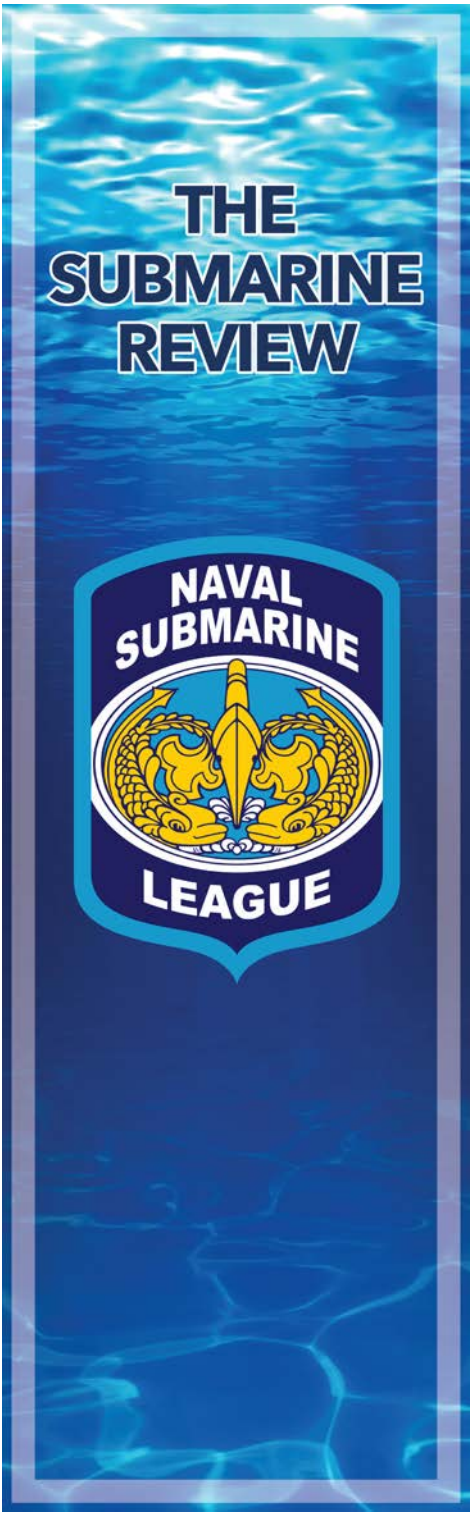

MARCH 2017

34TH ANNUAL SYMPOSIUM

FROM THE PRESIDENT

Our United States Navy Submarine Force is agile, mobile, lethal and persistent, capitalizing on its inherent stealth to operate with impunity in response to our Combatant Commanders' myriad tasking in each of the maritime theaters around the world.

This straight forward statement of fact, emphasized by each of our speakers during the Naval Submarine League Annual Symposium in October 2016, highlighted this year's Symposium theme - "Executing the Design for Maritime Superiority" - and clearly established the way forward as the Submarine Force and the Navy address the challenges that are ahead. In the dynamic and demanding environment of today's world, stealth is an enabler, while reconnaissance and intelligence are force multipliers, and payloads - delivered when required and as required - profoundly influence events. And the Submarine Force is answering the call.

As the nation begins a new year and the incoming administration implements its priorities, the Navy continues to demonstrate its value, influencing events around the world, and the men and women of the Submarine Force sustain the highest levels of technical, tactical and professional excellence, day in and day out.

The Navy's Force Structure Assessment (FSA), completed near the end of 2016, affirmed the need for a larger and more robust Navy, and the Submarine Force leadership and the Submarine Industrial Base enthusiastically embraced the challenge. Efficiently implementing the Submarine Unified Build Strategy, submarine programs are well managed and responsive to the demands of the fleet and have demonstrated the ability to align their efforts to provide cost effective and efficient alternatives in support of adjustments to the Navy's Shipbuilding Plan. This demonstrated responsiveness bodes well for the future.

The COLUMBIA Class Submarine Program (formerly the "OHIO Replacement Program") remains the Defense Department's top priority acquisition program and, having met all Milestone B requirements, is on pace to achieve its goal of construction start in 2021. This program reflects the nation's

commitment to maintain an effective and sustainable sea based strategic nuclear deterrent and relies upon the close alignment of the efforts of the Director for Strategic Systems Programs, the Program Executive Officer - Submarines, and the Submarine Industrial Base.

The VIRGINIA Class Submarine Program remains the model within the Department of Defense, delivering two attack submarines per year cost effectively and efficiently, and the VIRGINIA Class Submarines operating in the fleet today are excelling in the most demanding undersea environments. This highly successful program is poised to add the VIRGINIA Payload Module with Block V in FY19 to dramatically increase undersea influence effects and stands ready to respond to future fleet needs.

As has always been the case, the success of our Submarine Force relies, in large measure, upon the professionalism and dedication of those who operate and maintain our force. This exceptional group of submarine professionals works hard, trains efficiently, refines their operational and tactical capability, and hones their war fighting skills so that they are ready to respond when asked. They will show the way as the Submarine Force goes forward.

In the mid 1950's, faced with a growing and unpredictable Cold War threat, CNO ADM Arleigh Burke famously chose to use "brain power" to address the challenges of designing and building a survivable sea based deterrent against the use of nuclear weapons. Faced with push back within his staff, he chose two independent and innovative thinkers to lead the way forward: RADM "Red" Raborn, for the Submarine Launched Ballistic Missile, and RADM Hyman Rickover, for the large nuclear powered submarine to employ the weapon system. History demonstrates that technical excellence, innovation and "brain power" succeeded.

Today, our CNO, ADM John Richardson, has established a "Design for Maintaining Maritime Superiority" and, informed by the FSA, has applied his own notion of "brain power" to address our Navy's challenges in an uncertain world. ADM Richardson recently said: "We need to be constantly looking at new

approaches, new technologies, maybe even new ship classes. But as we do so, we don't have the luxury to stop." I encourage each of you to review this document to get a sense of the CNO's vision and the Navy's way ahead. ADM Richardson calls upon each of us to contribute as we are able and he is open to new ideas and innovation.

The Submarine Force, working with the Submarine Industrial Base, stands ready to answer that call, applying stealth, mobility and varying and ever increasing numbers of payloads to address future threats. As the Navy fleet grows to meet the clearly defined demands of Combatant Commanders around the world, the Submarine Force will continue to play a vital roll maintaining maritime superiority.

It is my hope that THE SUBMARINE REVIEW will inform you as you consider these important issues and that you will discuss them with colleagues and friends. Your support and the support of our Corporate Members is essential for promoting a strong Submarine Force within our Navy and helps to articulate the value, quality, and professionalism of our Submarine Force and the robust industrial base that sustains it.

As cold weather sets in for another winter season and there are signs that the drought may be easing in the West, I send my best regards to you all and ask that you keep those who serve our country in uniform around the world in your thoughts and prayers.

John B. Padgett III
President

EDITOR'S COMMENTS

I have reported aboard as Jim Hay's relief. It is an honor, privilege and pleasure to take over the responsibilities as Editor of THE SUBMARINE REVIEW. I have long admired Jim and his work and I am very pleased that he has assured me that he will not get lost, and will be available to lend advice and counsel as the days and years go on. So, I'm not going to bid him "Smooth Sailing", just "We'll see you around."

As you can see from the Table of Contents, this issue is a recap of the Submarine League's 2016 Annual Symposium. The 34TH Annual Symposium was held on 26 – 27 October 2016 and we are already looking forward to the 35TH Symposium which will be held at the Washington Hyatt Regency on 1 – 2 November 2017. Put these dates on your calendar.

You may also note that we only published three issues in 2016. This was an anomaly, a one-time situation, and not a precedent. With the delay of our Corporate Member Days, we plan to publish a Spring issue in addition to this current issue.

At the 34TH Symposium we had the pleasure of hearing from the CNO, ADM Caldwell, both SUBFOR type commanders, the Chief of Naval Personnel, OPNAV N8, the Director of Strategic Systems Programs (SSP), N97, PEO SUB, the FORCE Master Chiefs and Mr. Mark Gorenflo, at that time with the Defense Innovation Unit Experimental (DIUx). Additionally we enjoyed a Program Managers Panel and a Junior Officers Panel. We have selected several of these presentations for inclusion in this issue to provide you a better understanding of the issues on which our Submarine Force leaders are working. Since we don't have sufficient space in this issue for all of the presentations authorized for release, we will be publishing some of them in the next issue.

Our Force Commander, COMSUBPAC and N97 all gave excellent presentations on how they are proceeding in support of the CNO's goals, what they are looking at for the future of platforms and capabilities, as well as current and future operational threats and challenges. Likewise, the Force CMCs were right on the mark regarding the performance of our people.

VADM Terry Benedict has been the Director of SSP for over 6 years and previously has had 9 different assignments within SSP. He spoke of the OHIO Replacement (now officially designated as the COLUMBIA class) and the critical importance of staying on schedule with the design, construction and testing of the first ship. Additionally, he spoke of the absolute importance of maintaining and sustaining the OHIO class through the remaining extended lifetime of those ships. Please read his remarks to get the full scope of his excellent report on SSP's priorities and challenges. RDML Jabaley, as PEO SUB, is responsible for the execution of the vast collection of programs ongoing to support all aspects of the maintenance, modernization, design and procurement of our platforms within budget and schedule, not a small task. His report is wide-ranging and very interesting.

Finally, we enjoyed a special treat with Mr. Mark Gorenflo's presentation in which he described the innovation efforts with which he had been involved at the Defense Innovation Unit Experimental (DIUx). Mark is a retired senior submariner who was asked by Secretary of Defense, Ashton Carter, to join this newly formed agency to work on collaboration with industry to make DoD more effective through technology and innovation. The presentation is extremely interesting and important in informing us as to how we need to work with the best in the world to remain tops in our business.

I hope that you will enjoy this issue. We recognize that since we do not publish in color format, it is difficult to follow some of the presentation slides. We encourage you to look at the issue online at the Naval Submarine League website to view the presentations in color. Please don't hesitate to contact me with ideas and/or suggestions as I work with my Assistant Editor, Kristin Bernacchi, to provide all of our readers those ideas and examples of what is important to our Submarine Force today and as we go forward in *uncharted waters*.

