tailoring for each boat, but basically a common computer, common sonar is where it makes sense. The one thing I want to talk about on here – I'm not a big combat system guy from background but I'm in awe of what they do and appreciate all their efforts. Vice Admiral Hilarides' talked a lot about cyber and as those of you understand cyber and a threat, you see here it's a huge target with a lot of room for mischief. But the submarine community, you all doing this combat system work, we're ahead of the game. At NAVSEA we're working hard, as Admiral Hilarides said, on the control systems, and the combat systems, the non-IT systems for making them cyber secure. You

all should be proud because the submarine group, this SWFTS group, is ahead of the rest of the Navy on cyber. Now, that's no reason to relax or get too proud because there's still more work to do, there are vulnerabilities there, but the way this system was designed and developed from the beginning, with the idea of multiple levels of security, has provided quite a bit of cyber protection here and you all should be proud of the work you did many, many years ago before cyber threats were even a term.

So the SWFTS is a basic 2-4 process as envisioned, it started out of the ARCI, Advanced Rapid Cots Insertion program where we would change the hardware every two years and the software on the odd years every two years to take care of obsolescence and to continue giving more capability to the war fighter. And then every four years the idea was that platforms would get updated and we would keep a highly capable, well-integrated, common training system in the fleet. So even though this commonality provides a lot of real savings, keeping this level of capability is also pretty expensive.

We, the smart people in the PARMs doing this work came up with the SWFTS tailored system. As you can see, there's a number of platforms that are supported – they're down on the left there – and if we were going to do hardware for every one of those every two years, even though there's a lot of commonality, there are uniqueness. They have different sensors – only the Virginias have a chin array, for example, or a WAA [wide aperture array] and 688s don't. But the 688s are still a main part of our fighting force and need to be supported. So we came up with a tailored system where we grouped the systems that would be upgraded and so, in reality, we only upgrade the 688's design every four years or the Virginia's design every four years. But we have this constant drum beat of innovation and improvement with the software and the hardware and all the platforms get advantages of all of these increased improvements. If you want to know more about it you can ask Captain Neff who's on the panel right after me.

Now, one area that I wanted to talk about is on the EM systems. This has sort of been a stepchild in the submarine community for a long time, we've been more concerned about sonars than

the electromagnetic spectrum and other than having a new photonics mast there didn't seem to be a lot of innovation in this area. But Captain Steve Debus leading this group has really increased the exploitation of the electromagnetic spectrum, and is probably one of the reasons he was picked as the winner of the J. Guy Reynolds submarine acquisition award. There's a number of the programs he's been leading and championed that are important for our ongoing success in the future and just a couple of them are: the low-profile photonics mast on the left. It is much smaller and less detectable than the current photonics mast but because of the innovations they put in, the fiber optics, just as capable. Again, a commonality, not allowing the vendors to do their own way for hooking up to the submarine, but having a common copper fiber interface makes it easier for the ship builder and reduces cost.

The pod-based radar, it's a commercial radar which was basically giving the war fighter a capable militarized system of what he's had before with his commercial radars and it allows us to blend in. We no longer will have a military radar that's beeping away, radiating away saying, "Here's a submarine," but we can blend in with the traffic around us. And then the basic concept of there's a large electromagnetic spectrum there that we need to be exploiting more and Captain Debus has led the way there.

There are two torpedoes in our inventory. The Mark 54 and the Mark 48, and when you add the Tomahawk to that, that is the extent of our weapons in the submarine community and that's really not that great, it's not a good state of affairs. Now, there's a number of programs in the R and D area that I can't discuss here, but we are looking at other weapons. But I say to the community, we need to do a better job giving the war fighter more weapons here. One of the things to focus on, though, is the Mark 48 is kind of the volume that you have available from torpedo tubes which is one of the major vehicle water interfaces that we have, so you need to keep that in mind when you're designing systems.

The Mark 48, mod 7 is our current torpedo. We haven't actually built a torpedo in over fifteen years and that's one of the projects that Admiral Johnson has been pushing to get started is torpedo restart where we refurbish these, we reuse them a lot, we

fire them for training, and bring them back and refurb and reuse, but they're getting old. It looks like it's kind of a modular weapon but we've really only been updating the forward part with sonars and the electronics. So in the torpedo restart, we are going to be making this a truly modular design that you can pull out a section and plug in different payloads or different propulsion systems or different fuel supplies. And so as you're developing the payloads, you ought to be thinking about how you integrate with the modular Mark 48 some new capabilities and the like.

The Mark 54 has been benefiting from a lot of the upgrades we've been doing on the Mark 48. We've continually upgraded the software and capabilities of the detection system in the torpedo and these are being rolled over to the Mark 54, this being the weapon for all the other guys besides the submariners.

Getting to my last section. So the future SSN(X) is an opportunity for us to use innovation to help the future fleet.

We have recently increased the size of the Virginia program from a 30 ship class to a 48 ship class which will take us out into the 2020s building submarines – in fact, 2034 will be when we deliver the last Virginia – but we're already putting together a team to look at what's the future submarine after Virginia need to look like. This is looking forward just as the Ohio Replacement Program is looking forward but it's important that we do this now. We need to identify the technologies that we're going to need out in the future years in the attack submarine business. And, this is going to be a submarine that is going to have to be better integrated with UUVs and other sensors and other capabilities that we maybe haven't even thought of yet.

So this is kind of our timeline for the future SSN(X), we're starting now, we have a future capabilities group that's working on what kind of capabilities do we think we're going to need out in the 2050 time frame, and developing that, those ideas, those templates, those requirements so that the R and D community can generate that capability for us. And so we're having to think about what's the environment in the 2050, 2060 time frame that we want to be the best at as we are now. So we're identifying potential technologies and maturing the technologies that we have now.

So in 2024 we will be doing a study of alternatives for the new SSNX and what we're trying to do right now is set that space for them now, help make those decisions now, give them the technologies to do those studies, and that's what this future group is doing – working with industry and the labs and some of our partners in academia.

I just want to conclude with saying that I think this is an exciting job, it's great working with all of you, we're providing the war fighter with the capability they need – the best capability in the world – and I'm looking forward to having Admiral Jabaley take over and working together with all of you to do the right thing.

Thank you.

NAVAL SUBMARINE LEAGUE THIRTY-THIRD ANNUAL SYMPOSIUM

"ACCELERATING INNOVATION: MEETING THE UNDERSEA CAPABILITY AND CAPACITY CHALLENGES OF THE FUTURE (2025-2035)"

RADM FREDERICK ROEGGE, USN

THURSDAY, OCTOBER 22, 2015

I appreciate the opportunity. It's a great chance for me, really not just to speak on behalf of the Pacific Submarine Force, but again Admiral Tofalo and I are of like mind and he has duly deputized me to talk about some of the things going on in the Atlantic AOR as well. As Admiral Padgett mentioned in my first introduction of the day, my previous command assignment was Submarine Group 8 out in Naples. So I think I'm still somewhat current in that. What I'm going to do right now, very quickly, is just kind of touch on the theme—or go back to the theme of the conference and talk about some of the capacity and capability challenges that we've observed.

So, capability and capacity challenges. The world around us recognizes, as we do, the importance of submarines. They are investing heavily. A little bit of context here, one can plot the AIS tracks of every ship that's out there transmitting on AIS. That will kind of show where the sea-lines of communication are. It should come to the surprise of no one that this is a very busy and very important part of the world.

I can highlight some of the submarine programs that exist around the Indo-Pacific-Asia region. A lot of times we focus on what is Russia doing, what's China doing? Clearly, there's submarine activity among allies, partners, friends, as well as those who are not today allies, friends or partners.

Some of it is force in-being. Some of it is force where procurement plans are in-place. We can also note as well all the nations that now have indigenous submarine building, submarine production capabilities, or are aspiring to have indigenous capabilities

We should speak to orders of battle. It's no surprise to this audience that, at the moment, as we ramp up Virginia and Ohio Replacement construction, we're decommissioning 688s faster. Over time, inexorably, our force structure is going to dip down a little bit. That's at a time when many of our peer and near-peer competitors, having started investments either earlier or having started from a lower baseline, are increasing capacity and capability faster than we.

The Russian line looks pretty flat, but of course that's flat in numbers. They are replacing old, in some cases obsolete, platforms with brand new ones.

The Russians last year introduced the first of their new class, the Severodvinsk, the SSGN. Also just last year the Dolgorukiy, the new SSBN, very capable platforms, as we assess them.

The Chinese have gone to sea now with strategic deterrent patrols of their own with their SSBN, the Jin-class. Four of them are in inventory right now. Again, although China began a lot of its buildup by purchasing and borrowing designs from others, this is now an indigenous capability. Also they've got the Yuan AIP submarine that recently completed a multi-month deployment. Elsewhere in Northeast Asia, even North Korea is investing in submarine capability.

So let's focus on Russia just a little bit. Again, as I mentioned in my earlier discussion, I want to focus on what we assess to be capability. I'm not implying motive or intent. I think President Putin does a pretty good job of communicating his intent in places around the world through some of his recent activity.

Russia's military budget has doubled over the last decade and their priority in shipbuilding is their Submarine Force. Again, we're not the only ones who recognize the value, the importance, the force multiplying nature of submarines. As you transition from an older Oscar II to a Severodvinsk, or transition from a Delta III

to a Dolgorukly, you're getting increased capability, improved quieting, longer ranges or greater accuracy on missions.

Russian state media broadcast a video of the land attack cruise missile strikes of the Kalibr missile system that Russia launched from the Caspian Sea into Syria. There are lots of other ways that Russia could have delivered ordnance on target in Syria. Do you suppose there was some strategic messaging behind choosing to use a form of attack that hereto in the world really only the U.S. and the UK have employed, long distance land attack cruise missiles?

That system is assessed to be very capable, of course. We can draw range rings around our fleet concentration areas to represent nominal standoff ranges in either a land attack or an anti-ship cruise missile range arc for that missile system. And so for a stealthy platform getting underway from Petropavlovsk or getting underway from the White Sea area, it's a couple of weeks of patrol speed transit to potentially be within range. You have to cover an awful lot of ocean if you're going to do an open ocean search for these folks. So the tag line is, as quieting improves and if you have quiet platforms out in the middle of a big ocean and an uncued search, it's going to take a lot of assets, a lot of resources in order to try and accomplish what the nation expects of us, to be able to deter or to defeat.

There's a lot of talk about what the impact is going to be of continued warming and greater commercial viability of Arctic passages. Within the Arctic Council nations, of which the U.S. is currently the chair, that point is not lost on us nor on the Russians. They have spent a lot of time, a lot of resources lately, reactivating Cold War era bases on their Arctic frontier and building some new ones, adding some capacity. Again, if this in fact is going to become a commercially viable commerce route it could be just about having search and rescue capability for innocent stranded mariners. It could be about the protection of their economic zone. It's obvious, though, that in many cases—those bases were once Cold War era military facilities.

