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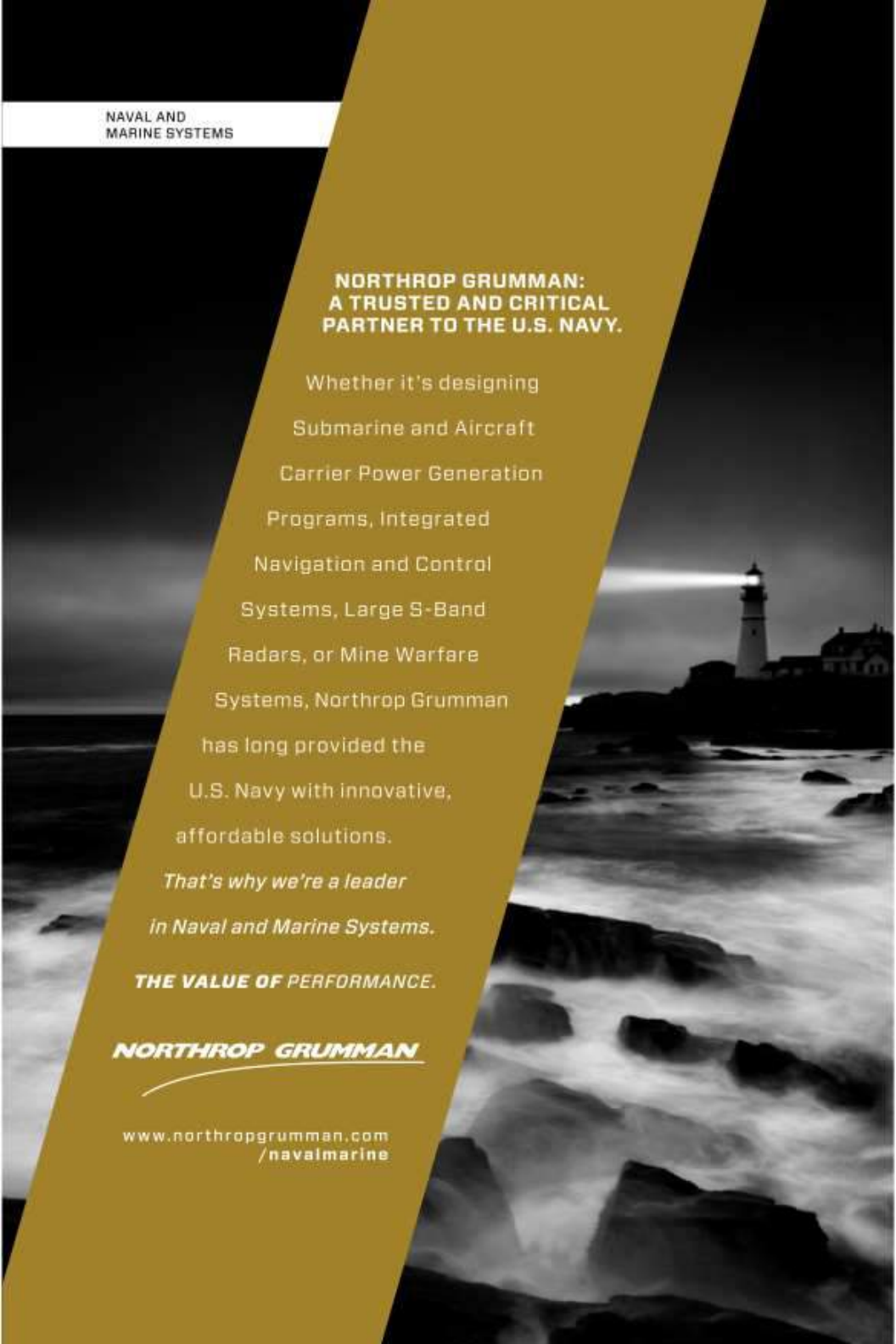
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EDITOR'S COMMENTS

The uniformed leadership making these presentations ranged from the Chief of Naval Operations and the Director of Nuclear Propulsion, through the Commander of Submarine Forces and the Commander of the Ships System Command. The Program Executive Officer-Submarines, who builds them and the Pentagon's Director of Undersea Warfare, who works the funding and programmatic problems.

In covering the range of submarine activity from Naval Strategy to ship and hardware acquisition to current operations, those presentations followed a seamless track of logic for what is needed, to superb industrial performance in high technology acquisition to military tenacity in meeting a high deployment tempo; all with professional excellence and hands-on leadership from command centers to deck plates. Throughout, all emphasized the national importance of building a new class of strategic submarines and the critical problem of bringing in that capability within the time frame made necessary by the end of life of the current class of SSBNs.

The Chief of Naval Operations showed a depiction of his priorities for the Navy and described his treatment of the first priority, *Maintain the Sea Based Deterrent*. It is noteworthy that his second priority is *Forward Presence*. That is what the Attack Submarines do.

Admiral Richardson, as could be expected of the Director of Nuclear Propulsion, delivered a no-nonsense, real time, evaluation of the tough technology, industrial and funding problems to be faced, and solved, in getting these new SSBNs into service on time—if at all. He also called for everyone in the submarine community; active duty, retired, civilian and industrial to get the word out into the public. It is vital to inform those voting citizens of what is involved with this submarine effort and how important it is that an informed citizenry be recruited to support the twin goals of a lasting, credible *Sea Based Nuclear Deterrence* and an Attack Submarine Force which can provide reactive, enduring *Forward Presence*; both for the foreseeable future of our national

security.

Vice Admiral Connor reported on the current status of the Submarine Forces and described the personnel leadership so necessary for the performance required of a nuclear propelled, nuclear armed, forward force. Those of us who had command during the Cold War can only admire what is going on in our submarines during these days which are as challenging as any we faced.

The shipbuilding and Pentagon programmatic worlds were well covered. Reading what Vice Admiral Hilarides had to say about the overall acquisition effort gives both a big, and a small, picture. (Think about what he says of real Cyber Security needs and the potential access to your personal vehicle.) As always, Rear Admiral Dave Johnson's detailed report of all that is going on within the purview of Team Submarine is most impressive. It is real, and it is hardware that is being produced and introduced into the Fleet. There is no smoke and mirrors about how good it will be, because it is all here and now.

For a glimpse of future submarine capabilities, Rear Admiral Tofalo's presentation is very complete and his offer of access to those efforts and their requirements for the industrial sector of the submarine community is very innovative and commendable.

Jim Hay
Editor

FROM THE PRESIDENT

"Winter storm ices South, dumps snow on East Coast"

So proclaimed the headlines in this morning's news, a recurring theme for the Eastern United States this winter, and with the Groundhog Day promise of six more weeks of winter, there will no doubt be more to come. At least the reduced price of oil and natural gas is expected to mitigate some of the pain.

The new Republican controlled Congress is addressing the myriad challenges of putting together a viable budget, working with the Administration to balance domestic and defense priorities. But the threat of Sequestration looms over all, making any budget forecast uncertain. A new Secretary of Defense is settling into a very challenging leadership role, attending to trouble spots around the world while investing in technology, force structure, and infrastructure in anticipation of future demands on our military.

The senior leadership of our Submarine Force has maintained a steady hand on the tiller, providing clear direction executing operations at sea and sustaining a robust military and industrial base team to build, modernize, and maintain our submarines for optimal combat readiness and responsiveness worldwide, now and in the future.

This issue of THE SUBMARINE REVIEW includes remarks from the Chief of Naval Operations, the Director of the Naval Nuclear Propulsion Program, the Commander, Submarine Forces, the Commander, Naval Sea Systems Command, the Program Executive Officer, Submarines and the Navy's Director, Undersea Warfare. Each of these officers addressed our Annual Symposium last October and their thoughtful insight provides a clear vision of our way forward and a solid framework for discussion as we debate priorities in the months to come. In addition, this issue includes other thoughtful and thought provoking articles relevant to the Submarine Force that reflect upon our heritage and our future in an uncertain world that is dynamic and diverse.

One constant in the midst of all the activity in Washington and around the world is the superb performance of our submarines and

the men and women who operate and sustain the Submarine Force. This superior performance is the key element that reinforces Congressional and Defense Department support for Submarine Force initiatives and Submarine Force acquisition and operational programs.

Our strategic deterrent force executes its critical mission with quiet professionalism, meeting the highest technical and operational standards. Today, our TRIDENT submarines clearly demonstrate the value and the wisdom of the investment made in the most survivable leg our strategic TRIAD four decades ago. The OHIO Replacement Program (ORP) is building upon this legacy, executing on a schedule to support construction start in 2021. ORP is critical to our nation's future strategic deterrent capability and the program is focusing its engineering and design effort on affordability, producibility, and sustainability to ensure optimal value for a ship that will service our nation for more than four decades to come.

The VIRGINIA Class Submarine (VCS) Program remains the top performing acquisition program within the Department of Defense. The performance of these magnificent warships continues to impress as they join with the rest of our attack submarines answering Combatant Commander's calls for relevant combat capability when needed, for as long as needed. Further, the VIRGINIA Payload Module (VPM) design is on track for VPM inclusion in the Block V of the VCS Program, providing additional payload volume and increased capability as new and varied payloads are integrated into the fleet to optimize our Navy's effectiveness.

The Naval Submarine League continues to enjoy strong support from our Submarine Force leadership, our Corporate Supporters and the Submarine Industrial Base. Many Corporate Members will gather on 4-5 March 2015 in Falls Church, VA to receive operational, programmatic, and budget status updates from senior Navy and government officials that will provide insight into the way ahead. As in the past, the Naval Submarine League is able to articulate the need for a strong and robust Submarine Force in large measure because of the support provided by our individual

and Corporate members. The message is clear: The Submarine Force provides great value and versatility for our nation's leaders as they address challenges around the world and is the essential element needed to assure undersea dominance for our Combatant Commanders in their respective threaters of operation.

Pitchers and catchers will soon gather to prepare for the 2015 Major League Baseball season and despite the snow and cold outside my window, spring will arrive in its time. I wish you all safe travels in the bad weather and look forward to another successful year for our Submarine Force.

John B. Padgett III
President

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2014 ANNUAL SYMPOSIUM
NAVAL SUBMARINE LEAGUE
23 OCTOBER 2014

ADMIRAL JONATHAN GREENERT, USN
CHIEF OF NAVAL OPERATIONS

Hello everybody. How are you doing today? It's great to be back. Thanks for inviting me. I've been trying to get an invitation to this darn thing for three years, and I'm almost not the CNO anymore. I figure that it's probably my dues, Rich. John Padgett, thank you John. Thanks so much for what you do for the Submarine League. I think it's a great professional organization. I've had interfaces with all of our Navy organizations, and this one is very squared away. I think it has a lot to do with your leadership as the president. So let's give a hand for John. Thank you.

Mr. Chairman, thank you for the invitation and thanks for your mentorship and your service through many, many years. I've seen that you've gotten a lot of presentations, so it's risky to get up and say, "Well, let me tell you about the undersea warfare and all the programs." You could say, wait a minute, that's not what we heard yesterday. I'll try to avoid that. Connor's looking at me like *don't you dare start about where we're going with the undersea plan.* I won't do that, Mike. But I do want to kind of summarize where I see the undersea issues.

It's really all about the Ohio Replacement and where we go. So one of my themes for this year, and I've actually been grinding on this for a while, has been sustaining undersea dominance. I mean, we have it today, I get a post-deployment debrief at least quarterly. Somebody rolls in there, and I've got to tell you, it doesn't matter if the ship is two years old or 25 years old, and some of them are. They are out there going wherever we need them to go, where it matters, when it matters. We can pretty much go anywhere we need to go out there, and we have empirical data. So I'll leave it at that. We are ahead by every category that I

measure, but we have to get going because things are moving in a different direction. We have competitors pursuing us. We know about China. That's really well spelled out. Not as many people know what the Russians are up to. I can't go into detail obviously about it today, but they're spending a lot of money, and as I look around this room, and I too have grey hair and a lack of it to prove the time in the Navy, that when they set their mind to things they can get going. So the Russians have been working on a sea-based strategic deterrent, undersea reconnaissance program, and an SSN, and put the first slide up. They know we have Navy Seals. And so in typical fashion, they said, "Well, you got Seals, I'll go bigger." (See Figure One) All right? But there's an interesting symbolic thing here. You know how when people send you these things, you usually hit delete right away. I said, “hey, this is pretty cute.” Taken obviously from a deck of a submarine, you know when that big guy wakes up there are going to be issues, and likewise, there's a little bit of a symbolic nature here that when they wake up and they're getting ready to stretch, we will have issues. So it's something that I look at out there in the future.

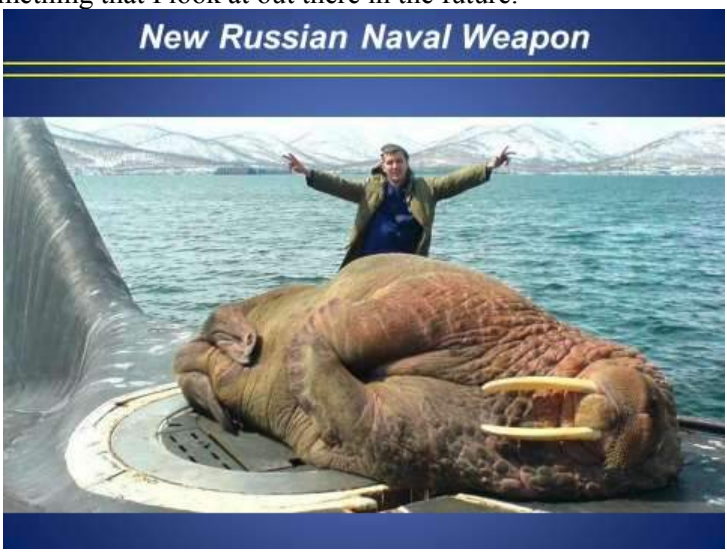

Figure 1

Let me talk a little bit about context on our budget, where I put things. So as folks before me have talked about what's going on, I thought I would share with you my view of how we do things. Go ahead and put the budget thing up. It's pretty simple (See Figure Two). My folks call it the swoosh because I said, look, as we go through these trying times we have got to figure out what's most important in a strategic manner. And what are the categories in which we need to invest. Then we've got to figure out what is the appropriate amount of investment to put in there. Then we've got to keep going back around there and make sure we got the balance right. As I look around the room. I see there are lots of flag officers here that help me do that. Principal among them is Adm. Joe Mulloy. Joe and Rick Breckenridge, are clearly two people in that group, and we have others of course. But here's the deal. Where you see *Maintain Sea-Based Strategic Deterrent*, I don't fill all these up and then say, okay, now move onto the next until we run out of money. That's not what we do, **except for that one**. We put the resources in here which we call Echelon One, the headquarters, until we say, do we have enough to get what you all need to get done. Now the enterprise for that, the leaders, and we've reviewed the nuclear enterprise—I'm just going to assume you all talked about that—but in simplistic fashion, John Richardson and I got together with our Director of the Staff, with the Vice Chief, with Secretary Mabus, and we say, look, let's simplify this whole thing. I am the one responsible to Secretary Mabus and Secretary Hagel for the nuclear enterprise. Let's simplify it. It's either Terry Benedict or it's John Richardson or it's Mike Connor, and the four of us get down and meet and get this thing right. So we've had a review. We're making some adjustments here and there, but I would tell you our issue in that is getting a little bit of training right, getting the throughput in our shipyards right. You're going to hear about shipyards a lot, and I think Willy Hilarides talked about it yesterday. It's a real challenge for us in nuclear shipyards. We've got to get that right. And we've got to make sure that our strategic weapons programs, that our weapons facilities are clear and ready to go. And then there's the big dog, the Ohio Replacement Program. I'll talk about that in just

a little bit. I really look forward to not calling it the Ohio Replacement. You all agree with me, right? Yeah, I approached it once for a name. I said, get out of here until we get this thing sorted further.

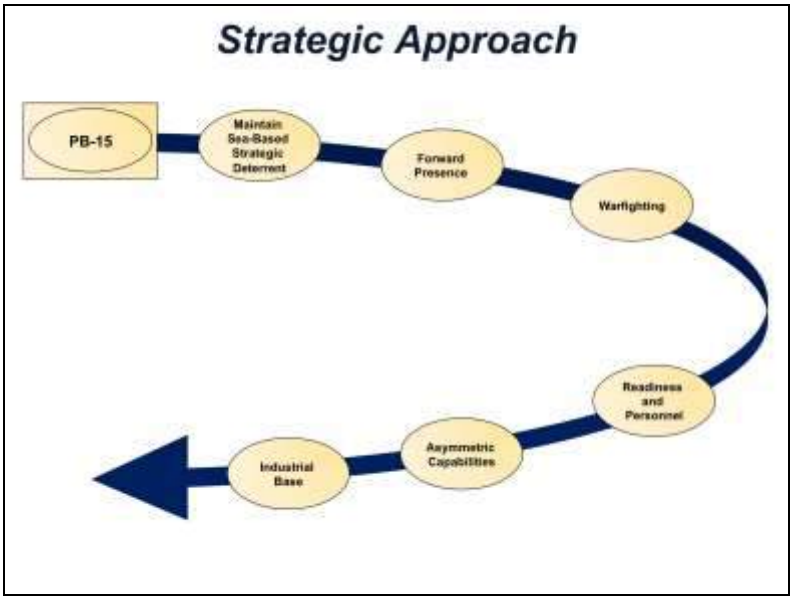

Figure 2 "Swoosh"

Forward Presence would be number two. For me, I say the term "where it matters, when it matters." To me, this is where we provide this nation better than anything else. It's the presence out there in and around the world. So for many of you who say, "Oh, he's not going to put that world globe [slide] up where the ships are ...", you're thinking that aren't you? I won't do that to you, but I'll tell you, today we have 104 of the 289 ships out and about around the world. 20 years ago we had over 400 ships. We were going from 460 down to about 410 in just a short amount of time. We had about 105 out there and about. So I think we're getting a pretty reasonable deal with the ships and the forces that we now have.

Well, how do you do that, Greenert? Well, we have a way of preparing our ships and our units to deploy, it's called the Fleet Response Plan. This plan was instigated over a decade ago, and it's still the way that we do it. We've been tweaking this thing, trying to make it the best it can be, and then produce those units in a manner so that our folks are organized, trained, equipped to go out and do the job. But the second part, we forward deploy. We have the forward deployed naval forces in Japan, in Bahrain, in Rota. We have forward stations, some ships in Singapore in the not too distant future, and this is a big payback that we have. We've got to have the right infrastructure in place. We've got to have the right training in place so that when we rotate our people and we get those ships over there they stay well-maintained and they can react. But we get a good plus from that.

The operations going on today against ISIL, which is the topic around town in a big way as we move forward in that campaign, as you probably know, but in case some of you were sleeping that day, it was the ARLEIGH BURKE and the PHILIPPINE SEA that kicked this off. The ARLEIGH BURKE was in the Red Sea, on her way home, and they said, "Hold on here a minute. We need to enter some targeting data," and about 30 missiles later, she was a little lighter as she proceeded through the Suez Canal, and went on to a port visit. She's back in Norfolk now. PHILIPPINE SEA is reloaded and back on station. The GEORGE H. W. BUSH nuclear aircraft carrier is doing something between 10 and 20 sorties a day, missions into Iraq or Syria—either one—and what is missing sometimes in the conversation, is everybody thinks it's all about dropping bombs, but they have the last of the Prowlers, which are the old jamming aircraft, like the A6. The EA6B, that's the last squadron out and about. Matt Moffit, you're the only AV I see in the back. Give me a thumbs up for the Prowlers, if you will. Okay, we'll replace that with Growlers, but my point is that electronic attack mission is also a big deal going out today. Everything else we do here, *War fighting*, that's meeting the operational plans. That's making sure that we can do the best we can do in those operational plans. That's a tremendous balance because there's more need than there are resources.

Readiness and personnel, that is getting the fleet response training right. You've got to get the maintenance done right so that you get out of the shipyard in time so that you can do the blocking and tackling so that you can go to integrated training so that you can go on deployment and be ready to surge if you need to. And the phases are: simply put, maintenance, basic, integrated, and then sustainment.

We got out of whack a little bit on these things through no one's real specific fault, but through a Continuing Resolution, through a sequestration period, through a furlough, a hiring freeze, and the inability to do overtime. We got behind in the nuclear shipyards. And we were also rebalancing them and going through a metamorphosis in there. We're starting to get out of that now. It's a long outward crawl. The output of this is longer deployments, frankly put. People think, "Well, it's just the real world demanding more things." Yeah, that's there, but it's really because we stopped working on the REAGAN. We stopped working on the VINSON. And we did little work on the GEORGE H. W. BUSH who just finished the nine month deployment because by the time she got out there, it was her turn, and there was a longer deployment. We're almost out of that, and we should be back at about what I think is a sweet spot, a seven month deployment by 2016.

Asymmetric capabilities, the undersea domain is a major part of that, and there's a lot of investment in that. But it's also cyber. It's also, as I mentioned, electronic attack, defeating cruise missiles, defeating ballistic missiles. It's also advanced air to air. Okay. Stealth is not going to answer all the problems of the future. You've got to look at all means of detection instead of trying to fly everything in close and do it. It's standoff weapons, standoff sensors, and the coordination of all of those things that bring that together.

If we don't have a relevant and decent *Industrial Base*, our future is really mortgaged out there. So it's our partners, many of you do that, and I thank you for that, out and about getting things out. Because of our Industrial Base we have the sea power that we have today. John Richardson, I'm sure, Terry, Mike Connor, Willy, all of them talked about the Ohio Replacement and made

the points that need to be made on that. But I will reiterate as I point up there, that is our number one program. That is the one that we have to get right. It's not just a Navy issue in my view. It's a Department of Defense and probably a national issue.

We've figured out how to do this in the past. There are ways to fund it. There are lots of ways to fund it. If we try to fund it in the Navy, simply put, we get together at best about $15 billion of shipbuilding money. The first one of these Ohio's is going to cost about nine. Then we wait two years and we bring it in (the second OHIO Replacement), and that's about six and a half. Am I close, Rick? Okay. You could do the simple ratio. You're all nukes or ex-nukes. And then if we're lucky, we hold it at five, 1/3 of the shipbuilding budget. So take it from there. It's going to happen. So those of you that work on this program, that's all of us that wear the uniform, we don't get a bye. I'm not telling you, oh, well we're going to build it anyway so relax. What I'm telling you is there's a tremendous pressure here, and if you love your Navy, and you do, or you wouldn't be in there. We have got to work on building the most efficient and effective Ohio Replacement. But we're going to build it.

Some folks kind of wonder, and I even get questions at all hands call, people wring their hands. On the KEARSARGE yesterday, on the BAINBRIDGE yesterday. So our sailors are thinking about this in a broader scheme, and it's not that they're thinking selfishly. So what I'm here to tell you I guess in a nutshell is we're going to do that and we've got to do it right. The pressure is on the other programs out there, the other shipbuilding programs.

So we have got to bring the next type of amphibious ship in, and it's coming in and it's wonderful, what this next decade is going to be about. 2020, we'll bring in what's called the LXR, which will replace the LSD. If any of you have done your midshipmen cruise or otherwise on that, you know what that was like. We very much would like to build the same hull, use the same hull shape. Use the LPD17. It makes sense, same system, same training, same maintenance scheme, almost all we can do, and de-scope that down. But we've got to bridge over from what

we're building today in Ingalls Shipyard in Gulfport over to that. So the pressure will be on that program. We've got to evolve the large surface combat. I don't think we can take this tremendous revolutionary jump and create a totally new cruiser just like that. We've tried to do that a number of times, and it started with DDX, and we called it the arsenal ship. You remember that, and then this, and then that.

We have to evolve over time as we get more power, more cooling, more aperture and the radar that we're going to use, better weapons, and we've got to think modular. We've got to think payloads that are going to go in there. Not an integrated beautiful ship that puts us in the place we are today where we've got to put our cruisers and our destroyers in for two years, so that we can upgrade them with the new systems that we need today. That can't be in the future, so we've got to think in that regard.

We've got to control the cost of the forward aircraft carrier. We have got to control the cost. That's on me and my ideas about *oh, I've got to have this, I've got to have that*, and it's on our shipbuilding partners. And it's not just the prime, it's everyone else. We have to do all that, and we have to compete every class of ship we possibly can. We get better value, we get better output from the shipbuilder. They don't seem to like it at first, but my guru, Sean Stackley, tells me it's all better, and if he says it's all better I'm in, if you know Sean Stackley.

So I leave you with this, and it gets me back to the Ohio Replacement. I went out and visited Electric Boat, had a wonderful visit, and I am convinced they're doing the best they can to bring this baby in. We were up there with Senator Blumenthal, and he said, "You know what? The essence of this boat is that it will be the strongest, stealthiest, most sustainable of any in the history of the world. And it will be that way for the remainder of the century," without exaggerating. So I know this institution, this group understands that, and that's pretty much true of the Virginia class, and God bless all of you that build that thing as we bring the NORTH DAKOTA in here Saturday. Early, under budget so people make some money, and ready to go to sea faster than probably any SSNs we've put out there. So we're in a good

place. We've got a lot of work to do. I look forward to working with all of you. God bless you all for doing what you do out there, and let's take your questions.

John Padgett: Questions. Tim?

Jon Greenert: Tim?

Tim: Admiral, you've talked to a lot of people. Who are the groups that you think don't really understand the importance of the Ohio Replacement? Is it the people in the Midwest? Is it the press? Who are the folks that we can engage with?

Jon Greenert: I think we need to educate the essence of what it takes to do such a complicated thing, certainly on the Hill. Okay? I think you've got about that many people, and by no fault of their own ... you go up to New England and they're pretty good. They sort of understand it. And so folks, I think the concept that many have is, "Why don't you just build another Ohio?" I said, okay, that's a good question, and I would love to do that. So you know where that goes. You say, "Let me tell you when we started designing that thing," then you take it to today. And they go oh. So then you tell them what you're doing and how modular it is, and it's just a lot of it is Virginia blown up into a bigger size. Do you see what I'm saying? So the Hill for sure because we'll have people who are advocates who will say, "Listen, we've got to get this thing going." Others are saying, "Why would I want to do that?" So I've got some work there when they reconvene, I've got some folks who are helping me gather some members together. But I think we need to educate them. In the Pentagon they understand that it's got to be. They understand that's job one and this recent nuclear enterprise kind of thing that Secretary Hagel led, we've got that. It will be interesting on us, the department, to get down to brass tacks on what's the funding plan, what's the strategy, I should say, and then we'll get a plan out of that.

Tim: Thanks.

John Padgett: Other questions? Oh, come on, guys.

Jon Greenert: Fred?
John Padgett: Fred.

Fred: Admiral, I was wondering if you could just give us your thoughts on manned and unmanned autonomous vehicles.

Jon Greenert: Okay. I don't think we'll ever ... shouldn't say *ever*. I think we are a couple of decades away from an unmanned aerial vehicle strike fighter. The decisional process that goes into delivering ordinance, assuming it'll still deliver ordinance, is so complicated as I watched things here today. But we can do a whole ton more, if you know what I'm saying. I'm saying exclusively unmanned strike fighter. Are you with me there? But undersea, I think I'd love to say the sky is the limit if you get my point. The whole undersea is the limit, and I think we have to go there. We can't build enough submarines. You all understand that. And even if we had billions and billions and billions more. So every time I go into the black world and I go into the compartmented world, and I see where we are, there is so much potential to pull things that are a little exquisite and bring them more into the general purpose force that we can get going. So I really think, and Mike Connor and I worked on this, we all work on it, that by the end of this decade we ought to be sending an autonomous unmanned large diameter UUV on mission. Now you say, "Okay, so you're talking about IOC?" And I say, I don't know. Maybe not necessarily. And maybe not in the most complex area of the world. But we've got to get it out there and see how it'll break down. Huge, huge opening there. Lastly, I would say in the surface world, we just did a demo down on the Hampton Roads. I don't know if any of you saw that. The video is out and around YouTube. I see midshipmen shaking ... Did you see that video? Did you think it was pretty cool? I thought it was pretty cool. Whether you do or not is up to you. But we are kind of going the other way on swarm. Why can't we do a swarm? And it didn't take

much to turn it around. We got a lot of Boston whalers. Putting a gun on it and putting a sensor on it is no big deal, and then being able to control a dozen of them remotely, they demonstrated it down in the Hampton Roads. And lastly, we got to get out of rotary wing dragging sleds for counter-mine. First of all, the 53 does it, but it's just incredibly expensive, and they're getting too old. And to build a 60, an SH-60, I don't know if anybody builds them here—sorry—but it just doesn't have the capacity. So unmanned surface vehicles towing the sleds. Get the man out of the loop.