Mike Hewitt
Editor

THE SUBMARINE REVIEW IS A PUBLICATION OF THE NAVAL SUBMARINE LEAGUE

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34TH ANNUAL SYMPOSIUM

NAVAL SUBMARINE LEAGUE
34TH ANNUAL SYMPOSIUM

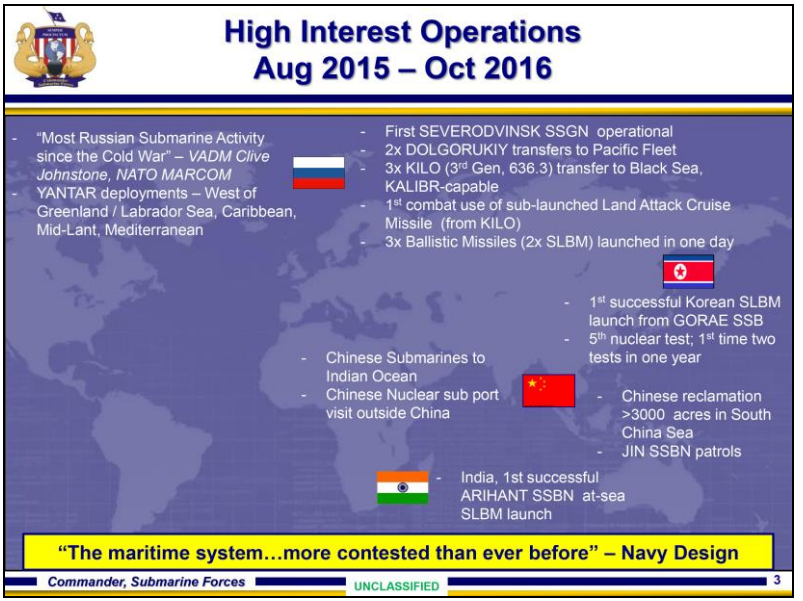
VICE ADMIRAL JOSEPH TOFALO, USN
COMMANDER, SUBMARINE FORCES

October 26, 2016

Admiral, thank you very much for that introduction. Thank you for your leadership, sir. Tim Oliver, I know you're out there as well. Thank you for all your hard work and for all the folks from the Navy Submarine League who give us this great opportunity. Thank you for that.

My task here is to be right on target with the theme of the symposium, and that is the Navy's maintaining the design for maritime superiority.

In keeping with the theme of the symposium, what better way to build upon how the Submarine Force is executing the design for maintaining maritime superiority than to hear from the CNO himself? Please roll the video of the CNO. (https://www.youtube.com/watch?v=mmTX0jlIUT4).



I think it's important to start with, what's been going on in the world since the last time we met. It's pretty sobering, if you look at this chart—with respect to Russian Submarine activity, very, very sobering. Talk to Vice Admiral Clive Johnstone, who is the NATO MARCOM commander. Here's a quote from him: "The most Russian Submarine Activity since the Cold War."

Since we last met, the SEVERODVINSK is operational. There are two DOLGORUKIY now in the Pacific fleet.

We've got Kalibr-capable KILOs in the Black Sea. Clearly no reticence in actually using kinetic power from Russia, and the first combat use of submarine-launched land attack cruise missiles from one of those KILOs. They just recently conducted a pretty significant show of force with three ballistic missiles launched—two from submarines—all in one day.

Meanwhile, over in Korea, I know some of the developments there are very, very concerning. The first successful Korean SLBM launch from a GOREA; the fifth nuclear test conducted by Korea—actually the first time ever we've had two in one year. This is from a country that's the only country to withdraw from

the Nuclear Nonproliferation Treaty and the only country to test a nuclear weapon since the turn of the century.

China is obviously doing some things that stress the neighborhood there with the reclamation of land in the South China Sea. The JIN ballistic missile submarine is making patrols. There's a recent report to Congress that talks about how sometime this year the Chinese, using the JIN, will conduct the first operational deployment of a SSBN. This would be the first time in your lifetime that someone other than Russia has held your family at risk from a submarine launched ballistic missile, from a country with which there is no START Treaty arrangement.

You get the picture. There's been a lot going on in the world. It certainly underpins what the CNO was just talking about in his call to action.

As was alluded to, here are the four lines of effort from the Design for Maintaining Maritime Superiority; you see here a place mat. Frankly, it's impossible to take this entire document/booklet

and put it in a place mat, but if you could this is what it would look like. Also here I show the Commander's Intent document that Admiral Padgett was referring to, that Fritz Roegge, Chas Richard and I signed out. I've overlaid that Commander's Intent document onto that Design's place mat, making the visual point that the Submarine Force is totally aligned with the CNO. So, just as Admiral Padgett referred to, we are very, very synchronized. You can hold these two documents up to the light and they are 100 percent aligned in where the Submarine Force is going and how that is 100 percent in support of where the CNO wants to take the Navy with Design for Maintaining Maritime Superiority.

So now we'll talk about some of the key elements from the Design that are manifest with the statement that I just made. First and foremost, Admiral Caldwell talked about it, Admiral Padgett talked about it in his opening remarks, is strategic deterrence. It

should not be lost on anybody in this room that this quote from the Navy Design is as stated, Strategic Deterrence is "foundational to our survival as a nation," period. It has prevented major power war for the past 70 years.

As you've heard, the sea-based leg of that triad is going to be on patrol through the 2080s. We have to get this right and there is no time to waste. All margin is gone. We can do it, but we have to continue to move out on all the things that we are moving out on.

Just to put a finer point on what Admiral Caldwell said, we've actually started to build OHIO Replacement already, in the form of the Common Missile Compartment. I'm always quick to tell people that it doesn't go on patrol in Fiscal Year 2031; it's actually October of Calendar Year 2030. So there is no time to waste.

The OHIO-class, as we stand here right now, represents a little over 50 percent of the nation's accountable nuclear warheads being carried on the sea-based leg of the triad. The other two legs of the triad combined are less than the Submarine Force alone, just as we stand here today at just a little bit above 50 percent. Under the New START Treaty, as Admiral Caldwell mentioned already, approximately 70 percent, seven-zero percent of the nation's accountable nuclear warheads will be carried on the sea-based leg of the triad. That is a big number. Again, we have to get this right. This is something that has prevented major power war for the last 70 years.

So OHIO Replacement, we're going to have 12 to replace 14. We went from 41 SSBNs to 18 to 14, and now it's going to be 12. Those 12 are carrying 16 missile tubes, not the 24 missile tubes that were on OHIO.

We can do this. We have done the hard work. We have done the math. We have done that rigorous analysis. But 12 is the number, nothing less.

The force structure of the SSBN force is not a function of the number of warheads. It is a function of the three things that are listed here: survivability, geography and target coverage. That's a much more sophisticated conversation than just the number of warheads. This ensures a credible two-ocean force, so that the other guy, when he wakes up in the morning, doesn't even want to

bother to come find us because it's too hard. It's in that way that we're able to deter for the defense of our own country, and assure our allies at the same time.

Efficiency for this program—extremely efficient. The American taxpayer is going to get a very high return on the investment here when you consider the things that we are pulling through from OHIO and VIRGINIA classes. Of course this also goes to that efficiency question because all of these things are now baked in across the Force. Take SWFTS, for example, the Submarine Warfare Federated Tactical Systems. It's the sonar system, the fire control system, the imaging system, the ESM system. All that being all together now and the SSBN being part of that family, all the money that is spent on working on the TI, tech insertions, and the APB program builds, the software part of it, all of that is leveraged automatically now into OHIO Replacement. That's a big part of that efficiency question.

All of this is being pulled through to OHIO Replacement, the Strategic Weapons System, the fantastic work that Admiral Benedict and his team are doing, and a lot of that being proved out over here in OHIO. The D5-life extended missile, SWFTS, acoustic superiority, propulsor, modular construction, all of that from VIRGINIA and OHIO, tremendous lessons learned, tremendous efficiency there.

But there are some new things, new technologies, significant ones that are needed for acoustic superiority. Probably the two most notable: electric drive from an acoustic superiority standpoint; and the 42-year reactor which is absolutely a major, major part of why we're able to do this: 12 to replace 14.

Value, I've already foot stomped this. About one percent of our DOD budget goes towards the procurement of the sea-based strategic deterrent. So when you consider that this platform; which has prevented major power war for the last 70 years, is going to be on patrol through the 2080s, and is still going to be carrying roughly 70 percent of the nation's accountable nuclear weapons; this is a tremendous return on investment. This is tremendous value, and the American taxpayer should be very, very proud of that.

Another thing that we're doing in the Submarine Force to help advance the design: preparing for the high-end fight. Admiral Richardson talked about that in the opening video. The world's oceans are more contested than ever. So some of the things that we're doing, Admiral Roegge and I, we call "Tuning the FRTP." The FRTP is the way we prepare submarines for their deployment, the Fleet Response Training Plan.

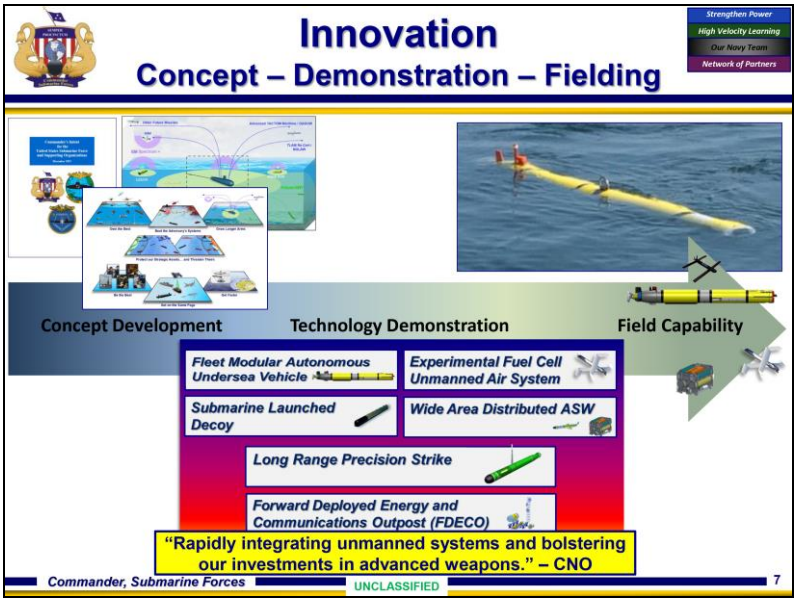
The bottom line is we're trying to increase the amount of at-sea combat type experience, sub-on-sub interactions, more tactical development. We're really working hard by really scrubbing—taking a hard scrub on our assessment and certification process to eliminate any redundancies, any overlaps, anything that we can take credit for in another way. Why test it again or test it twice or in a different way or at a different level? If we can wring out something north of 10 days of additional time, that would be a huge, huge victory. So we are really working hard on that, sharpening our pencils, and trying to get after that.

The Submarine Force also has an Electronic Warfare Wholeness Campaign Plan that's taking a hard look at the systems, the people, the doctrine and the overall alignment. I would also put in the category of preparing for the high-end fight; the Undersea Warfighting Development Center and the absolute success that this has been. It really has been a great success. This is not just for the Submarine Force, because it is not the *Submarine* Warfighting Development Center, it is the *Undersea* Warfighting Development Center.

Admiral Trussler, and now Admiral Pitts, bottom lines the ASW certification of carrier strike groups. He's the guy that gives them their Tactical Readiness Examiniation, TRE, to put it in submarine parlance, from an ASW standpoint, that is. That's huge. Admiral Merz has also had the same job in kind in a former life, and a former instantiation of that command (NMAWC).

But all of the warfare communities now have these warfighting development centers that fall in under the lead TYCOM, and again, the standup has been great. We have updated our own STORM, for those of you who remember what the STORM was, the Submarine Tactical Objective Road Map. We have adapted that model to the entire undersea and created an Undersea Tactical Objective Road Map.

We're also reinvigorating tactical development, which was something that was needed, the entire certification process from Theater ASW to carrier strike groups to independent deployers. We just completed the largest ICEX in U.S. history, four different nations, four different services, four different branches of government, 35 different organizations, two submarines, and 150 people on a moving ice floe over the course of that time. It's absolutely eye-watering. Nobody else has done anything like that—really huge.