You don't have to be an Arctic nation or border on the Arctic to have an interest in the Arctic. There are about a dozen nations

right now that have requested and been approved for observer status in the Arctic Council, including the Chinese who in their official media have characterized themselves as a near-Arctic state. I'm not sure what the liberal definition of near-Arctic is, but obviously they're the ones who get to define that for themselves. They recently had, not icebreakers, but modified merchant ships that transited that northern passage in both directions. And from their position in the geopolitical sphere, it saves an awful lot of money, a lot of transit time, getting to America and Northern Europe going through the north.

They have also let contracts for their first icebreakers. They are keenly interested in potentially partnering with the Russians in this part of the world.

Back to the Russians, again. In addition to some of those bases, they just have established a new Arctic command, activated or created some Arctic brigades that are based up north as well. So again, a lot of interest here.

Getting back to our friends the Chinese, they are very much doing what growing powers do. They are expanding in the nature and the scope and the breadth of their operations, exploring just what are the true capabilities that they're investing in. We see them operating further and longer at sea and demonstrating greater operational readiness.

As particular instances, a couple of diesels have recently concluded what we would consider a type of normal deployment, going out of area, going in places that their national command authority or naval hierarchy thinks are important, and managing to fix the boat when it breaks and conduct operations. Additionally, they are very Mahanian in their view of coaling stations and infrastructure and logistics. They are actively seeking not just port visits but potentially maintenance and logistics kind of capabilities, along what some of their writers have referred to as a new maritime silk road, that passage between the South China Sea through the Strait of Malacca across the Indian Ocean.

So, the Chinese have agreements with Sri Lanka and a lot of reporting of agreements that don't yet appear to have been concluded, potentially with the Djiboutians. They recently had

port visits in Karachi, Pakistan. But again, engaging in behavior that seems pretty logical if you're interested in trying to expand your influence.

The same for their service operations. And, of course, these are much easier to talk about at an unclassified level. They publish—in terms of messaging they're very open in talking about some of the things that they are doing, if you were to look at their area of operations five years ago, it would be a much, much smaller area, much, much closer to the coast. We see progressively over time them gaining confidence, gaining operational experience, and expanding the scope of their operations.

Currently underway, they are conducting an around the world cruise, which left a couple of months ago and currently is up in the Baltic. I think they just concluded a port visit in Poland. They will be heading across—they've requested to make a port visit on the East Coast of the United States. They've announced they intend to go through the Panama Canal. They're requested to make a stop in Pearl Harbor on their way back to China. So I may have a chance to greet them myself.

Similarly, just recently, just last month they exercised the international right of innocent passage and they had a small surface action group that went through the Aleutian Islands up in the Bering Sea. Again, we certainly see that if they are interested in or aspiring to become an Arctic presence it makes sense for them to do some of their own intelligence preparation of the environment. And it's not just their military capabilities. On the commercial side, their China Ocean Shipping Company, which handles port logistics, management, etcetera, currently has either controlling stakes or significant interest in port facilities in Antwerp, in Greece and the Suez and Singapore. They are even a minority owner of our own port facilities in Seattle and Long Beach.

And then, also in addition to capability, there's the capacity challenge. Admiral Swift recently was published having made remarks in Southeast Asia that accurately and rightfully pointed out that the combined order of battle of the U.S. 3rd Fleet and 7th Fleet is the most powerful navy in the world with the exception of

the aggregate United States Navy. But even so, on any given day, when you look at the assets we have forward deployed in the 7th Fleet AOR and what's in the PLA order of battle, it's entirely possible that on any given day there's going to be more of them running around out there than there are of us.

Now we still unquestionably have greater capabilities. I don't say that to raise a specter of fear of any sort, but it's simply a fact of numbers. If in the past we've had the luxury of at least considering going from a zone to a man-to-man defense, man-to-man could be a lot harder if you're outnumbered.

I mentioned North Korea a little bit earlier. They claim to have successfully tested a submarine-launched ballistic missile. It's unclear what it is that may have been successfully tested. There is certainly popular media speculation that that launch has aspects that look suspiciously photo-shopped. But again, that's popular media, that's not the official position of the commander of the Submarine Force, U.S. Pacific Fleet.

An intel assessment would indicate, based on the technology they've demonstrated to date that it might be possible for the North Koreans to be able to hold at-risk some things that the United States values. Additionally, just a couple of months ago when there was the increase in tensions on the peninsula over the landmine incident on the south side of the DMZ, and as tensions heightened the North Koreans in less than 24 hours were able to sortie about 50 submarines and get them to sea. I was, frankly, a little bit surprised that they had that ability.

That said, I have no indication whether any of them submerged. If they did, I have no indication whether they surfaced again. But the very fact that they were able to get them underway, apparently not even under tow, is noteworthy, I think.

So there are a lot of sources of friction out in this part of the world. There's a lot of talk about the Spratlys. The A lot of talk has been going on about the Chinese activity in building or expanding islands, and it is noteworthy. Less than two years ago, early in 2014, the Chinese were occupying seven different outposts in the Spratly Islands, the total aggregate surface area of

which was about five acres. Since then, they have created about 3,000 acres of land on various outposts.

But it's interesting to note here that it's not just the Chinese. All of those nations with competing maritime claims in the region: China, Vietnam, the Philippines, Taiwan, Malaysia, just in the South China Sea. There's 71 different outposts that are occupied, divided up amongst all those nations,

There are other small little outcroppings in the Spratlys that currently have operational airfields operated by the Filipinos, by the Malaysians, by the Taiwanese, etcetera. So again, it's a very popular part of the world, apparently. I guess real estate is very attractive there. It's all about location, location, location. So again, it's easy to focus on the Chinese, but there's a lot of activity among all those neighbor states.

The other point I want to emphasize here is that often times we talk about this topic or refer to it or it is written about in the press as a Chinese land reclamation process. I'm very careful here in at least proposing for our use—this isn't reclaiming because there's really no land there in the first place, certainly not by the international definition based on the tidal ranges. I mean, they're creating something that didn't exist and I think it's important that we try and be very specific in our words lest we give more legal legitimacy to a claim than might be warranted. And again, precedent is always very important in matters of law of the sea.

So the challenges in the operating environment are not always just the physical environment. It includes the electromagnetic environment. Two particular examples I'll highlight here, first with respect to the world of cyber, clearly cyber capabilities are of great benefit. They're a great force multiplier for us. They improve our ability to command and control forces and to achieve effects.

But there are vulnerabilities that come along with it. Our Submarine Force has made some significant investments in the last couple of years to try and improve not just our capabilities but our cyber security. For this industry crowd, I would ask again that we really have to keep in mind that every advancement in capabilities is greatly appreciated, is hugely beneficial, and has to

be matched by equivalent increases in security, or the ability to secure the capabilities that we're providing.

I think far too often we will find that in our eagerness to employ new capability, we will find that there's a security vulnerability for which the patch is in progress and may be lagging. And we need to reduce that delta. As I mentioned in my earlier comments today, this is an area where we really have to get faster. We have to be more agile, more nimble in modernization and acquisition.

Some of those things that we've done in the realm of cyber here recently, with respect to patches for example, we recently contracted for network onsite administrators at each of the ISICs. We were able to go down and help the boat's LAN division, help the communicator. They've got all the latest and greatest tools and patches properly installed. They're scanning the networks correctly.

We did recognize that there was a bit of a knowledge gap. So referring back to what our panel of JOs were talking about before, we've got great sailors, really talented, really want to do things and not in every case have we appropriately identified the necessary training and skills. So we recently made an investment in IT. We recently made a similar investment in officer training at SOBC and SOAC and the command course. And we're also looking at some organizational and billet things.

It has been many, many years since we had electronics technicians or their predecessors who were devoted to electronic warfare. We're piloting a program trying to re-establish that as a discipline. Similarly on the LAN side, one of the things that we've noted is that there has been a bit of a disconnect between the workload required of a member of LAN division to do all the scans and all the patches and everything that's required, and the number of hours in a day. So we've gone about trying to increase some capacity and are actually looking at potentially some combination or pooling of assets between the communications ETs and the information technology folks.

On the other side of the chart, the other end of the electromagnetic spectrum, commercial radars, if there are any fishermen out

there you know that you can get a digital solid state radar these days that is cheaper than the old analog types. What's interesting is the comparison of the two scan displays. That 30,000 watt analog radar is actually less effective, less precise these days than what you would get for a few hundred or thousand dollars with a 250 watt digital radar.

That really upends the whole paradigm of what it means to have electronic early warning. Signal strength now is kind of irrelevant against one of these things. So our countermeasures, our sensing capabilities, all, I think, are another opportunity for greater partnership.

Let me spend just a little bit of time talking about some of what we're doing in the realm of our operations in responding to and leading in this environment. On the strategic deterrence side, I think Admiral Haney appropriately characterized the many challenges, and as well opportunities. One of the things he didn't say very much about is that STRATCOM just recently got the Secretary of Defense to approve a new Strategic Operation Plan, a family of plans, that really is much more nuanced, much more calibrated. It integrates kind of a whole range of effects that STRATCOM is responsible for, from nuclear to cyber to space. It's specifically designed to be able to try and provide off ramps, so it's not just a continuing road of ever-escalating escalations.

He mentioned that we recently had a SSBN pull into Faslane. That's the first time in over 10 years we've had a strategically loaded SSBN pull into a foreign port. A little bit of strategic messaging ourselves, and a great assurance of a valued ally as well.

I've also emphasized—we talked a little bit earlier today about the importance of trying to get in and out of our maintenance availabilities on-time in order to improve the operational availability, the A_O. That is probably my number one priority on the force readiness side. I think I speak for Admiral Tofalo there as well. We've certainly invested a lot of energy into that.

Recently the CNO revised the funding priorities given to NAVSEA and to shipyards, making the timely completion of SSBN overhauls the number one priority. And so we expect to see

the next series of overhauls being executed as scheduled. We recently bought some more billets and increased the manning at the Trident training facilities, because of course as we do successfully modernize equipment onboard the boomers, we'll increase the demand for the training facilities to certify those crews.

On the SSN and SSGN side, again, you're very familiar with all the roles and missions. The thing I want to point out, though, is particularly in my part of the world where some would say it's a tough neighborhood, as tensions rise, as those potential friction points become more frictional, the people who are not China are getting increasingly nervous, and that makes us very popular. So there's an ever-increasing level of demand or requests for port visits, for presence, for exercises, for engagement, and that's a great opportunity for us in a very, very important part of the world.