Unnamed Speaker: Admiral, we've all read about the Army taking big cuts out of the Army. How is the Navy doing with the constraints and sequestration and so on as far as the impact on people in voluntary separations?

Jon Greenert: We're just fine, and as long as I'm the Chief, we won't do what the Army had to do. And it's not about the Army. It was put on them to reduce troop strength a huge amount. And so, officer and enlisted. We build equipment and we man it. They get personnel and they equip them. We man equipment, they equip manning. And the importance of that difference is our force structure, the amount of end strength, the people in the Navy will depend on how many ships and aircraft that we have. And you can't retire and reduce the number of end strength you need than say six, seven, eight to 10,000 max a year without laying people off, because the economy is not getting them out that quickly, and you can't process them out that quickly through the VA and all of the things that you need to do. So what you're reading is perhaps true, but if you follow the tags on everybody's back and say, when are they actually off the payroll, it's an extraordinary story of how people, still on the books if you will, but not counting into the end strength. So my point would be you can only do this so fast. They have a tremendous challenge. We're fortunate. We did a one percent adjustment about four years ago. Does that sound about right? About four years, three years ago called Enlisted Retention Board, which was a peculiar name because it didn't have anything

to do with retaining people. We laid them off. And we didn't do a very good job bringing it out, and hey, I was the vice chief, I was in the room when we made the decision. We got by that, and a lot of our folks said, "Hey, I kind of think I lost trust in you." So we've been buying that back ever since, if you would. Not literally with money, but we've been getting that back. So my point is we're good. The number of people per unit, we're good. And that's where I'm standing. We have the budgetary means to do that.

2014 ANNUAL SYMPOSIUM
NAVAL SUBMARINE LEAGUE
22 OCTOBER 2014

ADMIRAL JOHN M. RICHARDSON, U.S. NAVY
DIRECTOR, NAVAL REACTORS

Introduction

Thank you for that warm introduction ADM Mies. I would also like to thank the corporate benefactors, leaders of industry, and friends and family of the Submarine Force.

It's truly great to be here today. The fact that so many of you are here to share your initiatives is a testament of the superior support for the Submarine Force.

It is important that we hold this symposium today and synchronize our thoughts. When we leave this event, there should be no doubt in anyone's mind what must be done.

I would like to recognize my young NR engineers in the audience. I know they're excited to meet all our partners in the fleet and industry. They are the newest generation – our future! Our fate could not be in better hands.

It has been a busy and productive year.

The keel for the ILLINOIS was laid in June, our thirteenth VIRGINIA-class submarine. The first lady, Michelle Obama, was there as the graceful and exuberant sponsor.

The JOHN WARNER was christened in September. A submarine named after a truly great man and staunch supporter of the Naval Service. It is great to see him doing so well. The ship is already over 90% complete with construction. I can't wait to go on Alpha Trials when her time comes.

The NORTH DAKOTA is set to be commissioned this weekend and I look forward to seeing many of you there to welcome her into the fleet. Soon she will be heading off on her maiden deployment. I was fortunate to get to ride for her Alpha Trials. On her very first underway, we tested her limits – all ahead flank to all back emergency. We brought her to test depth, and

went to her diving and steering limits—we really ran her through her paces. When we were done there were zero, I repeat zero, deficiencies in the propulsion plant. That's quality.

The VIRGINIA-class is becoming the workhorse of the fleet. To date the first seven VIRGINIA-class submarines have deployed over 15 times. The MISSOURI and VIRGINIA each completed surge deployments in 2014 just months after returning from scheduled six-month deployments. To add to the class's record of success, recently we signed the contract for the biggest shipbuilding program in history, over $17.5B for 10 more VIRGINIA-class submarines.

As ADM Mies said, the NAUTILUS celebrated the 60th anniversary of her commissioning in September. I was fortunate enough to go to Groton to speak at this incredible event. In attendance were some of the plankowners and Mrs. Eleonore Rickover.

As we would expect, Mrs. Rickover was treated like a celebrity. Many of the former Sailors were eager to meet her and fondly recount their interactions with Admiral Rickover during their service aboard NAUTILUS. Even on a rainy Groton day, Eleonore and the former crewmembers were beaming with pride as the importance of the NAUTILUS was on display once more.

At the risk of saying something heretical in this room full of submariners, the GERALD FORD-class carrier is coming to life. It will be the first all-electric carrier with 25% more power than NIMITZ-class, 3 times more electrical power. Recently both plants were filled within weeks of the schedule that was set a decade ago. We used a new way of building the power unit, putting it together off hull and using a single lift onto the ship. This technique saved 18 weeks of schedule and $50M dollars using this method. In my office is a picture of the super crane at Newport News lifting the reactor core over the ship. When the core was suspended over the FORD, it was comparable to holding a D-cell battery over a Camaro – and that core will power the ship for 25 years.

Looking forward, we are excited about the OHIO Replace ment Program. It has so much going for it. The **security**

environment clearly dictates the need for this deterrent capability. That will not change in the foreseeable future. Russia, China, and India have already started their new SSBN programs.

And **ship requirements are stable** and approved by the Navy, which is key to cost control. The requirements are leading to a **stable and complete design**. It will be the most complete design at start of construction of any submarine yet.

The **industrial base is sound and ready** to tackle this challenge. They are gearing up for it.

Submarine acquisition programs enjoy broad respect and support. We stand on the foundation of a highly successful VIRGINIA-class program, which not only won the 2013 DOD Value Engineering Achievement Award, but also the David Packard Excellence in Acquisition Award in 1998 and 2008. We proved that we can reduce costs, increase acquisition efficiency, and improve the acquisition process – a model for the OHIO Replacement Program.

It sounds like everything is looking good and in fact, many of the assessments I show that the OHIO Replacement is *green* – *green* as opposed to *yellow* or *red*, like in a stop light.

As I look forward, considering the success of the last year, the stability factors I just discussed, including firm requirements, mature design, our best assessment of the future security environment and the strong national security priority, and the path that the OHIO Replacement Program is on, I see all the ingredients for failure.

That's right, failure. I don't feel *green* at all.

The challenge before us is real

The program is on track, but we are not *green*. First, the situation is far too complex to measure with such a simple metric as a stop light. There has been a lot of talk recently stating "OHIO Replacement is green…" and I worry the message is too optimistic; that we have over-simplified the problem. That approach could easily give rise to a complacency that is poisonous.

It is complicated and we need commitment…there is much to do, much to solidify. We still need creative thinking, we still must do anything we can to support this national program. The time is now to get skin in the game, put your shoulder to the blocking sled and keep your legs pumping.

To give you a more complete and accurate picture, let me describe the OHIO Replacement Program in terms of **six lines of effort.**

The first line of effort I see is the reactor plant and reactor core. The 40-year core is a huge leap forward. It will be the most energetic core we have ever built. By virtue of no longer needing to do a midlife refueling, we can build two fewer ships to achieve the same at-sea availability. The combination of two fewer ships and avoiding a mid-life refueling reap $40 billion over the Program's life.

There are big challenges remaining for the reactor plant. A lot of design and manufacturing work is left and we must get the S8G prototype refueled, to de-risk the final design for the OHIO Replacement. Funding for this work will come from Department of Energy, a budget that is under tremendous stress.

The second line of effort is the electric drive propulsion system. **An amazing technological development**. Advancements in the last decade associated with permanent magnet motors and power electronics have enabled greater torque and power capability in a package small enough to fit in a nuclear-powered submarine. Electric drive can achieve a level of stealth not possible for even the most advanced mechanical drive. It is the right solution to provide the stealth necessary for the lifetime of the OHIO Replacement.

We have plans and schedules to complete land-based systems level testing in Philadelphia for the electric drive prior to lead ship construction, but we will not have operated the capability at sea before building the lead ship. Since the land based testing is at full scale, we expect the risk to be retired – but this program must stay on track.

The third line of effort is in ship design. The design schedule is very aggressive and set to achieve the goal of 80% design

completion prior to the construction start date. Thus far, the ship specifications are complete, 68% of system descriptions are done, 28% of system diagrams are finished, and detailed arrangements are now starting. A complete design includes all of these products, plus the work packages, drawings, procurement and manufacturing information needed to build and support the ship through its life. There is no slack left in the schedule; we are on a brisk pace to achieve the level of completeness with these products that we need to control the cost of the program.

The fourth line of effort, the D5 Life Extension Missile, will be maintained for the OHIO as well as the OHIO Replacement, thereby delaying the need to develop a new missile. However, the missile tube industrial base needs recapitalization, and the launching system re-qualified, to support the OHIO Replacement. Testing at China Lake and Cape Canaveral is planned to reduce the risk in re-hosting the missile system aboard the OHIO Replacement. Again, this is a must-do program.

The fifth line of effort is the United Kingdom partnership. The U.S. and U.K. design teams and construction and qualification schedules are currently synchronized, but dependent on both the U.S. and the U.K. succeeding in our plans to achieve the design and construction schedule. It is imperative that we maintain this synchronization in order to minimize the effects of possible schedule slip on overlapping schedules and limited resources.

The final line of effort I see is funding. We have not yet figured out how we will pay for OHIO Replacement and we should take no comfort on the general commitment that "we'll get this done." With respect to funding, we are not in new territory. We have done this before when we found the money for the Trident submarine and added it to the SCN (Shipbuilding and Conversion, Navy) account. And each OHIO Replacement is only about 1% of the defense budget, a relative bargain for such an essential element of national security. It is not acceptable to crush the Navy's ability to build other ships, including new surface combatants and VIRGINIA-class submarines. We have also learned the hard lessons that stability, including funding stability, is a key driver to long-term success, including cost reduction.

Secretary Frank Kendall (USD AT&L) recently pointed out that there is a distinct relationship between budget uncertainty and cost growth. A recent Pentagon sponsored study shows that when the U.S. military budget is constrained, weapons system acquisition programs are more likely to experience cost growth. Industry takes risk in bidding, because there are fewer things to bid for. People who run programs and budgets take risk because they try to fit more capabilities into the bid. Program Managers and acquisition leaders cut corners and make assumptions that turn out not to be true. That's how you end up with cost overruns and schedule slips; there is a very strong correlation.

There is also the matter of advanced technology. In this regard, again Secretary Kendall points the way, *"I think we've been relatively comfortable for decades now about our technological superiority in the world relative to other powers. That's changing and we have to take it seriously. I think there's a growing recognition that we have to be better at getting advanced technology products out and better capabilities out in shorter cycle times."*

Technology has always been a central element of naval warfare and especially submarine warfare. We cannot cut corners here. Some technologies will last the life of the ship like the payload volume, quieting, max speed and max depth. With these capabilities, we have to invest up front. Other technologies, like combat systems and sensors, will advance over the ship's 40-year lifetime.

Using Moore's Law, in 40 years processing power will be over 1 million times faster. That is a huge difference. Parts for the OHIO Replacement are built to adapt and accommodate this increasing technology.

Summary

So let us review the bidding. I see the OHIO Replacement plan developing:

- Under two nations: the United States and United Kingdom
- Under two Executive Departments: DOD and DOE

- We've got well-defined but still aggressive programs in:
- Reactor design
- Electric drive
- Ship design
- Weapons systems

There are many budget lines to fund these projects.

All of these programs need to progress together, as a synchronized whole. We need to keep all these horses galloping down the road in formation.

If we, in this room, do not have butterflies in our stomach each day as we come to work on this program, we are kidding ourselves. The stakes are far too high. The question is, how to translate these feelings into actions?

In this regard, there are **things we can control. Things like — funding, government performance, shipyard performance, and vendor performance**. We have solid plans for construction and testing and we are building the necessary facilities. We are leveraging the things that we know work and are reducing uncertainty.

Then there are **things we cannot control**. Things like - the inevitable uncertainty in technology development and the changing threat picture. For the known engineering and schedule challenges, government and industry have identified executable paths forward to retire the key risks prior to start of ship construction. And for the rest, we need to ensure sufficient margin to accommodate the unknown. We must respect that we may not get this right on the first try. We certainly do not want to be introducing any more risk or uncertainty that's not needed. If it ain't broke, don't fix it.

The government team is working hard and has solid plans to retire risk but a lot still must be done to execute those plans. The reason we are here, in fact the true value of these get togethers, is to unite and discern a way forward. This situation calls for some Commander's Guidance.

I always try to make my Commander's Guidance succinct. If you become separated from the main body or lose

communications, you will still be able to contribute to the mission — know the things you can do to advance the cause, and know the things you must not do; things that will harm the cause.

Commander's Guidance enables decentralized operations, a key naval tenet, empowering more people to get involved and contribute. This concept can easily be applied to our situation with the OHIO Replacement Program. So let me offer you this Guidance.

1. Increase support. Inform those in your sphere of influence: everyone from your Congressmen to your local PTA. Look for ways to make people aware of how vital this is to the nation's security; the stakes are extremely high. Don't assume that somebody else will do this; we all need to do it. Like John F. Kennedy said, "Ask not what your country can do for you, but what you can do for your country."

2. Retire risk. Look for ways to put it behind you. Ensure plans get approved, designs get done, testing is pushed forward, and systems are integrated. Don't introduce more complexity or uncertainty if the current system is adequate and successful. Leave margin for unknowns; don't write checks that you can't cash. In the end, it only hurts our credibility.

3. Be judicious about cost. In this way, we will be in a position to take advantage of all the tools that have made our current submarine production program so successful. We have the confidence of all stakeholders: Defense, Energy, Congress and the American People. Stability and Confidence will allow the nation to invest, to buy in to the program in a way that best advances technology in a responsible way, and reduces cost.

In January 2015, we'll celebrate the 60th anniversary of "underway on nuclear power". Study that time carefully. Maintain the rigor that has served us so well in the past. Reduce the bureaucracy and distractions that are smothering us. Recapture some of the pioneer spirit, innovation, excitement, and urgency.

There is a role for the Naval Submarine League in these debates, for the League as a whole, and for each of you as individuals. If you're not part of the solution, you're part of the problem.

Be far less comfortable. I concur that we can get to *green*. We'll be *green* when that first submarine goes alert in 2031. Until then, we've got work to do and nothing to take for granted. We can do this. Let's get to work.

2014 ANNUAL SYMPOSIUM
NAVAL SUBMARINE LEAGUE
22 OCTOBER 2014

VADM MIKE CONNOR, USN
COMSUBFOR

Good morning, everybody. First of all, I'm sorry that I was not here at the social last night. From time to time we get called to go to Millington, Tennessee to do selection boards. Some of you have had the honor, and you don't exactly have to go if you don't want to, but if you don't go your community probably won't fare very well. So we did the right thing. As a result of that, I missed yesterday. I missed the cocktail social, which I always enjoy. I even missed the post-cocktail social tradition called, "one more drink". And as a result of that change in the schedule, and despite the fact that I got here at about 1 a.m., for some reason I feel much better than I normally do at this point in the conference. So I think we're in good shape.

This is my third time speaking with this group. So that probably means this is my last time, but you never know. I want to thank the League. I want to thank the sponsors for making the Sub League such a big part of the success of the Submarine Force. Thanks to all of you for what you do.

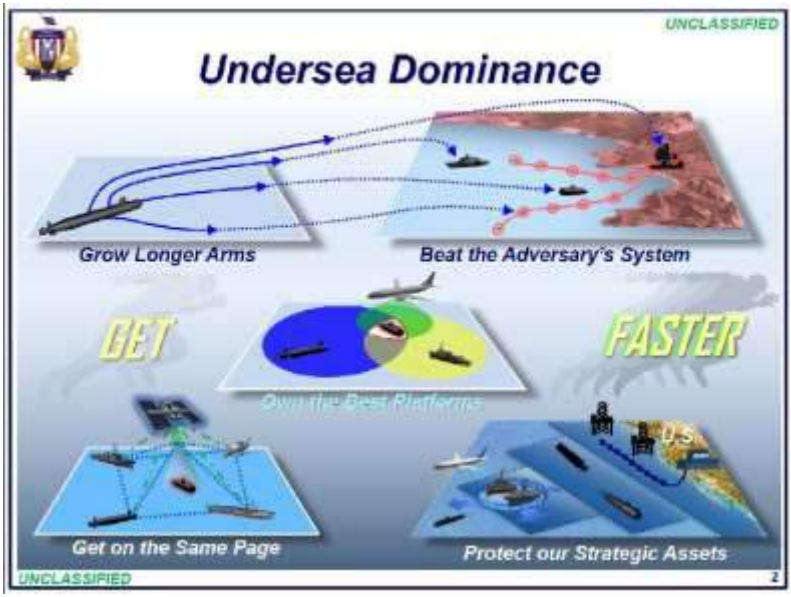

Figure 2

You've seen variations of this before, but this is a pictorial of our overall strategy in the undersea. You've heard it from us. You may have heard it in a talk earlier today. You might have even heard the CNO talk to it in some forums. And so I'm not going to do too much on the details of it with you, but I want to simply state that this is the Submarine Force vision. Because of the work that people like you do, whether you represent a manufacturer, laboratory, resource sponsor, program manager, whatever the case may be, we have the most coherent, executable plan for the way we build our ships, design the systems that operate from those ships, and the payloads that leave from those ships to do missions on their own. We have the most credible, consistent, cost-effective system today, and we have the most coherent plan going forward to realistically adapt the technology that we have to match our resources and work towards a future than any other part of the US military. I'd go head to head with anyone who thinks that someone

else is doing a better job. I want to thank all of you for being the ones that make this happen.

Figure 3

So you've seen the elements. We have to own the best platforms. We have this thing called *grow longer arms*, which means we need to extend the range of the weapons and other payloads that we deliver, whether they are delivered above the water or below the water. We need to beat the adversary's system, which generally means we need to be ready for a Russia, a China, an Iran or anyone else who has recognized the superiority we have today and seeks to develop an A2AD-like network underwater to match what many of them currently have at the surface and in the air. We know that's going to happen because the fact that we dominate under the water is driving some countries crazy. That's the bad news. The good news is we know what it would take for them to do that, and we know what we have to do to pace that threat so that after they have expended their valuable resources building a

network or whatever it's going to be that is geared to defeat us, we will have already put the tools in place so we can defeat that effort and maybe, in some cases, exploit that effort to our own advantage. That's what this plan is all about.

Next, we need to defend our strategic assets, which some of us think of as our SSBN force. But it's much more than that. It's the continental US, it's the national capital region, it's the huge investment in undersea infrastructure, whether that be oil, gas, communications, whatever. That is part of our vital infrastructure that drives our economy, and we will increasingly likely be called upon to defend it. Next, we need to get on the same page. To some of us, that just means we need to use the same common operating picture software tools. It is that, but it's actually much, much more than that because as we extend the range at which we can apply the effects that we generate from a submarine, whether it's underwater or cross-domain, we're leaving the world that is the sort of fire control problem that many of us grew up with, where everything is centered on the ship that shoots the torpedo and delivers the weapon and so forth. We will increasingly be a part of a world that is based on geographic coordinates, as we are today, say, in the Tomahawk world. That will apply in the future to pretty much everything we do, because we may deliver an underwater weapon that is based on third party targeting. We may even hand over the terminal stages of that weapon to someone else who's controlling it from another platform or possibly via space. So that's a mind shift for us, but it requires us to get on the same page. Lastly, as was said many times, we need to get faster. Again, that's very important. I'm going to talk about that in a minute.

Figure 4

So this is how it all lays down. It's very logical. The foundation is our platforms, and you can trace the evolution of the platforms that were developed over decades. We're talking right now about the design effort for the SSN(X). This is an effort that requires decades of concept development, detailed engineering and planning so that we can have the right platform that will operate on the order of 40 years as we're doing with the SSBNs and be very capable throughout that lifespan. That's hard work. It takes a long time. Once we go to all of that effort, we need to make sure we build platforms that last for a long time. Within that circle, we have the vehicles, things that by definition will become obsolete much more quickly because the pace of technology is so fast. That's where we take things like our torpedoes and we make them go further, we make them do a few different things. Maybe they can become a mine as well as a torpedo. Then we bring in more things we can do with a missile.

We're very good with the Tomahawk missile right now. Someone did ask the question in the last brief, “Should we be thinking about TASM-like Tomahawk anti-ship missile or variants of that?” The answer is, absolutely yes. You may recall we abandoned the TASM a few years ago because we had a missile that would go about 350 miles, and it was guaranteed to hit something. We just weren't sure what it would hit. That was years ago. Command and control today is much more precise. We have targeting methods that are much more accurate than they were back then. We now posses the ability to have artificial intelligence inside a missile determine the classification of one target among many. So now, that several hundred mile range becomes more like a missile from a submarine which can precisely hit the exact ship that you want to strike from 1,000 miles away. That's a huge problem for an adversary that can't detect our submarines from 1,000 yards away. It makes the value of each one of those submarines in our calculus and in the enemy's calculus that much greater. So even though there's not a whole lot of, say, warhead on those things relative to, say, a torpedo, we can get a mission kill on pretty much any surface ship with the right missile from hundreds of miles away from a submarine, provided we have its location. I dwelled on that a little bit, but the point is that this payload world is getting to be much more active and fast-changing. As I'm learning from getting into that world, even payloads have payloads now. The same common unmanned vehicle that you produce, might deliver a weapon, it might deliver an acoustic decoy, it might deliver an electronic decoy all from the same weapon, or it may just contain a sensor package. I hadn't really thought about that until people started bringing it to my attention. That's an extremely dynamic field.

So the way this is going to play out is that some of you some day will probably build our fleet standard unmanned vehicles, and then many of you will get to build the payloads that go on them, whether they be propulsion variants for longer range, sensor packages, and weapons and so forth. It’s a very, very dynamic field. We expect to be able to turn custom payloads based on real world needs in weeks to months, and as I alluded to in that little

picture of the mast on the far right of the picture, we pretty much do that right now. On special missions, we'll need to go get some signal, and if we can't do it all with the internal processing of the ship we'll go build a custom antenna system and we'll turn it around in weeks to months because we have some very brilliant people more or less on retainer that allow us to do that. It's amazing.

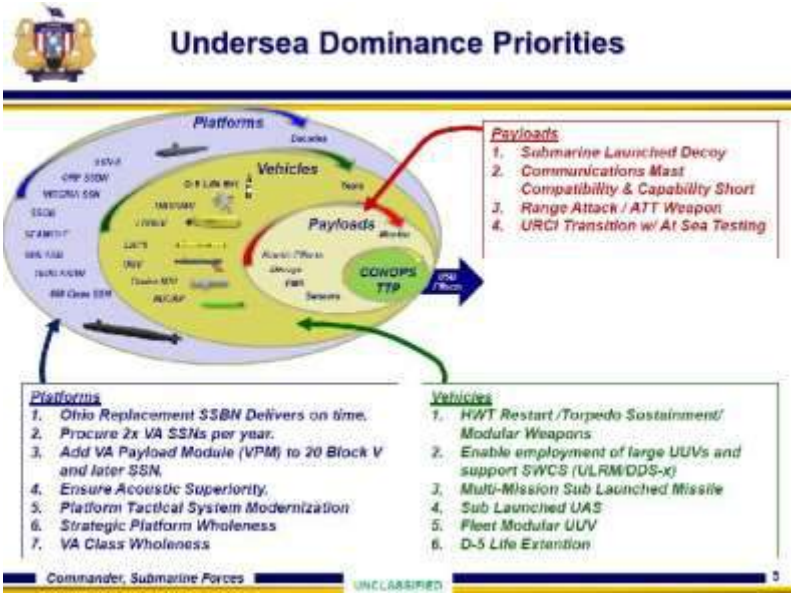

Figure 5

I just want to make sure you know that in each one of these major areas of activity, we have specific things going on. It's not a pipe dream. I think we've been through the Ohio Replacement and Virginia class stuff pretty much. That's our biggest investment. We're doing both of those programs well. Virginia continues to be the only major program in the DoD that consistently performs under cost and ahead of schedule. Ohio Replacement is on the same track with that same level of discipline to develop that very

important capability in the way we've done with Virginia. We're going to make some minor modifications to Virginia. We're going to improve its acoustic superiority even more because we think we'll have the need to do so with some new challengers, and we have some new technology that allows us to do that. So that's all good.

In the payload area we talked about re-starting torpedo production, and that torpedo production will be the foundation for an evolutionary program that brings in new technologies and ultimately leads to other payloads. We're enabling our dry deck shelters to deliver unmanned vehicles while we work on the mechanical ways of doing that, and we'll be doing that this year. We would be doing that this week. However, someone decided that they'd rather use one of our ships to kill terrorists than to work on the next generation in underwater vehicle development, and I can't fault them for that decision. Our Prospective Commanding Officer class that is going on as we speak will be employing unmanned air vehicles as one of the ways that they target our torpedoes at long range.

This is a very dynamic system that takes the technology you provide and feeds it into a scenario in which we can try to determine how we can fight better in the future. Eventually it gets down to some young officers saying, "Okay, if I can launch this unmanned vehicle, in this case out of my little 3 inch countermeasure launcher, and keep that thing up in the air for 40 to 60 minutes, somewhere in that range, think of the periscope observation equivalent you can get from that." It's amazing. It's just amazing. There's a whole bunch of other things that we're doing in the payloads area – Again, working very, very quickly, particularly in some areas like decoys and so forth.

Figure 6

On to some of our successes – The Virginia class program. We talked about that. Real world missions with unmanned vehicles this year. We talked about that. I thought I heard a program manager apologize for his TB29 towed array this morning. Hey, here's how I look at TB29s, folks. It's like crack cocaine. It is so good when it works that the world can't stand it when they break. I'm a fisherman. I know that when I throw things over the side of my boat sometimes they don't come back. That's kind of the real world we live in. Sometimes things fail, but sometimes we have things that we drag through the water for six months and things happen. But that array is by far the most phenomenal array ever built, and we now have the engineering challenge of keeping that performance while ruggedizing it in ways that give us better electronics but don't compromise the aspects of it that make it so sensitive and so effective. And I'll tell you, oftentimes the difference between success and nothing is a TB29. Some of you guys know what that means.

As I said before, we're building torpedoes again, and in the lower right-hand corner is a little shout-out to Penn State for some technology they're working with. I asked them to give me a propulsion system that would get us a 100 mile torpedo range. They pulled something out of the closet they'd been working on for a while in an ADCAP form factor that will give us a 200 mile torpedo range. I'm not sure I'm mentally prepared for how to employ a 200 mile torpedo, but we're going to put some thought into that. In the decoy world, we are very, very active. Success is being achieved at a pace much faster than I thought, in large part because the people in our Navy Labs have friends in the Air Force Labs and the good news is they all work together. The D5 missile program again remains the most successful ballistic missile program in history, and is the key to the inherent credibility in our strategic deterrent. All right, so that's it for the strategy material.

I want to spend the last 15 minutes I have here just chatting about a few things that are going on in the Force. So here are some topics I'd like to talk about. Let's get right into them.

Figure 7

Figure 8

CO development. I think ... I know, in fact, that we have the best commanding officers in the world right now. I put a lot of thought into it before I said that, but here's why. We're in a world, and I think Captain Patton might have alluded to this earlier, where much of the Navy and much of the world's navies are focusing on how they can more precisely control what happens on a ship from a great distance using satellites and the Internet technology (and we have some of that technology), we're very aggressively working—this is with Admiral Sawyer and myself and others—at going the other way. We're training our commanding officers to go forward and fight in a highly competitive environment for weeks to months at a time or until they run out of weapons with little to no external guidance other than some broad mission priorities, maybe a little guidance on where they need to operate, and where to go and call home when they're out of weapons. That's what we're training our people for. That's how we

run our commanding officer pipeline training. That is how we actually structure some of the missions that they do on their routine deployments, which tend to involve preparation of the battle space for things that might happen in the future. That's how they operate. And we've made a big deal of doing that, of not being overly prescriptive in how they operate their ships, having them come back and tell us how we could support them better or how they could share those lessons learned from deployments with others. I believe it's working very, very well.

We have some very, very thoughtful, capable commanding officers out there who know how to do this, and they're really rising to that challenge. Again, having been in a board, I sat down with my counterparts from other warfare communities, and they're having some frustrations right now with how to better control what happens on their ships. Some even asked, "What are you doing?" I said, first of all, we're trying to make sure we have the right people and that they're trained properly, and in fact, we are not trying to control them because we know that the one thing that no adversary's intelligence community can ever figure out ahead of time is what some aggressive, thoughtful, innovative, decisive commanding officers might do to ruin their day. Even if they can break the comms between us and them it won't help. So we put a lot of thought into that. We're very happy with where that's going, and I think you ought to be proud of the people who we have out there operating those ships.