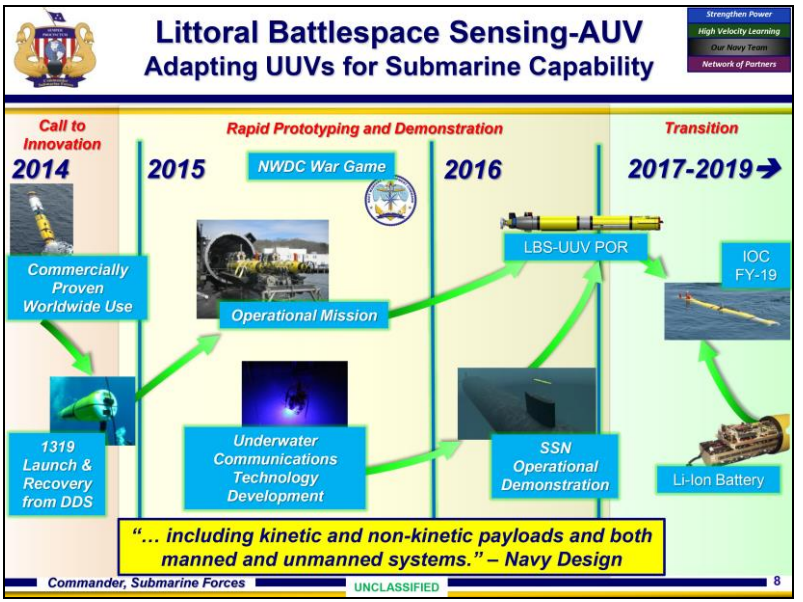
Innovation—a big part of what we're doing and right on target with what Admiral Caldwell is challenging us with. It's in the Commander's Intent and a big part of what we call Vision 2025. One of those little icons in the upper left corner is *Get Faster*, which is certainly right in line with what you heard the CNO say about *High Velocity Learning*. So we're really working hard to drag things across that Science and Technology, S&T, gap and go from concept; as laid out in things like Vision 2025, and the Commander's Intent; to field a capability with the goal of trying to do it in two years, where possible, and we're having success.

At the same time, there are going to be speed bumps. You can't be afraid to fail in this kind of business. You've got to learn from it. You've got to absolutely learn from every single lesson.

There have been some great successes. Some of them are shown on the slide here. I'm not going to go into each one of these; including the Wide Area Distributed ASW, the Fleet Modular AUV, Project 1319, some UAVs: Blackwing, a small UAV launched from the signal ejector with about an hour

endurance; and XFC, Experimental Fuel Cell UAV, which is launched from a torpedo tube with about a nine to 10-hour endurance.

FDECO is another technology demonstration, Forward Deployed Energy and Communication Outpost. I mention that only because this is an example of what Admiral Caldwell was referring to with thinking out of the box when it comes to UUVs. The FDECO station allows the UUV to plug in and get its power from a station, not from the submarine; to get to another way to look at Sydney Freedberg's question.



I do want to dive into this success story just a bit more, the Fleet Modular AUV, now as a program of record under the LBS-AUV, the Littoral Battlespace Sensing AUV. This is a great success story, a great example, of a tremendous team effort to pull something from a concept to actual demonstration in that two-year time period I mentioned. Very, very exciting stuff: using

commercial off-the-shelf Remus vehicles made by Hydroid, doing the 1319 launch and recovery experiments from a dry-deck shelter, and then actually doing a real-world mission in support of a Combatant Commander. We're also working on some underwater communications technologies and plan to dovetail that into the program of record as well.

And we've still got some other great initiatives, including some lithium ion power density work we want to do. Hopefully that will come to fruition here in 2018, and bring that all together with something that can be launched from a dry-deck shelter or from a torpedo tube if the mission is valuable enough, and either scuttle or recovered by a white ship.

So again, it's a great example of innovation that we discussed on the previous slide, to include achieving it, in an impressive two-year timeframe. A lot of people in this room have been a big part of this success story, so my hat's off to all of you.

Here's some more on high velocity learning and some stuff that's going on in the force. The model that you see there has become pretty popular.

It comes from Dr. Steven Spear who wrote a book called *The High Velocity Edge*. If you haven't read that, it's something that we're using a lot in our lexicon and our dialogue, and the way we're thinking.

But I have to say even beyond that, I've opened my aperture on a couple of things that we can do better. Let's start with the model see, swarm, solve, share, spread. Fundamentally, as nukes and submariners, we do a pretty good job of seeing things: monitor watches, post-watch tours, audits/surveillances, you put your black hat or your red hat on or whatever hat you want to call it—and you get out and see and learn and gather data and understand where you're at.

We do a good job of swarming. A critique is a good example of the swarming process. And overall I'd say submariners are a pretty smart group of people who are good at solving problems. The right end of the spectrum is where we can do better, sharing and spreading. I think of sharing as something that a person or unit does, but spread is something that the institution or submarine force does.

Sure, we write those critique reports, those incident reports or those lessons learned, but we haven't always done a good job of getting that back into the submarine force at the right place and at the right time so that lessons that are written in blood by somebody else don't get written again. So we're really working on that.

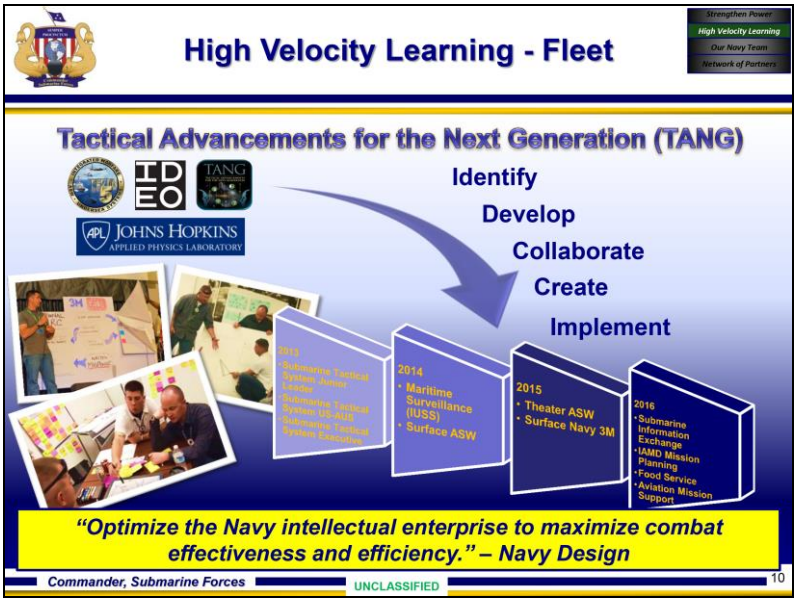
At the TYCOM level we've established this office called the Force Improvement Operational Safety Office, the FIOS office. You see that kind of at the center here. The CO is in the center of this little puzzle. The FIOS is a piece of that. The squadron is a piece of that: the training facilities; the Undersea Warfighting Development Center who works on the tactics, techniques, and procedures; the CONOPS. So at the TYCOM level, that's one thing we've done.

At the submarine level we've established this thing called the Operational Safety Officer. Every single submarine now has a Junior Officer, who has a primary duty, to be the Operational Safety Officer. That's a big paradigm shift from the way a lot of you in the room grew up.

If used correctly, this officer will help the CO, XO, Department Heads, all the division, get full utility out of the different tools we now have. From the new Lessons Learned Data Base, to Force Operational Notes, Technical, Organizational and Behavior Indicators or TOBI Reports, to improvement in Continuing Training and Qualification Software (CTQS), etc. I do not for a minute think that you have only one person in the wardroom that's responsible for safety, absolutely not. Every single member of that wardroom is responsible for safety.

But this is a guy who helps the Captain do better at getting the lessons learned from other people in so that what we learn in one Carrier Strike Group ASW exercise are not relearned. We don't have the time or the force structure to relearn lessons individually. We've got to try and get it right every first time that we possibly can, and that's part of this learning faster piece.

So at the strategic level, this is a big part of what the submarine force leadership is trying to do. If done right, this will help us with the High Velocity Learning approach that the CNO has challenged us with.



Let me give you a couple of examples of what the Submarine Force is doing here. I think a lot of folks in the room have probably heard of the TANG process. If you haven't, it's Tactical Advancements for the Next Generation. This is something that IWS-5, IDEO and Johns Hopkins work on together under the leadership primarily of IWS-5.

Let me give you an example. Let's say you're trying to work on sonar or a fire control system. Get the JOs, the chiefs, the petty officers in the room; take their uniforms off; civilian clothes, yellow stickies and magic markers, that kind of thing; thinking about how we can solve a problem better? What's the right visual interface, the right button pushing? And really, in a high velocity manner, get to what's needed so we can fold that back in and not have the same kind of challenges for everybody else going forward. That's an example. That was, in fact, the first one. We've done 11 of these now. They've become so popular that some of

the ones, on the far right there, some of the ones in the bottom of those two columns are not even Submarine Force examples. They've been picked up by other communities as a way to improve their own high velocity learning. So this has truly been a success story.

I would submit to you that our Submarine Multi-Mission Team Trainers, the SMMTTs, are a great example of high velocity learning. Here's a trainer that's integrated with the SWFTS model and what we call the two-four stroke, you're ability to every two years develop the software with the goal of updating it on hardware on platforms at four year intervals. We've modified that to probably more like four to six year intervals, but you can't go much more than six years because you get into hardware obsolescence. At the same time you don't want to spend a bunch of effort on episodic boutique gold-plated state-of-the-art systems,

when state-of-the-practice is totally adequate. In fact, it's very darn good. But the key is to have that constant drum beat of working in the state-of-the-practice where you're refreshing your subs. So you're spending your resources for the long haul in a predictable fashion that's helpful for industry, not in more spread-out episodic type model that are high-end for a while but then don't last.

And so because of that model we can update the SMMTT trainer at the same time we update different submarines in the same homeport, keeping our training in synch with our on-board systems. That's extremely huge.

From a *get faster* standpoint, we have real world examples where we have taken potential adversary type platforms, whatever they may be: planes, ships, submarines, whatever; and one submarine will come back from a deployment with data on that. We will hand that over to the program manager, and that will get rolled in to the trainer such that the next crew going to deploy is training on it right away. I can't think of a better example of high velocity learning, and this trainer allows us to do that.

Mission rehearsals and certification: I have Groton-based submarines that deploy to the western Pacific, and safely do so, because of their ability to train and rehearse in the exact environment they're going to be in. The SSGN crews that Admiral Roegge and I deploy are airdropped onto a sea-framed platform that is deployed for 18 months. That is unbelievable, to have a platform, a ship, out for that long that the crew is able to airdrop onto that platform in a place like Diego Garcia, and immediately go to sea and do their mission because they have done their rehearsal in that trainer. Our high SSGN Operational Availability could not be achieved without that.

If you have an untoward event or something that you want to really learn from, we can run every single Officer of the Deck, at a graduate level, through that scenario so that they know that they have lived and breathed whatever it was that you're training on. It's very, very powerful.

Some people examples. We've had a couple of examples here of late with Sailors. This one I love. Every submariner in the room has dropped their bunk pan on either their finger or onto something that was crushed when bunk fell. This young Sailor said, "Why can't I have on my submarine bunk pan the same gas shocks that I have on my car hood?" It's a really good question.