On the warfighting side, as I mentioned this morning, hopefully we will always demonstrate such capability, such capacity of our own, that it will deter both conventional and strategic conflict. But we need to be ready to fight should that be required. A lot of things that we're trying to do at the unit level, as well as at the headquarters level, are trying to make sure that we're ready for that.

So if you thought that it might be important in some future conflict for an attack submarine to be able to navigate without access to GPS, well we demonstrate that on a pretty routine basis. If you thought that in some future time or heightened tension it might be important to be able to rapidly deploy on short notice multiple attack submarines simultaneously and keep the water space de-conflicted, we've practiced these kinds of things. So we're always trying to keep an eye on that ball and again, it's certainly important for our proficiency. It's important for strategic messaging as well.

Another key partner in the undersea domain, of course, is our integrated undersea surveillance systems, both fixed and mobile. This is probably—I know that Admiral Merz, who is my CTF-74 commander out of 7th Fleet, the theater USW commander out there, would not necessarily trade a Virginia-class for a SURTAS

platform. But there certainly are situations when it would be more important for him to have a SURTAS platform than to have even another Virginia-class.

Capabilities are very important, very impressive, and this is an area where again, over time, we're dealing with an aging infrastructure. We've made some decisions that I'm sure were the right decisions historically, that it's probably warranted to revisit now both in terms of the investment in the platforms and the investment in the people. There was a time when a special rating, ocean technicians, which we merged into sonar men about 20 years ago. It's worth looking at whether what we have seen as a consequence, is what we want and what we think we need? And so, as I said, we're taking a look at it.

All this is against kind of a backdrop of what else has changed in the last 20, 30 years. The ocean environment itself is a lot louder. There's a lot more shipping out there, a lot more traffic, so it's a challenging acoustic environment. , The things we might be interested in trying to listen to, to monitor, are becoming quieter and quieter. Certainly on the SURTAS side, although we have very capable sensors that are being maintained very state of the art, the platforms themselves we're going to have to start planning for replacements.

Just a couple of recent things that we've had the opportunity to demonstrate on the unmanned, underwater vehicle side. Those are a couple of REMUS vehicles, autonomous underwater vehicles, that recently were the first to be deployed from a Virginia-class DDS shelter, very successfully. We can operate above the air-water interface as well. A small UAV launched from a 3-inch launcher can give the CO a much better high look than what the Dive usually offers him.

Let me just finish kind of with the topic where it all begins for me, which is on the people side. The theme of the whole conference, of course, is about accelerating innovation. I applaud all the previous speakers for how they've tried to capture and characterize the capacity and the capability challenges, and how we're innovating.

Let's not forget that people remain our most important asset and we are innovating in the world of people, as well. I think a lot of what the Force Master Chief had to report to you reflects a very innovative paradigm in terms of how we look at, how we assess, how we measure and evaluate our people performance, our people-centeredness. The same is going on at even a more strategic level. We're trying to make sure that we are thinking about what is changing in the people environment.

The Master Chief talked about the millennial generation. I love them. They're great Sailors. But young Sailors today, it certainly seems to me as an old guy, think a little bit differently. We as leaders need to understand that so we can enable their success.

Another difference with the people environment is that these days, if you look at kind of our standard accession cohort of 18 year-old young men and women, there is only about a quarter, 25 percent or so, of 18 year-old men and women across America today who are eligible for military service. What would make you ineligible for military service? Well, I don't know, a criminal record, can't get a security clearance, physically, some medically disqualifying condition, can't pass a physical fitness test. Maybe it has to do with ASVAB scores. We do have quality thresholds there as well, so any number of things.

But the fact is that the population is small and then from among that population we are competing. So again, the Master Chief expressed his concern about our ability to recruit and attract and retain. Well that's kind of my concern here as well. From among that population we need to be an employer of choice for that fraction of the population. Not every 18 year-old young man or woman grows up thinking I want to be a Sailor. We have to do a better job of communicating the great opportunities that exist not just serving the country—yes, that is vitally important—but also the ways in which serving the country through service in the Navy is going to help that young man or woman achieve the things in life that matter to them, and enable his or her personal goals.

So these are all initiatives that hopefully you've heard something about. I just came most recently from working for CNP on

that first one. Actually, I worked on all of those in my last job as head of personnel policy. But the CNO's initiative, Sailor 2025, is a range of things from modernizing our personnel systems, the hardware and the software, down to looking at our culture and how we can be an employer of choice, to what the Master Chief referred to on the learning side. Are we delivering knowledge in ways that are efficient and effective and that are going to enable our folks to be successful at every point in their careers?

The SECNAVs Task Force Innovation has adopted a lot of those same initiatives and tried to expand them across the naval team of Navy and Marine Corps and our civilian workforce. And SECDEF liked what he saw and his Force of the Future is currently evaluating a lot of those for application across the entirety of the Department of Defense. So why are we looking at people differently, why accelerating innovation?

The climate has changed. The environment has changed. And as a result, I would say the two big things we're trying to achieve here have to do with allowing for greater career flexibility; the kinds of things that allow somebody who gets to a point in their career where normally there might be an obstacle that might cause them to leave, to recognize that maybe there's enough flexibility here. I can accomplish what matters to me personally and continue my naval service.

It's about being able to better recognize and then appropriately reward the talent, the quality within our quantity. Every year I need about 105 submarine lieutenants to want to go back and serve as submarine department heads. I really want to be in a position where I've got all 200 of them who say, I want to go and be a department head, and I'm picking the very best 105, as opposed to hoping that the ones who do sign up are going to be the very best.

I say that, not that it's a problem to be fixed. It turns out we are largely attracting all of the most talented folks, which is great. But it's happening because of the inspiring leadership on the deck plates, not necessarily because we have systems and processes and programs in place that allow us to do that.

It's a whole range of things, from changing law, or at least considering changing law, like DOPMA and Goldwater-Nichols,

to changing policy, things such as the SECNAV's recently announced expansion of maternity leave benefits, the Career Intermission Program, which is effectively a sabbatical that allows a sailor to take up to three years off from active duty but maintain their promote-ability; or simply practice the resilience factors that the Force Master Chief mentioned. We heard some of the JOs talk about how tired they were. We've paid a lot of attention to sleep management in watch bill and watch rotation over the last couple of years. So a lot of great things intended to try and enable the success of our workforce.

That's about as quickly as I could get through it. I appreciate your time and attention. Thank you very much.

2015 ANNUAL SYMPOSIUM
NAVAL SUBMARINE LEAGUE

RADM (Sel) CHARLES RICHARD, USN
DIRECTOR, SUBMARINE WARFARE (N97)

OCTOBER 22, 2015

Admiral Padgett, thank you, sir. Thank you to the Naval Submarine League for putting this whole forum together and giving us this opportunity to have these conversations.

Some of you have heard me talk before and probably heard me say I think that it is a great time to be a submariner. Not that there has ever been a bad time, but there are some things that we are doing now that I find particularly exciting. So when you look at the world situation that we face today, when you look at what this nation needs in capability to defend itself, you keep coming back to the undersea forces as a key asymmetric advantage that we have. It's part of the inherent physics, frankly, of our domain. It's part of the inherent and designed-in capabilities of our platforms.

If you need to get there, we can get there… pretty much no matter where "there" is. In many cases we're the only force that can do that. We're the key enabler that unlocks the door and sets the table for the rest of the joint force. In fact, I'm so excited about this that if I could sign up for another 30 years, I would do it right now.

Now I might go to Admiral Caldwell—I meant to mention this to him yesterday—and say, can I maybe skip that prototype thing? But I'll tell you, if I could go back and be a prototype instructor right now I sure would. I think they have made that into a fabulous tour of duty.

Another thing that makes me very excited to be a submariner is the vision that we have for the force. The Submarine Force has had, and has, great leadership. They have crafted what I think is a tremendous vision for the future. In fact, immediately after me

you're going to hear from Rear Admiral Roegge, on behalf of Vice Admiral Tofalo, about that vision, and I could not be more excited about it.

I'm reminded that it takes substantial amounts of effort, work and just hard-nosed engineering effort in a lot of cases, to take a great vision and turn that into reality. I'll tell you that's where my focus is going to be. How do we take this vision and apply the rigor? How do I go out and innovate, be rapid, while at the same time remembering the technical rigor that got us here and not go off and try to build a paper reactor?

That is the challenge that I see for us. That, and serving as the synchronizer between an enormous number of organizations. Look at all the people that are in the room, what you represent, and all the places that you've been. We see ourselves at N97 as leading the effort to keep that collective experience and effort synchronized and on the same page.

We have our investment priorities. They come from the Integrated Undersea Future Investment Strategy, which is aligned to the force commander's direction and the vision for our force. Those should be familiar because they've not changed and because I think that they're very sound.

I want you to know that as the director, it is my intention to continue with these priorities, with just minor rudder adjustment to account for set and drift. I'll start from the top. First is providing the sea-based strategic deterrent.

Know that includes both the force that we have today and the Ohio Replacement Program (ORP). Let me make this point on strategic deterrence. If it is not intuitively obvious to you why strategic deterrence is the most important mission in the Navy and the most important mission in the Department of Defense, I'd ask you to see me afterwards and give me a chance to convince you otherwise.

I'll give you a hint, it starts with a conversation of the consequence of failure inside this mission. So I'll tell you right now, getting the resources and other efforts to get ORP in and on time, as well as providing what resources the current OHIOs need, will be my number one priority resourcing effort. It's on a list of things

that I worry that the nation takes for granted. One of them is strategic deterrence and the fact that we've had 70 years of nuclear non-use and how we got to that point.

The second thing that's on my list is sea control. To do that, you have to have adequate force structure. So, the next priority is maintaining building at least two Virginia-class per year. That has been very successful so far. My compliments to the entire team that has gotten us to this point. But we have to continue to do that, and that still doesn't do enough to address the shortfall that we face in the attack submarine structure that we see coming up in the future.

So the question there becomes, what are the limits? What else can we do to go address that shortfall? What is the maximum ability of our industrial base? Are there additional resources that could be made available? Are there other things we could do with the fleet that we have to give us more of the forces that we need to address this?

And then right behind that, the third priority, is enhancing our asymmetric advantage. The good news is we can get there. Once we get there, do we have the tools to understand what we need to do, communicate it, decide, and then go into action?

So you see, Virginia Payload Module (VPM). Again, great work so far to get to the program of record of one per year starting in FY19. We've got to make sure that that maintains course and speed and see if there's anything else we can do to further close that gap in strike capacity.