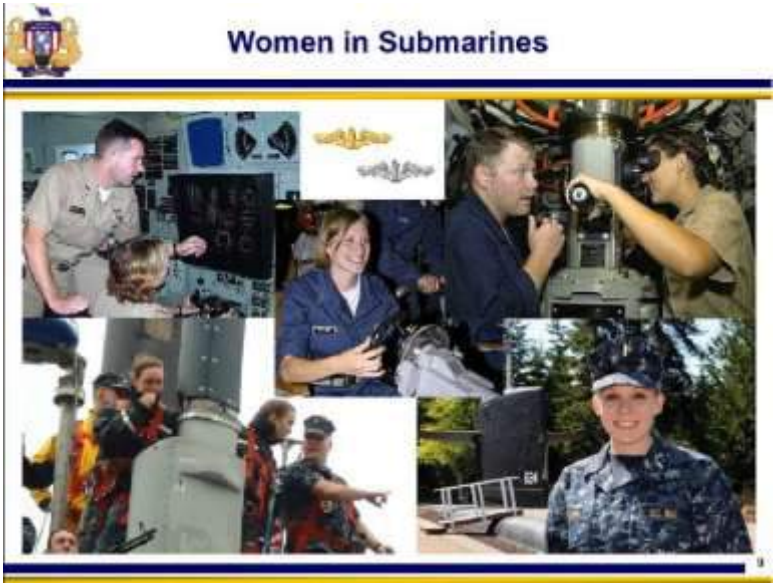

Figure 9

Women in submarines tends to come up in a lot of these areas, and so here's where we're at. We have over 100 women who have been assessed into our program. Some of them have already completed their JO tour and are rolling ashore. And their reliefs are rolling onboard. We have seven ships, 14 crews integrated right now with women officers. We're going to pick up two ships next year in Groton. They'll be Virginia class. Two the following year in Hawaii, also Virginia class, so that as the SSBNs and SSGNs that we started with, as they start to time out, we will have a broad opportunity for those women officers through command. They're doing very well. Then going forward, 2016 is the year that we expect to bring the first enlisted women on submarines. We're waiting right now. It's up to the Congress, and we've gone through all the procedures with the Congress, and there's a certain time requirement for when you tell things to the Congress, and they have to be in session for so many days. It takes 30 days for most things that involve notification of Congress, and you might be surprised how long it takes to have 30 days of Congressional

sessions to actually happen. But we think we're going to make it. That's the bottom line. And when we do that, if we do that, because again, Congress hasn't told us we can yet, but when we do, it will be in the same slow, deliberate way. We'll build upon the ships that have women officers to lead. We'll go through a process that brings in senior women at the chief petty officer level, from other communities in some cases, just like we did with the women supply officers so that there's always the senior mentorship. People who have been to sea before who know what proper behavior at sea is and is not, and we think we're on a path to slow but deliberate success in that area.

Figure 10

I gather you had some discussions on depot maintenance because the news headlines this morning said something about it. So here's how I see depot maintenance. Because of the degree to which the Navy as a whole has been run, which is much harder than it has been designed to be run, we have a lack of capacity, particularly in the naval shipyards that handle the nuclear aircraft

carriers and submarines. We're getting great support from the Chief of Naval Operations, who has invested in; (1) growing that capacity, and (2), accessing some private sector capacity in ways that we haven't done recently. We're doing that, and so now it's over to us, and there are a couple of things we have to do to make that happen. First of all, within the public shipyards, as in the naval shipyards, they're right now operating below their authorized end strength, and they have a fairly senior force. We need to be innovative in how we hire and train new workers, but also in how we find skilled workers in other industries to come work in our naval shipyards.

People, like welders and pipe fitters. As it turns out, there are a lot of people who work on things like oil rigs in the gulf or work on the gulf coast who would be more than happy to work in the safer, secure environment of a government shipyard than to be working offshore on a platform for weeks at a time and so forth, and we have to be a little more flexible in how we manage the civilian personnel system in the Navy to identify those people and bring them onboard. We're working on that through the human resources folks. It'll take a while. But we have a way to do that.

In the interim, though, we also need to be more effective in partnering with the private sector to use their capacity, and they have some capacity for submarine maintenance. The way we need to do that better is to have the right types of contract vehicles and a planning process in place so we can bring these resources to bear (we used to call it the one shipyard concept) and do it not at the last minute when we suddenly realize we're maxed out in the naval shipyards, but do it in a very deliberate way so we can look years ahead and have enough access to capacity. These things are very, very doable, and we're heading down that path. So yes, we have some work to do, but we're working with the Naval Sea Systems Command, we're working with the private sector, and we have the ability to manage this and we will.

Figure 11

One of the little problems I deal with every day is where to send the submarines and what mission to train them for. Of course, I really only get to do the second one because they go where someone else tells me to send them, and we have this whole thing we call the pivot to the Pacific. You've read a lot about it. In many ways, it's a very intelligent way to approach the future, although sometimes we'd be better off if we didn't talk about it even if we are doing it because somehow inadvertently, we're sending a message to other parts of the world that, "Hey, it's game on. Have a ball. You can do what you want." Which was never our intent. But at some times, it feels like that's the message that they got. So while we've been pivoting to the Pacific, and the Submarine Force is pretty much already there, the European Command Area, southwest Asia, and Africa are very, very busy. The way this plays out is that you can't send a submarine, for

example, to southwest Asia without going past Europe and Africa. And the way our system works is the guy whose water you're going through kind of owns you. You've all heard the *possession is nine tenths of the law* thing. Sometimes they don't get to southwest Asia because someone comes up with a brilliant idea along the way, and then that's the time when four stars, many of them who don't wear Navy uniforms, are fighting over submarines, which secretly makes me happy.

It's a busy world out there. There's a huge demand for what we do, and what we have been doing is saying, "We understand your demand. We will meet your demand to the best of our ability, but not at the expense of having time to properly train the crews for the missions that they're going on, and not at the expense of running the force into the ground because what we're running here is a marathon, not a sprint." We are very careful to watch the ships so that we will be able to get the whole life out of them.

Figure 12

The next couple of topics I'm going to talk about relate to safety. We took a good, hard look at safety. We look at safety all the time, but we took a particular look after a series of events in late 2012, one of which involved USS MONTPELIER. We looked at things like what incentives are we giving to the crews to be safe, what was our experience base, what other back stops might we provide them so they can do a better job and that sort of thing. I want to talk about a couple of those.

The first one is JO tour lengths. How many JOs do we have in the room here today, or recent JOs? Okay, good. We extended the JO tour length to 36 months. I know, some of you guys are going, "Extended to 36 months? What was it?" So it got a little bit less than that, and it was good people making some well-intentioned decisions to make room in people's careers for things like graduate education and so forth, and joint requirements that are mandated by law. But when we took a look around, so the first thing you have to know before you become a sophisticated joint warrior is how to drive a submarine. So we set the tour length at 36 months, and we further set it such that after you finish the engineer qualification, which means you're qualified to be the chief engineer on a submarine, that you stay an additional 12 months with no other required schools. That's the time when your ship driving skills really blossom. It's the time when the engineer and the weapons officer can delegate those hard jobs to you so your management skills grow, and you get confidence in landing the ship and some of the complex evolutions that we do. It benefits the JO because when they come back, as a department head they have that innate confidence that they know how to run a submarine. Of course, if you send a guy back to a submarine as a department head without giving him that confidence as a JO, nothing spells blood in the water like a new department head on the ship that doesn't really look like he knows what he's doing. We think that it’s time well spent, and that COs appreciate it, the department heads appreciate it, and the JOs we did it to didn't even know we were doing it because they just kind of show up when they're supposed to.

Figure 13

Next we took a good look at some things that other industries have learned in the area of safety backup and crew rest, and a lot of this originated in the airline industry. There are extensive medical studies, but the bottom line is this: there's a huge body of evidence that says people perform better if they get enough sleep and if they get it at about the same time every day. It's pretty simple. It's been generally ignored for the entire history of the nuclear Submarine Force. So we're working on that, and part of it is applying the science, but another part of it is telling COs that the measure of success isn't that everybody on your ship is working as hard as they possibly can until the point where they're exhausted. It's that they work hard enough to learn their jobs to be effective, and it really is okay to have a little bit of time to think and relax, and maybe even think about how you can make your ship better.

That sounds simple to say, but those of you in the business kind of know that there's a certain chunk of our force that is only satisfied if they have worked themselves to complete exhaustion. We sometimes forget about that once we leave the ship.

Figure 14

One of my JO friends decided that he would remind me of this phenomenon by sending me this picture of me in 1982, I think it was. Tell me if you can relate to this, but many of you were basically tired from age 22 to 42. Does that sound about right? Okay, hey, I've told you about a lot of things that I think are working fairly well.

Figure 15

So I think we're doing our job pretty well. We're wisely spending the resources that we have. We're developing good ships driven by good people, and we're buying them good sensors and weapons. But there is a challenge out there. The era of a world dominated by the US, and the good intentions of our friends I think has passed us. We have serious competition out there for who will influence the world and how they will influence it, and perhaps even who will have control of parts of the world. So, as well as we're doing, we have to do better. We need continued investment in that effort to do better, and I'd like you all to leave here knowing that the folks who presented their programs and plans to you today are taking that mission seriously, they are doing it in a very effective way, and they're doing it in a very financially responsible way. With that, I will take your questions.

Admiral Bowman: You talked about, correctly in my opinion, the need for adequate sleep. I've heard a little bit about the experiments that have been taking place moving from six hour to eight hour watches. Where are we in that?

Mike Connor: So the question, in case you couldn't hear it, exactly how are we implementing this crew rest and circadian rhythm respect program. We have some notes out on how to do it. We have avoided being prescriptive, but there's generally two methods that are coming into play. One is straight eight hour watches with a short break at the four hour point, and the other is a series of six hour watches with some fours in there that break up the day a little bit. But you stand watch at the same times every day, and then there's certain designated times of the day when all hands are expected to be awake for major drills and so forth. Some folks have asked that we not give them options, just tell them how to do it. We have resisted that for two reasons. One, I was very concerned that this is new to a lot of people. It's not what they did their whole career. And I was very concerned about the potential for malicious compliance because face it, things happen at different times. The maneuvering watches are at a given time, the special evolution you're doing on deployment, and so we can't give a one size fits all solution, but we wanted them to adopt the principles. So I just had a ship get back from a very successful deployment. They did eight hour watches. They did a break at the four hour point to get head call and a cup of coffee or something like that, and they had a plan that every month or so, if you're the day guy you'd be the evening guy after a month, but sort of by the time they got to the Mediterranean, they decided that they just wanted to do the same watch every day because they were in it, they really did feel good, they liked how it worked. Some of the guys were tired of eating breakfast every day before they came on watch. So their solution was, and I never would have thought of this, watches stay the same and meals change. You know… Who would have thought of that? So we're leaving it up to them to come up with those sorts of solutions. Remember, we sometimes

have some folks on some pretty long deployments, and there are people on deployments in areas that are much busier than most of us did our deployments in. Every tool that we can provide them to keep themselves happy and alert longer and also be mindful of the physical limits and when it's time to pull off and take a port call is valuable. Any tools like that that we can put in their hands makes those ships better and safer.

Rick Burgess: Thank you. I'm Rick Burgess with *Sea Power Magazine*. Several years ago, the sub force experimented with UAVs. I think it was the Buster UAV launched from surfaced SSNs. Are you continuing that experimentation, or where does that stand?

Mike Connor: We've more or less stopped doing that because you said surfaced SSNs. So we're continuing to fly UAVs, but we're doing it from submerged SSNs, and we have basically three different delivery methods. One is via the trash disposal unit, one is via the torpedo tubes, and the other is via the countermeasure launching system, which is like a small torpedo tube. We have active programs in each one of those areas.

John Padgett: One more, sir.

A Midshipman: Good morning, sir. I have a quick question for you. So this Tuesday, we had the privilege of having the CNO come to talk to us at the Naval Academy, and he spoke a lot about the future of the Navy and how controlling the electromagnetic spectrum is going to be vitally important. Can you speak specifically to how the Submarine Force is going to enhance our ability to dominate the electromagnetic spectrum, and specifically how directed energy might be one of those solutions?

Mike Connor: Sure. So first of all, to control the electromagnetic spectrum, you have to be able to put whatever your device is that controls that spectrum in the place where you need it. And we have a remarkable ability to take the sensors that we have and put

them in the place that they are most relevant because we can get closer. That has an impact on a whole host of defensive and offensive efforts to control the electromagnetic spectrum. Some of the devices that I mentioned earlier directly play into dominating the electromagnetic spectrum. You asked a question about directed energy. So we are probably at the very early stages of looking at that. There's a pretty active program on surface ships to do that, and the most efficient position for us to be in right now is to let them get the technology several levels higher than it is, and then we can look at how we can shrink some of that so it's compatible for a submarine. One of the things that we bring to bear once we do that is we have the power readily at hand to deliver some of those high energy effects, but the size of the packages that they're working with right now are far too big to not compromise most of the other things that we do.

2014 ANNUAL SYMPOSIUM
NAVAL SUBMARINE LEAGUE
22 OCTOBER 2014

ADMIRAL WILLY HILARIDES, USN
COMMANDER, NAVAL SEA SYSTEMS COMMAND

Thanks John. I would love to acknowledge all of my mentors who are here. And about half of this crowd had some hand in getting me to this point in my career. So I thank you all for everything you did for me and apologize for any of my shortcomings, which are legend. I will also note that the standing room only crowd has departed, so I thank Admiral Richardson for setting me up that way. That was very good. I think you all will be very proud of me. Yesterday I found myself nominated to go speak at a Strike symposium, a Long-Range Strike symposium. As I prepared for it, okay, well I'm a pump kicking shipbuilder, why did they ask me? So at the beginning of my presentation, I told them that I actually had the long-range strike badge, the Navy's long-range strike badge. I said a few feet at thousands of miles is pretty good. It's even better when it's a nuclear weapon, and so that did get a laugh out of them. I won't try to put it back on my uniform like I did there, but you all would've been proud of me on that day.

It is really good though to be in front of a crowd like this and in front of the people who I've grown up with, who have committed many, many years of hard work to let our Submarine Force be successful. And I thank you all very much for this opportunity. In the conversations I have around town, I always end up the first question being *how are you doing, how are your people doing?* So I'll just go right at that. It's a question that I very much appreciate and one, of course, I work on every day. Just a couple weeks ago, we celebrated the one year anniversary of our tragedy at the Navy Yard. And it was a wonderful day as it turned

out. In the morning, we had a remembrance ceremony in Leutze Park, and we spent the time with the families remembering our loss. And at noon, we went out to a different kind of event. A young woman who works for me had set up a 5K. She came to me and said, she'd like to have a 5K on the one year anniversary. I agreed. Sounds great. Good luck. And this young woman, her name is Wendy, went off and convinced the staff at Fort McNair to shut down the base. She convinced people to support us. At the end, we had almost 900 people come out of Buzzard Point, walk into Fort McNair. Several hundred of us, I think 400 or 500 of us ran a 5K, and a bunch of people walked a mile-and-a-half. Right at the beginning, three of the Washington Nationals racing presidents came up and kicked off the race, and they ran across the finish line with me. It was a great opportunity to celebrate that we're moving forward.

And I would just tell you that I feel that the workforce is in good shape. They're a good team and they're well-aligned. And they're moving forward together. We are on a trajectory to begin reoccupation of the now renamed Humphreys Building, building 197 there in the Navy Yard. The contractor will be done on the 1st of February. I've seen the contract, he'll be done on the 1st of February. That's a Sunday and that morning we'll go in and dedicate the remembrance area. There'll be a remembrance area inside the building. And I'll of course encourage you all after that to come see it. It'll be, I think, a very fitting remembrance to those that we lost. And on the 2nd we'll begin to reoccupy the building. I'll have my box there and be ready to go in. We will do some sort of blessing, christening of the building. Haven't quite figured out exactly what that is. And about the end of April, when the move is complete we will celebrate. I remind you all we're moving 2,700 people a couple of miles across Washington with secret and unclassified computers and about a million pounds of files. We are pack rats after all. And so then we'll have a big renaming ceremony. It's interesting that it corresponds really with the end of the 200th anniversary of the War of 1812.

The War of 1812 started in 1812 of course, but it finished at the end of 1814, beginning of 1815. We are naming our building

for Joshua Humphreys who designed the six frigates. The six frigates were critical to the success in the War of 1812, really to the foundation of the U.S. Navy. His heirs have reached out to us. A great-great-great grandson will be there for the dedication of the building. And the crew of the Constitution has said they'd like to come down and be part of it. So we'll have the crew of the Constitution. What a great way to close out the celebration of the War of 1812.

We are also taking the time to help people get ready to go back in. As the building has been under construction, we've been giving out pictures and showing what the new deck is going to look like. We've worked with the contractor and arranged tours. And so in between shifts in the building, a lot of the workforce has already been in. That has gone well, and people are really beginning the process of facing moving back in there. And you just have to remember, we evacuated that day, and most of them haven't been back in since. It was a crime scene for more than a month. And so it'll be almost a year-and-a-half between when they left and when they go back in. So we're very mindful of that, and I do appreciate everybody who asks. I encourage you to ask my workforce, as you meet people from NAVSEA, ask them how they're doing. Ask them if they're ready to go back in. I'd very much appreciate that. Because I think they actually like talking about it. We found, of course, that talking about it is what helps you get through all that stuff.

So what I'd really like to give you then is the state of play of NAVSEA from the Submarine Forces perspective. Three broad lines of effort. First is the research and development and support work that goes on at the Undersea Warfare Centers. Many of you know that Admiral Dave Duryea just retired after being a really great Commander of the Naval Undersea Warfare Center. He's been relieved by Mike Jabaley. The Undersea Warfare Centers have really done a great job of keeping all the programs in line, and keeping the research and development, technology and sensors and weapons, advanced payloads like unmanned vehicles, all those on a good trajectory. I'll just tell you that part of the business is going pretty well. And our alignment to the Submarine

Forces strategic initiatives is good. I think they are really doing a great job of supporting that.

On the program side, building new ships, I think Dave Johnson has got that one well covered. I've seen his pitch. It's one that I'm very proud of. Of course, I had a small hand in helping that program be on the solid footing. And I'll let him go through the submarine construction program, Ohio Replacement design, the torpedo restart, the warfare federated systems, the ARCI and BYG-1 programs, which are all very healthy and doing very well.

And so then the last part of the portfolio from a Submarine Force perspective is maintenance. And that's an area where frankly, we are in a tail chase. I've been out there a little bit lately. Many of us have been working on making it better. But it's relatively explicable how we got in a tail chase, so I'll just spend a minute to tell you. Most of the nuclear repair work in the Navy is done at the public shipyards. Some amounts are done at EB and Newport News, but the predominance is done at the four public shipyards. That nuclear workload, sort of while we weren't looking, went on a pretty steady upward ramp. You say wait a second, the fleets' the same size it was, what's the deal? Well, three factors, broadly. We did not have 11 nuclear aircraft carriers until the commissioning of the BUSH. We were building up the nuclear aircraft carrier force all through those years. Each one that comes online adds to that level of carrier maintenance. The second is, we started refueling the boomers. We had almost no refuelings going on before 2001 when we inducted Ohio to start her refueling. And so we are in a steady drumbeat of four boomers in the two big yards undergoing their refueling. And the third is that we really only bring, thanks to a lot of work by many of you and guys like Pat Brady, we only bring the SSN force into the shipyard twice in its life.

The first one, was called DMP (Depot Maintenance Period), the second one was called an EOH, engineered overhaul. Those EOHs started up and are in full swing. Of course we're in the part of the force that was built at three and four a year. That's what's going to cause our force structure problems out in the mid '20s. And so those three factors, increasing EOH workload, submarine

refuelings and carrier force, generate an increasing demand on the workforce of those public yards at a time when the perfect storm occurred; sequestration. This resulted in a hiring freeze, and that hiring freeze was technically only for a couple of months, but it was almost nine months between when they told us to stop hiring before I got permission to bring the first new workman. And that's just not hiring for attrition, that's not hiring at all.

And so we found ourselves down almost 2,000 people, compared to a workforce of 30,000. 2,000 people behind on an increasing workload. And not surprisingly, things start to go long. It's a fixed asset, and again, we work to ameliorate it. But that workforce, that great workforce is relatively a fixed asset and they fell behind. It started to show first on the attack submarines. Attack submarines, in our big yards, are significantly behind, and we will not catch those schedules back up.

It's begun to show on the ballistic missile force, which is a big problem. Admiral Haney, the Strategic Force Commander, if he were here, would be yelling at me. He does regularly. This problem is also very important to the conversation that we just had with Admiral Richardson about the boomer force of the future. Because we're counting on the force that we have now and those ships that need to be out there on patrol.

Even on the aircraft carriers, as many of you saw the article, we just rescheduled to switch two aircraft carriers, because the one that's in Norfolk Naval shipyard is just not going to get out on time to meet its deployment schedule.

And so I find myself in that tail chase and obviously a lot of hard work ahead. I will not be at the dinner tonight, and I will not be at the luncheon tomorrow because I will be down in Norfolk Naval shipyard, not surprisingly, working on that. Our plans are well along, but there's lots to do, significant amount of management focus of course, and I'll lead from the front on that one. We are hiring. Really since the hiring freeze came off in early '14, we have been hiring in the two big yards, and even in the smaller yards, at about the maximum rate that we can hire, and we have begun to see, of course, the strains on the hiring base.

In Norfolk, where Newport News is hiring, the Supervisor of Shipbuilding is hiring, the regional maintenance center is hiring, and Norfolk Naval Shipyard is hiring. It's pretty hard to find someone who's done a little bit of welding in their youth, to sign up and be a welder, and electricians, et cetera. And so we find ourselves in that challenge. That hiring, of course, results in a relatively green workforce. Our on-boarding and apprentice programs are how we get a worker ready to go paint the fastest possible way, weld the fastest possible way, fit pipe, pull cable, all the very complex things necessary to be done in those complex availibilities. That is the day job work for my team, and we're trying to gather the very best from the apprentice schools that the shipbuilders and everywhere else we can find them. And then of course, we have not been famous for maintaining our bases, and our shipyards are just like that.

Over the last few years as budgets have tightened, we have continued to reduce gradually, the sustainment funding to all bases including the shipyards. And not surprisingly, the buildings are getting old, and we have significant infrastructure tail to go work on. There has been commitment recently to up our game on that and bring those infrastructure pieces to a better state, for better training, for better repair work, for better shops. And I think it very much parallels the shipbuilders' experience over the last few years, with a hesitancy to commit to the kind of infrastructure improvements, to really get those activities to a modern state. Then of course, the other answer is to look for opportunities to move work into the private sector.

I think on any given day, there's 100 to 200 people out of Newport News, maybe even more, sent to work at my four public shipyards. More out of Electric Boat working at least at the East Coast yards and some to the West Coast yards. And then we continue to look for opportunities to exercise the commercial, the private sector repair base, which although we probably don't have enough work to make it proficient, we need it to be capable in those cases where we accidentally break a submarine that doesn't fit into the shipyards, which we do occasionally, that they're ready to do that maintenance and we do look for opportunities to do that.

There is one point, which is a conversation we're beginning to have with Admiral Connor. There is a piece I think that we can look to, a resource that's not normally thought of at least recently, nin the ship's crews that are in the shipyards, and I know this is a sensitive topic. They'll be throwing rotten eggs at me here shortly. But what I observed, and what I observed when I was in command of USS KEY WEST was some projects went really well, and some projects didn't go that well, and many times you can connect it directly to the engagement of the ship's leadership team and the crew in the maintenance. Our principal job while the ships are in the shipyard, at least for the last 10 years, has been to go train for your war fighting mission and let those ship repair guys go do it.

But if I go back into my history in 1985 at Puget Sound Naval shipyard, we were standing fire watches, we had a full load of ship's force maintenance, we participated in every part of the test program. And so one of the ideas that's out there is I need to at least normalize the ship's engagement in these availabilities, because it is clear to me, as I watch it, that there is a disparity between ships getting the exact same resource. And that could be connected to the ship's engagement in that maintenance. And so I look forward to that conversation. And I use this friendly audience because I know you won't throw me out immediately. So that's the sort of the baseline where I think we stand with respect to Submarine Force.

There is a new area. Many of you have heard me start to talk about it. We have just recently revised the strategic business plan, in fact, it's not even published yet, to reflect a growing threat, and I know you hate to hear the words cybersecurity, but it's cybersecurity from a slightly different perspective. We all know and hear sort of every day about the threats to our networks. Some of our vendors have had challenges there, some of our large industrial activities; the government has had its networks under fairly continuous probing and attack, careful to use that word, attack, from various places around the world.

What we've begun to recognize, and so there's a lot of work going on there, a lot of the government's activity is going out there to protect those networks and to figure out how to extend that

protection to our industrial base. The threat vector that I want to talk about is not that one, it is the threat to our control systems. And we're just now starting to hear the inklings of it. And I'll give you a very simple example of what I'm talking about.

I think it was now 10 weeks ago, some young, enterprising hacker, decided to take the project for himself to get into the OnStar system, the satellite system that talks to a car, and get through OnStar into the chip that's operating a 2013 vehicle. You say, okay, so my radio's not going to work and my navigation system will be kind of messed up. Well, not exactly. When you crawl down and look at the gas pedal in that car, there's no linkage to a carburetor or a fuel injector, it's a sensor that sends a signal to that chip. So you go look for the master cylinder on the back of the firewall, nope. Again, another sensor that goes all the way to the brakes. And so he was able to hack through OnStar, get into a car and activate the brakes from his desk. So you say, well, that's a car, you know, how...Okay, so we think of ourselves as we've got a nice hard shell around our ships and all that crypto and all those fancy things. Not so fast.

Many of the diesel engines in our Navy have a chip that runs Windows XP. But you're okay, because it's just in the control of the diesel. Well, not exactly. We really like the data coming off it to be able to display it around the ship and keep track of what's going on with the diesel. So it's in the machinery control system. Whew, well, at least it's not off the ship. Well, not so fast. We really like to have that data off the ship so that somebody off the ship can do the trend analysis and tell you when the bearings are going bad and when you need to change the oil. And so it's on an unclassified network in one of my warfare centers undergoing data analysis and it got off the ship automatically.

Okay, we're just like that car, just like it. Now there's some things that we can do relatively quickly to provide reasonable security to those systems, but ultimately, we're going to have to decide, and that's really what this is about, is that our control systems need to be built to be secure in this environment, which will be the way it is for the rest of time. We've opened a new era of warfare and it ain't going back in the tube. It's not. And so

while we take the time to design our systems to be able to be secure, we've got some work to do.

The pillars of what we're going to do in the short term, is (1), get people, get them the clearances and get them the training, so they even know what we're talking about. The National Institute of Standards actually has done a good job of developing standards for what you do for information systems and what you do for control systems, industrial control systems. That standard lets you know very clearly that this is harder than just I.T. systems. When you're doing an I.T. system and your screen blanks, you don't get your email for a couple of hours, it's a nuisance. When the primary logic controller of your gas turbine or your diesel shuts down, you've got a real problem. And so patching one and the other and how you go and do that and how you protect it, those are all very, very important. So people, clearances and training.

We have a specs and standards issue, but somebody's got to write those specs and standards so I can give them to the vendors and the shipbuilders and say put this in those systems so they're built right from the beginning. And then of course, we're going to come through how we're going to say that's safe, that's not safe, if you're allowed to operate that or connect it, or you can't operate that and connect it. So we have a lot of work to do on that. That's a growing area. It's an area you'll hear more about. And I'll tell you because you're also my industrial base. This is going to be something that touches pretty much everybody.

There's some really simple things, in what I call *cyber hygiene*. If you have a USB port on your computer that is not disabled, that's open, then you can plug in any device. A sailor looking for a place to plug his cell phone in and get the text from his wife, is the biggest insider threat you got. He violates every piece of security from every piece of crypto by plugging that phone into that USB port. So those kinds of things, what I'll call *cyber hygiene*, we just have to get on those and we're working to go get those things out. I want to close with a final thought; and I'll pose it as a juxtaposition. It comes out to me every day. The juxtaposition is made between compliance and innovation. We can make a clear case in this business for both. The case for

compliance is because we have nuclear weapons, we have nuclear reactors, we have enough explosives to blow the ship up; being operated by a bunch of 20 year-olds. That's a case for compliance, all right.

The case for innovation is made because of the Chinese Submarine Force, the Russian Submarine Force, the Indian Submarine Force, undersea sensors, new weapons, better and better surface sonars, et cetera. And so we find ourselves in that juxtaposition and the answer's has to be both. You cannot operate submarines out of San Diego and Honolulu and Norfolk without compliance. And we cannot possibly be successful without innovation. And so this is where I think the CNO's words, bold and accountable leadership apply. Bold in that you're innovative, accountable in that you've taken into place your compliance. I know that this is the leadership that knows how to do this. I see those challenges in front of us and they're clear. And they have to happen without somebody tossing you a bunch of bull.