So there's another example of some high velocity learning. We're taking a hard look at making that a configuration change and something that submarines can reach out and do.

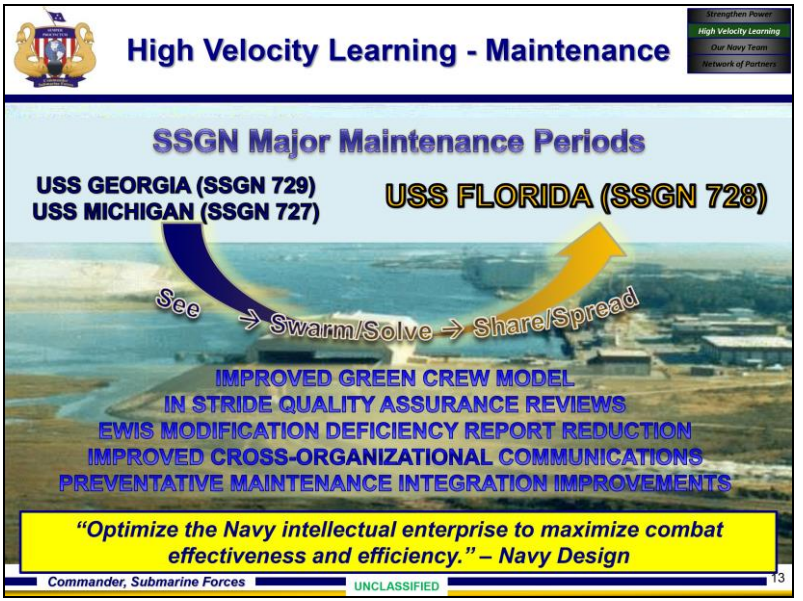
We've got a JO survey going on right now and a follow-on symposium, which I think is a good example of high velocity learning. We're reaching right out to the JOs, the first JO survey that we've done in about a decade. It's been a while, we really worked hard at it, and we got a tremendously high response rate.

Typically survey response rates are about one-third of your potential sample size. We got 57 percent responders on this, with

really good hard-hitting feedback. So we're going to work on that and we're going to bring a couple of key JOs from the different concentration areas together on the 7th of December to talk even more about how to implement this feedback.

We're using traveling instructors, a great idea from some of the folks at the junior level up in the training command. Why does every submarine in Norfolk or San Diego have to send certain Sailors to unique schools that may only be taught in Groton or Pearl Harbor? Why not bring the schoolhouse to the waterfront in key areas? It's much more efficient and you'd probably get more people trained because the ship probably couldn't afford to let some guys go.

And then a submarine database for lessons learned, I don't know why it took us so long to get to the idea of taking that thing offline and let's send it to the submarine, but how to do that? Well, why not use the SOBT products, Submarine On-Board Training? So now we embed the lessons learned database in that. Every submarine gets those twice a year and they've got pretty much 98 percent of the submarine lessons learned data base at their disposal.



SSGN maintenance, we worked very hard on taking the lessons learned from GEORGIA and MICHIGAN's MMPs, Major Maintenance Period, and applying them to FLORIDA, which is going on now. There are some great examples there. In the interest of time I'm not going to dive into those.

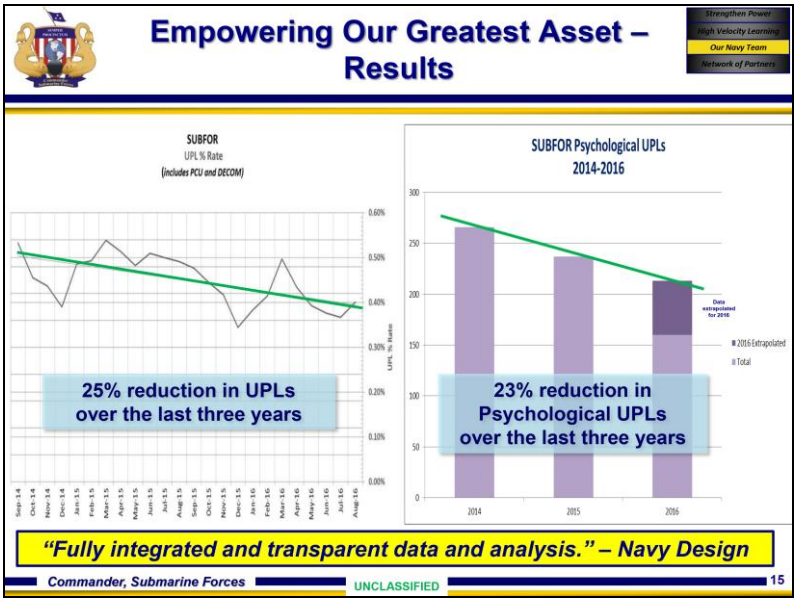
Let's also talk about the people piece, which is obviously very important. Some of the initiatives include: assessments, Sailor toughness, which is one of the attributes from the Design, and then also Force improvement. We have a couple of new assessment tools. One is called the People-centered metric. The other is this thing called TOBI, Technical, Organizational and Behavior Indicators. Actually, one of the inputs to TOBI is in fact the People-centered metric thing.

I'm not going to get into the science behind that, but there is science behind it. We actually brought aboard a specialist, a Ph.D. level specialist on the SUBFOR staff to help us design these products. These tools help the dialogue between the Squadron and the sub, between the Commodore and the Skipper. They now have an additional common frame-of-reference from which to talk to, and the great thing is that no overhead is required of the submarine to create this.

A lot of us in this room know some of the precursors of this required the submarine to provide all kinds of data. Now the submarine is hands-off. It's all data that we pull from "the Cloud" and put together in formula, and that allows the submarine to work on things they're supposed to be working on.

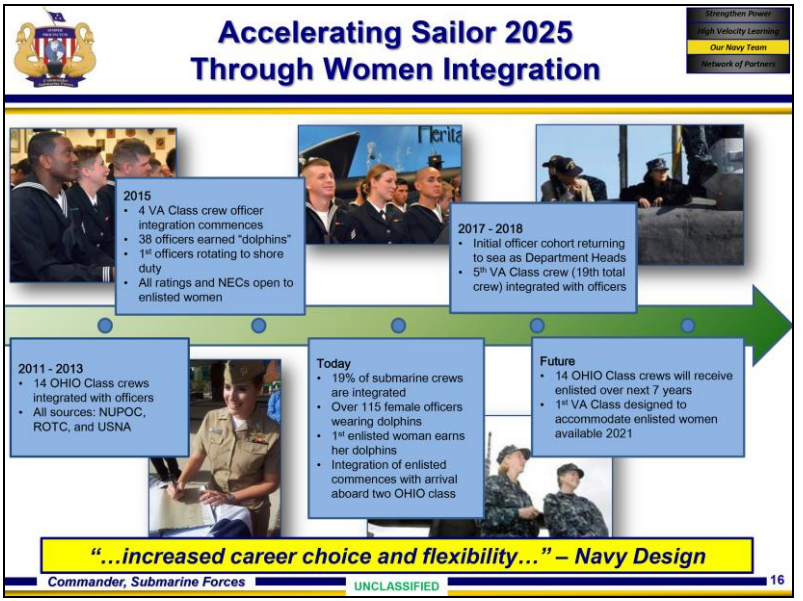
Finally, the Embedded Mental Health Program, and Master Chief Capps is going to talk about this also, has been a huge success. Probably the biggest thing that we've gotten out of this initiative is changing and opening the aperture of leadership; changing how we think about some of the challenges, whether it's mental health, removing the stigma of getting help, adding new terms to our vernacular and our dialogue, approaching things from a more preventative standpoint when we can, not to be afraid of that *checkup from the neck up*, as the SEALS say, which is exactly where our new Executive Coaching for the PXOs and PCOs came from.

My Force Medical Officer, Dr. Matt Hickey, is a Trident-wearing SEAL medical officer, so he came from that community and he's helped us navigate this. It has gotten great reviews from the PXOs and the PCOs, and an understanding of how to change the dialogue and work on that. So to that end, I've already talked about the items on the right side of the slide. Go to the next slide and let me show you some of the results.



We've had a 25 percent reduction in unplanned losses in the last three years, with a 23 percent reduction in the psychological contributors to those unplanned losses. That's fantastic. I will say that in the fleet concentration area where we did the pilot program, Norfolk, it was about 80 percent. In some of the other areas where we didn't run the full pilot it was more like 20 percent hence, the average being where it is.

The point is, where we did the pilot, there really was an effect. There's also an instrument called the OQ-45. It's an instrument where you fill out and complete it and then you have an interaction with a trained psychologist or psychiatrist. We've actually seen, in the pilot program, an increase in those scores. So as a nuke, I'd call this is objective quality evidence of the ability to increase Sailor toughness and resiliency. I think that's just fascinating, so pretty excited about that.



Women in submarines is going very well. We have about 19 percent of the force currently integrated. Over 115 female officers are wearing their dolphins.

As you know, a couple of years ago we started on the 14 Ohio-class crews being integrated with officers. In 2015 and 2016 we got four Virginia-class crews. Our 19th crew, WARNER, is going to happen in 2018 because we wanted to open one up in a fleet concentration area that's more than just submarines.

A lot of the female submarine officers have a male spouse that is not a submariner, but might be a JAG or an aviator. So we wanted to get an integrated sub in Norfolk because that's obviously a great place where there's additional fleet concentration other than just the Submarine Force. And that was based on feedback from the women, so we heard them loud and clear.

We are just starting the enlisted integration. We have two crews that are in progress and right now we have the OHIO as the third. Our model is about two-thirds conversions and about one-third new accessions. All the nukes are new accessions because we

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don't want to rob from the surface nuclear power program based on the small numbers there. So overall this effort is going well.

Finally, the Design talks about partners and I think we've got some great examples. I already mentioned ICEX-16 with the four different countries there. DESI, our Diesel Electric Submarine Initiative sets the standard for interactions in Fourth Fleet and in SOUTHCOM in a lot of ways. We work with Colombia, Peru, and Chile on this.

The Integrated Undersea Future Investment Strategy 3.0, this is Admiral Merz's document. Admiral Richard built upon something that I had started when I was N97 where I had this IUFIS Executive Summary for Industry. I feel it's important to communicate with industry because it's a win-win for both sides. Industry is more efficient, and more importantly, frankly, the

American taxpayer's dollar is used more efficiently. That's a good thing.

But Admiral Richard built upon my smaller piece, which was our first stab at it, and now this IUFIS 3.0, Distro D, proper clearances and need to know of course, because it's at the secret level. But it will allow a greater conversation with industry so that we can get to where we need to go faster. As the CNO said in the opening video, "the margins are razor thin, but they are decisive."

Faslane, the USS WYOMING went there last year. If you saw on the news just a couple of weeks ago, TENNESSEE also went there a year ago. A great strategic message here. It's showing the world what we already know, that we are everywhere on the planet with our SSBNs, and it is also a great message to assure our NATO partners and the UK, with whom we have a special relationship through our Polaris-Sales Agreement and the Common Missile Compartment in the Ohio Replacement.