We're off to a great start on acoustic superiority. Earlier speakers and program managers talked about heavy weight torpedoes. I have to go get that line restarted at the same time we're talking about a Continuing Resolution (CR).

By the way, Martin, where are you? I've got to make sure—I get excited about this stuff and there's a chance I'm going to run long so I've got Martin back there to give me the cue if I go too far. And the other piece is he's there to keep me calmed down, right, to keep reminding me you are in a hotel room not on a watch floor, so you've got to be a little careful about what you say.

I mentioned the continuing resolution a few minutes ago. That's a body blow in terms of my ability to get the resources and get them into the hands of those program managers so that we can go make torpedoes, would be a very high one on the list. That's just next to impossible under a continuing resolution.

So I've got to start making torpedoes and then what I have to do is I have to come up with an entirely new array of "schwack-age" options that I can go give the fleet. That includes both undersea, that's with the heavy weight torpedoes capabilities, as well as an expanded missile portfolio. High on my expanded portfolio list is figuring out how to get back in the anti-surface ship missile business.

And then behind that, large and small diameter UUVs. You saw Admiral Girrier come up here yesterday and start to give you the vision for what we're going to do for N-99.

We have been working in 97 quite a bit with Admiral Girrier. You'll recall from his presentation he takes things up to milestone B. We're the post-milestone B people and we're in some active conversations with him right now on some of the programs that are going to come into the N97 family so we can properly take care of them and get them into the fleet.

Other pieces of this stuff won't go down a classic acquisition path. There won't be a milestone B. They're simply extensions of existing capabilities we have in the combat control system, and so there's another path that we're going to pull stuff in from N99. And, of course, that's at the back-end of what he does.

At the front-end he is just now going out to look for candidate technologies and nascent programs that can come into his process. It's like we're standing there with a stack of 1250s in late September, when all the sweep-up funds become available, and saying "here you go shipmate". These are some things we'd like for you to consider; large and small UUVs.

And then, we get to the middle ware, right, how do you get LDUUVs on and off the submarine? Have we thought this through from an end-to-end standpoint of how we're going to employ them? The Universal Launch and Recovery Module (ULRM) is high on the list. So, there's the list of priorities. It hasn't changed.

On-track, minor rudder orders, but a lot of work to do to get those things through the POM and get them into the fleet.

So, if you heard my presentation at NDIA, what you saw me do was allude to is the fact that there's a whole bunch of other stuff we're working on. This is the next level of stuff that we're thinking about. What I show you in the lower right hand corner is taken from the force commander's brief. It's a piece of the vision. The idea here is we have this wonderful vision, now let's do the hard work to put further definition in it in a number of areas, go figure out what the path is go get there, and then see what are the near term decisions, capabilities, concepts that we need to go work on so that they move off of slide two and roll into the bottom of slide one as we complete things., We move them into our priority list through the program objectives process and then on into the fleet.

We organized this asking ourselves the question, once you have access what do you do when you get there? And I don't mean to imply that we can't do anything today. We're actually very capable in a number of areas.

This is the next question. We broke it out into sensing, command, and control. We show payloads, but it's really an effects thing. Remember, there's a whole bunch of effects and payloads that we already have that we're working on to get into the fleet relatively rapidly.

I want to highlight using the sea floor as a particular subdomain that I think we have to put a lot of effort into, and I also highlight one specific mission. I'll just leave it here. As you see me do this, a lot of it is going to be posed as questions that we're asking ourselves.

Don't take the fact that I'm standing up here asking questions to let you think that we actually don't have a couple of answers or a couple of areas where there's some vigorous debate going on. It just goes back to, Chas, you're in a hotel room. There's certain things that we've got to keep in the playbook to ourselves, at least for now.

On the sensing the environment piece, what I really want to draw a big circle around is that electromagnetic spectrum thing.

As we shift from a platform focus to a domain focus, we are going to have to radically rethink what we do in electromagnetic spectrum. I have described this as I have to move from a world where the big question I'm trying to answer is "*Has my periscope been detected?*" to "*I may be the only aperture in this location, what is the state of the electromagnetic spectrum? Who do I tell about it, and then what do I do with it?*" That includes effects delivered in electromagnetic spectrum.

So, not only is it how we operate in there—and again, I don't want to leave you with he's gone all War College on us. There's actually a lot of more specific work that's going on inside that. But it's answering that question and how does a stealthy, submerged platform interface with the electromagnetic spectrum in the future? Is it the mast? Do we see that as the interface all the way into the future or are we going to get to the point we have to think radically differently about how we get that aperture into the electromagnetic spectrum? There's a lot of specific details inside of it. Just know that I'm highlighting electromagnetic spectrum.

We haven't forgotten acoustics. We're very good in acoustics. But, are there any other advantages we can wring out in that area? The acoustics superiority program would be a near-term example where we asked that question, answered it, and then moved out to put a capability in the fleet.

So once you understand where you operate, you've got to understand command and control. There are a couple of pieces in here. One is, remember it's not all widgets that we're talking about. In some cases it's ideas, it's concepts.

I'll tell you, if you want to help me with something this is a good one. It's not hard to predict a future that has maybe 10 or 100 times more things operating in the water.

That's going to be a lot of SUBNOTEs. I think we're going to have to buy more Lieutenants or I've got to have a new plan on how I manage all the things in the water.

And that's not just in PMI, for those of you familiar with that term. We're talking about putting effects out at much longer ranges. We're submariners, we're doing the math, we're trying to figure out how we're going to do the targeting at long ranges.

The Navy has tried that before. It's really hard and we didn't get to some really good answers before.

We think we're on the cusp of getting to it with our new technologies. But it's not going to do me a lot of good to have a target quality solution with a weapon with the required range, if I'm waiting for permission to fire because my command and control networks aren't in a position to let me go do that. We can gain competitive advantage over a potential adversary if we can get inside his command and control loop. So, we're working on that.

Another question on C2 is, how do I have a future Submarine Force that can be fully integrated into the larger Navy's battle networks when I want to, while never losing the ability to operate as an independent operator? That is a prized ability for the Submarine Force. I think we have to guard that very jealously as one of our key advantages, without forgetting, that even when you're operating independently, you are part of a command and control network. It just doesn't work the same.

Remember, even in World War II you had to go report to Lockwood at some point. It might not be until you got back to port and talked to him, but you were in a broader command and control network. Are we thinking our way through that properly?

We talked about payloads. There's another class of payloads and effects that I want us to start thinking about. And again, I'm kind of overstating it a little bit of this for effect, but in some cases one way to visualize it is I see a future that has—to use that Pentagon term—competition short of war.

I'm a football guy, and I think of this more as like chest bumping. So we're not exactly at peace with somebody, but we're not exactly winging guided missiles back and forth at each other just yet. So what can we offer combatant commanders in these types of environments? And again, I'm going to overstate it for effect just a little bit.

Right now, in some cases, it's "*Boss, you want a picture? I can get you a picture. You want me to blow it to smithereens? I can blow it to smithereens*."

But Chas, do you have anything in between? So we're asking ourselves, what is the opportunity there? And I then go back to the electromagnetic spectrum looking potentially very attractive in your ability to put an effect on a target to perhaps neuter its capabilities, to otherwise make it ineffective for what it's doing there, with a reversible effect on it without going all the way to a level of violence that may not be appropriate.

I want to highlight using the sea floor sub domain. I think the question there is, what is the military utility of access to the sea floor? Can we gain an advantage with that access in sensing? Can I get myself bigger aperture by utilizing the sea floor than I might be able to achieve with a mobile system?

If I can, can I make that portable? Can I move it into a place fast enough for it to do me any good? And then, what's the right combination of your mobile—think submarine—versus these deployable systems? And then how would I interface to it? Is there an opportunity to use that to mitigate the loss of the traditional C2, particularly the overhead architectures?

This is the idea of an underwater constellation. Is there potential in there? How about power density? Is there a way to go after that?

And it's one of those areas as it starts—there's a whole lot of effort going on, but do we need to sort of bring some order inside this, put some vision in it, and then focus our efforts in a couple of areas? I do want to make a point there which is, one of the challenges when you say you want to go innovate rapidly has to do with you being inside a large bureaucracy. So I can't set it up where it's like the innovation team meets at 10 o'clock and you have to have the ideas before you go home.

Innovation doesn't work like that. But at the same time, I have to have that technical rigor before we go off and either spend money or put something onboard a ship. C4 is a piece of that.

And then finally, we have a lot of work to do on in what we're doing with the Special Operations Forces. Again, you heard Captain Newton talking about where they are with SWCS, the Shallow Water Combat Submersible Program. One of the issues there is, as both communities work to define what their future is,

one of the things I have to do is make sure we don't at least inadvertently preclude a future capability because we made a decision without fully understanding the implications of what we were going off to do.

So those are some of the things that we're thinking about to define better the force commander's vision, get it to some actionable steps so that we can make programmatic decisions on resources and concepts and then move them onto slide one.

This is the how piece. It's an electrical engineer sort of inspired drawing. What we're trying to show you in this is that Line of Effort Three (LOE 3), future capabilities, comes from the commander's vision for the force.

That's my responsibility. I owe that back to my force commanders to have a leadership position in terms of what's coming in for future capabilities. So as you step out and look at all the ideas and concepts, one is how do we organize ourselves to get this conversation going between the people who know what we can do—think more technology—with the folks that know what we need—think war fighting—and have the back and forth so that something comes out of it, it matures, and we can go take some action on it?

So there's a process piece inside that, and we're putting a lot of effort into looking at both our traditional processes—think acquisition program—as well as some of the novel rapid things that have been going on. I'm very proud to be in a force that has the URCIs, the Undersea Rapid Capability Initiatives. What have we learned from those? What pieces of those need to be institutionalized so that I have some fast lanes when I have a compelling need?

So you see it's revitalizing things that we have already had, in some cases. Plus, what are the new things that we can go off and do inside that world? The Future Capabilities Group, for example, that we talked about in Mr. Drakeley's presentation, is looking at promising solutions to future needs. The Transition Advisory Board, provides structured recommendations for acquisition. working to revitalize that.

Remember then, a piece of that is just the culture that we set inside the force. I think that's very positive right now. The fact this a theme of our symposium this year, that we want to go talk about innovation, is very positive. Our force commanders could not have made it more clear that they're interested in us doing that.

Once you do this process, you've had the debate, you've tested it, you have technical rigor, we've come up with the ideas that we need to push forward, we roll it into Line Of Effort 3. Pace is a piece of LOE3. We like to think of pace in terms of three time frames.

So some things you have to think about over a very long-term tend to be the platforms. These are things that you have to think about—have to be baked in from the very beginning.