Thank you all very much.

2014 ANNUAL SYMPOSIUM
NAVAL SUBMARINE LEAGUE
22 OCTOBER 2014

RADM DAVE JOHNSON, U.S. NAVY
PROGRAM EXECUTIVE OFFICER FOR SUBMARINES

Thank you very much, John.

All right, so good morning. This is my fifth time getting to address this crowd, and as your program executor for submarines, as John noted, I've been doing this for a while. I took over as Virginia program manager in 2005, and that was after slaving away for two of my mentors, Steve Johnson and then Tom Eccles to get JIMMY CARTER delivered, that ship was still one of the coolest things we've ever done as a nation. But it was a great experience getting ready to do the tough work and getting Virginia's back on track and also then getting ourselves prepared for the next big challenge for our industrial base, which of course is called Ohio Replacement. But for the now, I think we have had what I would call an exceptional year for our business, and it's probably been the most successful since I've been the PEO starting in October of 2010.

And we've seen Department of Defense, and I'll say Big Navy, in Congress's recognition into the value of what our undersea systems bring to our national defense. If you just look at our budget and the support that we've gotten; two per year Virginias for as far as we can see through the FYDP locked up in a multi-year procurement contract, we call that the block four. Also fully funding the research and development for Ohio Replacement in a very tough competing environment, and starting a recapitalization of our torpedoes, probably the only naval munition that is in the plus column and not the minus column. So, I think undersea dominance, undersea warfare, respect for the credibility that this team brings and our ability to deliver, as I tell my folks, what we see when we say it and for what it's going to cost does bring you

credibility in this tough acquisition game that we play every day. A full contact sport. In my discussion today, I'll highlight some of the areas Team Sub has been working on. Expanding undersea dominance, which is the theme for this conference. I will start with the best platform.

Now, my Team Ships friends say, "Hey, now, what about DDG51?" Well, I still think Virginia's topped that, but that's always a friendly tussle between me and my PEO Ships friends, and what we're doing to keep this DoD best acquisition benchmark ever-improving and ready for future adversaries, I'll spend some time discussing payloads, growing longer arms in the words of Admiral Connor, and the Undersea Dominance Campaign Plan with Torpedo Restart, our universal launch and recovery module, and the dry deck shelter extension and the modernization of that. And then we'll change tack a bit and discuss our model for rapid acquisition and give you some objective quality evidence.

Today I'll tell you about our low profile photonics mast work that Captain Debus and his team have pulled off, and the work that Moises Del Toro has done in the anti-torpedo business protecting our CVN fleet. Truly eye-watering performance. And then I'll finish up with Ohio, our future, and the planning for the next SSN, which we should not forget. At the end of the Ohio build, we have to build something after Virginia, and right now it's cleverly called SSNX.

First up, the Virginia class. Now, you may have recognized that on the 12th of October we had a significant milestone. That was the 10th year since we delivered USS VIRGINIA, and it has been without a doubt a decade of excellence since. In that timeframe, we have delivered 10 ships since VIRGINIA delivered. So we just are going to commission the 11th this Saturday.

We reduced our build span by two years as part of our two-for-four-in-12 program, and we've delivered over four years of additional Virginia class service. Four years that the fleet gets to use submarines before they thought they'd get them.

We reduced our ship costs by 20 percent, one-fifth, and we did that while we were building a ship class. We were adding

content, reducing span, and reducing cost all simultaneously. No one thought we could do it.

We reduced total program cost by over $4 billion, and that is reflected in our selected acquisition report. Numbers are solid. We improved the quality and the completeness with every successive ship. It's without a doubt that the 784 was our most complete and highest quality ship, and I will show you some objective measures that prove that.

But, what's most important to Admiral Sawyer and Admiral Connor is, *can I use it*, and is it *a mission-ready ship at delivery*, and they are. We've open architected the payload capability with the Virginia payload tubes, and frankly, our open architecture submarine warfare tactical federated system, SWFTS, allows us a true *plug and play* capability for modular payloads. We've delivered ships with modern combat systems. 2010 for the first four ships of block three and 2014 technology. And so think about it. We contracted in 2009 for a ship with a 2014 combat system in it. If that's not a statement of interface standards and open architecture, I don't know what is. And I can tell you that the folks at GDAIS, the folks at Lockheed Martin and others are a bit sweaty because they're delivering stuff for that 2014 combat system this December at the COATS Facility at Electric Boat. They're the lead. We haven't been in this position. A bit sporty, I'll say, but we're heading in the right direction.

This program office was awarded multiple times, including the 2008 David Packard Award, and I'll talk later that I think potentially another one is on the horizon. But most importantly, these ships have conducted 14 deployments to frontline missions. This is an outstanding story that we should not forget to remind others about, and for which this audience should feel justifiably proud. So, a round of applause. Well done.

All right, next. That's the most fun part of the brief. Okay, now to the business. Blocks: we buy our ships in five-year increments that matches the multi-year procurement contract span limits that's in law. Ships from block one and two were essentially the same configuration. We worked very hard early on getting the requirements right. If you look at VIRGINIA, the operation

requirements document for that ship was really solidified in 1993, signed in 1994, and has not substantially changed in now almost two decades. And that is because we got it right. We worked hard, we tussled between the operational and acquisition community, and then stacked hands and off we went.

And we executed this thing called Virginia. You don't see a lot of change in our programs, and that's because we build flexible, adaptable programs on platforms, but also because we work hard up front to get it right. So block one and two essentially the same, VIRGINIA to MINNESOTA, 774 to the 783. And we focused on improved construction performance throughout that block, injecting block three strategy improvements and cost reduction items incrementally as we went down from 84 months, 86 months for VIRGINIA, down to just over 60 months for the last ships in block two. Stunning performance. If you look at the ship delivery spans, we delivered essentially from HAWAII, that would be ship three, with a small blip for two months for the 777, which I'll say delivered on time because it would have, and then all the way through the 10th ship. All early, all under cost, and all, each one, better and more complete. So in block three, that's the 2009 to 2013 authorized ships, a 20 percent re-design that included inserting the Virginia payload tubes and the large aperture bow array, and a host of other acquisition and life cycle support changes like high solids paint in the main ballast tanks that resulted in not only acquisition but operating and support cost savings. We just delivered the first ship of this block, the NORTH DAKOTA, two days early to contract, and we'll commission her this Saturday up in Groton, Connecticut. The 2011 ships, we call them ILLINOIS and WASHINGTON, are the two-for-four-in-12 ships, the $2 billion in FY05 dollar Virginias achieved one year early. So really should have been two-for-four-in-11. In block four, we tackled reduced total ownership costs, RTOC, which improved our operation and support savings and squeezed availabilities and added deployment.

So we now get 15 deployments, the same as our Los Angeles class ships do. These ships continue the trend of reduced costs and shorter construction spans with 57 month ships or less. We're

getting there. 57 month ships later in the block. I think actually we are going to achieve that in block three, but we'll see. Block five, that's where we see substantive capability improvements, including the introduction of the Virginia payload module, the VPM. It's a validated requirement.

RDML Joe Tofalo and his team have done a great job of getting us a capabilities definition document approved by the Joint Requirements Oversight Council, and they did that almost a year ago in December of '13. It leverages the success of the Virginia payload tube work. That was block three. Developed for that ship class and existing multiple-all-up-round canisters currently in use back at our SSGNs. VPM (Virginia Payload Module) adds key performance parameters for strike capacity, cost, and schedule. We are the first guys really to get the cost, key performance parameters put into an operation requirements document. It was really an annex called a capability definition document, but it's in there, and we're living to them. Not only for construction, but also for design. It increases the Tomahawk land attack missile capacity from 12 to 40, that's a pretty good jump, without precluding future capability to host other missile systems in other combinations with a different interface configuration. Payload open architecture. Much like our predecessor class, the Los Angeles, Virginia class will continue to be updated to keep well ahead of the threat and adapt to ensure continuous undersea dominance.

Now, from a program point of view, delivering early is a substantial achievement, but what the fleet cares most about is capability and quality, and *is this early delivered ship ready for tasking*. We have the objective quality evidence that the answer is *yes*. The Board of Inspection and Survey, our independent assessor in the Navy, keeps scores on delivery and each shipyard has improved their scores with each delivery, and NORTH DAKOTA came in at 0.93. And believe me, Bob Bolden who's working on the 785, the JOHN WARNER knows that number, and he's determined we're going to do better than 0.93 on the WARNER. You talk about collaborative competition, that's it. These are proud shipbuilders, and it actually works out the best for the Navy and

for industry. But that 0.93, best SSN score in five years. Pretty amazing.

We see our grades on areas graded. So not only have we continued to do better at the test, but the test keeps getting harder every year. The number of graded areas are improving or increasing every year. NORTH DAKOTA is the second ship of the last three to get all satisfactory ratings. We would have gotten that on her predecessor ship if it weren't for one darn weapon simulator that we fixed on the spot. Now, as for the number of material deferrals. It's no good if I delivered early with a lot of what we call liabilities in this business, but we continued to push downward the trend for those, where the number of deferrals today is only about 10 percent of what they were at the beginning of the program. You see a slight uptick for the 84. That's the 20 percent redesign with some issues as we come through the first of, in that almost lead class—I've called it at the christening for that ship, the NORTH DAKOTA class because it was substantively different than her block one and two predecessors, but that's the right trend. And then finally, the one factor I think is the most important. How long does it take me to turn over a Virginia class ship to the fleet? Now, the early Virginias were tied up with operational tests and evaluation as we stamped out a brand new class of SSNs, but however, after that, we worked to accelerate turnover. And the key component is that you have to reduce the post-shakedown availability. How do you do that? You've got to deliver the ship with a modern combat system. It does not have to go into a post-delivery availability like we did with the previous 10 ships, and modernize them right out of delivery. That's not required anymore. That, by the way, is also another procurement Navy savings for which we don't even take credit, but it's real money that the Navy does not have to spend. But we also are shortening the post-shakedown period. So 12 months. That's our metric. From the time that ship delivers to the time it's in what we call the fleet readiness training plan, FRTP. We can actually probably do better.

Six years from when you strike an arc to when the ship is in the fleet commander's hands ready for workup and getting ready to

do its work. Delivering early, under cost, with first time quality. That's our standard.

Nine ships are under construction, including the first of the block four ships, which are the two FY14 ships. We just began construction of ship number 20, and that's the second FY14 ship on the 30th of September. We are full into the two per year drum beat. We've waited a long time for this. Let's see, where's John Casey? How many times did we listen to John stump for two a year Virginias? Well John, we're there. And we'll have two keel layings this year. We did the ILLINOIS and we have the WASHINGTON coming up in December. That's the 786 and 787. That trend will continue. We awarded the block four contract only five months ago, now six months ago really, at the end of April, and block four is the 10 ship. $17.6 billion multi-year procurement contract providing two boats a year all the way through the acquisition year 18. Multi-year procurement was a Congressional authorization and appropriation committee-supported effort. So we have great support in Congress. The contract has minimal design changes, increasing the availability of the ship and reducing the time it spends in the shipyard. It is the largest contract in Navy shipbuilding history. Simply impressive.

The team that negotiated this contract is the Navy submission for the David A. Packard Award for acquisition excellence. That would make the third Packard Award for the Virginia class program. Continued excellence. That's also a standard we expect.

All right, onto payloads. We're going to talk a bit about torpedoes. The third element I talked about is being very well supported in a budget. MK 48 mod 7. It's the US Navy's latest torpedo with advanced capabilities against advanced countermeasures, and which significantly improves torpedo performance in the littorals. The MK 48 mod 7 capabilities were initially introduced into the fleet by upgrading the guidance and control system of the pre-existing MK 48 mod 6 torpedo inventory. We are essentially in an inventory conversion business. That's how we get to the mod 7s. The last production of a complete MK 48 torpedo was more than 15 years ago, and some of you, some of the more mature people like Phil Davis will remember those days. But the Navy has

retained its current inventory of mod 7s by upgrading existing torpedoes. Now while these 48 inventories have drawn down, the Navy's inventory objectives have gone up. And that's why we need a production restart of an all-up round production contract that's expected to award in FY16. As the threat has continued to evolve, the Navy has begun exploring options for improving performance in traditional anti-submarine warfare and anti-surface warfare missions, and additionally expanding into missions such as long-range safe haven attack and covert mining with a family of 21" submarine weapons potentially evolving from the MK 48 heavyweight torpedo. With its long history of reliable performance, the MK 48 provides a solid foundation to build upon. The key to providing an affordable multi-mission platform will be the introduction of open architecture upgrades to the MK 48 as a technology enabler.

Advanced Processor Build 5 provides the first step to open architecture. In providing flexible and modular adaptable software necessary for implementing future upgrades. The first APB 5 has been completed and is scheduled for the sub launch in-water testing late October. So, this month. APB 6, tech insert one, it will build on that APB 5 modular software by adding significant capability improvements with a new 112 element array and transition of anti-surface warfare and extended range future naval capability upgrades from our friends at the Office of Naval Research and modularity improvements.

Now additionally, the APB 6 software will advance the modularity of the software itself to enable *plug and play* capability so that new internal devices can be integrated into the torpedo with significantly less effort. This *plug and play* capability enables a range of potential missions so that the next step has multiple simultaneous options which can be tailored to the hardware configuration of the specific unit being prepared at Pearl, Yorktown, or Keyport, our intermediate maintenance activities, by the demand signal of the fleet. For Admiral Davis and Dick Bonnen, they led a heavyweight torpedo restart and future modular undersea heavyweight vehicle review committee which concluded on 15 September. This was an outstanding effort by this group,

and gave myself and Rear Admiral Joe Tofalo a series of recommendations which today we're already moving out on to the next step. So, open architecture upgrades combined with the ongoing heavyweight torpedo production contracts will provide the path for inserting new technologies as they become available to meet the future undersea warfare weapon needs. So that's torpedoes.

Now, payload. Plug and play. You all are in the universal launch and recovery module (URLM). It's a prototype today configured to fit inside a specially designed C4 missile two canister, because that's what we had, and is totally self-contained within the missile tube of an SSGN. External power and signals are the only penetrations. The payload module provides large diameter ocean interface, pressure boundary, wet space, and maximum payload volume. The launch and recovery mechanism is housed within the payload module and provides mechanical advantage to hoist and pivot payloads up to 10,000 pounds, that's the prototype, and 30,000 pounds, which is tactical, which greatly opens the aperture for this unit. The payload support service module, PSSM, is dedicated to the hydraulic and electrical services, ULRM monitoring and control operations, standard *plug and play* payload interface and payload cradle command and control, and isolated payload control networks. You can hear a lot of payload, networks, *plug and play*. It's because we want to make this the home to house vehicles like large diameter UUVs or shallow water combat submersibles in this configuration. It will go either on an SSGN—if I had my vote, it'd be on a block three Virginia—this next fiscal year to demonstrate the at sea capability and build the foundation for subsequent tactical unit build.

Key is to establish a good interface control document to tie payload and deployment efforts together. This is one of two key large ocean interface efforts that we're undertaking at Team Submarine. The second is next. The dry deck shelter modernization project, it establishes a submarine large ocean interface. I don't like that acronym, SLOI, it sounds a little weird, but it is a large ocean interface capable of launching larger special operation forces vehicles, some of the work that we're doing today with our

friends at SOCOM, large displacement unmanned undersea vehicles, the LDUUV that's out of PMS406 in ONR and then testing and validating new concepts for launch and recovery.

We do this right and it should be relatively low risk. Captain Mike Stevens in PMS399, is leading this effort, and it's accomplished between four separate but related field changes. It was the most efficient way to press on with this change. This is ground breaking. It is co-funded by the Special Operations community and the Navy. We don't usually do that. And it will greatly expand our ability to host large payloads effectively.

Now I want to brag a little bit about rapid acquisition. So in 2011, PMS435, that's Captain Steve Debus' group, began developing a low profile photonics mast (LPPM) with a planned introduction in 2018, four years from now. The LPPM has a visual size. It's about the size of a type 18 periscope. The ISIS-augmented system, ISIS is the integrated submarine imaging system, well this is a nested acronym. Very clever. The IAS mast, which is also Kollmorgen, Lockheed Martin effort, L3 KEO and Lockheed, and an OMS 200, which is the other variant, 3 Phoenix with Cassidian, they were planned as technology prototypes to test different design approaches and technologies, and to foster competition to build a competitive market for Low Profile Photonics Masts. They had this thing called CLUSTER BIGHT it has been developed by the Office of Naval Intelligence. It's a special purpose photonics mast, and is approximately nine inches in diameter at the top. It deployed initially in 2011.

In June of 2014, COMPACFleet, Admiral Haney, identified an urgent requirement for a lower profile photonics mast, and determined that commencing in '15, Virginia class ships are required to have these to deploy. That resulted in a bit of a change to our plans. This time, we had to shake up our schedules to meet it. And it was necessary to convert these technology development prototypes into fleet deployable assets. Those of you in this business know that's no small deal. So to do this, we had to improve the reliability well beyond a prototype, develop logistics and sparing to support these all the way out to 2022, plan an install cycle that would support various configurations, TIO 2, 8, 10, 12,

14. Several baselines in the Virginia class throughout their deployment cycles, converting the OMS 200 mast to be on a pre-TI 10 baseline. That was not our plan. Procure enough, at least five, to support the fleet until the program of record low profile masts are fielded in 2017 through 2022, and not least, finding the money.

Now, working closely with SUBPAC and N97, we put a plan together, found the funds, prioritized the puts and takes, and brought it all together. These masts will go to sea in the second and third quarter respectively of FY15, and the plan of record low profile contract will be awarded in the summer of '15 with an initial installation in '17. This is rapid acquisition. This is an outstanding effort by Captain Steve Debus and his team to accelerate this capability three years. Outstanding. Could not have done it without guys like Jack Gellen, Matt Reiki, and 3 Phoenix to actually pull together with the industry and get this done. It surely shows what we can do when we work together.

I know this is a submarine audience, but we do work on things that protect these big flat things, called carriers. So now onto surface ship torpedo defense and the great work Captain Moises Del Toro and his team have done. The system reached a major milestone back in February when the first article deployed aboard the USS GEORGE HERBERT WALKER BUSH. That's CVN77. The countermeasure anti-torpedoes, that's a CAT, are located on the port sponson. The USS BUSH is now eight months into a scheduled nine month deployment with the first hard kill torpedo defense system. The first. Data collected from this, numerous straight transits executed by the BUSH and lessons learned in the crew employment will have benefit as we develop future systems.

Now SSTD, surface ship torpedo defense, is a different kind of program. We greatly streamline the acquisition process to get this onboard the ship, tested, verified before she deployed. We did at sea testing, and we did a quick reaction assessment on the BUSH before that ship deployed. It is a CNO priority, and required close collaboration between that surface ship torpedo defense team consisting of small business, Penn State and the

Warfare Centers to put this capability together. A great team effort on a program that has run through some pretty unstable budget environments. We did that all despite sequesters and CRs and furloughs. Yet, we still delivered a capability in 16 months from the time the CNO said, "I want it," and 25 months to get that on deployment. That's the kind of responsiveness and ingenuity we need, and is a very good example of what we can accomplish together. Now, what next?

The TEDDY ROOSEVELT has been outfitted with a slightly different variant, and this is pretty darn clever, than the BUSH—a roll-on, roll-off capability. It was necessary because there isn't enough time to complete an install similar to what we did on BUSH. ROOSEVELT will have added capability in an active component to her towed array. The USS EISENHOWER and the USS TRUMAN, they're the next CVNs to be outfitted with a torpedo warning system and a countermeasure anti-torpedo. EISENHOWER will get a roll-on, roll-off installation. However, TRUMAN will get an engineering development model install similar to BUSH. Each of these systems should have incremental improvements as they deploy. Now so this rounds out my section on velocity to the fleet. Low profile photonics mast, I didn't talk about TB29As. They fit in that also, our thin line towed arrays, and the anti-torpedo defense systems. We know the fleet needs these capabilities, and we are simply pulling out all the stops to meet the demand. And I offer this as great work by my program managers to get this critical work done.

Now to the last but not least, Jack Evans and his Ohio Replacement team. The next generation SSBN. We do call it Ohio Replacement. Some day in the hopefully not too distant future, we'll have a more appropriate name than the replacement for the Ohio class, but for now it fits. There's been a significant discourse by the Navy, both by senior Navy, Department of Defense, and Congressional leaders about paying for Ohio Replacement. There's no question, a ship of this capability and cost will impact the Ship Construction Navy (SCN) budget, from FY19 to FY35. Just look at the budget. Jack Evans and his team are acutely aware of this fact and are pushing in all areas to drive down the cost, in

engineering and design, in construction, and in operation and support. This is a tough problem that will require the Navy and our industrial partners' best efforts. Just listen to what Admiral Richardson talked about yesterday.

We'll move the capability definition document (CDD), to the Joint Requirement Oversight Council this spring, and at the end of '15, submit a request for a proposal for the Ship Construction Navy design contract. Milestone B is not far away, occurring in 2016. So this program, after I talk to you, you'll get the distinct feeling we're moving.

What Admiral Richardson discussed yesterday about alignment is our holistic plan to deliver a capability. Sea-based strategic deterrent is a capability. It's not a platform or a missile or a reactor, it's a capability. And we have to have our funding fully committed even though we have to face things like continuing resolutions, like sequestration, or worse. Strategic weapons and in our efforts, along with the PEO they must stay aligned. The ship propulsion plan and switch developments, we are synchronized to deliver a ship that's ready for deployment on its first patrol in 2031.

We also have to be mindful that any delay also impacts our partners, the United Kingdom and their ability to support the Successor SSBN, especially important this year as the UK works to what they call Main Gate, equivalent to our lead ship authorization in 2016. The basic premise is unchanged. There really is no margin for delay. Ohio replacement is STRATCOM, Strategic Command's, number one modernization priority. It is the most enduring leg of the triad, and is backed by national support. It will carry, without a doubt, about 70 percent of the operationally deployed nuclear warheads going forward. This is our country's strategic deterrent capability.

FY15 is a crucial year in the design of the Ohio Replacement. The pace of design has picked up immensely, as Will Lennon will tell you, and as will Jack, over the past two years and will continue to increase through 2018. In '14, the design products alone doubled over the efforts completed in '13. The Navy has worked closely with Electric Boat, the design yard, over the last

year to get our collective teams on pace to meet the increased design product demand signal. As Admiral Richardson noted acutely yesterday, no one should be sleeping comfortably at night. This is tough stuff. People shouldn't be asking us, "Hey, do you really need all that money?" People should be asking us, "Hey, can you do it?" because this is tough work ahead, and I can see it in some of the faces out there. Guys like Roger Sexauer or Jeff Geiger and others, this is tough business. We have to achieve a better than 80 percent design complete because we have to build this thing in 84 months, two months shorter than we built Virginia, and we have to deliver this thing in the water by 2028. That leaves us three years, a mere three years to test, certify, do a post-shakedown availability, get it to King's Bay, load it out, and have it on patrol by 2031. Pretty daunting challenge, but very doable with this industry.

I want to tell you about some of the good things we have done in the last year since I talked to this forum. I'll also give you some update on some critical ongoing efforts planned to be completed in the near term. So we set the requirements for the sail in September of 2013. We set the ship length, and those of you in the submarine design business know that's pretty significant because now you've set basically the buoyant volume of the ship, now you've got to manage weight, and we certified 159 sections of the ship specifications in March. One of the last things that Captain Bill Brougham did during his tenure as the Ohio Replacement program manager was just truly outstanding work.

So the upcoming efforts; we're about to award a missile tube contract for 17 tubes. It'll happen next week, maybe on the 27th, and that will be for 12 United Kingdom tubes, four First Article quad pack. Those are basically the first tubes for our submarine, and then one to go down to the Port Canaveral life cycle test facility that is a joint effort between SP and PEO SUB. It's a big deal. Over the past four years, we have competitively reconstituted the missile tube industrial base, which has been dormant since the 1990s. We'll also complete missile compartment arrangements, and we're in the business of doing missile compartment arrangement reviews all the way through this year and next to support not

only the US but again the United Kingdom's Successor first of class submarine, which is on patrol about three years before we are. We'll complete this week, it's happening right now as we speak, the ship control system concept of operations exercise, COOPEX, and it's at EB using crews from USS WEST VIRGINIA and from the pre-commissioning unit ILLINOIS with evaluators from the Strategic Systems Program.

This COOPEX is the start of a three-year three-phase effort, and Ohio Replacement will be the first SSBN with a *fly by wire* ship control system, and the first US Navy nuclear submarine with X planes. A steering configuration we haven't seen on a submarine since ALBACORE. So a little bit of another new effort. So that gives you some idea of some of the progress we've done in the program efforts as we're heading towards milestone B in 2016, and our requisite 83 percent design completion at construction start. Real progress on this national program.

Now, the ship is a blend of re-use, like the Trident II and D5LE, life extended strategic weapons systems, and we also have innovation where we need to either adapt systems and components like the propulsor or design new like electric drive to meet our challenging requirements. And I'll just show you a few here.

You have X Stern to achieve Ohio-like maneuvering capability, electric drive, our integrated tube and hull construction so that we can actually drive about 15 months out of the construction schedule, shaft life and change out, shaft going 12 years means one SSBN does not have to be bought. That's $20 billion savings right there. Life of ship core, as Admiral Richardson noted, $40 billion savings over the life of the program. So significant R&D efforts for engineering integration so we can meet the challenging requirement that an SSBN has to have. 124 patrols in the same cycles that we do today with Ohio.

I'm going to finish with a look to the not too distant future, replacing the Virginia class, which we call SSN(X). The current long-range shipbuilding plan is for a new SSN authorized in 2034 in lieu of the eighth block of Virginia class. 2034 may seem far off, but the designer research community needs to take action now. The AOA will likely be in 10 years, like 2024, and it leaves only

nine years to identify, develop, and demonstrate any significant long-lead technologies. So I've chartered a small team to propose a way ahead in the form of a five-year plan with an annual drum beat, which will involve many of you. Now while not final, the early projections are we need to estimate the environment the SSN(X) is going to live in out in the 2050 timeframe, and Karl Hasslinger has just completed a 2050 seminar. Regan Campbell did the same thing for a visioning conference. We're in the business of trying to figure out what will we have to be facing in those timeframes and what technologies might be necessary to counter that threat. We're going to start concept studies to explore capability cost and tech trade space, identify potential candidate technologies in the S&T community early enough to sufficiently mature. We had a time critical science and technology for Ohio replacement. I'd like to make it a little less time critical for SSN(X). Emphasize integration and interim operability, especially with off-board systems. That came out in the 2050 studies. And take full advantage of ongoing cyber awakening, and ensure we cultivate, not insignificantly, our people, our processes, and our tools. We have to be ready. We're going to be working with many of you on this and welcome suggestions, and we look forward to briefing you as we go ahead.

I know I'm about seven minutes over, but in summary, there's never been a better time to be in the undersea warfare business. I've given you some of the high points. Having not touched on many of the areas we made significant progress on such as common sonar with our surface surveillance systems, advanced surveillance builds, submarine rescue transfer under pressure, JIMMY CARTER, major modification. Payload control system RFP and modernizing our electronic surveillance systems and setting up the Submarine Force for future non-kinetic capabilities. Today we're not in the same budgetary predicament we found ourselves in last year with the government shutdown, sequestration, and potential year-long continuing resolutions. We do face, however, uncertain times. Despite these challenges, I'm ever-impressed with what our Navy-Industry team can do. Take NORTH DAKOTA on sea trials for example. The first of a block

ship, which might as well be as I said first of a class, with 20 percent design change from block two, and she still delivered early to the contract date. Absolutely eye-watering. We can never rest, though. If we are to remain the world's premier undersea platform, we must keep improving. We'll be facing tough potential opponents. One only has to look at the SEVERODVINSK, Russia's version of an SSGN. I am so impressed with this ship that I had Carderock build a model from unclassified data that Huntington Ingalls, Newport News provided, and placed it right outside my office in the common area, a spot I walk by every time I enter my office, just so myself and my team never lose focus on what we're facing. The model is right out there next to the registration table. And that one goes to Joe Tofalo. So Joe, there's your present. But don't forget the other guys. They get to vote. The rest of the world's undersea capability never stands still. Thanks for the opportunity to speak with you today, and I look forward to the work ahead. Thanks. Okay. All right, I'll answer a few questions.

Speaker 4: My understanding is the turning radius of the VIRGINIA is a little more than we would like.

Dave Johnson: Yep.