As for our work in innovation, I can't fit all the organizations and all the symbols on there for the team that is representative of this effort. Again, it's a lot of folks in this room, so my hat's off to all of you. It really is great work and something I'm very proud of.

And then, of course, our Theater ASW work. Admiral Roegge, I'm sure will talk about some of the flags there on the Pacific side, the ROKs, the Aussies, the Japanese; and on the Atlantic side, the Canadians, the Brits, the French and Norwegians; just all tremendous, tremendous partners. Theater ASW is a team sport, absolutely a team sport. The oceans are huge, and it really takes everyone—and the way that we work together has just come so far in the last decade. It's really something to be proud of.

Alright, that's what I have for you this morning. Again, my goal was to demonstrate to you how the Submarine Force is 100 percent executing the Navy's Design for Maintaining Maritime Superiority.

NAVAL SUBMARINE LEAGUE
34TH ANNUAL SYMPOSIUM

RADM FRITZ ROEGGE, USN
COMMANDER, SUBMARINE FORCES,
U.S. PACIFIC FLEET
October 27, 2016

Well good morning everybody from beautiful Pearl Harbor, Hawaii. I bring you a greeting of a warm Aloha!

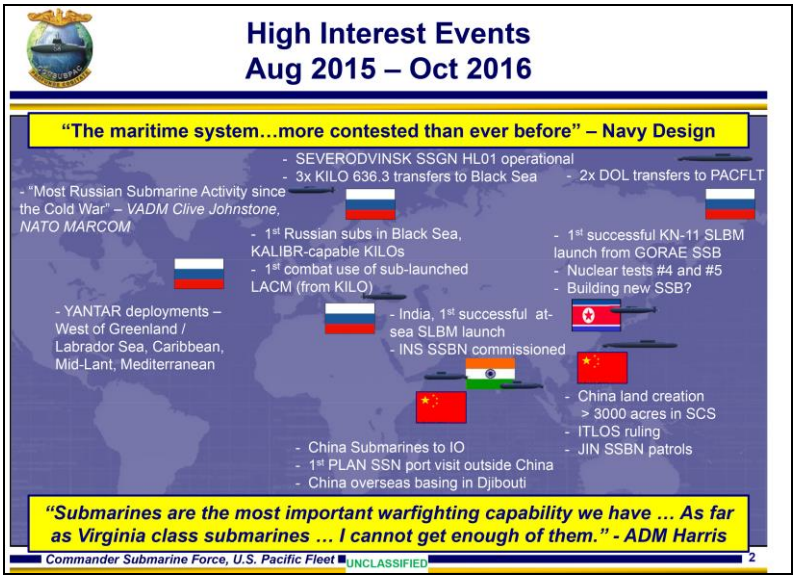
CHORUS: Aloha!

Alright, everybody obviously is a SUBPAC sailor at heart. Thank you again, John, for that kind introduction. Thank you to the Submarine League and to everybody here for the opportunity to talk to you a little bit and talk about things in the Pacific.

What I'm going to do just very briefly here, and certainly consistent with our theme for the symposium, is I'm going to take a little bit of time and describe the environment in which we're operating along the lines of the Navy's design for maintaining maritime superiority. Then I'm going to describe some of the things that we're doing in that environment. But my major theme, the one takeaway with which I will start, finish and probably highlight in the middle, is actually something that has been voiced by some of my predecessors here on the podium. And that is, it is an incredibly important time to be a submariner. It's also an incredibly exciting time to be a submariner.

I want to highlight here on the cover slide, on the top, the strategic mission. That, like Admiral Benedict briefed, that was the DASO D5 missile firing out of San Diego which was visible from Sausalito looking across the Golden Gate Bridge. That is not photo-shopped. That is what it actually looks like when you fire at dusk when the sun is illuminating the vapor trail and the sky is dark.

And then here, obviously, the return from deployment of one of our new Virginia-class submarines, the North Carolina.



Admiral Tofalo already gave kind of a run down of some of the high interest activities. Some of the things in particular to the Pacific I want to emphasize here from the slide. The first is the fact that in addition to—in the middle there you can see a discussion of the Indian navy activity. In addition to the fact that they have just recently had a first successful launch of a ballistic missile, they have commissioned a ballistic missile submarine.

When we look over on the east side of the world, as in the slide there, we've already discussed the fact that recently North Korea test fired a ballistic missile. That calls into question, at what point will they then also deliver an actual, operational ballistic missile submarine? I have no doubt that that would be consistent with their intentions.

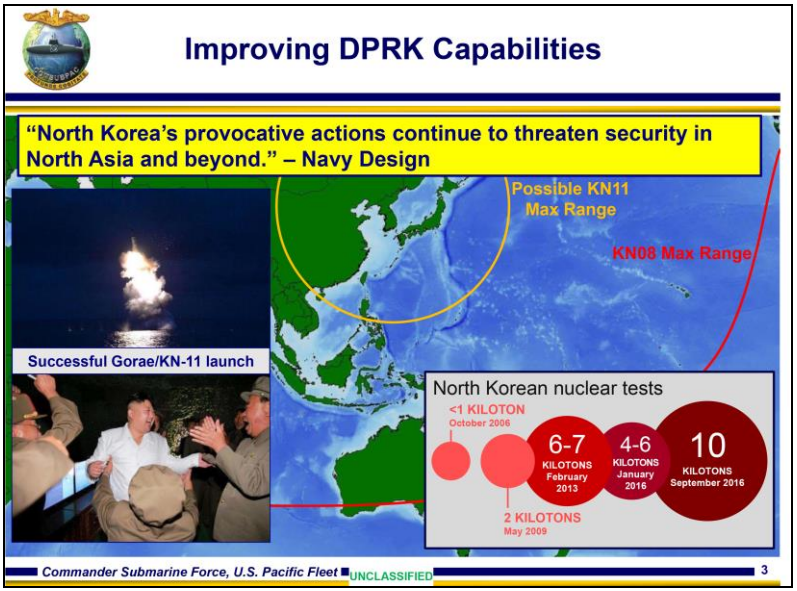
I'd also point out on here that the high interest operations is not only what's going on beneath the surface. High interest operations include things like the fact that this last year in January the government of China concluded an agreement with the Djiboutian government. At the end of a two-year period in which they've invested about $14 billion in infrastructure and improve-

ment products in Djibouti, they now have the authority to build a port that will be able to serve as a host for PLA vessels.

Similarly, it's probably worth pointing out that on the other side of the ocean and of this line, is that just recently, a month or two ago, the International Tribunal on the Law of the Sea, rendered a ruling on a request from the government of the Philippines with respect to South China Sea territorial claims. What constitutes a land mass which can generate an exclusive economic zone, et cetera? Interestingly, although there are many, many territorial disputes which I'll talk about more later, the Philippines is the only government that had gone to the International Tribunal, which largely ruled in its favor. So a lot of very interesting things going on in the world.

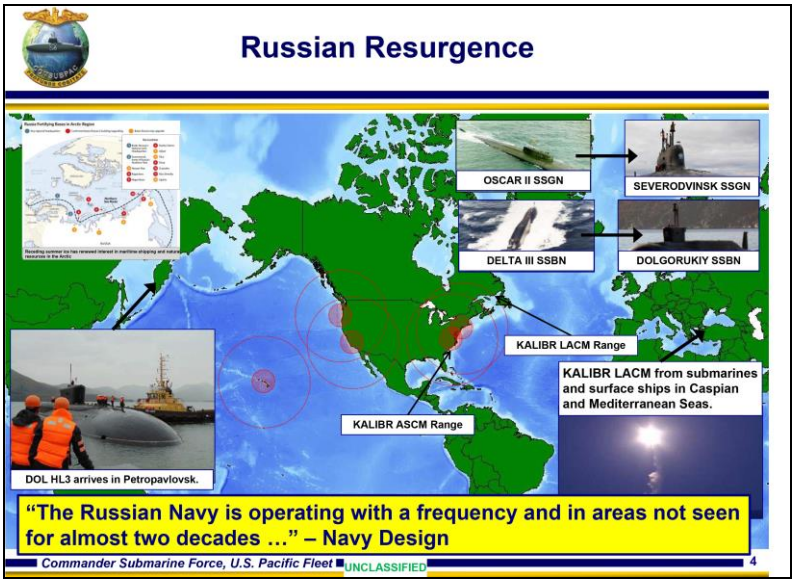
Of course, on the yellow banners there you'll see the top one comes from the Navy design. But I really want to call your attention to the bottom one, which is my Pacific Command Commander in his testimony to the Congress last year. For everybody in this crowd, and by that I mean of course it is self-evident, what could possibly be interesting and noteworthy about that?

Well what's interesting and noteworthy about that from my perspective as the senior submariner in the Pacific is I've got many, many bosses. But particularly within my theater, when I go to the 3rd Fleet Commander, Vice Admiral Nora Tyson, the 7th Fleet Commander, Vice Admiral Joe Aucoin, the Pacific Fleet Commander, Admiral Scott Swift, the Pacific Command Commander, Admiral Harry Harris, and as of next week the new Strategic Command Commander, General John Hyten, I've got four naval aviators and one Air Force general officer, and those aviators all telling me that they love the Submarine Force and wish they had a lot more. So that's what makes that particularly noteworthy.



I'll just kind of walk around the theater briefly again. We've talked already at length on some of North Korea's recent activity. Again, the design calls out provocative actions. And almost as if on cue, they've unveiled just within this last year, since the publication of the design, two more nuclear tests. As you see in that CNN graphic in the lower right, ever increasing in size or estimated power, and of course now increasing in the frequency of testing.

So as one of the previous speakers mentioned, two tests in a single year, that's also unusual. For comparison purposes, the World War II nuclear events, Hiroshima and Nagasaki were a little bit larger but the same order of magnitude. Those were about 15 and 20 kilotons apiece. Admiral Harris in his testimony made it very clear that his assertion or his estimate is that North Korea is on a quest to not only develop this capability but to be able to miniaturize it, weaponize it, and to be able to try and defend their perceived security interests by being able to hold regional potential adversaries at risk.



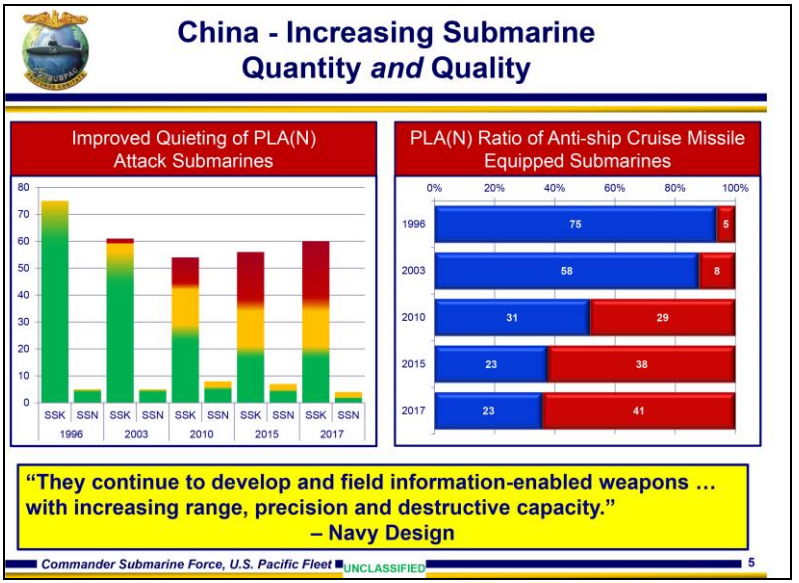
Also we've talked a little bit about some of the activities in the Russian navy. In the upper right there, the purpose of those four pictures is just to kind of show that the significant investments that have gone on over the last five years, halfway through this decade, have resulted in a lot of modernization, a lot of new capabilities and a lot of new modernization. So although in overall order of battle the Russian navy is, like our navy, isn't larger, it's actually smaller than it was in the Cold War. The capability is much improved through modernization, as you see going from Oscar II SSGNs to Severodvinsk in the ballistic missile side; from Deltas to Dolgorukiy, which we now have out in the Pacific.