Stealth is a great example of that. I can't retrofit stealth into a platform very well. Another one is flexibility. We talked about the things that we might need to go do.

You have to have thought about that ahead of time. Space, weight, power, cooling, modularity, all of those are very hard to retrofit so we have to think about those upfront, knowing that you pay a premium for some of that. And so I have to balance how much of a premium I'm willing to pay for flexibility upfront compared to what I have to do to be fiscally responsible in the budget environment that we're in.

Then as you move into intermediate and shorter terms, now I start to take advantage of flexible software and hardware architectures that we got right in the beginning. We must build modularity into payloads through the interface standards that we established. And then, do I have mechanisms to rapidly go do the things that we see emerging that we need to go have?

Because of wise decisions that have been made in the past, you have unmanned vehicles operating off of submarines today. For a lot of this—it looks like PowerPoint—we're there now and now we're in the transition point to take some of these systems and put them up to fleet scale. What is the next step that we have to go do to make sure we can do to scale the next technology in the future?

One final point that I meant to make all the way back in the priorities discussion, is I gave you a list of things, programs that we're pursuing in the future. Know that what underlies all of that is current readiness. N97 is also responsible for providing the resources for current readiness. So we make difficult choices in terms of what we have to do.

It doesn't do me a lot of good to talk to you about the cool new torpedo I'm going to have that's going to start whacking things at hundreds of miles if I haven't given the resources to the fleet so they can get the boat out of overhaul. You have to tie those two things together. And you can't forget the people inside this, right? We say that we're a people centric organization, but that requires a commitment in resources and that's on my list as well.

So how do we wrap all of this up? Well, we're submariners, we write it down. We have the Integrated Undersea Future Investment Strategy. What I would want you to know about this is it's not new. It dates all the way back to 2011. It has been updated twice.

Admiral Tofalo did it most recently before he left to go down to SUBLANT. Know it has been very useful to us in the past for some of the successes that the force has enjoyed. We're going to continue to use it not only to get success inside the POM, but to shape where we're going in the future as a force.

We have an executive summary. That's the piece that's designed to communicate with you, industry. It has a distribution list "D" controls on it. We have to do that. It, by necessity, goes beyond the program of record because it describes our aspirations. But there's pieces of that that because it's pre-decisional needs to be held within the OPNAV staff.

So we've carefully gone through and done that. It's available to you. When you take a look at it, if you haven't already, what I'm trying to invite is a conversation. Let's go have the back and forth. Let's go have the debate.

We already had some of it going on today. We talked about directed energy. I think there was a really valid debate on, do we have the right priority on directed energy systems inside that electromagnetic spectrum piece balanced against what would I be

willing to give up to push? It's a great conversation that we need to go have. I'm looking for that kind of conversation more broadly.

AWARDS

33rd ANNUAL SYMPOSIUM

BANQUET

DISTINGUISHED CIVILIAN

MR. RICHARD McNAMARA

Thank you very much. Tim Oliver told me I've got five minutes and I'm off, but I may have to go to six. Thank you very much. It's pretty amazing to be nominated for this and it's really exciting actually to be awarded as a distinguished civilian. So thank you, whomever the selection board is. I appreciate everybody doing that.

I looked at the list of prior winners and one thing that I noticed is that all of them whom I recognize – a number of them - I had the opportunity to work with. It's really an honor and humbling to be put on the list with them. But I thought I would give you an opportunity to learn a little bit about how I got into this business for 40 years. I guess that was enough for a career.

I do have roots. I grew up in New London, Connecticut, a good Navy town. Everybody has done their time there, I'm sure.

Submarines and Electric Boat are pretty much a part of everything you do. My story starts about 100 years ago. In 1915 the first submarine disaster to ever occur was the F-4, she was the original USS SKATE and went down off of Pearl Harbor.

They rushed the only five Navy divers who were then working out of the Brooklyn Navy Yard to try to do a salvage – initially a rescue but in those days it took two weeks to get there. So they went to Pearl Harbor and dove on that submarine. During one of the dives one of the divers got stuck at about 280 feet for a couple of hours, and he was saved by a diver by the name of Frank Crilley. Frank Crilley is now the namesake for Building 201 at the

Navy Yard. It's the Crilley Building, because he saved the other diver and was later awarded the Congressional Medal of Honor.

Well that other diver was my grandfather. So from a young age I used to see Grandpa Bill, he had a broken hip, and he would always sit in the big chair on Sunday nights when we'd go over for pizza. But I would hear Navy stories, and that started to instill the Navy in my view. Of course my dad had worked at EB during World War II building subs as a ship fitter, and then he later returned in the late '50s and early '60s to build the nuclear Navy.

I had an uncle that worked at EB for a number of years. He did interesting things. He was a deputy program manager on the Aluminaut back when R. J. Reynolds had their own submarine the Aluminaut, the Star boats, some of the more exotics. As a kid I used to get to see all these pictures of the design work coming home, and that kind of moved me down the road.

Back to my grandfather for a second, interestingly enough he was stationed at the Washington Navy Yard during the '20s, with Swede Momsen, and helped develop the McCann Diving Chamber and the Momsen Lung. He actually worked with the design team that put together the submarine escape towers. I think the only one that's left is the one at Pearl. The way my family ended up in New London is he was sent to New London to construct the escape tower in New London. He then moved to San Diego and oversaw that one.

While he was working in diving and salvage, he was called to almost every disaster that the submarine community faced, as we grew up in that whole business of deep diving submarines. S-5 and S-51 were two that come to mind that I know have been written up. But probably the highlight was the USS SQUALUS. He was on the USS FALCON, a submarine rescue ship, when they brought it back—he was the master diver salvage guy, when they brought back over 30 of the crew from the SQUALUS.

Living in New London, I found out that I later played football with the sons of people who had been saved on the SQUALUS by the USS FALCON team there. So it's kind of a little rich history. It tells me how I was pointed in a particular direction. And how I ended up as an engineer is because I didn't do very well in

spelling and English, but I was pretty good at math and science, so they let me into college to study engineering.

So that was how I got started. I ended up with a career that began at the Underwater Sound Lab in New London. I went through a co-op program at Northeastern and learned a lot about the lab. When I came back I worked there for a couple of years and was brought down to NAVSEA.

Back then, they had NAVSHIPS, a predecessor to NAVSEA, and I worked for Don Baird and a guy named Bob Snuggs. Bob Snuggs is, of course, a NSL Distinguished Civilian Award winner from past years. He got me engaged in the submarine sonar business, AN/BQQ-5. I'm sure everybody here has been to sea with a BQQ-5.

I really didn't realize it at the time, but that was part of the transition from an analog submarine fleet and started the transition into the digital world. It was great to be part of that. The Reagan years were wonderful. I got an awful lot of satisfaction working with people like Bob Fox, the SHAPM and Frank Visted, who was the cruise missile program manager as we put Tomahawks on submarines.

I had the opportunity to work with and know very well Jack Wakefield. Jack Wakefield in the acquisition profession was the professional's professional. He was the singular deputy program manager of the 688-class from its inception until he left to start Seawolf.

I used to ride to work with a guy named Bill Lorino, and I learned more about shipbuilding and ship design on those rides to and from Crystal City over the years. And I think all that ended up contributing to and helping me prepare to ultimately start working on the Virginia program in the '90s when that came along. I also had Vice Admiral J Guy Reynolds as a boss. He now has a NSL award named after him and this year, Captain Debus was awarded that today.

But I had the opportunity to work for Admiral Reynolds, and he challenged CDR Dave Burgess and me back in the late '80s to come up with a common combat system that would work across SSBNs and SSNs. We made that work and it became the

foundation for what you see today with the Common Combat System, with these rapid COTS insertions that keeps our all fleet up. It's remarkable what did happen and what I've been able to experience.

Large and small businesses. I've kind of got a nickname for being the small business guy, but I realize that small business is never going to build a nuclear powered submarine. The HIIs, the EBs, the big guys, you're doing what needs to be done and you're making room and allowing small businesses to be able to contribute. I think that's great and I think that's part of what you see in this room today. Everybody isn't part of a big guy. There's another part of the team that's coming along.

I learned a lot from people like John Cottrell from the big business side, from John O'Neill, big business now he's small business, just a number of folks that have done things. Walt Kitonis is another good example of a small business that shows what they can do.

So obviously I didn't do all this by myself. You have to have at least two people, a money guy and a technical guy. You can't find a better technical guy than Steve Lose.

Mr. Steve Lose: Eighteen years.

Eighteen years on Virginia. He's the guy who brought it forward. I think that continuity is what makes everything go. I believe that we have a passion in the acquisition workforce that tries to equal what you have in the fleet. You can't come to work at Team Sub and not feel like you're part of the Submarine Force. That's a passion that I want to see keep going and I want to try to mentor people who do, which is one of the things I do now.

The last part of my career, as I was moved into the SHAPM and PEO business, I had the opportunity to work with guys like: CAPT Glenn Sieve; I was his deputy for a while; Captain Paul E. Sullivan, when we were working through a transition to production on Virginia; and then obviously when he became Vice Admiral Paul E. Sullivan, COMNAVSEA, then Willy Hilarides, and John Butler. And the common theme there—and I see Phil

Davis here and he let me do it too—they let me do things that were not just normal. They made my life interesting, with the things we did, with the ways we used programs, our outreach to women-owned small businesses in the shipbuilding business, how to get small businesses through SBIR, how to get our money back from SBIRs and make it work for us.

So I was very blessed in having leaders that I worked for in a deputy role, to be able to do that. So I look back at many years. It was 40 that I put in and I don't regret a moment of it and I would do it all again. And I bet everybody else on this distinguished list that gets awards like this would say the same thing.

There are probably two events that really struck me. One is, when we IOC'd Tomahawk and put airplanes on submarines, as Captain Bob Fox used to say, it changed an awful lot of what we do now. The fact that we got four SSGNs running around with the payloads they have, beefing up the Virginia payload, it's really cool.

And when we IOC'd that I had the opportunity to not only IOC TLAM-C, but I also went through the whole Pre-Operational and Safety Study, for the nukes. I don't know where they hid the nukes. They took them all away a number of years ago, but we've still got them somewhere.

And then a thing that I never thought I would get to be able to do, Jack Wakefield had told me about it, which was when I got to sign the certification message certifying lead ship Virginia ready for sea. That was probably one of the most rewarding things that came to me given the time working on that program, and recognizing the whole team, and everybody pulling their piece of the job forward over 18 years or 14 or whatever it took for us to get the lead ship out.

Like I said, inside the beltway I think we hold ourselves to a high standard. We want to keep doing it. We want to continue to be innovative. Guys like Debus, who got an award for that today, need to be recognized, and the next generation and the next generation.