Speaker 4: On block five with the increased length, is that problem going to be exacerbated?

Dave Johnson: It will if we do nothing about it.

Speaker 4: Are there some plans to do something about it?

Dave Johnson: Yes. It could be as simple as increasing the rudder throw to 45 degrees. That creates some arrangement issues in the engine room because you don't really have the length in the ram to extend that. We looked at potentially doing the X planes on that, which is a significant design change and will add costs, but yeah.

We recognize we have to do something. So a very good, astute observation. Thank you. Hi, Lee.

Lee: Hi. How's it going? My question is about the continuing resolution. Is that impacting the design of the Ohio Replacement right now?

Dave Johnson: No, it's not.

Lee: Okay.

Dave Johnson: And the reason it's not is because the Navy has been very good at supporting the cash flow requirements for the Ohio Replacement. So we have the funding necessary to award the missile tubes that I talked about and keep up with the pace of design. And so I couldn't be happier with Admiral Mulloy and his team to keep the Ohio Replacement on pace. We've told him the impact if in fact we have to live to I'll say a traditional continuing resolution limitations, and again, Jack Evans is the master and we've been able to convince the Pentagon that we need to keep funding this thing despite the continuing resolution.

Lee: Great. Thanks.

Dave Johnson: Yep.

David Larter: Admiral, I'm David Larter with Navy Times. I'm wondering how the design considerations are coming along for the attack boats and the Ohio Replacement for incorporating berthings for female sailors and officers.

Dave Johnson: Ah, that's a great question. So Ohio Replacement is being designed to fully accommodate mixed gender crews, enlisted and officers. For the Virginia class, we actually have the capability to do that for the officers, and we're also right now doing the work to do the design changes necessary to do that for the in-service Virginias as well. Frankly, the tough part is to try

and integrate the enlisted berthing and the chief's quarters. The officers are fairly easy to adapt to, but for the enlisted berthing and the chief's quarters, you have to do a little bit of work on the ships, and we're trying to do that as affordably and non-disruptively as possible. So we are looking forward to mixed gender integration, both officer, chief petty officer, and enlisted in our submarines going forward. It's a must. It's the right decision. And we're moving ahead.
John Padgett: Anything else?

Dave Johnson: Any other questions? Yes sir.

Speaker 7: A lot of interest in the Arctic in the 1980s and not much lately, but can you comment on how NEW MEXICO did with Virginia class design for Arctic capabilities? I know she was up there. It was advertised as a success, but didn't hear a whole lot of extra.

Dave Johnson: And so you expect me to say something different?

Speaker 7: Yes.

Dave Johnson: You can ask Admiral Sawyer that question, actually, as the operator how well that ship did. These ships are Arctic capable, and they do very well in the Arctic. Okay. Appreciate it. Thank you.

2014 ANNUAL SYMPOSIUM
NAVAL SUBMARINE LEAGUE
22 OCTOBER 2014

RADM JOE TOFALO, U.S. NAVY
DIRECTOR, UNDERSEA WARFARE

Admiral, thank you very much for that kind introduction, and a special thank you to all the of the Submarine League leadership, Admiral Mies, Admiral Padgett, Tim Oliver. I greatly appreciate the opportunity to be here, and I'm also very grateful for your leadership in providing this venue, which is extremely important to allow that interaction between industry and the government. You saw all the program managers that were just up here. It's really great stuff. So I appreciate that. I would like to also echo my classmate Phil Sawyer's recognition of all the folks up here. I'd like to have a round of applause for everyone from industry that is here. We absolutely could not do what we're doing without the commitment of the great Americans that are in industry and supporting this. So my hat is off to all of you. I want to point out the 20 Naval Academy midshipmen that just walked in. Why don't you ladies and gents stand up. So there's the future of our Navy right here, and I'm sure there's a couple of submariners in the crowd.

Yesterday, Admiral Richardson talked about synchronizing the message. So my remarks this morning are going to be about the Integrated Undersea Future Strategy (IUFS). It's the bedrock foundational document upon which we do that synchronization. I had a lot of people since October come up to me and say, "Hey, very impressive. You guys are really right on message. It's clearly well-synchronized." And I'll be honest with you, that didn't happen by accident. We work at it, and its efforts like the IUFS that helps that. So it's really important to me that you understand that. I'm going to take my time this morning to talk about it. Admiral Richardson talked about commander's guidance and getting the

message out. He challenged all of you to go out and interact with folks, whether it's calling on your own Congressmen, or if you belong to some organization from the Chamber of Commerce to the Rotary Club. I am committed to help you do that. If anybody needs help in strategic messaging, then you call "1-800-N97" and let us know. Commander Martin Sprague, would you stand up? Go slip him your business card on a break, and if you need trifolds, priorities briefs, talking points for your Congressman, we are more than happy to support you.

Now, another thing that Admiral Richardson talked about yesterday was the six-factor formula, and I know Admiral Donald and Admiral Bowman are looking at me right now. So I thought it would be appropriate to give you the N97 perspective on the six-factor formula. As you know, sequestration is going to hit one of the factors. Admiral Richardson accurately alluded to that.

The IUFS is organized into five pillars - platforms, platform enhancements, payloads, posture, and people. It is the document we use to align our undersea warfare strategies with the Navy and national objectives. It's an internal SECRET level document only really accessible from within N97. So, if you are a Distribution List-D cleared contractor and have access to a CAC (Common Access Card), you will be able to download an industry overview version of the IUFS. The IUFS is a 200 plus page document. I've distilled it down into five pages to describe where N97 is going and what our priorities are, our integrated undersea future strategy. I want people to know where we're going. That shouldn't be part of the mystery. Okay, so the website address is https://usff.portal.navy.mil/sites/csl/stratcomms/default.aspx, and we'll go from there.

The IUFS has been around for a while. It served us well in leadership transitions, and I think the results speak for themselves when you consider the fact that everyone from POTUS to Congress to DoD, DoN are really in line with our priorities. The priorities are listed. OHIO Replacement is number one followed by building Virginia class at a rate of two per year. Next is getting the Virginia Payload Modules (VPM) starting with block five VIRGINA and beyond. I add a fourth priority because it's

something we really want to get going on. That's the heavyweight torpedo restart. Dave Johnson alluded to that a little bit in his remarks. In the end, the IUFS is all about prioritization, alignment, communication.

The Undersea Dominance Campaign Plan (UDCP) has six lines of effort, and Admiral Connor talks about the UDCP a lot. He talks about these six things: own the best platforms, grow longer arms, beat the adversary systems, defend the undersea base, getting on the same page, and getting faster. That has all of the things that are both *to* and *from* the undersea domain. There are multiple resource sponsors involved, N2N6, N89, N95, N96, N97, N98. What's different about the IUFS is that N97's approach addresses the investments that are *from* the undersea. So the UDCP kind of does both the *to-from* thing and the IUFS is just about the *from* part. The UDCP is essentially the blueprint for what needs to be done, and the IUFS is about how N97 will address that *from* part. So I'm going to build this concept out a little bit. There are the five pillars of the IUFS that I mentioned earlier—platforms, platform enhancements, payloads, et cetera, and the same six lines of effort that we just talked about from the UDCP. Now, some of those connections are very obvious, like platforms. As we work through this, I'll show you how a lot of the IUFS has multiple touch points with the UDCP.

So here's the platform part. Obviously, they're our largest financial investment, and a lot of the early IUFS work really focused heavily on trying to address the significant platform challenges that we were going after. Let's face it; platforms are the biggest rocks, so we need to put those into the jar first. You also see the heavy emphasis on that prioritization that we talked about, the Ohio Replacement and maintaining that strategic deterrence in those first two blocks, and of course Virginia class, two per year.

All right, platform enhancements. We used to focus primarily on payload volume, and recently we broadened this pillar to reflect additional platform improvement efforts such as modernizing and maintaining acoustic superiority in light of next generation threats. Consequently, this is kind of the second biggest chunk of rocks, and therefore, we need to put them into the jar next. Owning the

best platforms includes being flexible and responsive to support the capacity and capabilities required of future operating environments and threats. The connection between the IUFS and the UDCP is much broader than it is on the platform side. From the standpoint of owning the best platforms, platform enhancements is the pillar that really puts the best capabilities in the best platforms. Platform enhancements enable all the things like grow longer arms, beat the adversary systems, et cetera, and then it provides the tactical systems that allow you to get on the same page. Payloads are one of the big focus areas for the next revision to the IUFS. Again, the full IUFS is a SECRET-level government internal document, so that doesn't mean as much to those of you in industry. But this is where we're putting a lot of work because a lot of the spade work for platforms and platform enhancements has been done and it's time to really hit the payloads part a bit heavier. I think you're all aware of Admiral Greenert's emphasis on payloads from his *Proceedings* article. I'm going to talk a little bit more about the payloads in a minute. So I won't dwell on each one here, but I would point out that payload development is something that requires a lot of partnership and a lot of teamwork. For example, we have to work with N2N6 who is the Resource Sponsor for Large Diameter UUVs. When it comes to pursuing advanced missiles, we have to coordinate with the surface folks in N96, the aviators in N98, and even the Air Force, because we all have interest. Coordination adds to the complexity of the process, but we're working that very hard.

Finally, posturing and people. I'd be remiss if we didn't acknowledge that these are also in the mix. At the end of the day, the only thing a submarine is capable of doing by itself is sitting next to the pier and rusting. So, if it weren't for the people, we'd be nothing. Relatively speaking, I don't have the major near-term investment pull from these two pillars, so I'm not going to dwell on them in my short amount of time here today. So there are investments that I'm going focus on a little bit more, and these are also the things that are going to get the most attention in the next IUFS update that I was telling you about. I would also add that these are the areas that require industry expertise to move from a

concept or basic design, towards a capability that we can use to maintain undersea dominance through 2025.

So let's discuss briefly the platform enhancement piece. VPM and the Acoustic Superiority Program (ASP) are the two most investment intensive aspects of the platform enhancement pillar. RADM Dave Johnson went into the VPM quite a bit. I'm not going to get into the details, but the bumper sticker is—you get greater than a three times increase in firepower for less than 15 percent increase in the cost of the ship. A fantastic selling point for this very, very vital capability that we need when the SSGNs retire. When the four SSGNs retire in the mid to late 2020s, there is a 60 percent reduction in our undersea payload volume. VPM is the answer to that. It is a huge enhancement.

Then there is acoustic advantage. USS SOUTH DAKOTA is a test platform for three crucial aspects we're working on for acoustic superiority. The first is improved sensors. The second is an improved submarine coating. Third, there are a dozen or so noise reduction initiatives we'll be obviously pulling through to the rest of the Virginia class and into Ohio Replacement as appropriate. These are very, very important. It's my intention to pursue all of these acoustic superiority technologies on in-service and future SSNs and SSBNs. You will read in our industry overview that that's where we want to go, and we're leaning very far forward to do that. The degree to which we are able to do that is going to be a function of budgetary pressures. The Submarine Force is the key that opens that Anti-Access Area Denial (A2AD) lock. We're the folks that are expected to get in underneath, and at the time and place of our choosing, do what needs to be done. A significant part of our ability to do that relies on our acoustic advantage. Acoustic advantage translates to tactical advantage, and in the end, be able to put green metal (torpedoes) on black metal (adversary submarine).

Let's talk a little bit about the payloads. Tomahawk blocks three and four, the current inventory, are sunsetting in 2022. We'll be working that re-certification and upgrade process starting in '19. It adds some very significant electronic upgrades and about 15 years of life to each of those weapons. The Next Generation Land

Attack Weapon (NGLAW) capability assessment should complete this fall with the initial capabilities document completed in '15, followed by the Analysis of Alternatives (AoA) in '16. The Offensive Anti-Surface Warfare (OASW) weapon also has an AoA that's being updated. In general, I can see a future with a multi-mission missile commonality, not necessarily an identical missile from platform to platform. The surface warriors don't have that access that the submarine has, so the submarine may not need as long legs on the missile that the surface ship does. At the same time, they both need the seeker, the autonomy and the navigation. There's definitely multi-missile commonality without necessarily an identical missile. That's the kind of commonality that we're working for. Think of complexity in coordination we talked about earlier when it comes to this particular weapon system because it's N95, N96, N98, and even the Air Force. The heavyweight torpedo restart timeline is all there also, RADM Johnson already mentioned that. The bottom line is we've got a lot of things that are coming together. Between APB 5 software modularity, APB 6 hardware modularity if you will, the 112 element array, and the Future Naval Capabilities (FNCs) that are all feeding in, there's some great hardware that's all going to come together here in a critical mass, and we're excited about the future.

In the non-kinetic payload roadmap we have project 1319. It's a Remus 600 vehicle that is going to be doing a real world mission soon. That's delivering a UUV used in a real world scenario to a commander, and we're very excited about that. The extended Dry-Deck Shelter (DDS) allows you to put an LDUUV in there. It also allows you to get a Shallow Water Combat Submersible (SWCS) in there. It not only gets you the additional 50 inches in length, but automation gets the diver out of there, which lets you use the full diameter of the DDS. As for the Universal Launch and Recovery Module (ULRM), we've successfully completed the land demonstration. We are pushing hard for an at sea demo in the fall of '15. We want the ULRM to be able to handle the LDUUV. That's the prime target, but ultimately we also want to handle future SWCS vehicles. Having that vehicle on the ULRM will allow dual SWCS vehicle ops from a single submarine. You'll

have SWCSs in both the DDS and the ULRM. That's key. From a SOF perspective, you get a backup SWCS for one thing, but you also get a significant increase in your operations because you've got two SWCS that can work simultaneously or augment each other. Finally, there is the LDUUV. Think something that's about 22 feet long and about 54 inches in diameter. That's the kind of thing that we're going for.

So, wrapping it up here, the IUFS as I mentioned, hits those top three priorities—Ohio Replacement, building Virginia class at two per year, and the Virginia Payload Module. These are pretty well established, and frankly, the main challenges are fiscal. Of course, as RADM Johnson talked about, we've got to hit those costs and scheduled targets. Below our top three are things that we know we want to accomplish but frankly we're still figuring out how best to do that. The things that we can use help from industry on are endurance, modular capability, sensors, coating, energy, autonomy, targeting, commonality, and all that I've talked about throughout the brief. The IUFS and the UDCP are very much aligned. I'm looking forward to any feedback on the IUFS from Industry as you get it. This will ensure that we will maintain undersea dominance as we go forward into the coming decades.

So, for questions, the first question I want to answer, because I know Sydney [Freedberg] is going to ask me anyway, is regarding ORP oversight. I want to make sure that you clearly understand that there is a very, very vigorous ORP oversight process. We have a Flag Oversight Board (FOB) chaired by RADM Johnson, and he is the whip cracker. You asked, "who cracks the whip." I think Mr. Mulholland and Mr. Geiger, the two presidents of the two shipbuilding companies, can show you their lashes. He sends them letters all the time and tells them about performance issues, schedule issues, et cetera. So there's your *whip cracker*. Informally, that flag oversight board meets every Thursday in a teleconference. On a more formal basis, they meet about every two to three months face-to-face. On this Flag Oversight Board are Admiral Johnson, Admiral Tofalo, Admiral Benedict, and Admiral Richardson is represented by SES Karen Henneberger who was here yesterday. Admiral Richardson acknowledged her as a result

of her leadership award. Oh, and Jack Evans himself is also on the FOB. So, all the stakeholder SESs and Flag officers meet once a week informally, and formally quarterly. What else? Oh, you also asked about the chain of command, if you will. So given that RADM Johnson is the chairman of that board, the chain of command is very, very clear through the acquisition community. ASN-RDA Stackley, who is the Service Acquisition Executive in accordance with the DoD 5000 instruction. He works for Mr. Kendall, Under Secretary of Defense for Acquisition, Technology, and Logistics, and is the DoD Acquisition Executive, again, in accordance with the DoD 5000. I want to leave you with a very clear understanding that there is a very rigorous oversight process for the Ohio Replacement.

All right, other questions?

Speaker 21: Sir, could you comment briefly on what's coming down the pike and what can be done to ensure that we can operate credibly in the absence of or seriously degraded space assets?

Joe Tofalo: This is in our DNA, right? I mean, we're the guys who go out for entire patrols and never communicate. So from a communications standpoint, VLF is not the kind of thing that's going to be impacted by loss of communications satellite. Our ability to do navigation using the ocean bottom is well-known. So again, you're not relying on a satellite. So, already baked into who we are is the ability to not communicate and to navigate independently.

Speaker 21: I agree with you, but do we practice those things?

Joe Tofalo: Oh, absolutely. You bet. We challenge Commanding Officers to come up with different initiatives. I know when I was a group commander we had several COs that demonstrated the ability to go extended periods of time without any communication. I'm talking leaving the port not communicating. That’s in addition to the mission requirements. They also go extended periods of

time utilizing navigation that's not reliant on GPS. So, yes, absolutely. Great question.

John Padgett: One more.

Speaker 22: One of the things you discussed was a long-range tactical missile. Once upon a time, there was a thing called TASM. Is that a foundation for a long-range tactical missile?

Joe Tofalo: It's certainly a conceptual foundation. What that's going to actually look like, we have to allow the process to assess and determine what that's going to be, including the appropriate JCIDS wickets that it has to meet. From a conceptual standpoint, I don't think there's anybody out there that doesn't want to ensure that we have a weapon that will allow us to engage surface combatants.

Speaker 22: All right.

Joe Tofalo: Thank you very much, everybody. I appreciate it.

A NAVAL DISASTER IN THE MAKING
THE MISBEGOTTEN PLAN TO SHRINK THE U.S. SUBMARINE FLEET

by Mr. Seth Cropsey

Seth Cropsey, a senior fellow at the Hudson Institute, is the author of Mayday, an account of American seapower's current challenges. He served as a naval officer and deputy undersecretary of the Navy in the administrations of Ronald Reagan and George H. W. Bush.

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The US Navy's latest shipbuilding plan would see its attack submarine fleet diminish from 55 to 41 boats in the next decade and a half. That decision, confirmed in August, was eclipsed by the advance of ISIL, war in Gaza, and sedition in Ukraine. But the Navy's announcement—the single-largest strategic consequence of this administration's defense cuts—has the most far-reaching ramifications of the summer's events.

The United States faces the prospect of drawn-out tension leading to possible conflict on two fronts, the Middle East and the Far East. Of the two, Chinese ambition will require more attention. It is supported by growing wealth, expanding military power, and abundant patience. The challenges these generate are likely to remain a century from now. China's leadership, meanwhile, will confront a host of problems in the next 15 years—when the US attack submarine fleet will be a quarter smaller than it is today—including an aging population that can't sustain the optimistic predictions for China's economy.

As Nick Eberstadt notes, 15 years from now, because of the preference for male babies, 20 to 40 percent of rural, uneducated 30-year-old Chinese men will not be able to find mates—with large and unknowable possibilities for turmoil. Over the same period, competing regional markets' lower labor, utility, and rent

costs will becalm the expanding economy on which China's authoritarian leaders have justified their rule. A multitude of state-owned industries employing millions are already seeing the loans they need to stay afloat failing to perform; more could follow.

Equally troubling is a political class whose hegemonic ambition matches its contempt for international agreements. Consider the National People's Congress decision to renege on China's 1984 signed promise to allow Hong Kong's political arrangements to continue intact for 50 years. In August, Hong Kong's voters were told that they will select their senior political official in the 2017 elections from a slate approved by a mostly pro-Beijing nominating committee. At the same time, China's increasing challenges to many of its neighbors over territorial issues in the international waters of the South and East China Seas are nourishing a spirit in surrounding states that could mature into determined opposition. In short, China's internal pressures are mounting in parallel with external aggression.

China, however, possesses one advantage not of its own making. The chances that the United States will be there to organize and lead the states that fear China are dimming as the gulf between the ships the Navy needs and the ships it can afford widens. What China will have to show for throwing its weight around in the region depends on what the United States does to preserve its dominance as a Pacific naval power. On that score, the strategic importance of the Navy's decision to cut its attack submarine fleet by 25 percent cannot be overstated.

Beijing aims to keep the US Navy out of range of Asia. Its large investments in naval aviation, cyber warfare, a modernizing surface and submarine fleet, a fledgling carrier force, and a ballistic missile intended to sink or put out of service US aircraft carriers place at risk our bases in the region and interrupt our communication with allies. If wielded successfully, these measures will assure the safety of China's navy and mainland and end our run as the West Pacific's great power.

But China's strategy is vulnerable—chiefly to submarines. Subs are very difficult to detect and cannot be targeted by missiles while underway. They can demolish an enemy's fleet and their

cruise missiles can destroy targets ashore. As a hedge against China's anti-access strategy, submarines are matchless. Long-distance drones launched from carriers at a safe distance will eventually offset the dangers of China's ship-hitting ballistic missiles. Then it will be but a question of time until China adds to its missiles' range. So long as submarines remain stealthy, they bypass the age-old technological cat-and-mouse game of countering an adversary's technology and in turn being countered.

Because of its war-fighting abilities, a robust attack submarine fleet is also a highly persuasive deterrent against conflict itself. But the idea of deterrence is missing from Obama administration thinking. When a Chinese jet fighter approached within yards of a US Navy surveillance plane in international air space in mid-August, the State Department sent a disapproving letter. China responded that the United States must cease its patrols over international waters or face more dangerous encounters.

Notwithstanding repeated parallel incidents in international waters against US allies in the region over the past couple of years, China was invited to join the United States and those same Asian allies in an annual U.S.-led naval exercise the previous month. The plan for a diminished attack sub fleet is a broader expression of the Obama administration's hopeful idea—not shared by Chinese leaders—that there exists no strategic competition between China and the United States.

The president's refusal to build defenses, (or anything else that will maintain US power) harness them as legitimate instruments of international persuasion, and actually use them is—in conjunction with his skepticism about the morality of American leadership—as responsible for the growing international chaos as it is incapable of preventing its metastasis.

USS GEORGE H. W. BUSH, for example, which has been using a minuscule portion of its powerful strike force against ISIL for the past few weeks, was the only US aircraft carrier in the region. The two-carrier presence that the United States had previously maintained ended last year as a cost-saving measure and as an encouragement to Iran for a deal over its nuclear weapons program. The single remaining American carrier had

been patrolling the northern Arabian Sea supporting the withdrawal of US equipment from Afghanistan. Its departure for the Persian Gulf left a hole in the Afghan mission that could only be filled by ground-based attack planes—which are also scheduled to be withdrawn.

Meanwhile, Vladimir Putin's ambition for a reborn Russian empire is fanning blazes that begin in Moldova and reach through Crimea, Ukraine, and end—for now—in Abkhazia and South Ossetia. Turkey's Islamist president Recep Tayyip Erdogan openly supports Hamas, has facilitated the transit of Westerners crossing the Syrian border to join ISIL, and holds an international record for the number of imprisoned journalists.

The territory south of Asia Minor is in a turmoil whose end cannot be seen. All these lands are either joined by, or set back from, the Black Sea. The great power conflicts that overlapping areas of interest ignited in the mid-19th-century Crimean War and concentrated again, with bloody results, at Gallipoli six decades later are likely to engage American attention for years.

The paucity of carriers where they are—or might soon be—needed is a here-and-now crisis. But it is congruent with, and a harbinger of, the strategic crisis that will unfold if the political will cannot be found to build the US attack submarine fleet at a rate to assure, at a minimum, its current strength over the next three decades, as events around the globe point toward a darkening future.

THE OFFSET STRATEGY – WHAT DOES IT HOLD FOR SUBMARINES?

RADM Jerry Holland, USN, Ret.

Jerry Holland is a retired officer who has been a frequent contributor to THE SUBMARINE REVIEW.

Two recent announcements of U.S. strategy have great significance for the future role of submarines and the importance of the Submarine Force. The Pivot to the Pacific made explicit in the 2014 Quadrennial Defense Review was the first. The second was Secretary of Defense Hagel's declaration of an *Offset Strategy*: prominent in which was *undersea warfare*.

The geography of the Pacific region creates a battleground of long distances, difficult hydrography, gentle littorals and many islands. In this geospatial arena submarines have substantial advantages. The long distances of the Pacific make timely arrival and duration on scene problematical. Nuclear propulsion powers the ability to reposition quickly and without a logistics train: an incalculable advantage in any time-constrained situation. Adding the capability to redeploy America's total force of submarines on short notice places great stress on any potential opponent. Such an opponent must count on facing all active American submarines within weeks. In any crisis the first forces to arrive at the scene are of great tactical importance and strategic significance. When those forces are not only powerful but stealthy, the effect is multiplied by uncertainty in their location and strength.

This Pacific *tilt* of the national strategy relies on the Navy to execute such missions as likely to be required in both peace and in times of crises or war. While the Air Force is mentioned as a partner in this endeavor, there are not enough bases for the deployment of large numbers of aircraft nor are the available bases necessarily close enough to the probable scenes of action to allow employment of shorter range aircraft. Employing long range strike

aircraft based in the continental United States is possible but the support required for those deployments limits the numbers and duration of that effort. In short, American military influence in the Western Pacific relies almost totally with the Navy.

The potential peer competitor in this area claims to be developing an anti-access/area denial (AA/AD) strategy based on a suspected land-based ballistic missile that can target ships at sea. While the difficulties in creating and then operating such a system are enormous, the eventual deployment of such a weapon might threaten major capital ships (read aircraft carriers). But a strategy based on such a system is vulnerable to submarines. In the words of Seth Cropsey, an important defense analyst and former Assistant Secretary of the Navy,

> "As a hedge against China's anti-access strategy, submarines are matchless. . . . So long as submarines remain stealthy, they bypass the age-old technological cat-and-mouse game of countering an adversary's technology and in turn being countered.[1]"

While this recognition is well understood by those with submarine experience, the annunciation by a nationally recognized figure who has no investment in the Submarine Force signals the wide awareness of the asymmetric advantages of submarines now and in the future.

Following on the heels of the QDR's pronouncement on the importance of the Pacific was the description of a military strategy in which submarines are prominent. On September 3, 2014, Secretary of Defense Hagel warned that China and Russia are ". . . pursuing and funding long-term, comprehensive military modernization programs," to include fielding an array of capabilities "designed to counter traditional U.S. military advantages". Rather than wading into a symmetrical fight against those weapons the Secretary went on to promote *Off-set Strategies* – based on technologies and associated operational skills which impose disproportionate costs on any competitor; specifically

> ". . . key investments in *submarines,* cyber, next-generation fighter and bomber aircraft, missile defense, and special operations forces – putting a *premium on rapidly deployable, self-sustaining platforms* that can defeat more technologically advanced adversaries. *Undersea capabilities that can deploy and strike with relative freedom of movement and decision will continue to be a vital part of the mix."* [2] *(Italics supplied).*

Such a strategy was originally proposed twenty some years ago by now Undersecretary of Defense Robert Work when he was an analyst in the Center for Strategic and Budgetary Assessment. Even then Mr. Work was promoting submarines as the example of investing in weapon systems in which the United States possessed a clear advantage with a lead that could grow faster than a potential adversary could match. This *off-set* strategy, rather than matching one's opponent's strengths, seeks to impose on a potential competitor burdens that will require more time and resources than he can muster. The goal of such a cost-imposing strategy is not just victory in conflict but deterrence: making evident the costs and thereby discouraging competition and conflict.

The operational aim at the heart of this strategy is to position submarines in the coastal and near ocean areas of a potential enemy as a crisis builds and should war break out to quickly sink all opposing surface ships and submarines. War games have demonstrated the great advantage to "flooding the littorals with SSNs". In such exercises, the submarines' value is not as a land attack vehicle but as a sea control device. Properly operated, submarines become a national maritime resource, not simply a component of a Battle Group or the primary launcher of land attack missiles.

But this strategy has two potential pitfalls of our own making. The praise by surface warfare officers lauding submarines as the front line ASW forces, an outer ring defending the battle group, warps their understanding of a strategy in which the submarines

they praise would not be available or present. Properly employed, those submarines would be elsewhere, in direct contact with the potential enemy even before major surface elements of the Navy entered the battle space. This undersea dominance is a uniquely strong capability but flooding the opponents' littorals with submarines will be crippled if every battle group demands direct support submarines. The submarine's most valuable function is first destroying the enemy navy and then bringing all shipping to a halt. There will never be enough submarines to both provide direct support and thickly inhabit the enemy waters.