Over the last five years, really over the last decade, Russian military spending has roughly doubled; and that despite some pretty significant economic sanctions, that despite negative economic growth over the last few years as a result. It clearly is a national priority and they are doing what nations do. They're investing where they see their national priorities.

A couple of other things I want to point out on this slide. In the upper left, it's a little hard to read, the details aren't specific, but that is a little picture of the Arctic with the northern Russian coastline at the bottom of the picture. What that is, is identifying all the investment going into resurrecting Arctic capability along the northern military district bordering the Kara Sea, the Arctic Sea, et cetera, Arctic Ocean, et cetera. So there's a lot of Cold War bases that had been shut down now being reactivated; again, investments in capabilities and repositioning of forces.

Now again, with the potential that there could be greater access to the Arctic for commercial traffic, that could be as simple and humanitarian as the desire to be able to be better postured to render aid and assistance to stranded mariners. I won't surmise, maybe any motives, but the capability is certainly being put into place there. And the Arctic, of course, is one of those areas of the world that as it becomes more accessible it does have resources and will probably become an area where there's going to be competition among nations.

In the lower right is just a picture of a cruise missile in this case being fired from a surface ship. Ever since 1991, and for the last 25 years, that picture would have had to have come from a U.S. warship or a Royal Navy warship. I mean, we're the only nations that had precision guided munitions and have actually fired them in time of conflict. That changed within the last couple of years as the Russians have deployed their Kalibr missile system and have employed it in some of their current ongoing conflicts, including having been launched from a Kilo diesel powered submarine into the Middle East, into Syria.



To talk about China now for a moment, again the specific numbers here are less important than just kind of the trend. On the left here what you see is improved capability, and I'm just drawing the broad kind of conclusion that as you modernize and develop capability, you know, boats are getting more quiet. What you see there is, there's no legend on the slide, but basically you can see the older classes of submarines, and the newer, modernized, and more capable submarines.

So you can see the trend, both on the conventional powered SSKs as well as SSNs, but the trend is that they're investing in improving their capabilities. On the right hand side, what you see is, of those submarines, what is the ratio of boats that are capable of going to sea carrying anti-ship cruise missiles? And then not explicit on the slide, but I hope implicit from my remarks, is that as they invest in capabilities it's not only the number of platforms capable of employing anti-ship cruise missiles, but the capability of those missiles continues to improve.


PLA(N)'s Expansion into "Distant Seas"
YUAN in Karachi, Pakistan.
PRC Operated Colombo Container Terminal
PRC Defensive Layers
Task Group Deployments
Hawaii
Guam
Pacific Ocean
RIMPAC 2016 PARTICIPATION
Diego Garcia
Indian Ocean
SHANG deployed to Indian Ocean.
Djibouti Base Development
Vanuatu
Warship Deployments
Anti-Piracy Task Forces
Intelligence Collection
Goodwill Port Visits
Hospital Ship Deployment
"… engaging in coercion and competition below the traditional thresholds of high-end conflict …" – Navy Design
Commander Submarine Force, U.S. Pacific Fleet
UNCLASSIFIED
6

Operationally, there's a lot on here. It's a little bit dense, so give me a moment to kind of walk you through this. This is going to be a challenge. I'll both gesture and stay close to the mic, so forgive me if I wander off here.

First off, kind of with respect to a PRC or PLA view of the world, we've all heard discussion of things that matter to the Chinese, the first island chain, the second island chain. So as they've developed capabilities they have sought to be able to defend or protect their national security interests by ever expanding those defensive layers.

Although typically we think of the second island chain as being a Western Pacific sort of an arc, there is some literature that indicates as well that in the Chinese view that extends around into the Indian Ocean. Obviously if you reside in India, you have always extended historically to view the Indian Ocean as your own area of strategic interest. So that has the potential to raise some interesting conflict or certainly friction in the future.

So of the lines then have to do with some of the nature or specific trends in deployments and operations. What you see over here is that as China again has done what growing naval powers do, they are expanding their areas of operations. They are trying to test themselves and determine what their limitations are; identify then what the limiting factors are and try and address those.

So they've been operating more and more outside of the Western Pacific and moving to the India Ocean, a very Mahanian sort of perspective, coaling stations and all that. So they're looking to provide the ability to sustain and provide support to naval forces along here. They recently concluded a commercial operating agreement with Sri Lanka for a container terminal in Colombo. They've had port visits in Karachi, Pakistan. As I mentioned earlier, $14 billion worth of investment in Djibouti and in return the right to establish a logistics presence there.

This is operation by surface ships and task forces, by diesel submarines and by nuclear powered submarines as well. Again, although there are certainly areas where there is competition with the PRC and the PLAN, we continue our engagement with them as

well. Both in 2014 and now more recently in 2016, China was invited to participate in the Rim of the Pacific exercise.

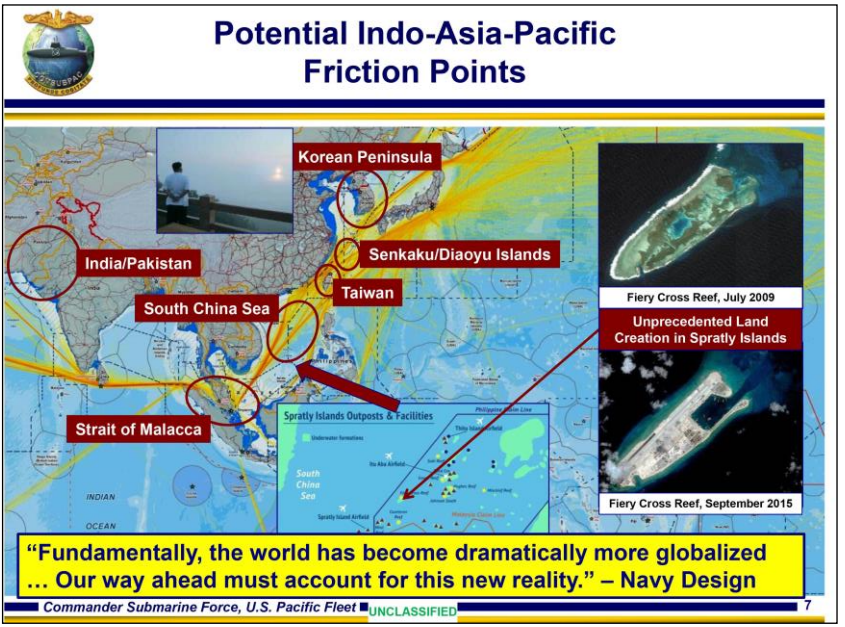
So this last July and August we had five PLAN ships visiting Pearl Harbor in support of RIMPAC. And then interesting here, you know I mentioned the Arctic earlier. But of note here in 2015 there was also a Chinese task force deployment that went up for the first time into the Bering Sea. That, again, is completely consistent with how China has expressed their interest.

There is an Arctic Council of Arctic littoral nations. China is not an Arctic littoral nation however they have requested observer status because they have declared themselves to be a near-Arctic nation. That's an undefined term. I don't know exactly what that means, but it matters to them so I thought I'd share it with you.

Also in 2015 there was an expeditionary task force that concluded an around the world cruise as well. It left the Indian Ocean through the Med, circled up to port visits in Scandinavia, over to the U.S., Panama Canal, and back across again. So again, they're doing what growing navies do.

And that also includes arms and weapons sales. Their Yuan-class SSK, their latest conventional AFE submarine, they've announced deals to sell those to Pakistan and to Thailand. In fact, this is an area where there is a lot of nations now that operate submarines.

Last year when I was briefing I pointed out that, perhaps surprisingly, a lot of those nations, apart from submarines, are not only buying something from overseas but they're investing in the capability to indigenously produce their own submarines. So it's not only this crowd that recognizes the values of the undersea domain and of submarines.



I mentioned the competition, possible sources of friction. This is a graphic that helps me to tell that story. This shows the increase in intensity, which has to do with density of shipping as tracked through AIS, the Automated Identification System used in the commercial maritime environment.

So again, it's no surprise to this crowd, but these are vital shipping lanes. Twenty-five percent of all traded goods and 25 percent of all oil goes through the Strait of Malacca. Most of that, as well, continues through the South China Sea. That means that

when there are sources of friction, that should be of concern to us as naval professionals.

Obviously, America has always been a maritime nation. Our prosperity, and consequently our security, rides on trade across the oceans and the freedom of the seas that enable that. Of course, as a naval officer, I have to note again that even our founding fathers recognized that in the Constitution, because that's where it's recorded that the Congress has the power to raise armies as needed, but the responsibility to maintain a Navy. So I would roll that out on Army-Navy Day.

And of course for the last 15 years our focus has been ground combat in the Middle East. But now that that is winding down, our focus has shifted and, of course, concurrent with that was the end of the Cold War. But now we do see that there's nations that are aggressively seeking to expand their influence, building military capabilities, and that competition among nations often plays out first in competition on the high seas.

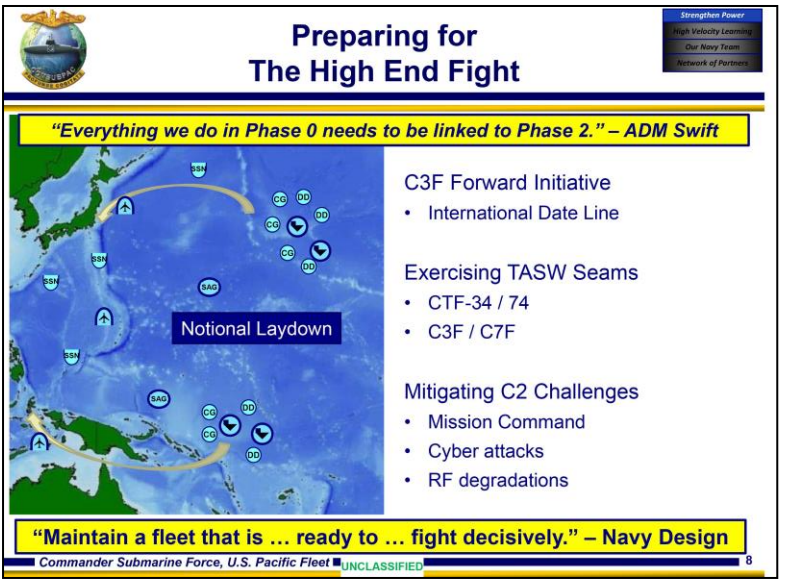
Therefore, the focus of U.S. military activity for the next 15 years is likely to be at sea. So this is a maritime decade, unquestionably I think, but more importantly I think this is preponderantly going to be a submarine decade. As a potential adversary develops those capabilities that are specifically designed to thwart the U.S., there's no question it increases the risk to surface ships, to aircraft. But fortunately, thanks to all your good work, the Submarine Force retains the unique ability to go undetected anywhere in the world and to hold at-risk the things that potential adversaries hold most dear.