With all that, I would be remiss if I did not thank my family for allowing me the opportunity.

I didn't deploy for six months anyplace, but through long hours and lots of trips my wife, Pat manned the household as our four kids grew up pretty well. I've got the two boys, John and his wife Laura, and Will with us tonight. My two girls are tied up teaching field hockey and taking care of a daughter.

So thank you very much. I appreciate the turnout, the thanks and the recognition.

VADM JOHN H. NICHOLSON, USN, RET.
2015 DISTINGUISHED SUBMARINER
ANNUAL SYMPOSIUM
BANQUET
THURSDAY, OCTOBER 22, 2015

ADM. PADGETT: Our last but not least recognition goes to our second Distinguished Submariner who in many ways paralleled Ken Carr's career, and holds a tremendous amount of legacy in the beginning of our nuclear propulsion program. Nick Nicholson graduated from the Naval Academy, I think, in 1946. He was the second to go into the nuclear propulsion program under Admiral Rickover. He was a shipmate with Ken Carr on the NAUTILUS and served on the NAUTILUS in those early years underway on nuclear power.

He went on to have a very, very distinguished career in the Submarine Force. Again, you can read his bio in the program. He moved up through the ranks. After he made flag he served at Submarine Group 8. He was also, like Ken Carr, a director of the Joint Strategic Target Planning Staff out in Omaha, very critical in our strategic deterrence programs. He had great influence there.

After retirement he has continued to be very, very active in the Submarine Force and community. He continues to this day to be very actively involved in our Naval Submarine League chapter in San Diego. So it is with great, great pleasure that I introduce to you, Vice Admiral Nick Nicholson.

ADM. 'NICK' NICHOLSON: You've heard a lot of high-tech stuff and what the status is of the Submarine Force and what it's going to look like in the future. It was really a great thing to hear, today. But you're not going to hear that from me.

I will obey the five minute limit. You're going to get a spot look at what 65 years ago felt like. Shortly after I got qualified in

submarines in a diesel boat, a secret message came out asking for volunteers for a new atomic submarine. Of course, every JO in the force wanted to do that. They had some sort of a committee to determine which officers to pick. The Atlantic picked two officers and the Pacific picked two officers. Somehow, I was one of those from the Pacific.

I got orders to go get an interview with a Captain Rickover. Nobody in the COMSUBPAC staff or any other staff had ever heard of him at that time.

It would have been a good idea to have known him.

They ordered me to make this interview, so I strode into his office in the bowels of the Bureau of Ships feeling very cocky about being selected. And he said, "What have you done to prepare yourself for this nuclear power program?" I said, "I went to a two-day radiological safety course last week."

Captain Rickover's face went like that, and then he said, "How hard are the submarines working these days?" I said, "Well, we get underway about 8 o'clock and operate three or four hours, and then the skippers race to get to the buoy to see who can get to the bar first". With this, he didn't look very good, to put it mildly.

He said, What other books have you read?" He said, "Have you even read any nuclear physics books?" I said, "No. He said, "What books have you read?" I said, "Mickey Spillane mysteries".

Man, I tell you, his jaw really went down with that. Then, he said, "Do you study at night?" I said, "I don't do much studying at night since I just qualified in submarines. So we usually go to a movie because they're only 10 cents out here."

Well that was it. He said, "That's it." He said, "You've had it. You're wasting your life away. I can't imagine what else you're doing. Get out."

I felt like I was crawling out under the door. So imagine my surprise when I suddenly got orders along with the other Pacific officer, to take 10 enlisted men and go out to Pittsburgh and have Westinghouse start training you in nuclear power. We did that and I thought why on Earth did he pick me to do this? I'm lazy and naïve, but at least I'm honest. That's the only thing I could think about.

I learned to be honest on those interviews on the very first one, I think I got credit for that.

After 18 months of training in Westinghouse, our group of 12 and another group of 40 headed by Buz Cobean were ordered out to the desert in Idaho Falls to learn to operate the Nautilus prototype. So we got out there and we first had to write most all of the operating procedures because this was a steam plant and not a diesel plant and there wasn't anything to work from. So we really did it and I was in charge of trying to get it all together.

But we made suggestions to Captain Rickover on several things, engineering and so forth, on changes that should be made to make it safer and more effective. The Captain really welcomed those kinds of recommendations, as we all know. And not only did he welcome them, he expected them and you'd better get them in.

We finally got the reactor critical in 1953. We did a full power simulated trial across the Atlantic, and then we provided electrical power for the town that's right next to Idaho Falls. So the plant was a big success. We still had lots of time to do some tests there and wait for the boat to be ready, so we worked 24 hours a day, seven days a week, to do that. Then finally several of us got orders to go to the NAUTILUS pre-commissioning. Of course we used all the procedures that we had developed and Admiral Rickover's people had okayed.

Then on this one wonderful day in January of 1955 I was Engineering Officer of the Watch and we were getting ready to get underway. There were thousands of people there. The skipper, who was Dennis Wilkinson, ordered all back two-thirds.

We started to back out and a horrible noise came out of the right induction gear. I notified the bridge and shifted to electrical power. Dennis Wilkinson said—he was up with Admiral Rickover who was on the bridge—and Wilkinson said, "I think we'd better go back in." Rickover said, "That doesn't sound to me from what I heard that this is serious. I'd wait a few minutes."

And as has happened to all of us in here, one of your best guys, a machinist mate, found that it was just a minor item in the gear, a locking pin on a retaining bolt, just a minor thing. So

Rickover said, "That's fine with me." Of course, Dennis was ready to go.

So we then shifted back to nuclear power and started backing out. Somehow because of that machinist mate finding a minor item that we could get by on, saved an absolute disaster to the Submarine Force; and if you look back on it, probably to the world, I don't know. They never found out about that. Dennis then sent the message Underway on nuclear power and they just went around like a flash and we were able to get it repaired without anybody knowing.

I retired in 1980 and we moved out to California in 1985. Just a few weeks after that I joined the southwest chapter of the Naval Submarine League and have been enjoying that and trying to help. In general, I get more out of them than they ever got out of me. But as you get my age, you don't have that many people your age. So going to these great spots is like going back to each boat you had and becoming a submariner for at least once a month. So I want to thank you.

I want to thank you, Admiral Mies, for giving that call to notify me of this award. I really think it's the nicest thing that has happened to me in a long time and I'll treasure this award for—I was going to say all my life, but I don't think I'd better do that one.

A TRIBUTE TO VADM KENNETH CARR, USN, RET.
2015 DISTINGUISHED SUBMARINER

REMARKS BY CAPT. JIM PATTON, USN, RET.
OCTOBER 22, 2015

As personally fulfilling as it is to stand here and say nice things about Kenneth Monroe Carr, I'd much rather be sitting in the audience listening to him speak to us.

Jimmy Carter has been quoted as saying that with the exception of his father, no one had impacted his life as much as Admiral Rickover. Well, Admiral Rickover also impacted my life, usually favorably, but not always in a good way. Ken Carr always shaped mine in an extraordinarily positive manner.

To best frame the man's character, for those that don't know him, I have to go first to his retirement ceremony in 1985. It was at the Recruit Training Center at San Diego where all the recruits paraded in front of the podium. His opening lines went like this, "42 years ago I was standing out where you are and I was really annoyed about having to stand in the sun and listen to some darned officer give a lecture, his retirement speech. I swore that day that someday I would get even. Today, I'm getting even. What I want now is a few of you to get mad at me and come back in 30 or 40 years and get even." What followed, now that he had everybody's attention, was a wonderfully motivating speech for recruits and audience alike.

I first met Ken Carr in 1961 when he was an XO. As one of the first direct inputs to nuclear power training I and a couple of dozen classmates had just finished an abbreviated sub school the day before when I reported to SCORPION, just out of PSA and just about to leave for Norfolk to become the first nuke in Norfolk. After I came aboard I learned in quick succession from the XO, the ship was getting underway in 15 minutes, I had the bridge, there were no tugs available, that I'd be on the watch as the diving officer within a week, and within a month I'd be an OD. I was to

stay out of the engineering spaces because I was to concentrate on becoming a submariner.

Standing my first OD watch a month later I came to periscope depth at six in the morning. Watching a sunrise through a scope, I said to no one in particular, wow this is fun. Just off the periscope stand, Ken, who I hadn't noticed was there providing a little adult supervision, said "When it stops being fun I'm going to get out." And every job he had thereafter I was around to observe, he had fun and he acted like that was the best job in the world.

Being trained by Ken was also fun. Along with the jobs of sonar and electronics material officer, I also had the collateral duty of public affairs officer. One of my jobs was to send 8 by 10 pictures to those who wrote to the ship to get them. I was running low and went to the XO and said, how do I get more? He said, you write a work request and send it to the tender. I said, okay and filled out the work requests and came back and gave it to him. He said, how many do you need? I said it's right there, 50. He said, let me tell you what's going to happen. You'll put this in and in a couple of days the chief petty officer in charge of the photo shop will call up and say, we're kind of busy. Can you make do with 25? He said if you really want 50, ask for 100. So I went back and I re-did it again. I came back and gave it to him and he said, very good. I'm going to teach you one other thing, think big, and he put another zero on there.

A couple of days later the chief of the photo shop called up and said, we're kind of busy. Can you make do with 500?

Ken had wanted to leave SCORPION to relieve as CO of THRESHER, as they came out of the New Hampshire shipyard. He didn't get that job. He was ordered to be the blue crew XO on the new construction JAMES MONROE, because he was the only prospect available that was senior to the blue navigator who had commanded a diesel boat.

I'm also pretty sure that he was instrumental in getting myself and my classmate ordered in as the two sea experienced JOs in new construction, which an SSBN rated. We had come back from our third deployment, and three spec-ops as unqualified officers and ensigns is not too bad as an OD. That was pretty nice. But

when we opened up the order, opened the mail, we had orders to report to Bettis in three days. And Yogi Kaufman very reluctantly, was ordered to give us Dolphins so we could get in the car and get on the road and make Bettis on time.

In due course JAMES MONROE found itself the first new construction submarine to go to sea following the loss of THRESHER. There's plenty of adult supervision on first sea trials, Naval Reactors, SUBLANT reps and all that. But on sea trials BRAVO we were all by ourselves, and the tension level was pretty high.

I came down off watch, (second sitting) and there was a movie going on. All of a sudden Ken looked over his shoulder at the cluster of instruments that are right there by the ward room door, threw his chair back and ran out of the ward room. It was kind of a 1001, 1002, and both CO's threw their chairs back and ran out of the ward room. The other XO threw his chair back and ran out. As did both navigators.