The second pitfall for faulty employment comes from the Joint Force Combatant Commander whose focus may well be on the battle ashore and the targets associated therewith. Combat Commanders may want subs positioned to provide land attack missiles for *theater purposes*, i.e. the objectives of the campaign ashore. But there can be plenty of sources of weapons to attack such targets. Submarines possess unique characteristics not duplicated by other forces. In a maritime strategy in which "sink 'em all" is the goal, the value of land attack weapons delivered by submarines designed for anti-submarine and anti-shipping roles is secondary to their primary mission. The combatant commanders urge to employ submarines as missile launchers to the detriment of their maneuvering for anti-shipping actions may limit the execution of their proper role. Submarines will need to be sheltered from becoming dedicated missile launchers when that task interferes with their primary role of maritime dominance unless there is some unique aspect of the weapon delivery that coincides with the submarine's characteristics, e.g. short time of flight or attacking from an unsuspected azimuth.

The operational military effort involved in this strategy is a return to Mahan's classic dictum that the first aim of the Navy is to destroy the enemy's fleet.[3] Before 1945 this meant major fleet actions but today any such fleet action is exceedingly unlikely and made more so by the ability of nuclear powered submarines to dominate the ocean surface. In future conflict, the enemy fleet will be widely dispersed and the most important part will be stealthy. Engagement will be defined by the ability to locate the individual

units and bring them to battle. The historical parallel is the cruiser warfare of the War of 1812 and World War I rather than the major fleet actions of Trafalgar or Jutland. But the goal remains the same: the first aim of a Navy in war is destruction of the enemy fleet.

Whatever the name, this effort is ***offensive anti-submarine warfare***. Naval officers most practiced in *offensive anti-submarine warfare* are generally submarine officers. To have a grasp of the pertinent issues involves understanding the vagaries of the underwater domain, then developing an appreciation for the wide variability in accuracy of information sources and gaining some notion of the employment of the various forces involved. As fewer opportunities to operate with submarines are available, the number of officers experienced in ASW declines and their individual skill weakens. Opportunities for major exercises are rare and in those that do exist the many artificialities necessary to structure the exercise detract from the learning experience. Though open ocean ASW is a team game that involves maritime patrol aircraft, long-range sensors, submarines and in some stages surface ships, the amount of interest, capability and time spent in the actual practice of ASW is overwhelmingly in the Submarine Force.

Undersea warfare involves a wide range of equipment and resource sponsors. Among the difficulties associated with such dispersion of management is that many of these equipment and resources are overseen and operated by people who are not familiar with the undersea environment. In this circumstance, the Submarine Force needs to act as the subject matter expert in building the architecture and designing the procedures to operate in this new era.

ENDNOTES

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[2] Secretary of Defense Chuck Hagel, Southeastern New England Defense Industry Alliance, Newport, RI, September 3, 2015

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LIFE EXTENTION OF THE *WALRUS* CLASS – FROM GOOD TO BETTER

by CAPT RNlN (Ret.) Pim Rozendaal and Dr. Ir. Carel A. Prins

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The Walrus lineage

Ask a Dutch submariner who first invented a submarine and he will name Cornelius Drebbel of Alkmaar, the Netherlands (1572-1633), who is rumored to have demonstrated his submersible to the English King James I in the 1620's. Ask a British submariner the same question and he will tell you that Drebbel borrowed the idea from the drawings of the Englishman William Bourne (1535-1583). In truth the designer of the first functional submarine is John Philip Holland from Ireland[1] (1841-1914). The story of the early endeavors to navigate below the surface up to Holland's success is filled with heroic exploits, half truths and hearsay if not fiction. The story of the submarine service of the RNlN begins when the Koninklijke Maatschappij de Schelde[2] took the initiative in 1904 to built a type Holland-9 submarine *"Luctor et Emergo"* for its own account. On demonstrating the submarine to the RNlN the submarine was purchased and commissioned in 1906 as Hr. Ms. O-1.

This short history tells us not only of the pride of submariners and designers alike in their own boats but also that new submarine designs always 'stand on the shoulders' of previous designs. Since the O-1 the RNlN operated 63 boats. Of these 56 were build in the Netherlands. Between 1942 and 1969 one U-Class and two T-Class boats were transferred from the RN and two Guppies from the USN. The Dutch designs, in the early years, were based on concepts of the Electric Boat Company and other foreign submarine builders. After WWII the first domestic design was of the so called triple hull type, with three pressure hulls arranged in a triangle (the *Dolfijn* Class of which four were build). But when USN NAUTILUS reached the North Pole in 1957 the nuclear promise brought the RNlN back to the US to request nuclear technology transfer for a Dutch SSN. This was denied by the US Administration in 1960, but the RNlN had already obtained the drawings of the diesel electric *Barbel* Class as a possible future platform. So, as it turned out, the submarine based on this US design the – *Zwaardvis* Class – became a diesel boat. Two were build and operated until 1994 when the next generation, the *Walrus* Class, had come into service. Their design proved to be successful both for open ocean and littoral environments. The latter has been recognized to be one of the advantages of a diesel boat.

Operational concept shift

The *Walrus* Class ocean going submarines were designed for Cold War missions. With a displacement of 2800 ton and a 10.000 NM range their strategic, NATO based, operational area was the North Atlantic. Already during the building phase of the *Walrus* Class, the end of the Cold war altered the political scene. Fortunately for the RNlN, the use of a diesel electric submarine is easily adjustable to the new circumstances without major technical changes.

With these political changes the setting for Naval operations for the whole western world entered a new era. It meant a shift from blue to brown water operations. This was also true for submarines and history shows that the four *Walrus* boats have

been active in many different areas and with new missions. They have participated in many international operations, including peace keeping, anti drugs and anti piracy operations with ISR as the prime task. Experience has been gained during missions in the North Atlantic, the Caribbean, the Mediterranean and the Indian Ocean.

Life extension and technology update

New lease on life

In 2003, a Defense white paper announcing several changes for the Defense organization made clear that the Netherlands government acknowledged the importance of keeping a Dutch Submarine capability. Following this White paper the Naval Force has been reorganized preparing the fleet for the future. New capabilities had to be developed for *Operations other than war*. As part of this process it was decided that the operational life of the *Walrus* Class had to be extended from 25 to 35-40 years. To live up to this requirement several operational systems had to be updated and functionality had to be added. As a first step to enhance the Submarine's capabilities, a Sonar safety project was initiated by adding a Mine and Obstacle Avoidance Sonar (MOAS) in the submarine's bow, updating the Acoustic analysis capability and improving the intercept Sonar capability.

This was, however, certainly not enough to realize the envisioned life extension. More functional and even fundamental improvements and updates were considered necessary in order to ensure the operational performance until 2025-2030. It should be kept in mind that all the *Walrus* Combat Systems were designed and build before the appearance of the Personal Computer. Processing power and memory capacity of the boat's current systems are limited and block future functional updates of the Combat Management System (CMS). As for now, for instance, several Lap-top computers are used for (operational) support functionalities. Furthermore several systems suffer from obsolescence and cannot be maintained any longer resulting in a high failure rate of aging equipment parts.

To execute the Life Extension Program as required on a limited budget the Naval Staff carried out a study involving the Operators (Submarine Service) and Maintainers (Naval Dockyard). The outcome of the study formed the input for the Operational Requirements for the LEP. The essential items in the Operational Requirements are:

- Replacement of the Combat Management System including the Operator consoles
- Concentration of all Sonar processing in a Sonar suite
- An Optronic sensor to replace the navigation periscope
- Addition of a SHF SATCOM high data rate COMMS(NEC)
- The implementation of Electronic Maps (WECDIS)
- Introduction of the MK48 7AT capabilities (upgrade existing MK 48)
- Replacement of the Weapon Interface Unit (including FC for the MK48 torpedo)

Operation & Support experience

All shore based maintenance of RNlN submarines is carried out at the Naval Dockyard. Over the years much experience has been accumulated with the result that the maintenance cost of the *Walrus* Class is markedly lower than has been reported by various navies operating (ocean going) diesel subs. Also the availability (per ship/year) is proportionally higher. With the in house expertise several upgrades and adaptations could successfully be implemented over the years.

Managing the LEP

A "menu" at the start

The Defense Materiel Organization (DMO) made the LEP conditional to some strict requirements. The modifications ought not exceed the DMO imposed budget which made it a *design to cost* project. The modifications had to comply with the original *Walrus* technical requirements and the overall LEP design must be both functional and safety driven.

The governing documents were the original *Walrus* build specification, a CONOPS prepared by the submarine service and a SEWACO (sensor, weapons and command system) development plan prepared by DMO's Joint IV Command[3].

Prior to the initiation of the LEP the Wet Ends of the mine avoidance sonar had been mounted on the bow and the Intercept Array had been replaced. Some processing algorithms were developed for the MOAS and Intercept sonar by the TNO D&V research institute and implemented by the supplier. The Sonar Safety project was installed on 2 Submarines in a Stand Alone configuration. Under the LEP, the new functionality will be fully integrated in the Combat Management System (CMS) of all submarines. The existing Sonars, i.e. the Long Range Sonar (LRS) (Towed Array and Flank Array), the Medium Range (MRS) and the Passive Ranging Sonar (PRS) will be replaced by one Sonar suite taking care of LRS, MRS and PRS processing. For budgetary reasons the existing wet ends will not be changed (except for signal digitizing and front end conditioning), but there are high expectations that the overall performance will be much improved by the new processing and the fact that the Sonar suite integrates all sonar functions enabling Sensor fusion at several levels.

The *menu* of the LEP requirements globally consists of:

1. A new functional software package for the Combat Management System will be developed "in house" by DMO's Joint IV Command. The Hardware will consist of COTS processing and memory devices and specifically designed Multi Function Control Consoles carrying COTS HW components and processors. The successful Guardion system and its proven functionality of the surface fleet is earmarked to be the basis of the new submarine CMS. This concept allows for fully multifunctional consoles and ensures commonality with the surface fleet.
2. Implementation of the modified MK 48 torpedo in combination with a new CMS requires a new Weapon Interface Unit. This Interface Unit contains the Fire Control functionality for the modified MK 48, a newly defined CMS interface and the interface with the Torpedo launching

systems. This interface is partly created by reverse engineering for the control of the Launching Tube system, the Turbine Ejection pumps and to establish a Fire control sequence.

3. The current conventional Navigation Table needed to be modified to accept an IMO certified WECDIS system. The WECDIS chart and track information will be interfaced with the CMS to provide consistent and reliable information for both Navigation and tactical Operations.
4. An Optronic mast shall replace the conventional Navigation periscope and will be fully integrated in the CMS. Two of the MFCC's will have facilities for hands on control by means of a joystick. The video information from the cameras will be shared with the CMS on multiple levels in order to enhance this video information both within the Optronic system and the CMS Video processing.
5. The required information *turn-around time* including CMS track data, sonar data and data from the Optronic mast has to be substantially shortened. It has to be shared with other assets and headquarters in preferably (near) real time. To achieve this, the SHF SATCOM will provide for a *high data rate* data channel.
6. The Central Control Room will undergo a major upgrade because of the replacement of the Navigation periscope, the new MFCCs and the modification of the Navigation console. In addition to that, several electronic equipment spaces will be rearranged where obsolete cabinets will be replaced by new hardware.

Limited human resources

The years of budget cut backs that the MoD has experienced effected the technical knowledge base in numbers and in capability. This was compensated partly through an industry initiative based on existing working methods. In fact there is a tradition in the Netherlands of collaboration of MoD, the research institutes and the industry, which is called the *triple helix*. Since the time the *Walrus* Class was introduced into the submarine

service no new submarines have been build. Furthermore RDM, the submarine building yard, closed in 2004. Shortly before that closure several companies and research institutes with submarine experience formed a platform to exchange information, support (mutual) marketing efforts and initiate and jointly carry out concept studies with the objective to maintain submarine technology. The name adopted for the platform is DUKC (Dutch Underwater Knowledge Center). The members aim to collaborate and meet periodically. The industry based DUKC invited the RNlN/DMO as observer.

Living with preliminary technical requirements

The LEP planning recognized three phases: an engineering study phase aimed to provide well researched grounds for selecting the new components and defining new arrangements, a detailed design phase and an implementation phase. The Naval Dockyard would be responsible for the LEP related shipyard work to remove, modify and install all equipment and systems. When DMO planned the LEP, it was found they needed outside assistance. In response, based on their philosophy, DUKC proposed to provide support for the engineering phase of the LEP.

Subsequently five members formed a joint design team and presented a generic plan to DMO. The proposal was a novelty in the sense that all five participating industries would work under one contract with standard conditions identical for them all. One company would be the acting legal and financial administrator for the group. A project manager was given the task of integrating the design work and overall project management. The participating companies agreed and accepted that they would form a team of independent consulting engineers with no preferred position for equipment choices by DMO and during the implementation phase.

The contract would be on a *price not to exceed* basis. This was an important condition for cost control because initially there were only limited and general technical requirements as mentioned above. The project named WESP (*Walrus* Engineering Support Project) was contracted and set in motion by DMO. WESP performed tasks for which DMO lacked the capacity at the time.

One of these tasks was to generate a Basic Design and define technical solutions for the modification of the submarine itself.

The WESP terms of contract were formulated around four separate *one page functional work assignments*. DMO remained responsible for functional and technical (procurement) specifications for the new systems and equipment. In addition to that, existing general design specifications for the submarine had to be supplemented taking the new equipment into account. The integrated approach of WESP was aimed at keeping to an otherwise slipping planning.

The *menu items* of the requirement and the WESP project plan were functionally clustered into four engineering work assignments. (Major) changes or additions to the WESP assignment would require a Change Order form. This was necessary only once.

The way of contracting WESP had the advantage that the terms and conditions were identical for all participants giving them the same responsibilities with respect to their work packages. This made the formation of an integrated project team in fact more easy than when entering into a conventional contract with a main contractor and subcontractors.

The second novel aspect was the interaction between the WESP team and the various navy departments involved. WESP had direct interaction not only with the DMO project organization but also with the Naval Shipyard, the Joint IV Command, the Submarine Service and the Operational-school. The DMO team gladly reciprocated, making an effective communication scheme possible. This was necessary to design, propose and select technical solutions for the desired new functions following from the CONOPS and SEWACO plan. To avoid a cacophony of discussions between the actors of the WESP team, with members working on their particular items of the *menu items* and their counterparts in the various DMO departments, a strict but flexible form of communication was established. Technical meetings on (isolated) topics could be scheduled involving WESP team members and DMO representatives and the meeting results were communicated project wide. These could concern straightforward

issues as agreeing on the outcome of a shock calculation or elaborate design solutions when alternatives were presented for the rearrangement of the central control room. The advantage was direct interaction between the relevant players and specialists with (parallel) identified lines of communication on technical issues. This was called *consultation*.

The other important line of communication was the formal line involving *acceptance* of performance, progress and results. Acceptance included the major technical decisions. This acceptance of results and the fundamental decision making was the prime responsibility of the DMO program manager and the WESP project manager and was organized with informal and formal reviews.

The functional and commercial choice for selecting a component or system supplier was the sole responsibility of DMO. WESP however was involved in the selection process several times for direct technical advice on feasibility of proposed solutions and interfaces. This involvement continued until (contractual) technical interfaces were completed. In this way procurement work for the major components went on in parallel with the engineering of (ship) interfaces with these components. Due to the complexity this was accepted by all parties involved, including (potential) suppliers (OEMs). In the execution it proved to be an effective way to reduce the technical risks.

In practice the communication within WESP worked out very well. One reason was that fairly soon the WESP team members, although coming from different companies and a research institute, understood that interdependency was essential to draft an integrated WESP proposal and to perform accordingly. It proved to be an effective framework to identify and evaluate alternatives and to submit technical solutions to DMO. At the same time the representatives of DMO saw immediate progress. They could make use of appropriate technical expertise helping to come to decisions while they received (pre-)engineered data to set up and improve the interface requirements with OEMs. It also offered similar advantages for the OEMs reducing program risks and as a result enable them to compose competitive offers.

The case of the central control room and new processing

An example of the way how WESP operated, is the interactive redesign of the central control room. A specific (LEP) CONOPS outlined new operational procedures based on the perception of what the new sensors, Network Enabled Capabilities and a new CMS would offer. The important new technology offers potential for fusion of the information coming from independent sources, mostly from sonar and optronics. The CMS is designed to provide a common operational picture for the command team to decide on deployment of available means to suit the submarine's mission.

With the newly implemented SHF SATCOM the command team might have to face an avalanche of data. The requirement for the new CMS was to make all that information manageable and effective by incorporating a level of automation that is higher than was experienced on submarines up till now. The DMO Joint IV Command[4], the in house IT developer of DMO, was tasked to customize the Guardion software for submarines. All relevant information flows from sensor-, communication-, and information systems are collected, fused, upgraded and distributed to support planning, decision making and data logging. The customized Guardion concept will bring in experience from CMS designs for AAW, ASUW and ASW tasks of the Guardion equipped surface vessels.

To improve safe navigation in a littoral, shallow area WECDIS and MOAS are added to the sonar suite of Medium Range sonar, Passive Ranging sonar, Flank array, Towed array and Intercept sonar. The objectives for new sonar processing concerned new digitized data acquisition, beam forming, signal and audio processing to get better detection, classification, Target Motion analysis, and recording of (audio) tracks. Already the high definition broadband mode of the Sonar suite processor has been tested with actual signals. This showed a better system performance for the tasks mentioned than the existing sonars. Some detection ranges have been doubled due to the new processing.

The WESP team analyzed the procedures and basic routines of the CONOPS meaning to optimize the operational process and the

design of new MFCC's. It was also their task to design the re-arrangement of the central control room in line with the MMI required for the new CMS, the (partly new) functions and paperless navigation.

For the new arrangement, the TNO participants of the WESP team were leading in setting up the dialogue with DMO, the submarine service and the Op-school. A number of work shops[5] were used to generate concepts for the optimal design of MFCCs and their arrangement in the central control room. The workshop planning involved three phases: the establishing of functional demands, the concept design phase and a design definition to be the basis for the detailed design. The WESP team had made 3D computer models of the existing operational spaces. The new components and alternate re-arrangements were visualized using these computer models. The introduction of the non hull penetrating optronic periscope with displays for all operators to see, the integration of WECDIS and the introduction of SATCOM communication and NEC were an integral part of the conceptual design phase. Following the CONOPS about ten operational scenarios were formulated. For each scenario a link analysis on information flow and communication in the command team was carried out and confirmed during the interactive WESP–User workshops.

Following the analysis three different layouts of the central control room were generated and proposed to the Program manager as potential solutions. A conventional concept that stayed closest to the existing situation with one additional MFCC made use of an existing foundation/shock frame. In a revolutionary concept, the existing shock frame was removed placing MFCCs in an arrangement looking forward to the ship's bow, instead of being aligned along the (starboard) side. The third, evolutionary, design concept was an intermediate arrangement making use of advantages of both concepts using the existing shock frame. An important difference with the existing design is a dedicated, simplified console for the CO facing to the forward bulkhead and giving access to both CMS data and NEC enabled (operational) networks.

Figure 16. View of he CCR as is.

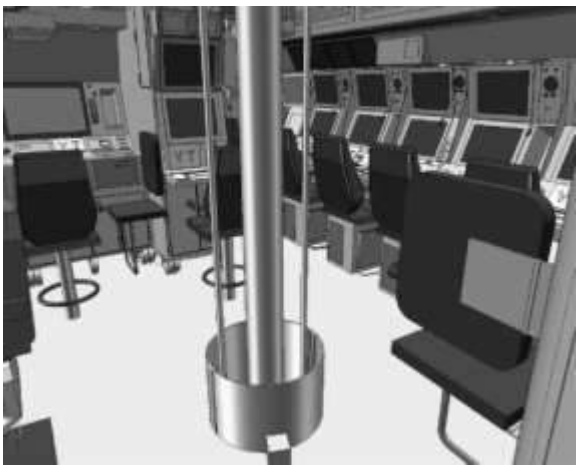

Figure 17. 3D model of final arrangement of the CCR showing WECDIS, CO console and MFCCs.

For all three alternatives the human factor played an important role in the ergonomic design of the MFCCs, the overall arrangement and the positioning of additional displays for command team information. The workshop discussions led to well-founded concept proposals for the Program manager taking into account all relevant aspects including the budget. This enabled the Program manager to make a considered choice that was widely supported by his team, (future) operators and technicians. The conventional arrangement with some adaptations was finally chosen. An important reason for this selection was to keep consequences for actual outfitting within limitations of the current arrangement of the central control room. This was done to reduce risks and to prevent overstretching the actual building planning.

In the last, more detailed, design phase production issues of the arrangement were reviewed by WESP team members with production experience. They assisted in the process of drafting practical technical procurement specifications for the MFCCs. In fact the procurement specification came close to a preliminary design, giving DMO substantial money and time savings for the production contract of the MFCCs.

Overall effect of the interactive collaboration.

The other assignments of the *menu* were carried out in a similar manner as described above for the Control room arrangement. The WESP engineering study was followed by a detailed design phase that was completed mid 2013. At present the implementation of the LEP on the first submarine is in progress at the Naval Dockyard. The first submarine undergoing the modifications is Zr. Ms. Zeeleeuw. The completion and start of sea trails is scheduled for 2015.

Conclusions

WESP proved that experienced professionals from (in this case four) industrial companies and a research institute, working as a team of independent consulting engineers interacting directly with DMO specialists has been a success factor for the engineering

of the LEP. For the program it helped to control progress and expenditure.

The framework of a *price not to exceed* contract offered flexible control based on progress and actual costs. The contract ensured that the WESP project was transparent to all parties and could be carried out within the limited budget even when working with only preliminary technical requirements at the start. It provided MOD a *no surprise* Engineering Data Package without undue risks.

During the engineering phase WESP supported the procurement process for the equipment and services for the implementation phase. This has been beneficiary for DMO, but also for the suppliers in particular regarding proper technical interfacing resulting in risk mitigation for all concerned.

ENDNOTES

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SUBMARINE WARFARE-OFFENSE AND DEFENSE IN LITTORALS

by CAPT. Jim Patton, USN, Ret.

Captain Patton commanded PARGO and is a frequent contributor to THE SUBMARINE REVIEW.

Background

Submarine Operations in the Cold War

Even though the World teetered at the edge of an apocalyptic chasm for the better part of the last half of the twentieth century, there was also a ubiquitous stabilizing effect globally as two superpowers and their close allies stared one another down. *Other* nations maintained armed forces which included navies and their included submarine forces, but these were largely composed of cast-offs from the *big guys*, and were largely for show and for some token deterrence of nearby *other* countries, but generally, no nation would be allowed to start much of a tussle with a neighboring country unless they had the tacit permission (or even encouragement) of one of the superpowers. There were of course some exceptions to this general statement, most notably in the mideast.

For the two superpowers, however, there was constant posturing and probing across the military spectrum, with the underwater domain being no exception. The U.S. and its allies were very fortunate in this domain, however, since for most of the Cold War U.S. submarines enjoyed as much as a 40dB *acoustic advantage* over their Soviet counterparts which resulted in what was almost a *no contest* environment in a one on one scenario. In spite of many deep water submarine vs. submarine encounters, the *checkmate* of the Cold War at sea was when the *Maritime Strategy* of the mid-80s moved the prospective battleground from the deep oceans to the Barents Sea, the Sea of Okhotsk and other Soviet littorals. Traditionally, when a naval power is forced into a defensive position in its own waters, it is essentially defeated, and with today's spectrum of naval-based weapons available, if a nation

loses the ability to operate in and defend its own littoral waters, it is as well as defeated.

During the time frame of the Cold War, there were nominally about 40 countries that operated some 400 submarines. In the post-Cold War era, there are now (still) some 40 countries operating some 400 submarines, but the demographics behind these numbers have changed significantly, and there are now some uncertainties as to whether, because of technological changes, naval forces can now (and perhaps must) successfully establish some form of Anti-Access/Area-Denial (AA/AD) zones in their own waters that would prevent other naval forces from affecting events ashore.

Modern expeditionary nuclear submarines operating in offensive roles in littoral waters are extremely quiet, are not subject to the majority of measures available to a defending entity as AA/AD means, and will likely be able to penetrate such barriers essentially at will. On the other hand, the modern AIP (Air Independent Propulsion)/Anti-Ship Cruise Missile (ASCM) -armed non-nuclear submarine not tasked with closing an adversary's surface warships, and hunkered down at very slow speeds represents a nearly impossible *target* against which to conduct classic broad area Anti-Submarine Warfare (ASW) search with the intruding submarine's passive sonars. So, this *Mexican standoff* exists—the defending nation can't keep the offensive SSNs out, but those SSNs can't find and engage the defender's AIP/ASCM submarines that are keeping the surface warships out of the AA/AD zone, and therefore outside of their ability to conduct strikes ashore. What's a fellow to do?

Discussion

Sea Control versus Sea Denial

In the classic Mahanian sense, the first order of business for a nation's navy is to establish *sea control* in the sense that their and their friends' merchant and warships can essentially go anywhere and do anything on the surface of the seas. The Revolution in Military Affairs (RMA) that the submarine brought about during and after world War I (WWI) was the concept of *sea denial* – i.e.

"…I might not have unhindered use of the seas, but neither do you!".

It has always been true that the real utility of naval strength was the ability to affect events ashore, but another RMA that has continually evolved since World War II (WWII) is the extent to which events ashore can be affected. Other than the ability to impact economies through blockade, the real-time *kinetic* effects of a navy were limited to the range of its warships' guns, and later the range of its aircraft carriers' airplanes. With the post-WWII advent of Submarine-Launched Cruise Missiles (SLCMs) and Submarine-Launched Ballistic Missiles (SLBMs), the range of these kinetic effects were increased dramatically, and when nuclear warheads are factored in, so were their effects.

At the height of the Cold War, both the United States and the Soviet Union held one another at bay with, among other things, nuclear warheaded SLBMs that put most of each nation's population and productivity resources in jeopardy. Towards the end of the Cold War, when unequal technological developments in submarine quieting and SLBM accuracy put *all* of the Soviet Union's nuclear weapon inventory at great risk—including the sea-based component on their SSBNs—the United States essentially removed the Soviet Union's option of operating in their own littoral waters, let alone the open ocean, sea denial at its best, while leaving their infrastructure vulnerable to our sea-based weaponry—checkmate.

Modern Offensive and Defensive Considerations Related to AA/AD Zones

Defense first—while there is not the same level of concern about the massive use of nuclear weapons by major powers, nations with oceanic shorelines still have need to be concerned about the threat of non-nuclear weapons launched from naval platforms, and have good reason to establish AA/AD systems—a major component of which could be comprised of modern, quiet submarines launching good ASCMs based on targeting information provided from sites ashore where multiple sensor information is fused and transmitted. These submarines operate, in

effect, as almost submerged mobile SCUD launcher—that infamous weapon system of the first Iraqi war for which there are no confirmed pre or post-launch kills. Remaining covert and hidden until directed to fire, they can then effectively *clear datum*, so even observed knowledge of the launch site will be of little use when countering assets arrive at some *time late*.

Submarines operating covertly at slow speeds in acoustically difficult waters represent a Herculean search and localization effort for even the very best ASW platforms, including modern SSNs, and if not essentially impossible, involve a statistical length of search that is unacceptable if time is of the essence (which it always is) to degrade the AA/AD effort. Their *Achilles' Heel* is that they cannot do their own targeting from long stand-off ranges while hunkered down, and are entirely dependent on being given targeting information from data fusion site ashore.

That said, the offense—the submarine(s) having penetrated into the AA/AD zone—have a more attractive option to "neutralize" rather than kill the defending ASCM-armed submarines by including in their initial land-attack salvo against critical shore-based elements of the AA/AD complex the known sites from which the targeting information is being sent to the defending submarines. There will be, of course a need—just as there is with taking down known air defense sites—to be prepared to target previously unknown comms sites that *pop up* following the initial salvo. Denied targeting information, these submarines, certainly have the option to attempt to close the opposing surface forces to generate their own torpedo/missile targeting data, but in doing so will play to a credible strength of these surface forces to detect and engage non-nuclear submarines, even if they are equipped with AIP, who are trying to close to visual range.

Benefits and Vulnerabilities Associated with Level of Connectivity

All submarines benefit from improved connectivity, but perhaps a bit counterintuitive, there is an inverse relationship between the degree of benefit received as a function of the level of capability of the submarine platform. If a platform has a virtually

infinite amount of stored energy, extractable at high rates of power while divorced from the atmosphere for months at a time, it has the ability to operate large sensor suites and data processors, and to relocate itself quickly if it is determined that it is improperly positioned. In fact, this platform often becomes more of a *supplier* of tactical information to others than it is a consumer. Although it generally has the organic ability to conduct very high data rate two-way connectivity, its operational culture has a history of being able to perform exceptionally well given only low data rate passive (receive only) information.