Our submarines are able to do that, of course, because they are the best submarines in the world, again thanks to all of you, but most importantly because they're operated by the world's most capable submariners, the most capable crews. So that remains our secret sauce. Bill Merz already kind of alluded to that before. On the scale of technology there's always going to be competition, there's always going to be step improvements. I don't foresee a future in which our technological advantages are ever surpassed, but I'm very confident that our people's core competency is never going to be surpassed.

I just wanted to point out as well here that this competition here, the competing territorial claims, all these littoral nations are a part of that. There's any number of—well, seven different nations around here that have claims that conflict with each other. Similarly, down here in the Spratley's, there's 71 different outposts on different little outcroppings of rock, again from the seven different nations.

So although I think these examples here like Fiery Cross, are probably the most extreme examples of trying to enhance territorial claims. It's not only China, but again, it's probably the most dramatic. And, of course, one of the things I really want to emphasize here is that sometimes this activity is referred to as land reclamation. I don't think there's any legal or moral sense where you could say that that is an accurate characterization.

There was never any land there to reclaim. This is reef destruction for the purpose of land creation, all for the purpose of enhancing territorial claims.



But that again was kind of the walk around the environment. What are we doing in that environment? Well, Admiral Swift has been my Pacific Fleet Commander boss. He has been very consistent in reminding all of us that in these days of competing

demands and limited resources, we've got to be very sure that we're very efficient in what we do.

So everything that we're doing in phase zero peacetime operation, ought to be able to tie directly to the developing skills, competencies, deterrence, credibility, things that can be linked to phase two. So one of the things on the right hand side here is some of those things that we are doing to prepare for the high-end fight should, God forbid, that become necessary. So make no mistake, if we are very, very effective at phase zero at demonstrating our capability and having the credibility of our ability to employ those forces, we'll never get to phase two. I'm very confident of that.

But part of making sure that deterrence is effective is always being ready. So 3rd Fleet forward, Admiral Swift has talked a lot about this. It's really nothing new. I mean, this is how World War II was fought. We had multiple numbered fleets all operating forward under their own OPCON, and that's something that—and of course we've always had ships from the 3rd Fleet that are generated before deployment, and are manned, trained and equipped in kind of a fashion that then goes forward and operate forward under 7th Fleet OPCON.

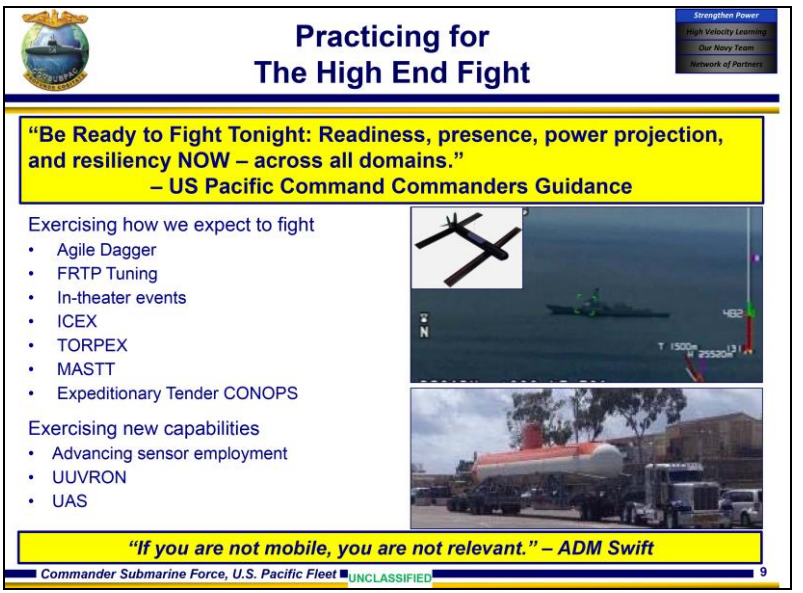
What's different here is operating in the 3rd Fleet OPCON. Of course it seems kind of intuitively obviously. If I'm the Pacific fleet commander and I've got all these ships, if I ever need to do anything, achieve some objective, why wouldn't I use all the ships? So it's interesting that somehow it seems to be characterized with great surprise and really innovative. Of course, I tell my boss he's really innovative, but again it's just the way we've always kind of operated.

Additionally, Admiral Merz really highlighted from his time at CTF-74, the great partnership that we had. So I do not only the force generation, but I'm also CTF-34 for theater ASW. And one of the things that we are doing more of now is making sure that when we do our own kind of training event and exercises, it's very easy to generate an exercise that has somebody come down and evaluate my theater staff's ability to do our job, but that's now how a fight would actually be fought. A real fight would be fought, again, with multiple demands and competing resources,

and so we'll have to be sure that we are exercising our ability to manage those competing demands.

The DDG that Bill mentioned was great fun when he had Administrative Command (ADCON) in order to employ for ASW, but maybe a DDG may be desired by the air and missile defense coordinator to provide BMD support or something. So he can't really stream his tail at that time, so how are we going to deal with those kinds of stresses? So we're exercising across those seams.

And then, of course, we anticipate that there's always going to be the potential to have to overcome challenges to our command and control. Obviously mission command-type orders is, again, how we fought World War II, I think with some level of success. But, of course, now with cyber attacks we need to be sure that we are prepared to defend against and work through, as well as things in the rest of the electromagnetic spectrum.



So part of being prepared, again, is making sure that we're exercising how we expect to fight. Agile Dagger is an exercise that

is self-generated—initiated with some backup as our partners. We take each of our various old plans, and we make sure that on any given day we know exactly how we would resource them, ship by ship, hull by hull, where are the torpedoes coming from, and our ability to meet the timelines expected by the commanders.

Admiral Tofalo mentioned Fleet Readiness Training Plan (FRTP) tuning. This is an effort to make sure that we are squeezing out of the inter-deployment training cycle, all of the discretionary time that we can in order to develop our war fighting skills, whether it's having our own boats in theater locally working against each other for the purpose of improving their anti-submarine warfare skills, whether it's dedicating them to tactical development. But generating more free time gives us as operational commanders a greater ability to demonstrate our readiness for phase two. And that's not only local waters, on the force generation.

Well, FRTP is on the force generation side, but Admiral Merz again as CTF-74, and did great things in taking the boats that I had sent him forward, while forward deployed, and doing in-theater events. Again, it has the extra benefit then of making sure that those commanding officers, those crews, are practicing those skills in the environment in which they might be called upon to use them. It's a big ocean. From the surface, an ocean looks like an ocean. But the thermocline, the bathymetry, in the Eastern or Central Pacific around me where I'm doing my work, is very different than a lot of the places where Admiral Merz was employing forces, a lot more in-theater events.

ICEX, as we mentioned, again, the ICE is one of those environments that we've called home for years. ICEX 2016 I had the opportunity to go up and visit. Incredible, impressive level of effort in just making sure that we're always generating proficiency and comfort operating up there. Again, as we mentioned, it could be key to how we operate our forces in times of increasing tensions.

We do TORPEXs in theater, just like we operate some kinds of things in theater. MASTT, that's the picture in the lower right, that's a mobile ASW training target, 80-foot long, autonomous.

We can have it bottomed and determine the effectiveness of our sensors being able to detect. So it's a great capability coming online.

And then as you see in the banner at the bottom, part of operating in this theater—and particularly as potential adversaries develop capabilities with ever great reach—part of our plan for success is to ensure mobility, the ability to avoid being threatened or targeted by not being there. So if you're not mobile, you're not relevant, and that's certainly how we're approaching things. We recently brought the submarine tender Emory S. Land back from Diego Garcia, home ported in Guam.

So now we have a concept of operations that basically has one of those two tenders always out and about and certainly providing logistics supports to submarines as well as surface ships. It's a tremendous engagement tool. We recently were doing an engagement with a Southeast Asian partner and they were very reluctant to be seen having a U.S. submarine in port, but having a U.S. submarine tender in port, that wasn't an issue. So that's probably a good first step.

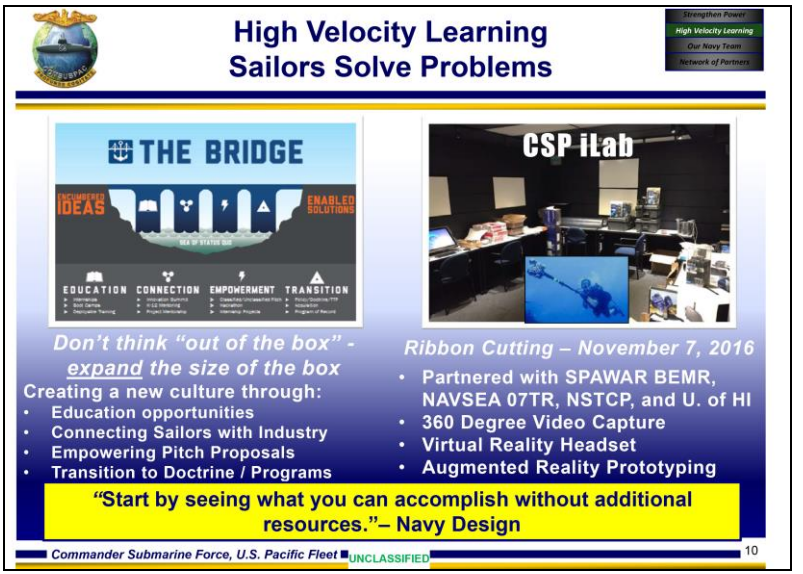
And then new capabilities, sensor employment, we're always developing, working on improving our tactics, our techniques and our procedures. Again, something that was mentioned a little bit earlier, as the predominance of our force slowly shifts from Los Angeles-class to Virginia-class, I believe that there's more we can wring out of the tremendous capabilities of the Virginia-class. I think that in many cases we're still driving Virginia's the way we drove the 688s because that's kind of how we all grew up, and I think that there's more that we can do. That's a challenge that formerly Admiral Trussler, now Admiral Jimmy Pitts at the Undersea Warfare Center has embraced.

We talked a lot about unmanned vehicles. This year we're creating a UUV, unmanned underwater vehicle, squadron, subordinate to DEVRON 5 up in Bangor, to provide more focused support. And Admiral Merz has mentioned unmanned aerial systems. In the upper right there you see one such system.

That is kind of like Admiral Tofalo mentioned yesterday with some of the Remus vehicles in the unmanned underwater

environment. This is something that went very quickly from a capability that we discovered to being tested for operation in the submarine environment. And it's now something that I have on deployment today going forward that we are going to find ways to use.

This is a little three-inch device that gets shot out of a single ejector. You can control it with a kit on a joy stick from the submarine. It's pretty amazing. And of course, we've got a generation of young submariners who are just fighting for the change to have that joystick, because that's an environment they're very, very comfortable with.