The lights came on. The movie stopped. The steward asked me, where did everybody go? I said, I don't know, but wherever they went they don't need me. I was just up there.

Ken came back in in a few minutes, sat down and got some popcorn and was eating it. I said, XO, where'd everybody go. He said, I don't know about everybody else, but I went to the head.

What I learned later from the OD who was up there making holes in the ocean at 10 knots, 400 feet, was that forward door flew open and in came both COs, one of the XOs, and both navigators. They looked around a few minutes, didn't say anything, went back down, came in the ward room, sat down, the lights went out, the movie came on, and nothing said. But the tension was gone. From there on in, everything was kind of neat.

When Ken got his orders to be PCO of FLASHER building at EB, no doubt that's why I wanted to go. So we were there—for the first three or four months it was just he and I, which was kind of neat. We were the third crew ordered in. When they decided to cut the ship in half and roll in 14 extra feet, they disbanded the first crew.

When THRESHER went down it was decided it was going to be the first fully sub safe crew, they disbanded the second crew, and we were the third. We were kind of behind others. The FBMs were being pumped out and we'd go into a dry dock for one or two days in between FBMs. So we were there for a long time at EB.

He always maintained, every time EB said we'll get that particular problem in PSA, he'd say, there's not going to be a PSA. . He'd say, you've got to fix it now. They'd say, that's going to take 1,000 man-hours. He'd say, send 500 guys down and we'll be done before lunch, with a big grin.

He could get away with anything because he had this big grin. But we left for Pearl Harbor—when we first formed up most all of the wardroom were bachelors. But Molly and he married us all off before we left, except one guy who reported aboard the night before we headed for Pearl.

BATFISH and LAPON rightfully get an awful lot of praise for a very successful trail. But Ken Carr really was the first guy on FLASHER to do a very extended trail. And the story behind that, which you don't hear about much so I'm going to tell you, is we were supposed to have a PSA in Pearl Harbor, even though he told EB we weren't going to do that. We were operating on weekly ops.

We came in on Friday and the squadron commander is on the pier. He said, Commander Carr, can you be ready to deploy on Monday? Carr said, hell, I can be deployed tomorrow?

The problem was, we had run all the ships into the ground. All the ships in Pearl were broke. We were trading power transfer valves around to the deploying ships. We hadn't figured out that material readiness is a consumable. So we were the only ship, brand new ship.

The problem was an Echo harassing aircraft carriers off San Diego. We were going to go try to find them and if we did we'd pass it off to Task Force Bravo or somebody, which we did. They came charging in and scared them off. So we had to go find them again.

After about the third time they said, if you find them again this time, just try to stay with them as long as you can. So we took them all the way back home to the upper left-hand corner of the Pacific. That was the first long cruise. It was a lot of fun.

Anyway, when Ken was debriefing with CINCPAC, CINCPAC asked him, to what do you owe your great success? He said, with a big grin, prior planning, good training and the fact the OD cleared his baffles a half an hour before I told him to. So he would always accept luck, but he was always ready to exploit it when it came up, and that's the key to it.

Ken called me one day and said, Admiral Rickover just called and he expressed a great deal of displeasure that I have not sent anyone back for an engineer's exam. I said, okay, fine. He said, you're going back Wednesday.

Okay. Fast forwarding, Ken came down to Newport News from his job as head of OP-713 in the Pentagon, submarine R&D less nuclear power and missiles. He came down to attend my lieutenant commander wetting down party. I was the engineer on DANIEL WEBSTER for decontamination, refueling, overhaul. Don't ever volunteer for those.

So he asked me, do I know anybody, lieutenant commander, commander level, that was good at sonar, because he had a slot opening up and Bill Pugliese was going to leave? I said, no, I don't. The next morning cleaning up the kitchen I had a grand mal seizure, and I became that guy. So it was a small shop, Gordy McGary and myself, Ken, and a very efficient secretary.

Ken talked to Gordy and I one morning and he said, there's no way we all have to be here early in the morning to go through all the message traffic so we can brief our Admiral up for his 10 o'clock meetings. And we've got to be here about four when he comes back and he's got a bunch of stuff he wants us to do before the next day. He said, between 10 o'clock and four o'clock we just need one guy to answer the phone and make excuses for the other two. So that one and three watch bill made Pentagon duty fairly reasonable.

He had a knack for cutting through all the nonsense. On a Friday afternoon the chief of staff would come running in to OP-

713 and say, we've got to take a big budget cut. You've got to cut everything back 10 percent. He'd said, I'm not going to cut back everything 10 percent. If you want money I'm going to kill HY-130, I'm going to kill the Dolphin. He said, you can't kill anything. He said, I'm going to fully fund the Mark-48 torpedo and all this, that and the other thing. He said, never mind, I'll get the extra money from the aviators.

And I watched Jerry Holland do that same thing at sub school. We brown-bagged at the Pentagon, even though in that time you could go eat lobster on Main Avenue every day with two martinis if you wanted to, with the ex-admirals walking up and down the hall saying come and talk to me. Over a ham sandwich one day he was looking at the POM, the Program Office Memorandum, the money thing, and said, you know there was a good program in here that never makes the cut. It's called the permit plunger sonar.

He said, who in the world would ever give money to something called the permit plunger sonar? What has it got? It's got DIMUS, improved narrow band, accelerated active search, DNA. Well the big thing in the news in 1969 and 1970 was dioxynucleoside acid. He said, let's rename this program the DNA sonar, which he did. It got approved.

So he called up the program manager and said, how much money do you need for this five year period to get it into production? The guy said, $20 million. He said, thank you.

So over another ham sandwich Carr said, you know, there hasn't been a major program in this building gone through that hasn't at least tripled during this pre-production phase. He says he needs $20 million, we'll give him $100 million. Now how do you spend $100 million in five years?

Well the easy answer is 10, 20, 40, 20, 10. He said, nobody will believe those numbers so let's make it 9.43, 19.78, 40.65, 21.03 and 9.11. You see the process there. It got approved.

So the commander calls him in and says, Carr, what the hell am I going to do with $100 million? Carr said, "We have every expectation you will find a way to deal with that problem."

Years later I picked up a copy of Navy Times and read that program is having only a 10 percent overrun on a major program.

At the end of the OPNAV tour, Carr wanted to go be CO of one of the new tenders. That's what he had told BUPERS. So he got a call from BUPERS and they said, sorry, what you're going to do is relieve Paul Early, the head of the Nuclear Power Examining Board. It was the only time I saw him physically angry, for about two minutes.

And then all the other captains started showing up to try and make fun of him a little bit. He had this big grin on and said, you mean you didn't have that on your preference card? They said, what do you mean?

He said, where else can a captain get a four-star to sign a fitness report, and you don't have to fix a damn thing? All you've got to do is say, that's broke, that's broke, that's broke, you'd better fix it, and you leave? They said, you're right, and they left saying geez we should have had that on our card.

One other thing, during this period of time, because of this seizure business, I had to go to a medical board over at Bethesda. The medical people wanted to throw me out. Carr came over as a witness in this adversary proceeding and at one point they turned to him and said, Carr, if you were at SUBLANT would you want a guy like this driving one of your submarines? He said, him and 12 like him. I thought, wow.

Well, that came to pass. About half way through a two year tour Carr called me up, now at SUBLANT, and said, can you be ready to deploy right out of the shipyard? And I always wanted to tell him, hell, I can be ready to deploy tomorrow, like you told the squadron commander, but I just said, yes sir.

So we went right into POM and we had a lot of fun. We were ready to go. He sent me two CO eyes only messages. This was Pargo, preparing to deploy. The first one was when we were coming back from a shooting exercise torpedo at AUTEC. He told me my father had died. He had met my father and he really caused an epiphany for me when he called my father, sir.

He appreciated people. He knew people. He would call the cleaning lady at EB by her first name when he made his tour at night. He's just that kind of people person.

The other time he sent me an eyes only was after we had sailed on deployment and we were just south of Greenland and I've got to make the decision, do I duck under ice under the Danish Straits or do I go into the Norwegian Sea? He sent me a message saying the mission has been cancelled, come on home. It turned out that Admiral Rickover had never been told about the medical thing.

When he found out kind of back channel, he was a little annoyed the operational guys hadn't told him. So what it was is there was Rickover, Carr and RLJ Long, they're in a room in the Pentagon arguing this thing out. The decision was to bring me on home, which was too bad. I didn't like that, but that was the only time he didn't succeed in supporting me. I'm so grateful for the many times that he did.

But I'm just one of many, many, many people who have a deep and abiding appreciation for his consideration and heartfelt concern, in a word, love. A lot of people think Ken and Molly didn't have any kids. They're wrong. They had dozens.

NAVAL SUBMARINE LEAGUE
2015 Fleet Award Winners

RADM JACK N. DARBY AWARD
CDR Todd A. Figanbaum, USN

MASTER CHIEF FRANK A. LISTER AWARD
MMCM (SS) Wayne E. Fetterley, USN

CHARLES A. LOCKWOOD AWARD
LCDR Kenneth M. Kirkwood, USN

CHARLES A. LOCKWOOD AWARD
ETCS(SS) Charles A. Simonds, USN

CHARLES A. LOCKWOOD AWARD
ET1(SS) Joshua R. Argo, USN

FREDERICK B. WARDER AWARD
Mr. Michael J. Carreiro

LEVERING SMITH AWARD
LT Jason D. Baker, USN

VADM J. GUY REYNOLDS AWARD
CAPT Steven M. Debus, USN

GOLD DOLPHIN AWARD
CAPT Louis E. Mayer IV, USN

SILVER DOLPHIN AWARD
ETCM Christopher D. Beauprez, USN

2015 LITERARY AWARDEES

FIRST PLACE
RADM W. J. Holland, USN, Ret.
Submarines: Key to Offset Strategy
~ August Issue 201 5 ~

SECOND PLACE
CDRE Paul O'Grady, RAN
Submarines of the Regia Marina and the Axis Anti-Shipping Campaign 1940-43: Lessons for Contemporary Combined Operations
~ June Issue 2015 ~

THIRD PLACE
Mr. Mark Jones
Submarine Shortage Solved: French and Italian Submarines as U.S. Navy Training Targets in the Western Atlantic, 1943—1945
~ June Issue 2015 ~

LITERARY AWARD FOR BEST ARTICLE BY AN ACTIVE DUTY AUTHOR
LCDR Ryan Hilger, USN
Reflections on Admiral Rickover's Modern Legacy
~ December Issue 2014 ~

2015 PHOTO AWARDEES

First Place
Protecting Freedom
ETC(SS) Michael A. Dlabaj, USN

Second Place
Pittsburgh Homecoming
Mr. John Narewski

Third Place
Minnesota SSN 783 is graced by the presence of multiple dolphins while on Bravo Sea Trials
Mr. John Whalen

Honorable Mention
Legend in the Crosshairs
Captain Mike Bernacchi, USN

THE SUBMARINE REVIEW

THE SUBMARINE REVIEW is a quarterly publication of the Naval Submarine League. It is a forum for discussion of submarine matters. Not only are the ideas of its members to be reflected in the **REVIEW**, but those of others as well, who are interested in submarines and submarining.