On the other hand, the ASCM-shooting submarines discussed above are extraordinarily dependent on connectivity ashore, and their operational commanders ashore, particularly if their submarine forces are a recently developed asset, possibly do not have the level of personal operating experiential confidence to allow these units to operate in a passive, receive only mode, and will require them to acknowledge frequent orders via active, two way comms—creating an additional vulnerability. Therefore, in the type of *communications-degraded* environment that modern warfare might quite likely involve, those who remember (and have practiced) how to operate passively with a minimum of external direction and support will have a decided advantage.

Submarine Capabilities and Vulnerabilities

Capabilities and vulnerabilities vary significantly with time and technology, as do therefore the Tactics, Techniques and Procedures (TTPs) to exploit either. For example, during WWII the last thing that the allies would have wanted to do would have been to degrade the German shore based capability to talk to the U-Boats, since this perceived (by the Germans) nightly *secure* 2-way link was the primary source of cuing for the ASW efforts. In the above described scenarios, it is much to the benefit of the offensive forces to force an adversary's deployed submarines to fend for themselves as regards targeting, since *keep 'em moving* is now analogous to WWII's *keep 'em talking*.

It is prudent, however, that whenever an exploitable vulnerability of an adversary is discovered, that one's own existing TTPs be critically reviewed to see if that same vulnerability is present in one's own operations. In this case it would not be surprising if it was discovered that one's own submarines have become too dependent on frequent, real-time two-way connectivity with masters ashore, and that any disruption of that connectivity would also have an adverse impact on their performance. Very much unlike the WWII German submarine Command and Control (C^2) model, U.S. submarines of that period were provided with Operation Orders that covered port-to-port contingencies as best known, were sent receive-only intelligence support during the deployment, and COs were trusted to *operate in the best interests of the Queen* without any outgoing transmissions from the submarine until a patrol report was hand delivered upon return to port. If that model can no longer be *precisely* adhered to, units should still routinely practice the capability to remain effective in a seriously degraded connectivity environment.

Conclusions

The Competitive Advantage

The end-all and be-all of the Cold War "Third Battle of the Atlantic" (as Professor Owen Cote of MIT's Security Study Group has named it) was the *acoustic advantage* possessed by the Western Allies, sometimes as much as 40 dB—a 10,000 to one ratio of something to something—a nice edge to bring to a fight. That degree of relative advantage no longer exists, and even though some acoustic edge is still usually there against top-end nuclear and non-nuclear submarines of potential adversaries, it can sometimes equate into initial detection ranges and *detection advantages* measured in hundreds of yards rather than many 10s of miles.

The *bad news* associated with this reality is that it is often not a viable option for even a modern, quiet submarine to *sanitize* a given geographic area looking for other modern, quiet submarines, since the mathematically derivable *mean time to detect* is

unacceptably large. The *good news*, however, is that that same modern, quiet submarine that is ineffective in quickly finding other submarines within an AA/AD area can itself operate with relative impunity within that same area to perform other types of mischief quickly, and in real time. The option being proposed is that one set of mischiefs that should reside high on any priority list should be surgical offensive actions that reduce the ability of the adversary to obtain and provide targeting information to their own modern, quiet submarines that are armed with good ASCMs.

What is necessary for successful submarine employment in present and foreseeable scenarios is to establish a *connectivity advantage* analogous to the Cold War acoustic advantage, not so much in the context of the *quantity* of traffic passed, but in its assurance through a large part of the submarine's operational envelope together with the maintaining of the skills required to operate effectively with a minimum of such *high quality* traffic.

There are two key assumptions behind the concept that disrupting shore-based targeting facilities and their connectivity to off-shore submarines will largely neuter a modern AA/AD complex. One, and perhaps the most critical one, is that *adequate* C^3I connectivity will be maintained with the penetrating SSNs and SSGNs, and the other being that the adversaries' submarines within the AA/AD complex will be largely incapable of effectively operating in an autonomous manner within an AA/AD area that can be as large as 1.5 million square miles when the threat being defended against is a cruise missile with a range of 1000 miles.

Established submarine forces have a long history of *having to* function effectively in an independent role with very little *bandwidth* available to ask for or receive *advice* from their masters ashore. Admittedly, this resulted in a necessary skill set that was very technique associated, and as such required an extensive *apprenticeship* to develop those skills. Modern technology, which provides very large *pipes* through which to pass two-way data, information and knowledge, enables the operation of such as submarines in a more *procedurally* associated manner, and therefore permits these platforms to be effective employed with far less experienced crews—*if this high bandwidth connectivity isn't*

disrupted. If established submarine forces can resist the temptations associated with having these large comms pipes available, and actively maintain the techniques of operating effectively in a degraded C^3I environment, then both of the above assumptions should remain true.

As a final note, it is worth emphasizing that the larger, expeditionary and offensively-oriented submarine platforms typically have, due to their available power and redundancy in equipments, more options for connectivity, but properly operated, are less *dependent* on this connectivity than the space and power-limited smaller defensively-oriented submarine platforms. This apparent dichotomy provides a great deal of favorable options for the offense platform and again highlights a defensive vulnerability to be exploited while playing to an offensive strength.

A REFLECTION OF THE RICKOVER INFLUENCE IN A LETTER BY DR. ZACK PATE

A graduate of the US Naval Academy, Pate holds a PhD in nuclear engineering from MIT. Serving in the US Navy from 1958 to 1980, Captain Pate commanded nuclear-powered submarines and was a special assistant to Admiral Hyman Rickover. Dr Pate is a recipient of the James N. Landis Medal, the William S. Lee Award for "visionary leadership in encouraging and promoting excellence throughout the nuclear power industry", and the Henry DeWolf Smyth Nuclear Statesman Award. In 2002, Dr Pate was honoured by the World Nuclear Association for his "distinguished contribution to the peaceful worldwide uses of nuclear energy" as a founder and leader of the World Association of Nuclear Operations (WANO). He is Chairman-Emeritus of both the Institute of Nuclear Power Operations (INPO) and WANO.

Philip L. Cantelon, president of History Associates Incorporated, graduated from Dartmouth College and holds an M.A. from the University of Michigan and Ph.D. in history from Indiana University. He taught contemporary American history at Williams College for nine years and then worked for a year as a policy analyst and speechwriter at the Department of Housing and Urban Development.

January 12, 2015

Dear Dr. Cantelon,

The purpose of this letter is to discuss Admiral Hyman G. Rickover's legacy as it relates to INPO and WANO, and to the civilian nuclear power industry.

A few days ago you and I were discussing the recent PBS documentary film The Birth of Nuclear Power and the observation that the film did not include coverage of the impact Rickover had on the US nuclear utility industry, or INPO, or, ultimately, on WANO. (nor do any of the several books written about Rickover).

I mentioned that I had been asked twice to come to Washington to give a testimonial for the documentary (coming to the filming studio in DC was a condition of participating) but that health issues had prevented my participation—and that, if I had been able to participate, my theme would have been Rickover's contribution to the commercial nuclear industry in the US, and indeed, worldwide.

In my view Rickover's influence carried over well beyond the nuclear Navy in a major and very positive way through the influence he had on hundreds, indeed thousands, of officers, enlisted men and civilians whose professional behavior and even character were shaped by their participation in the Naval Reactors program (aka Rickover program). His methods, his high standards, his emphasis on accountability, his unrelenting quest for excellence, his focus on *safety first*, etc. are all well documented, so I don't need to dwell on that. But what is not well documented is the ownership of his methods and principles that so many participants took as their own—and the bonding and mutual trust that developed among so many of us. (This was not true for all participants—some even resented Rickover's approach—but I believe it was true for a healthy majority). These qualities and relationships were carried into civilian life as participants in the Rickover program retired or left the service after a significant period of *indoctrination/inoculation*. I'll call this the Rickover Civilian Legacy.

INPO was a major beneficiary of the Rickover legacy. First of all by having retired Vice Admiral Dennis Wilkinson as its first CEO. Wilkinson exemplified the qualities just discussed. It was a blessing to me (and I believe to INPO) that I had the privilege of working for Rickover for three years and then Wilkinson for four years just before becoming CEO of INPO.

By the mid-point of my tenure as CEO (~1990) sixty five people who had served in the Rickover program were employed by INPO. Most had extensive nuclear experience and more than 20 of the 65 had had command of a nuclear submarine or nuclear cruiser. Virtually all brought their Rickover training and indoctrination with them to INPO with a sense of pride. By 1990

nine of INPO's top 11 executives (vice president or senior) had served in the Navy nuclear program. Needless to say, many of the principles and the passion for nuclear safety that were standard fare in the Rickover program became embedded in INPO's culture.

We had an impressive team—in the late 1980s Bill Lee (Lee, CEO of Duke Power and a key founder of INPO. was INPO's first chairman) stated in an INPO board meeting that INPO had enough executive and management talent to run any of the biggest utilities in the country (INPO had about 400 employees; the largest utilities over 20,000).

Meanwhile, a significant number of senior nuclear trained officers were retiring and taking positions with nuclear utilities. By the mid-1990s I could count over a dozen retired admirals, as well as numerous commanders and captains, who had retired from the Rickover program and taken positions with INPO member utilities. Quite a number of these people became the top nuclear executive, and several became the president or CEO.

By the early 1990s I had visited and toured each nuclear plant in the US, some more than once. During these visits I always encountered and had discussions with operators and technicians, department managers, etc. who had previously served in the nuclear Navy. At some plants more than half of the control room operators had come from the Navy nuclear program. With few exceptions they spoke favorably of their training and experience in the Rickover program, and its value in their current job—even when they were unhappy about the last INPO team visit!

In addition to positions in the utilities, by the mid-1980s quite a few people from the Rickover program were employed in various positions at the Nuclear Regulatory Commission. Two retired admirals who were prominent in the Rickover program (Lando Zech and Ken Carr) served successively as chairmen of the Nuclear Regulatory Commission, from 1984 to 1991. A third retired admiral, also prominent in the Navy nuclear program, served as Secretary of Energy from 1989 to 1993—more on this later. All three were fully supportive of INPO, and most helpful in building INPO's stature and credibility.

Moving forward in time, well beyond my retirement, to INPO's 35th year. Six of the seven executives who have served as CEO of INPO have had experience in the Navy nuclear program. Each CEO was selected by the INPO Board of Directors, made up of utility executives, on the basis of merit and the candidate's perceived ability to carry forward and improve the performance and culture built in to INPO over the years.

In summary, many hundreds of professionals from the Navy nuclear program had left the Navy in the years following Three Mile Island (some on an ideological quest to share their Rickover training with the civilian nuclear industry). Many more had left in the years that followed, as the Cold War wound down and the Navy nuclear program began to shrink in size, to take positions throughout the civilian nuclear industry—with many earning top positions.

The improvement in the performance of the US nuclear utility industry over the past three decades is widely documented and recognized, but perhaps it can best be summarized by the following observation: In the 1970s and early 1980s the performance of the US industry was among the worst of the more than two dozen countries then operating nuclear plants to generate electricity. Our industry's performance was frequently derided at international conferences and in other forums. I personally witnessed this on too many occasions. Today, the performance of the US industry is World Class among the very best of the 29 or so countries with a nuclear electric program. It is admired and emulated worldwide. Many, many fine people who were never involved with the Navy nuclear program contributed to this phenomenal success but for sure Rickover's Civilian Legacy played a major role.

WITHOUT RICKOVER THERE WOULD HAVE BEEN AN INPO BUT THERE MAY NEVER HAVE BEEN A WANO

After retiring from the US Senate, and as chairman of the senate armed services committee, Georgia senator Sam Nunn took a keen interest in INPO. Partly because he became an admirer of

Rickover while in the Senate, and thought the civilian industry could benefit from his approach to nuclear energy. And partly because he and Ted Turner were then planning and soon forming the *Nuclear Strategic Initiative*—a non-proliferation Non Government Organization (NGO) based in Washington. (NGOs are typically not-for-profit, as is the case for INPO). Sen. Nunn visited with INPO senior executives and staff at our offices in Atlanta several times and received many briefings on INPO. He accompanied me on a trip to Moscow to help gain an audience with the Russian Minister of Energy (and to help persuade him to fully support WANO). He arranged access to Vice President Gore to get help with a complicated international issue, and he attended two WANO BGMs, giving a keynote address at one in Victoria, BC. After this extensive involvement he stated, on several occasions, that INPO was the most effective NGO he had encountered, and he had been involved with many. He stated further that INPO makes things happen, while most NGOs hold meetings, do research, and publish papers that are useful, and often shape opinions, but don't actually go out and fix problems. Similar sentiments have been voiced by others over time.

So, without Rickover, there would have been an INPO, but it may well have been a typical NGO as described by Nunn.

There are two major reasons why there may not have been a WANO without Rickover. First, under Wilkinson's leadership INPO established an international program (with an International Participant Advisory Committee) in its earliest days. Through that program senior executives from 14 or so countries had been closely observing INPO's progress and the US industry's progress for several years when the Chernobyl accident occurred. They were impressed by progress in the US, and quick to say so. Members of this committee participated directly in planning what to do in response to Chernobyl. If INPO had been a typical NGO, and US industry progress had been minimal, there would have been little incentive to emulate INPO on an international scale. Quite the opposite occurred.

Second, and on a more pragmatic note, in the many months of planning leading up to the WANO Inaugural Meeting in Moscow

in 1989, INPO met a lot of resistance from the US State Department and the Department of Energy. Recall that at that point in time Cuba was building nuclear plants and South Africa, which operates the Koeberg nuclear plant, was in the midst of Apartheid. Both countries were prospective members of WANO. State did not want the US associating with these countries in any fashion—but a basic premise of WANO was that all countries operating a nuclear electric plant should be members. Bill Lee, along with a person from the State Department, made a trip to Cuba and a visit to Cuba's construction site for their Russian designed nuclear plants to try to help us get through this bureaucratic obstacle. After many meetings at State and DOE by retired Admiral Stan Anderson, then vice president of our International Program, and our extraordinarily capable attorney, James Miller, and some help from a very influential Bill Lee, we thought we were doing pretty well. The Inaugural meeting was fully planned and many, indeed most, US utility CEOs were registered and had plane reservations to attend. Then on a Friday just a few weeks before the Moscow meeting I received a letter from a senior official at DOE, addressed to me by name, effectively directing INPO to cease and desist in any plans to form an international nuclear organization. That was a horrible Friday—we quickly realized we could not proceed with that letter on record—no one from INPO could go to Moscow---and most, if not all, US CEOs would cancel. The Inaugural meeting would have to be postponed, and re-scheduling, with US government opposition, would be problematic.

I finally reached the Secretary of Energy at home (no cell phones then) late Saturday afternoon and he agreed to meet me in his office Monday morning at 7:30, before his first official appointment. I walked out of the DOE building at mid-morning that Monday with a letter retracting the cease and desist order, signed personally by the Secretary of Energy. The Secretary, at that point in history, was retired Admiral James Watkins. He had been a star in the Rickover program for many years, with his last post being Chief of Naval Operations. I had not known Watkins personally in the Navy, but we had the special bond of both serving under Rickover. And, my last post in the Navy, working

directly for Rickover, was the exact same post Watkins had held a decade or so earlier. He knew that and I knew that—that strengthened the bond.

In most any other circumstance it is unlikely that a Secretary of Energy would have been so helpful to the CEO of a very small company in Atlanta. Any top executive is reluctant to override a senior person in their organization. Once again the Rickover Legacy was crucially important.

And the legacy endures as WANO progresses. Two chairmen of WANO to date had served in the Rickover program. Three executives who have held the top position in WANO's London Office had nuclear Navy credentials. So have four of the chairmen of the WANO Atlanta Center—as have many, many participants in WANO peer reviews and other WANO programs. As I write this, Tom Mitchell, CEO of Ontario Power Generation (OPG), is chairman of the WANO Atlanta Center and a member of the main WANO Governing Board. Mitchell was on Rickover's staff when I served at Naval Reactors and came to INPO in the early 1980s—which was the start of his distinguished civilian career in the US nuclear industry and then in Canada. OPG operates the largest nuclear program in Canada and the third largest in the Western hemisphere. A second member of the main WANO Governing Board today is INPO's CEO Bob Willard, a retired four star admiral who was qualified by Naval Reactors before serving as Commanding Officer of a nuclear powered Aircraft Carrier. Willard's last position in the Navy, before retiring and being recruited by INPO, was commander of the Pacific Theater, where he gained valuable WANO related experience interacting with many Asian countries.

WANO's 25 year history of growing influence and success is the result of hard work and dedication by many people from all over the world. The Rickover Legacy has not and does not dominate WANO's worldwide landscape—but it has been an important contributor—and it lives on!

Best Regards, Zack

REFLECTIONS ON

ADMIRAL RICKOVER'S MODERN LEGACY

by Lieutenant Ryan Hilger, USN

Lt. Hilger is a recent graduate of the Navy PostGraduate School and is enroute to his Department Head tour via SOAC.

In the span of eight short years, a little-known Navy Engineering Duty Officer would revolutionize submarine warfare, reshape a corner of the American military-industrial complex, and begin a fundamental transformation of the Submarine Force officer corps. Captain Hyman Rickover did not set out to build a veritable nuclear empire. He sought only to harness the atom in order to build a better weapon to help win the Cold War.[1] But his clear vision of the future, grasp of technology, and dedication to people, despite his prickly nature, created a lasting legacy that expands beyond the hulls of the Submarine Force. The broader Navy, American industry, and the post-Navy employers of nuclear-trained officers have all felt the effects of his efforts. Rear Admiral Dave Oliver's recent book, *Against the Tide: Rickover's Leadership Principles and the Rise of the Nuclear Navy*, offers an opportunity to assess Admiral Rickover's legacy in the modern Submarine Force from the perspective of an officer who had not yet been born when the Admiral retired in 1982.[2] Now into the fourth decade from his retirement, Naval Reactors and the Submarine Force share many similarities with the Admiral Rickover's founding principles: a driving emphasis on education and training to develop quality people, a strong commitment to operational excellence and reactor safety, and an organizational efficiency that continues to seep into other areas.

Quality is Key

The Submarine Force still attracts the best and brightest within the Navy and strives to ensure all officers maintain the highest standards. Admiral Rickover, once the NAUTILUS project proved that nuclear powered submarines were viable, changed the metrics by which he had hired civilian engineers in order to recruit the right kind of military officers. Instead of seeking officers with extensive engineering experience and intellectual talent, like NAUTILUS' first Commanding Officer, then Captain Eugene Wilkinson, Admiral Rickover sought natural leaders to whom he could teach engineering.[3] This action allowed him to balance the need for exceptional engineering of the submarine with the leadership required to take the submarine potentially into combat. The officers he interviewed and brought into the program possessed a combination of intellectual and leadership capabilities that would prove quite effective in the world's oceans as the United States took the Cold War to the Soviet Union. Sherry Sontag and Christopher Drew's *Blind Man's Bluff* relates the competitiveness found in the wardrooms of American submarines, implicitly highlighting the strength of Rickover's decision.

Only a handful of officers interviewed by Admiral Rickover remain on active duty today. The interview process has changed somewhat from the initial interviews, but only insomuch as Naval Reactors has gained the ability to more effectively screen and train potential officers in nuclear power and leadership. Rickover berated Captain Dunford, one of his top officers at Naval Reactors, about the goal of his interview process:

"And you people are supposed to have checked out their practical technical smarts. So what I'm trying to find out is how they will behave under pressure. Will they lie, or bluff, or panic, or wilt? Or will they continue to function with some modicum of competence and integrity? I can't find that out with routine questions. I've only got a few minutes with each one, half an hour at most. I've got to shake 'em up. That's the only way I'll know."[4]

Time, distance, and shielding from the initial volatility of the nuclear power program in the 1950s has allowed the accession and

training process to become more formalized and standardized. Officers still interview with the technical staff and the Director of Naval Reactors. However, the interview with the Director is no longer the storied affair that it was under Admiral Rickover, as the above quote alludes to. Those stories are now committed to the lore of the Submarine Force and some of its artifacts, such as the wooden chair with a few inches of the front legs sawed off, enshrined for successive generations.

The training pipeline, likewise, has become more formalized but is still in keeping with Admiral Rickover's principle of providing the highest quality education possible. The Naval Postgraduate School now accredits Naval Nuclear Power School for 28.5 graduate credits. The two schools, Naval Nuclear Power School and the Nuclear Power Training Units, or prototypes, still cover the basic tenets that Admiral Rickover established so long ago: conservative engineering practices firmly grounded in theory. This theme carries into the operational boats through the continuing training program.

Operational Excellence

Admiral Rickover's zealousness for operational and maintenance procedures and the commitment to procedural compliance as a means of ensuring reactor safety and proper operation reshaped American industry and brought a new paradigm of thinking into the Submarine Force. The concept of *creeping nukism* can be interpreted as either derogatory or as having a positive impact depending on the context. In this author's experience, junior officers tend to see it as the punch line of a joke, but with some perspective, the management principles that the nuclear power program instills into its officers have served the Submarine Force, and American industry, very well. Officers are thoroughly conditioned to follow procedures, think through actions before taking them, and keep the bigger picture in mind, both in terms of reactor safety and operational capability. These qualities make nuclear-trained officers some of the most sought after candidates in the civilian job market.[5]

The Submarine Force trains incessantly. With every officer onboard nuclear-trained, the above-mentioned traits and engineering practices have *crept* into the tactical picture. Officers now train for and expect the same procedural compliance and understanding of procedures from non-nuclear divisions and in tactical operations. Our procedures are written with the expectation of being followed verbatim. If they cannot be carried out, the officers will seek clarification, or if it is not available or practicable, are sufficiently trained to take the necessary, likely conservative, actions to keep the boat safe. After the fact they will pursue clarification and propose changes as necessary to the procedures. While the theoretical underpinnings of the non-nuclear aspects of submarining have yet to reach the graduate level, as Nuclear Power School does, most officers do bring the some of the same intellectual rigor to those areas.

Organizational Effectiveness

Naval Reactors has evolved significantly from the Naval Group at Oak Ridge National Laboratory in 1946, but many of the founding principles remain unchanged. Most junior officers see Naval Reactors, somewhat jokingly, as a monolithic organization bent on conditioning them into something else. This author has slowly gleaned insights from superiors that the organization has, in fact, changed little. It is still very dedicated to providing direct support to the Submarine Force, through both the Naval Reactors Representative Offices (NRRO) and through an exceptionally flat hierarchical structure. The NRRO representatives, in this author's experience, have proven very helpful and capable. Sure, they do come onboard to inspect the engine room for deficiencies, all of which must be acted on by the Commanding Officer and Engineer within twenty four hours, but once engaged, they are more than willing to provide insights into area best practices, how they inspect, and much more. Interacting with these representatives can yield a valuable educational experience for any junior officer.

Maintenance and repair issues tend to dominate a junior officer's exposure to Naval Reactors and, thus, Admiral Rickover's legacy. For non-nuclear matters, the boat must work through its

parent squadron to obtain the assistance needed for urgent repairs. These efforts can take precious time if the squadron must work with other organizations to find an answer and report back. Naval Reactors provides a direct line to their corporate knowledge base. Another historical example shows that the desire to provide all necessary assistance to the Submarine Force. A boat in the Barents Sea reported a problem, the staff at Naval Reactors developed the response, and presented it to Admiral Rickover for approval.

"The admiral stood in the hall reading without comment and then invited me inside. He went over to the rolltop desk that was just off the living room, reached into one of the pukas, and took out a half-inch-thick package of yellowed envelopes encased by a rubber band. He fanned through the pile, slipped one out from the pack and handed it to me. "Tell them this," he said."[6]

The short, four-word answer was Admiral Rickover's way of giving the boat expanded operating margins in the case of a particular casualty. Bill Wegner, Admiral Rickover's deputy for submarines, recalls that the envelopes were given to Commander Anderson, Commanding Officer of the NAUTILUS, prior to his mission to the North Pole. Admiral Rickover did not approve of the mission but could not stop it since President Eisenhower was behind it. The envelopes had been sitting in that puka as emergency contingency plans since 1958.[7] Today, all boats enjoy a direct line to Naval Reactors should they need it. Direct messages will be acted on promptly, bringing to bear all the technical knowledge of Naval Reactors to the problem. Removing the layers of bureaucracy and streamlining the solution path allowed the Submarine Force to more aggressively pursue repairs and actions to maximize operational availability and effectiveness.

It has been nearly three decades since Admiral Rickover laid his oar to rest. However, the organization he developed fundamentally transformed the Submarine Force and American industry for the better. His irascible demeanor may not be missed, but the deft hand with which he managed the evolution to nuclear powered warships and the persistent drumbeat to effectively educate and train officers has left an indelible mark on the Navy. Today's officers would do well to reconsider this aspect of the Submarine

Force's history and how it has shaped our organizational culture. His legacy deserves to be perpetuated and enhanced wherever possible. The Force can only get better from it.

ENDNOTES

1. Theodore Rockwell, *The Rickover Effect*, Lincoln, NE: iUniverse, 2002.
2. Dave Oliver, *Against the Tide: Rickover's Leadership Principles and the Rise of the Nuclear Navy*, Annapolis, MD: Naval Institute Press, 2014.
3. Oliver, p. 27.
4. Rockwell, p. 237.
5. Personal conversation with Mr. Lee Cohen of Lucas Group, 2011.
6. Oliver, p. 24.
7. Ibid, p. 25.

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.

NEW MEXICO MAKES SUBMARINE HISTORY

by Mr. Dick Brown, Former ETR2(SS)

About the Author: Dick Brown is a long-time NSL member and Cold War submarine veteran, having served aboard USS BARBERO (SSG-317) and USS LAFAYETTE (SSBN-616 Blue) in the 1960s. He played a lead role in the effort to have SSN 779 named for New Mexico, his adopted state, and chairs the USS NEW MEXICO Committee.

Members of the crews of New Mexico's three namesake submarines made concurrent visits to the land-locked state in mid-October 2014. This crew visit may be the first time any state, especially one with three or more active-duty namesake submarines, has had crews visit at the same time. It is certainly a record for New Mexico. But records aside, more important is the great opportunity for New Mexico to show appreciation for her undersea warriors and for the crews to gain an appeciation for the state's diverse Native American-Spanish-Anglo culture, centuries-old history and mile-high geography.

While in the planning stages for months, it was not until the commanding officers of the Los Angeles-class USS ALBUQUERQUE (SSN 706), the Improved Los Angeles-class USS SANTA FE (SSN 763), and the Virginia-class USS NEW MEXICO (SSN 779) compared their operating schedules that a first-ever simultaneous visit, albeit a historic event, looked even remotely feasible.

A collaborative effort by the Navy League New Mexico Council's support committees for SANTA FE and NEW MEXICO, combined with support for ALBUQUERQUE by the Greater Albuquerque Chamber of Commerce, made it all possible. The purpose was three-fold: to increase public awareness of the importance of submarines to our national security, to show the submariners some real southwestern hospitality and to render a

final salute to San Diego-based ALBUQUERQUE as she nears the end of her service life. The rare visit included all three Commanding Officers and their wives, and a total of twenty members of the three crews.

Among the twenty planned events was a lunch for ALBUQUERQUE's thirteenth Commanding Officer, CDR Trent Hesslink, hosted by the Chamber's President and Chief Executive Officer Terri Cole and Albuquerque Mayor Richard Berry, both of whom had a ride on ALBUQUERQUE last July. The Chamber has been a long-time supporter of the officers and crew of ALBUQUERQUE; in fact, many years ago the submarine was made an honorary member of the Chamber. It just so happens that FTC(SS) Ramon Escalante of the ALBUQUERQUE was on leave in his hometown and was able to join some of the activities, including a Mexican buffet dinner with Navy Leaguers and visiting submariners. During the visit, CDR Hesslink reported "ALBUQUERQUE to date has made 1,035 dives." He added, "Last August, we journeyed to British Columbia to test weapons with the Royal Canadian Navy which was celebrating its Submarine Centennial. We are now preparing for our final deployment." ALBUQUERQUE will be retired later this year after thirty-three years of service to our Navy and our Nation. There is a move underfoot to acquire the sail for a future USS Albuquerque Memorial in the city.

There is an ongoing challenge involving the partnership of ALBUQUERQUE and her namesake city. At the boat's commissioning ceremony, then-Mayor Harry Kinney presented a set of keys for a Rolls Royce to the Commanding Officer, with the stipulation that the first skipper who brought ALBUQUERQUE up the Rio Grande for a port call would win the car. The keys have been passed along to each succeeding skipper at the boat's Change of Command ceremonies. Now with less than a year to go, it looks like the fabled Rolls Royce will go unclaimed.

Other events during the *triple-sub* crew visit included a cultural presentation at Tesuque Pueblo for CDR Timothy Poe and his SANTA FE crew, several grade school visits in both Albuquerque and Santa Fe, and the Navy Birthday Ball at Sandia Pueblo's

resort with the three Commanders, which by the way are all mustangs, as the honored guest speakers entertaining two hundred Navy fans. With regard to the event's Sea Cadet Color Guard, CDR Todd Moore of NEW MEXICO commented that he had never seen such a sharp posting of the colors.

Other events included live interviews by two Albuquerque TV stations on the launch field during the Albuquerque International Balloon Fiesta. Seventeen hot air balloons were standing by to take the sailors aloft but the weather did not cooperate. In Santa Fe the sailors visited the Rotunda in the State Capitol building for a special photo opportunity.

One of the highlights of the triple-sub crew visit was a chuck-wagon-style barbeque at the Bonanza Creek Movie Ranch, a working cattle ranch with a mock Old West town southeast of Santa Fe, home to movie sets for over seventy westerns, including *The Man from Laramie* in 1955, *Butch Cassidy and The Sundance Kid* in 1968, *The Cheyenne Social Club* in 1970, *Silverado* in 1985, *Lonesome Dove* in 1989, *Buffalo Girls* in 1994, and *Cowboys and Aliens* in 2010. As if on cue, a cold north wind blew tumbleweeds down the dusty town street, giving the sailors a real feeling of the Old West. They could follow the footsteps of John Wayne, Kevin Costner and James Stewart through the swinging doors of the Bonanza Creek Saloon where several wives of the crew wore period costumes and the three skippers, uh cowboys, sidled up to the bar for a shot of "snakebite".

The undersea warriors attended a reception and luncheon for one hundred and fifty, sponsored by Santa Fe Community College's Veterans Resource Center. Again the Commanders served as guest speakers. Santa Fe Community College had just received recognition as the best veteran support, two-year college in the nation. Students at the College had arranged a rousing flag-waving welcome upon arrival of the sailors plus an impressive static display of the state's three namesake submarines. The College luncheon was followed by another reception and tour at the New Mexico History Museum where the SANTA FE crew posed with a six-foot model of their submarine and the NEW MEXICO crew marveled at USS NEW MEXICO (BB-40)

artifacts and the intricate details of a seven-foot model of the battleship.

Stepping back in time, specifically the period 1935-1937, there is an interesting story about a young lieutenant serving as Assistant Engineer aboard the battleship NEW MEXICO. He was known as a hard worker and a fierce competitor, albeit sometimes conveniently harboring a disregard for standard protocol. He had a compelling desire to win the engineering "E" efficiency award for his ship. At the risk of a crew rebellion, he shut off the coolers to scuttlebutts and modified showerheads to save hot water. Scuttlebutt has it that he dragged men out of the shower if he felt they were taking too much time. The fanatic lieutenant was none other than Hyman G. Rickover. NEW MEXICO went on to win three consecutive annual engineering awards, thanks to her water and energy-saving innovations. And Rickover went on to become the Father of the Nuclear Navy and the longest-serving naval officer (sixty-three years); in fact, Secretary of the Navy Ray Mabus recently announced that ADM Rickover would again be honored when the Virginia-class boat SSN-795 carries his name.

LTjg Nate Pelletier, a native of Albuquerque and one of four visiting members of the crew of NEW MEXICO, spoke at the University of New Mexico Naval ROTC unit. He briefed midshipmen on the life of a junior officer aboard a submarine and the exciting benefits of a career in the Navy's nuclear propulsion program.

The twelve members of the SANTA FE crew, which CDR Tim Poe calls his *rock stars*, participated in various community relations projects throughout the Capital City, including visits with patients at the Santa Fe Cancer Center and a visit to Kitchen Angels where the crew delivered a generous check to this volunteer organization dedicated to providing nutritious meals to folks facing life-challenging situations. The SANTA FE crew also was interviewed by a local Santa Fe radio station, made a courtesy call on Santa Fe Mayor Javier Gonzales at City Hall, and touched base with the local American Legion Post.

On the final morning of the visit, the Commanding Officers spent an hour in the studio of the most powerful radio station in

the state, answering questions from callers. The skippers described the history and importance of our undersea Navy and reiterated how special it is for New Mexico to be so prominently represented in our Submarine Force.

CDR Poe of SANTA FE reported that his Pearl Harbor-based boat played *target* during RIMPAC 2014, the world's largest maritime exercise, involving twenty-two nations, fifty ships, two hundred aircraft, and twenty-five thousand sailors in the Pacific. And CDR Moore of NEW MEXICO described his Groton-based boat's role in ICEX 2014, including torpedo exercises under the Arctic ice, two hundred miles north of Prudhoe Bay, Alaska. "After ICEX, we surfaced one hundred and fifty yards from the North Pole," reported CDR Moore, adding "We were the first Virginia-class to surface at the pole. On our way home, we made a port call at Halifax, Nova Scotia." Later CDR Moore presented Governor Martinez a souvenir vial of water collected at the North Pole. NEW MEXICO conducted a burial-at-sea ceremony while at the Top of the World; the remains of a World War II combat submarine veteran from Albuquerque were shot out of a torpedo tube.

The Grand Finale for this unprecedented namesake crew visit was a special reception at the residence of New Mexico Governor Susana Martinez. She spent three hours with our undersea warriors, and endured a number of *selfies* with the crew's cellphone cameras. The skippers presented ship's plaques to the Governor and Army Brigadier General Juan Griego, New Mexico Deputy Adjutant General, read the Governor's Proclamation designating October 13, 2014 as "New Mexico Submarine Fleet Day". It just happened to also be the Navy's 239th birthday.

It was no small feat to pull off such a monumental crew visit; the planning, the coordination, the sponsorship, the execution were all major challenges. Complimentary round-trip airline tickets helped get the ALBUQUERQUE and NEW MEXICO submariners from San Diego, California and Groton, Connecticut, respectively, while many Santa Fe individuals and corporations funded airfares for SANTA FE submariners from Honolulu, Hawaii. In addition, a Santa Fe car dealer loaned five vehicles to

the crews for their use during their time in the state. The Navy League New Mexico Council sponsored all lodging for the ALBUQUERQUE and NEW MEXICO sailors in Albuquerque, using monies raised during fundraising activities throughout the year. The Santa Fe Fire Department hosted the SANTA FE crew members in their fire stations while the skipper was given a complimentary room at a historic downtown Santa Fe hotel.

As the visiting crews returned to their respective homeports, they carried home a new appreciation for the cities and state that their boats represent. In turn, the citizens of New Mexico took great pride in the support they provide to our Submarine Force and expressed their heartfelt thanks to the submarine crews for their service.

In conclusion, the State of New Mexico has a long and distinguished partnership with the US Navy, as exemplified through the many ships that have proudly born names related to the state, including a patrol frigate named ALBUQUERQUE, a light cruiser named SANTA FE, and a battleship named NEW MEXICO, all of which served with pride and distinction during World War II. New Mexicans are most grateful that the Navy has again bestowed great honors upon their state by naming three of its active-duty submarines ALBUQUERQUE, SANTA FE and NEW MEXICO.

AN OPEN CALL TO THE NAVAL SUBMARINE LEAGUE: PROFESSIONAL DEVELOPMENT

by Lieutenant Ryan Hilger, USN

After three wonderful years on shore duty at the Naval Postgraduate School and working with the Chief of Naval Operations Strategic Studies Group, I am now under orders to return to sea duty as a submarine department head. I am excited to be returning to the Submarine Force and the talented men and women I will be serving with. I have periodically reflected on my division officer sea tour to gain insight into achieving excellence as a department head. My preparations broadened as I reached out to a few of my mentors and opened discussions not only on being a department head, but also on my eventual qualification for command. I was content to continue discussions and this method of learning, but an essay written by Lieutenant General Paul Van Riper, the former commandant of the Marine Corps University and an exceptional historian and thinker, profoundly affected me and the way I was preparing for my return to sea duty.[1]

More of a focused memoir than an academic treatise, General Van Riper recounted his career from his early enlistment to his retirement in terms of an evolving, personal professional development program based on literature—his essay serves as a veritable guide for starting a professional reading program. He relates how he came to reread certain books over and over again for their reminder of how horrific infantry combat can be to broadening the scope of his reading to prepare him for each new assignment. I immediately set out to create my own professional reading program to help me prepare to be a submarine department head. My list contained more than thirty books to be read over the

[1] Van Riper, Paul K. "The Relevance of History to the Military Profession: An American Marine's View," in Murray, Williamson and Richard Hart Sinnreich, *The Past as Prologue*, New York: Cambridge University Press (2006).

next year, a very reasonable goal given my proclivity to reading. The books span from leadership to navigation and operations to submarine history. It is this body of topics that I wish to explore further.

The Submarine Force has a storied and proud history. After re-reading *Thunder Below* by Admiral Eugene Fluckey and *Clear the Bridge* by Admiral Richard O'Kane, I feel humbled to wear the same dolphins and be called a submariner. I re-read these books, along with many others, though the lens of leading high-performing teams and command. The results left me further in awe but lead me to redouble my efforts to gain greater knowledge and wisdom so that I may be a better submariner, but I still crave more.[2]

Much of our modern history remains untold. After consulting with the NSL Executive Director, CAPT Tim Oliver, we agreed that the corporate body of knowledge within the Naval Submarine League should be shared with our current submariners. For chapters not near fleet concentration areas, sharing the wisdom of your careers and mentoring our active duty sailors can be remarkably difficult. We want to alleviate that problem. The end product has not been settled yet, but we are looking for your sea stories, lessons, and advice for submariners moving on to the next stages of their careers. We are looking for articles on the following topics, though all relevant submissions are welcome:

- Becoming a Chief Petty Officer
- Chiefs Molding Division Officers
- Developing First Class Petty Officers
- Being a Leading Chief Petty Officer
- Technical Competence and the Division Officer
- Being a Division Officer
- Leading Peers as a Junior Officer
- Division Officer as an Internship for Command
- Being a Department Head

[2] The insights I have gleaned from reading our history books will be forthcoming in a separate article.

- Preparing for Command as a Department Head
- Mentoring Division Officers
- Being an Executive Officer
- Being a Commanding Officer
- Vision and Strategic Direction
- Navigation and operations
- Leading teams (The Chiefs' Mess, the Wardroom, Watch Sections, Divisions, etc.)
- Handling conflicts and poor performers at all levels
- Relevance of Submarine History to Submarine Leadership
- Learning from our Medal of Honor Winners
- Role and Value of Mentorship
- Sea stories for all of the above topics!
- Humbling experiences or other lessons learned that you want others to know!

Please be cognizant of classified material in your stories. Any length will be accepted; there is no minimum. Should you find writing a bit too daunting, we are willing to help you tell your stories, just ask! Simply, we want to ensure that this and future generations of submariners benefit from your experiences. If you are interested in contributing to any of the above topics, please contact the Editor, THE SUBMARINE REVIEW at the Naval Submarine League, 5025D Backlick Road, Annandale, VA 22003.

ETERNAL PATROL

Mr. William L. Ace
Mr. Leon G. Gaus
CAPT John H. Howland, USN, Ret.
CAPT Charles M. Meeker, USN, Ret.

USS *Minnesota* (SSN 783)

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15 April 2015

Navy Yard Museum, Cold War Gallery

SUBMARINE TECHNOLOGY SYMPOSIUM

12-14 May 2015

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33RD NSL ANNUAL SYMPOSIUM

21-22 October 2015

Fairview Park Marriott, Falls Church, VA

FIRE ON THE WATER; CHINA, AMERICA, AND THE FUTURE OF THE PACIFIC *BY ROBERT HADDICK*

United States Naval Institute Press, 2014, 273 pp.

Reviewed by Dr. William S. Murray, United States Naval War College

William S. Murray is an associate research professor and the Co-Director of the Halsey Bravo research effort at the United States Naval War College. He served on, and qualified to command nuclear powered submarines. He is the co-editor of the United States Naval Institute books China's New Nuclear Submarine Force and China's Energy Strategy; The Impact on Beijing's Maritime Policies. He has published articles in International Security, the U.S. Army War College Parameters, the journal Comparative Strategy, the United States Naval Institute's Proceedings, Jane's Intelligence Review, Undersea Warfare, and the US Naval War College Review.

In this book military analyst Robert Haddick, a former Marine officer, describes why and how the United States military should fundamentally change to prevent, or prevail in a war with China in the Western Pacific.

The author's derivation of why China's military modernization and potential demands our respect and attention, and why the US military's means of countering any future Chinese military aggression should fundamentally change, is very well done. In particular, his discussion of the limitations represented by the USAF's and USN's reliance on short-range air power, and how China apparently intends to take advantage of the factors is both compelling and sobering. Also quite good is his analysis of why the approaches described in the Department of Defense's Air-Sea

Battle (ASB) and the CJCS' Joint Operational Access Concept (JOAC) are probably not up to the task of successfully deterring or defeating China. Completing this trifecta of valuable analysis is Haddick's consideration and ultimate rejection of T. X. Hammes's strategy of Offshore Control which argues for blockade options as a means of countering Chinese military aggression. Informed readers might not agree with Haddick on all aspects of his logic, but most will concede he makes his case well. This sets the stage for the second half of the book, in which he describes how the Pentagon should respond to China's implicit threat to forcefully evict the US military from the Western Pacific. It is here, where Haddick builds what he calls an effective Competitive Strategy against China, that the author's logic becomes less convincing.

Haddick argues that the best way to deter or defeat China is to "hold at risk, with conventional strike operations, assets valued by China's leaders, in an effort to dissuade those leaders from coercive strategies". He lists some of the classes of potential targets his strategy envisions striking, including underground and other hardened military facilities protecting "command and control structures, logistics assets, its missile forces, and some of its naval assets". As the author notes, these assets are well protected by China's modern integrated air defenses, which leads him to assert that the Air Force must build a follow-on to the B-2 stealth bomber, known as the Long-Range Strike Bomber (LRSB). Only aircraft this large and this stealthy, he notes, can carry ordnance such as the 30,000 pound Massive Ordnance Penetrator (MOP) necessary to destroy such hardened targets. But this leads to an irreducible problem. One might expect that the LRSB will be approximately the same size as the B-2, which can apparently carry sixteen 2,000 pound bombs. This suggests that the LRSB could carry at most two, and probably only one MOP. This in turn, indicates that the US would have to build many, many LRSBs to credibly "hold at risk" the many (hundreds? thousands?) hardened or deeply buried targets Haddick envisions destroying. He also recommends that a variant of the LRSB should carry dozens of very long-range (500 km) air-to-air missiles and function as an air-superiority bomber, and that the Navy should buy and employ

LSRBs from land bases as a means of achieving sea-superiority in the Western Pacific.

All these uses for the LRSB stuck this reviewer as unlikely if not fanciful, especially as there is little precedent upon which to base a belief the Air Force can build 80-100 LRSBs at its estimated $550 million unit cost, or that Congress will fund the construction of very many LRSB, whatever the unit cost. One can legitimately question the wisdom of building a military strategy upon such an uncertain foundation.

Some of Haddick's other recommendations also tend to ignore additional limitations and obstacles. For example, he states his concept requires the ability to locate and destroy China's mobile missile launchers. His solution to this vexing challenge is to build very large numbers (he implies many thousands) of a new version of a small autonomous weapon developed and abandoned in the 1990s called the Low Cost Autonomous Attack System (LOCAAS). In limited tests this meter-long cruise missile could independently and autonomously find, classify, and attack mobile targets such as missile launchers. Haddick acknowledges that the old-LOCAAS' reported half hour endurance and 100 km range would limit the system's utility in a China scenario, but addresses this fundamental shortcoming by stating that "The next-generation LOCAAS needs a much greater range and loiter time, ideally thousands of kilometers and hours or days of search time." Similarly, Haddick considers the TLAM's utility to his strategy and concludes "the Air Force and Navy need a new land-attack cruise missile with at least double the range of the 1,600 kilometer Tomahawk."

Unfortunately, there is little reason to think such improvements in cruise missiles' range and endurance is physically possible. Jet fuels have a known, limited specific energy, and there is no chance that turbofan or other engines' efficiencies can achieve the orders-of-magnitude performance increases necessary to meet Haddick's many/small/smart/cheap/long-endurance requirements. A new-LOCAAS would therefore have to be much larger than the 1990's three-foot long LOCAAS –at least on scale with and almost certainly larger than the current TOMAHAWK

Land Attack Missile (TLAM), which cannot achieve the performance Haddick's recommendations require. Doubling TLAMs' range will require a new, larger missile, meaning fewer will fit in a given surface ship, submarine or airplane, which works at cross purposes to Haddick's requirements. Perhaps boosted hypersonic warheads or some other exotic means could meet his demanding performance criteria, but absent a technological breakthrough that redefines aerodynamics, that is unlikely to happen any time soon, if ever. Strategies that rely on advanced weapons must be firmly based on what is physically achievable. It isn't clear that at least some of the concepts and strategies in Fire in the Water are.

Even if one suspends disbelief about future weapons' performance, another perplexing aspect of the book is its assertion that any dissuasion strategy will have to hold at risk "assets valued by China's leaders". Haddick argues that extensive conventional strikes against the Chinese mainland are irreducibly necessary to successfully deter or fight China. Haddick, however, criticized JOAC and ASB's reliance on mainland strikes "to destroy the adversary's reconnaissance and command systems" as dangerously escalatory. Despite this, his alternative relies on comparable strikes to destroy similar targets in hardened bunkers or deep in tunnels, and also requires the ability to "hold at risk" very large numbers of multiple classes of land-based tactical targets. Haddick does not adequately explain why his strategy is structurally any less escalatory than that described in the JOAC or in ASB.

A larger problem looms over all of this. Reasonable people can disagree about the wisdom or necessity of conducting conventional strikes against a nuclear China. Yet such strikes are inherently escalatory. This fact obligates advocates of mainland strikes to convince others that a deterrent that relied upon such measures would be credible, especially given the disparity of perceived value in the objects being fought over. China wants Taiwan very badly, officially calling it a core interest over which it is willing to fight, and apparently is unwilling to compromise.

China also, as Haddick clearly relates, strongly desires and is willing to push hard against accepted international norms for the Senkaku Islands and control of the South China Sea. None of these objects, however, unarguably constitutes a vital interest to the United States, which could logically lead a future Chinese leader to conclude that a US threat to risk escalation through extensive mainland strikes was simply a bluff begging to be called. One could make a stronger case arguing that preserving a US-led order in the Western Pacific warrants taking larger risks. Yet even if that argument is made, it is far from clear that the best way to deter such conflicts is through a strategy that fundamentally relies on extensive mainland strikes. Other alternatives, such as the denial strategies forwarded by the Naval Post Graduate School's Wayne Hughes and Jeff Kline (Between Peace and the Air-Sea Battle) and the Naval War College's Andrew Erickson (Deterrence by Denial: How to Prevent China From Using Force) have the potential to effectively deter and do not rely on extensive mainland strikes. Such potential strategies therefore deserve careful consideration. However Fire on the Water did not really do this, and instead argued strenuously in favor of a more punishment-based method of deterrence.

A war with China is one that certainly must be deterred. But effective deterrence must be credible, as the Naval Submarine League's The Submarine Review's readers certainly understand. The great question then is "How can this deterrence best be established and maintained?" Unfortunately, the strategy proposed in Fire on the Water, and the forces necessary to support it, does not seem credible, at least to this reviewer. Despite this fundamental shortcoming, the book remains useful since the author explained clearly how the United States and China arrived at their current military state of affairs, why that condition is potentially unstable, and why current and many proposed military approaches for dealing with this issue are inadequate. These factors alone will advance the public debate on this important subject. Consequently, *NSL Review* readers will find this book worthwhile, whether they agree with author Robert Haddick's recommendations, or not.

NAVAL SUBMARINE LEAGUE

STATEMENT OF FINANCIAL POSITION
March 31, 2014

ASSETS	
CURRENT ASSETS	
Cash	$ 7,439
Cash Equivalents	-
Accounts Receivable	96,353
Investments at Market (Note D)	483,095
Prepaid Expenses	13,426
Total Current Assets	600,313
FIXED ASSETS	
Furniture & Computer Equipment	36,359
Office Condominium	251,021
	287,380
Less Accumulated Depreciation	(195,051)
Total Fixed Assets	92,329
	$ 692,642
LIABILITIES	
CURRENT LIABILITIES	
Accounts Payable & Accruals	$ 21,500
Accrued Taxes Payable	5,444
Deferred Revenue	25,486
Deferred Membership Dues	52,067
Rental Deposit	1,500
Total Current Liabilities	105,997
LONG-TERM LIABILITIES	
Deferred Membership Dues	215,158
Total Liabilities	321,155
NET ASSETS	
UNRESTRICTED	
Undesignated	350,337
Board Designated for Equipment	21,150
RESTRICTED	-0-
Total Net Assets	371,487
	$ 692,642

NAVAL SUBMARINE LEAGUE

STATEMENT OF ACTIVITIES
For The Year Ended March 31, 2014

REVENUES	Unrestricted	Total
Contributions	$ 203,291	$ 203,291
Dues	54,377	54,377
Annual Symposium	282,243	282,243
SUBTECH Symposium	-0-	-0-
History Symposium	4,500	4,500
Bank Interest	261	261
Interest & Dividends	15,669	15,669
Advertisements	34,900	34,900
Rent	6,000	6,000
Realized Gain (Loss) On Investment	65,011	65,011
Unrealized Market Gain (Loss) On Investment (Note D)	(13,799)	13,799)
CB Days Receipts	75,000	75,000
Other	1,055	1,055
Total Revenue	728,508	728,508
EXPENDITURES		
Awards and Grant	9,389	9,389
Publishing	101,174	101,174
Promotion	2,681	2,681
C.B. Days Meeting	97,215	97,215
Annual Symposium	248,850	248,850
SUBTECH Symposium	12,927	12,927
History Symposium	21,736	21,736
Submarine Advocacy	59,078	59,078
Chapter Support	6,070	6,070
Total	559,120	559,120
SUPPORTING SERVICES (Note C)	229,803	229,803
Total Expenditures	788,923	788,923
INCREASE (DECREASE) IN NET ASSETS	(60,415)	(60,415)
NET ASSETS, BEGINNING OF YEAR	431,902	431,902
NET ASSETS, END OF YEAR	$ 371,487	$ 371,487

NAVAL SUBMARINE LEAGUE

STATEMENT OF CASH FLOWS
For The Year Ended March 31, 2014

OPERATING ACTIVITIES	
Increase (Decrease) in Net Assets	$ (60,415)
Adjustments to Reconcile Change in	
Net Assets to Net Cash Provided	
Depreciation	6,544
(Increase) in Accounts Receivable	(29,498)
(Increase) in Prepaid Expense	(3,522)
(Decrease) in Accounts Payables & Accrued Expenses	(703)
Increase in Deferred Revenue	3,576
(Decrease) in Deferred Membership Dues	(8,767)
Increase in Rental Deposit	1,500
Net Realized (gains) on investments	(65,011)
Net Unrealized (gains) and losses on investments	13,799
NET CASH PROVIDED (USED) BY OPERATING ACTIVITIES	$ (142,497)
INVESTING ACTIVITIES	
Investment in Securities	(956,190)
Proceeds from Redemptions and Sales	1,031,911
NET CASH PROVIDED BY INVESTING ACTIVITIES	75,721
NET INCREASE (DECREASE) IN CASH	(66,776)
CASH ON HAND, BEGINNING OF YEAR	74,215
CASH AND CASH EQUIVALENTS ON HAND, END OF YEAR	$ 7,439
SUPPLEMENTAL DISCLOSURES OF CASH FLOW INFORMATION	
Cash Paid During the Year for:	
Interest Expense	$ -0-
Income Taxes	$ -0-

2014 NAVAL SUBMARINE LEAGUE AWARDEES

2014 FLEET AWARDEES

RADM JACK N. DARBY AWARD
CDR Christopher A. Nash, USN

MASTER CHIEF FRANK A. LISTER AWARD
MMCM (SS) Edward T. Rathgeber, USN

CHARLES A. LOCKWOOD AWARD
LCDR Adam M. Matthews, USN

CHARLES A. LOCKWOOD AWARD
EMCS (SS) Zachary T. Montello, USN

CHARLES A. LOCKWOOD AWARD
MM1 (SS) Vinh Mai, USN

FREDERICK B. WARDER AWARD
Ms. Myra M. Yamada

LEVERING SMITH AWARD
LT Mark S. Williams, USN

VADM J. GUY REYNOLDS AWARD
CAPT David A. Goggins, USN

GOLD DOLPHIN AWARD
CAPT George Norman, USN

SILVER DOLPHIN AWARD
CMDCM (SS) Eric H. Antoine, USN

2014 NAVAL SUBMARINE LEAGUE AWARDEES

DISTINGUISHED SUBMARINER

VADM BUD KAUDERER, USN, RET.

ADM CHARLES LARSON, USN, RET. (POSTHUMOUSLY)

DISTINGUISHED CIVILIAN

MR. THOMAS CONRAN

HONORARY

MR. BILL RYZEWIC (POSTHUMOUSLY)

LITERARY AWARDS

1ST PLACE
CMDCM Eric Antoine, USN

2ND PLACE
CAPT Jack O'Connell, USN, Ret.

3RD PLACE
CAPT Jim Patton, USN, Ret.
Mr. Joe Buff

4TH PLACE
LCDR Sean Kido, USN

PHOTO AWARDS

1ST PLACE
ETC Michael Dlabaj, USN

2ND PLACE
MC2/(SW/AW) Kyle Carlstrom

3RD PLACE
MC1/SW/AW) Steven Khor

HONORABLE MENTION
CDR Michael Quan, USN

2015 NSL CORPORATE MEMBERS

5 STAR LEVEL

The Babcock & Wilcox Company
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

Battelle
Booz Allen Hamilton
Dell Services Federal Government
General Dynamics
Mission Systems

3 STAR LEVEL

Adaptive Methods, Inc.
AECOM Management
Services Group
Curtiss-Wright Flow Control
Company
DRS Technologies, Maritime
and Combat Support Systems
Oceaneering International, Inc.
Progeny Systems Corporation
Sonalysts, Inc.
TASC, Inc.
TSM Corporation
Ultra Electronics – 3 Phoenix, Inc.
USAA

2 STAR LEVEL

Advanced Acoustic Concepts, LLC
Alion Science & Technology
American Systems Corporation
BAE Systems Integrated
Technical Solutions
Boeing
Cunico Corporation &
Dynamic Controls, Ltd.
General Atomics
In-Depth Engineering Corporation
Innovative Defense Technologies
Marotta Controls
MYMIC, LLC (new in 2015)
Nuclear Fuel Services, Inc.
Preferred Systems Solutions, Inc.
Rolls Royce Naval Marine, Inc.
Securitas Critical Infrastructure
Services, Inc.
Systems Planning and
Analysis, Inc.
TE Connectivity
Ultra Electronics
Ocean Systems, Inc.
UTC Aerospace Systems

2015 NSL CORPORATE MEMBERS *(continued)*

1 STAR LEVEL

AMADIS, Inc.
AMI International
Applied Mathematics, Inc.
Applied Physical Sciences Corporation
Applied Research Laboratory-Penn State
Business Resources, Inc.
C.S. Draper Laboratory, Inc.
CACI International Inc.
Capitol Integration
CEPEDA Associates, Inc.
Dresser-Rand Company
Garvey Precision Machine, Inc.
Imes
Micropore, Inc.
Murray Guard, Inc.
Nord-Lock/Superbolt, Inc.
OceanWorks International
Orbis, Inc.
Pacific Fleet Submarine Memorial Association, Inc.
Precision Defense Services
PRL, Inc. (new in 2015)
RIX Industries
SSS Clutch Company, Inc.
SAIC
Sargent Aerospace & Defense
Seawolf Solutions, Inc.
Security Technologies International
Siemens, PLM Software
Teledyne SeaBotix, Inc.
Treadwell Corporation
Undersea Solutions Group, A Subsidiary of HII (new in 2015)
VACCO Industries (new in 2015)
Westland Technologies, Inc.

NAVAL SUBMARINE LEAGUE

LIFE MEMBERS
CAPT Duane R. Ashton, USN, Ret.
CDR Dan Bacon, USN
RADM Charles Beers, USN, Ret.
CAPT James R. Carey, USN, Ret.
EM2 (SS) Douglas Sharkey Chartier, USN, Ret.
Mr. Richard Ector
LCDR Krysten Ellis, USN
LCDR William Fatek, USN, Ret.
Mr. Jacob Glassman
Mr. Ronald C. Katahara
Dr. Angus Greer Hendrick
MCPO Isaac Ingram, USN, Ret
Mr. Michael A. Izatt
SCPO Daniel W. Lawrence, USN, Ret.
CAPT George W. Martin, USN, Ret.
LCDR Fenton T. McGonnell, USN, Ret.
CAPT Dennis McKelvey, USN, Ret.
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