Articles for this publication will be accepted on any subject closely related to submarine matters. Their length should be a maximum of about 2500 words. The League prepares **REVIEW** copy for publication using Word. If possible to do so, accompanying a submission with a CD is of significant assistance in that process. Editing of articles for clarity may be necessary, since important ideas should be readily understood by the readers of the **REVIEW**.

A stipend of up to $200.00 will be paid for each major article published. **Articles accepted for publication in the REVIEW become the property of the Naval Submarine League**. The views expressed by the authors are their own and are not to be construed to be those of the Naval Submarine League.

Comments on articles and brief discussion items are welcomed to make **THE SUBMARINE REVIEW** a dynamic reflection of the League's interest in submarines.

Articles should be submitted to the Editor, SUBMARINE REVIEW, 5025D Backlick Road, Annandale, VA 22003-6044.

NAVAL SUBMARINE LEAGUE

STATEMENT OF FINANCIAL POSITION
March 31, 2015

ASSETS

Current Assets	
Cash and cash equivalents	$ 182,387
Investments	515,129
Accounts receivable	58,626
Prepaid expenses	4,398
Total Current Assets	760,540
Property and Equipment	
Office furniture and equipment	9,947
Condominium	201,021
Land	50,000
Less: Accumulated depreciation	(173,728)
Net Property and Equipment	87,240
Total Assets	$ 847,780

LIABILITIES AND NET ASSETS

Current Liabilities	
Accounts payable	$ 4,976
Accrued taxes payable	6,274
Deferred revenue	48,230
Deferred membership dues - current portion	37,750
Total Current Liabilities	97,230
Long-Term Liabilities	
Deferred membership dues, net of current portion	225,706
Total Long-Term Liabilities	225,706
Total Liabilities	322,936
Net Assets	
Unrestricted	
Undesignated	503,694
Board designated - capital asset replacement	21,150
Total Net Assets	524,844
Total Liabilities and Net Assets	$ 847,780

NAVAL SUBMARINE LEAGUE

STATEMENT OF ACTIVITIES
For the Year Ended March 31, 2015

Revenues and Support	
Contributions	$ 321,422
Annual symposium	314,264
Subtech symposium	231,164
Sponsorships	66,250
Advertising	57,450
Membership dues	56,530
Investment income	37,603
History Seminar	10,000
Lease income	9,450
Other income	2,326
Total Revenues and Support	1,106,459
Expenses	
Payroll expenses and contract labor	$ 244,784
Annual symposium	185,437
Subtech symposium	159,154
C.B. Days meeting	66,665
Professional fees	63,550
Publishing	62,950
Bad debt expense	28,255
Submarine advocacy	27,401
Computer expense	17,347
Office occupancy	16,599
Chapter support	13,000
Bank charges	12,839
Marketing	11,692
Office supplies	8,911
Postage and shipping	6,389
History seminar	5,798
Depreciation	5,089
Insurance	4,747
Telephone and internet	4,238
Awards and grants	4,022
Printing	1,531
Equipment rental and repair	1,255
Membership and subscriptions	1,021
Transportation	428
Total Expenses	953,102
Change in Net Assets	153,357
Net Assets at Beginning of Year	371,487
Net Assets at End of Year	$ 524,844

NAVAL SUBMARINE LEAGUE

STATEMENT OF CASH FLOWS
For the Year Ended March 31, 2015

Cash flows from operating activities	
Change in net assets	$ 153,357
Adjustments to reconcile change in net assets to net cash provided by operating activities	
Depreciation	5,089
Unrealized gain on investments	(25,869)
Changes in assets and liabilities:	
Decrease in accounts receivable	37,727
Decrease in prepaid expenses	9,028
Decrease in accounts payable	(16,524)
Increase in accrued taxes payable	830
Decrease in rental deposit	(1,500)
Increase in deferred revenue	22,744
Decrease in deferred membership dues	(3,769)
Net cash provided by operating activities	181,113
Cash flows from investing activities	
Proceeds from investments	4,937
Purchase of investments	(11,102)
Net cash used in investing activities	(6,165)
Change in cash and cash equivalents	174,948
Cash and cash equivalents, beginning of year	7,439
Cash and cash equivalents, end of year	$ 182,387

SAVE THE DATES

HISTORY SEMINAR- *41 FOR FREEDOM*
6 APRIL 2016
Navy Yard Museum,
Cold War Gallery

SUBMARINE TECHNOLOGY SYMPOSIUM
3-5 MAY 2016
Johns Hopkins University – APL

34TH ANNUAL SYMPOSIUM
26-27 OCTOBER 2016
Crystal Gateway Marriott,
Arlington, VA

IN MEMORIAM

CAPT James Barry, USN, Ret.
CDR John Gluck, USN, Ret.
CAPT Norman Nash, USN, Ret.
CAPT Colin H. Saari, USN, Ret.
CAPT Richard Schleicher, USN, Ret.
CAPT Glenn Secrest, USN, Ret.
MCSC(SS) D.P. Sipin, USN, Ret.
Mr. George Sviatov
CDR Richard K. Westfahl, USN, Ret.

2016 NSL CORPORATE MEMBERS

5 STAR LEVEL
BWX Technologies, Inc.
General Dynamics Electric Boat
L-3 Communications Corporation
Lockheed Martin Corporation
Newport News Shipbuilding a Division of Huntington Ingalls Industries
Northrop Grumman Navigation and Maritime Systems Division
Raytheon Company

4 STAR LEVEL
Booz Allen Hamilton
Dell Services Federal Government
General Dynamics Mission Systems
Leidos (New in 2016)

3 STAR LEVEL
Adaptive Methods, Inc.
AECOM Management Services Group
Curtiss-Wright Corporation
DRS Technologies — Maritime and Combat Support Systems
Engility Corporation
Metron, Incorporated (New in 2016)
Oceaneering International, Inc.
Progeny Systems Corporation
Sonalysts, Inc.
TSM Corporation
Ultra Electronics – 3 Phoenix, Inc.
USAA

2 STAR LEVEL
Advanced Acoustic Concepts, LLC

1 STAR LEVEL
AMADIS, Inc.
Applied Mathematics, Inc.
Applied Research Laboratory-Penn State
Business Resources, Inc.
C.S. Draper Laboratory, Inc.
Capitol Integration
CEPEDA Associates, Inc.
Gryphon Technologies, LC (New in 2016)
Imes
MIKEL, Inc.
Murray Guard, Inc.
Nord-Lock/Superbolt, Inc.
OceanWorks International
Orbis, Inc.
Pacific Fleet Submarine Memorial Association, Inc.

2 STAR LEVEL (continued)
Alion Science & Technology
American Systems Corporation
ArgonST a Boeing Company
BAE Systems Integrated Technical Solutions
Battelle
Cunico Corporation & Dynamic Controls, Ltd.
General Atomics
In-Depth Engineering Corporation
Innovative Defense Technologies
Marotta Controls, Inc.
Moog, Inc.
MYMIC, LLC
Nuclear Fuel Services, Inc.
Preferred Systems Solutions, Inc.
Securitas Critical Infrastructure Services, Inc.
Systems Planning and Analysis, Inc.
TE Connectivity
Ultra Electronics Ocean
UTC Aerospace System

PRL, Inc.
RIX Industries
SAIC
Sargent Aerospace & Defense
Security Technologies International
SSS Clutch Company, Inc.
Tech-Marine Business, Inc. (new in 2016)
Teledyne SeaBotix, Inc.
Treadwell Corporation
Undersea Solutions Group, A Subsidiary of HII
VACCO Industries
VLP Financial Advisors
Westland Technologies, Inc.

Naval Submarine League
5025D Backlick Road
Annandale, VA 22003
Tel: 703-256-0891 • Fax: 703-642-5815
www.navalsubleague.org

MEMBERSHIP APPLICATION FORM

Name: _____ Birth Year: _____

Rank/Rate, Service (if applicable): _____

Duty Station (if applicable): _____

Preferred Mailing Address: _____

_____

Telephone Number (H/O/C): _____
Circle one

E-mail (Home):_____ (Office):_____

THIS SECTION MUST BE COMPLETED BEFORE YOUR APPLICTION WILL BE PROCESSED

I hereby apply for membership in THE NAVAL SUBMARINE LEAGUE. I certify that I am a citizen of the United States or a citizen of _____. I also certify (check one) that _____ I do not or _____ I do act as an agent, representative, employee (includes active duty military), or in any other capacity, at the order request or under the direction or control of the government of a foreign country or a foreign political party. If "I do" is checked above, a brief description of the foreign affiliation must be provided with the application.

Signature:_____

NAVAL SUBMARINE LEAGUE MEMBERSHIP APPLICATION

ELECTRONIC *REVIEW* MEMBERSHIP

The following Membership levels include only the electronic version of The Submarine Review.
Please check the applicable membership level:

☐ Active Duty E1-E3 or Officer Student (e.g., USNA, NROTC, SOBC, NPS, NPTU) Initial: Free for 2 years

☐ Active E4-E6/01-03 3 Years $15.00 ☐ Active, Reserve, Ret., Civilian E7-E9/O4-O10 3 Years $30.00

***OR* LIFE MEMBERSHIP** with electronic version of *The Submarine Review*. *(Life membership may be paid in 5 equal installments)*

☐ Age 39 and younger $250.00 ☐ Age 40-59 $200.00 ☐ Age 60+ $150.00

PRINTED *REVIEW* MEMBERSHIP

The following Membership levels include the printed version of The Submarine Review.
Please check the applicable membership level:

REGULAR MEMBERSHIP* ☐ $35.00 For 1 Year ☐ $90.00 For 3 Years

**Persons residing outside the United States are required to remit an additional $20.00 PER YEAR for mailing costs.*

***OR* LIFE MEMBERSHIP** *(Life memberships may be paid in 5 equal annual installments)*
☐ Age 39 and younger: $500.00 ☐ Age 40-59: $400 ☐ Age 60 and older: $300.00

PAYMENT

☐ CHECK ☐ VISA/MASTERCARD ☐ I would like to request automatic membership renewal

VISA/MASTERCARD #: _____ Amount to be charged: $ _____

Exp. Date: _____/_____ Security Code: _____

Signature: _____