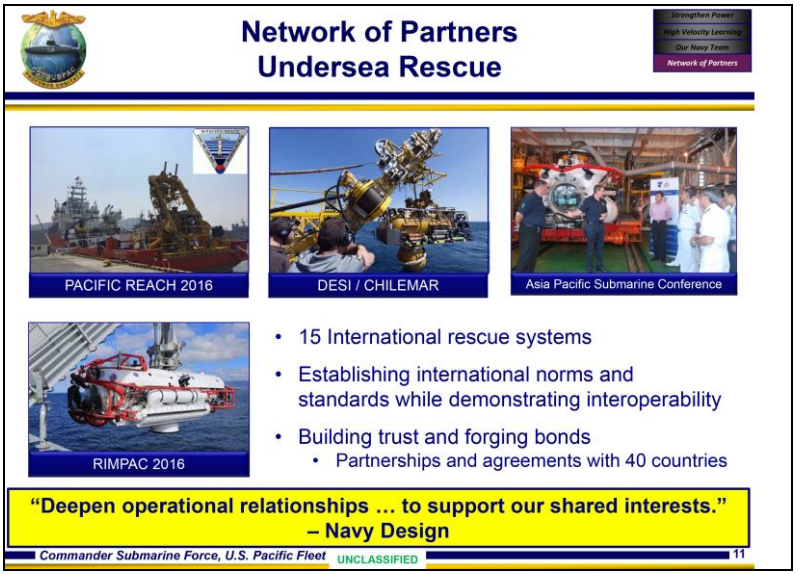


On high velocity learning, this has been talked about a lot. I just want to highlight a couple of specific initiatives. The bridge is really on approach. It's a venue, a marketplace almost for ideas. But Admiral Swift has been very proactive in reaching out to the waterfront in recognizing that the good ideas don't get generated

by headquarters. The good ideas get generated by sailors on the deck plate. So he's provided a venue for those ideas to be brought forward, and it's working very well.

On the right side, out at SUBPAC we're creating our own innovation laboratory. We're looking to have a ribbon cutting here as soon as I return from my current around the world travels. We found a room up at the Naval Submarine Support, Naval Submarine Training Center Pacific (NSTC-P). That's a great place because every submariner goes through an NSTC-P at a pretty regular drumbeat. Put it right by the front door, and basically we're creating a MakerSpace.

So we've got some VR technologies, some AR technologies, and what you see there in the little inset picture right here. So this is an application lab. This is something that was done with the SEALS for the training of operators for operating with dry deck shelters on submarines. Basically for a $10,000 Oculus Rift or equivalent kind of capability, we had some divers go down, film themselves with a bunch of GoPros, and now you can put on the headset and without ever having to get into the water or get into a wetsuit, you can train your SEALS on the skills required to land that little SEV in the DVS, and with huge efficiencies, increase the number of reps much, much to reduce training times.



Partners. Speaking of partners, I'm delighted to see so many of our international partners in the room today. Again, as Admiral Tofalo made clear, in our own commander's intent, certainly the CNO highlights it in the Navy's design, we are better for our combined strength. So again, I appreciate seeing all of our partners here.

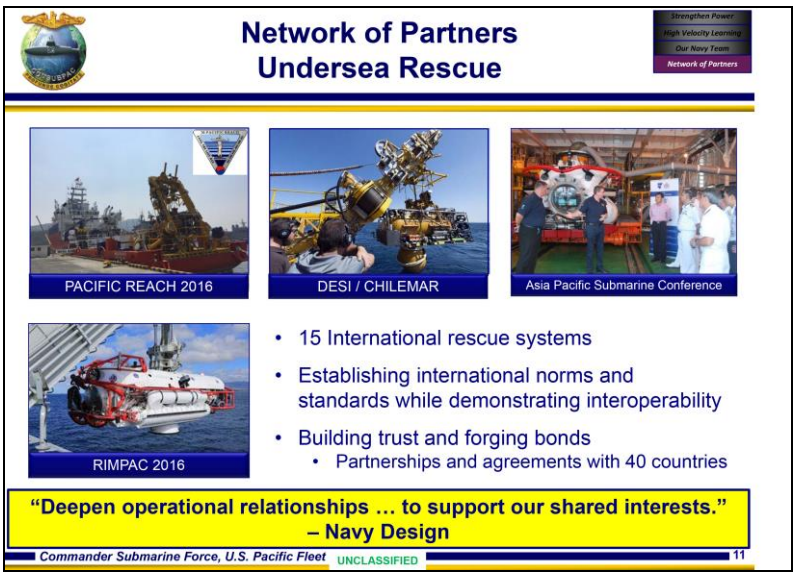
The way that we've organized in the Submarine Force is at SUBPAC I'm also the lead type commander for the Navy's submarine escape and rescue capability. Submarine escape and rescue turns out to be a great—I mean, it's certainly an important skill. It's one as a submariner I hope to never have to call upon.

But it's a great engagement tool. Regardless of what other areas of naval activity there may be competition, how can any reasonable nation not agree that it would be good to have interoperability in submarine rescue? And so just within the last year you see several examples of this.

We had Pacific Reach in 2016, an event hosted by the South Korean navy and participated in with the Japanese, the Australians, and a Malaysian support vessel. In the middle there, the

DESI, the Diesel Electric Submarine Initiative, Admiral Tofalo mentioned. We have a Chilean submarine, the Thomson, up in San Diego right now. We did a submarine rescue event on the Thomson out of San Diego.

There's the Asia Pacific Submarine Conference annual conference, initiated by the U.S. Submarine Force, but now embraced by the international community who kind of takes turns hosting things. Twenty-seven nations all participating to discuss how we're going to better cooperate. And even the RIMPAC 2016 this last year, for the first time we had a submarine escape and rescue event. This was one that was done with a multi-national table top exercise. Then, for the first time ever, we did a specific event that allowed the PLAN to demonstrate the ability to use their rescue vehicle to mate up to a NATO sized training device that we had parked south of Oahu.



Partners also include a lot of training that we provide at SUBPAC. You can see here some examples. Japanese, Australian, Korean, Singapore, are among those taking advantage of the facilities at NAVSEAPAC. A fire control center, attack center training, sonar and oceanography kind of classes. We get certainly great engagement, but we also get greater interoperability by better understanding each other's capabilities.

And then that partnership includes certainly RIMPAC. We've talked about, theater ASW, which Bill Merz has already covered. In the interest of time I won't expand anymore.

But it also includes our outreach. Over there on the right side, this is going to be a pretty public year for the Submarine Force. Last night there was an event at which CNO Richardson addressed a smaller group. One of the folks that was recognized last night was George Wallace.

I don't know if George is in the room right now, but he's a former submarine commanding officer and now published author. But add to his resume right now a screenwriter because one of his books is being turned into a movie called "Hunter-Killer" which is

filming on Oahu next week. The second unit is filming, not the stars.

This right here is my new good friend Jerry Butler. Gerard Butler is right there coming out of the wet trainer as part of his orientation there in Pearl Harbor. "60 Minutes" has just recently had something on the nation's nuclear deterrent. I hope everybody saw that. I thought it was a piece that was well done and did a good job of explaining the importance of the strategic mission.

IMAX was out filming something for something that's going to be in theaters next year on sea power. Hopefully some of you as well have seen the Smithsonian series Hell Below on the World War II experience. And then I want to call out the Bowfin as well.

I know Chuck Merkel was here. Chuck, I know, was here yesterday. Chuck now runs the Bowfin out in Pearl Harbor.

One of the things that's pretty unique about—and this is my getting off the stage splice, so don't worry I'm wrapping up—but one of the things that's really kind of unique about being at Pearl Harbor is I can sit in my house and look out over the harbor and with one scan of the horizon I can see very visceral reminders of the start of World War II, in the Arizona Memorial; the end of World War II, in the USS MISSOURI where the peace treaty was signed; and of course all the reasons why we eventually won World War II. I can look over the shipyard and recognize the dry docks that were struck. Six of those eight battleships that were sunk returned to fight in the war thanks to the naval shipyards.

I can look over and see the fuel farms and recognize it because they weren't struck. Four billion barrels of oil were able to power the fleet as it went forward on December 8th. And of course I can see the submarine base.

Of course, we as submariners all know that period of World War II, certainly a period of some of our greatest successes, generated some of our greatest heroes, also our greatest sacrifices. But the fact that the submarines and the submarine base wasn't struck meant that on December 8th submarines could start flowing forward with the results that we're all aware of.

Anyway, that's a long segue to explain my bullet here. The most popular tourist attraction in Pearl Harbor is the USS

ARIZONA and the visitors center there. It's a great little museum at the Arizona visitors center, but you can go anywhere around Pearl Harbor and not find a single mention in any of the public tourist information displays about that proud history of the U.S. Submarine Force.

So thanks to a good partnership between my staff, on or about December 7th of this year, the 75th anniversary, we're going to put a large information display up down there at the —you know, the BOWFIN shares the site with the ARIZONA Memorial, so the BOWFIN will host it but it will be available for the tourists of the ARIZONA. That highlights those significant contributions of the U.S. Navy in a way that currently is not captured anywhere. So I'm very excited about that and very pleased with the partnership with the BOWFIN.

With that, what you see here is the final home port visit for the USS SAN FRANCISCO as she heads off to her inactivation. Again, in closing, to all of you here, men and women of the Submarine Force, all the organizations here that support our submarines, let me just again close by reminding you that this is an incredibly important time for our Submarine Force, and also an incredibly exciting time. What you all do every day, what our force does every day, makes a huge difference to the Navy, to the nation, and to our allies across the world.

NAVAL SUBMARINE LEAGUE
34TH ANNUAL SYMPOSIUM

RDML BILL MERZ, USN
DIRECTOR, SUBMARINE WARFARE (N97)

OCTOBER 27, 2016

Thank you, Admiral Padgett for the introduction and thank you for the update on "Big Al" Konetzni. Certainly anybody at least my age, when you hear that name, it brings back a flood of memories probably across a spectrum of ports and liberty stories.

But I will tell you, the then-commander Konetzni is the reason I'm in the Submarine Force. At the Naval Academy he brought Midshipmen Merz into the Submarine Force. So we hope he is okay and I'll look forward to future updates.

It is good to be back in the D.C. area. I'm actually that guy that likes D.C. My wife is from here, and after two years in Japan it is nice to get back to America. Thanks for having me.

You heard it stated a couple of times over the last couple of days, that I am fresh from command at Task Four 54 in Bahrain and Task Force 74 in Yokosuka, Japan. We talked about numbers and capacity, but to put that into the real context, between those two task forces they own the chunk of ocean from the Suez Canal to the international dateline, going the other way around. That's 8,700 nautical miles, so I certainly have a capacity problem.

At last count, it included somewhere north of 220 what we call credible submarines, ones that can actually go to sea, submerge, and operate. China, Russia and North Korea are all included into the numbers of ballistic missile submarines, and they're marching right along. That overall number is growing at a concerning rate.

So with that thought going out to those jobs, I was determined to run our submarines exceedingly hard. I burned a lot of EFPH (Effective Full Power Hours). For the non-nukes in the room, that's the gas tank we use to measure our reactor plants.

I really wanted to find the limits of our boats. And in some cases, Admiral Roegge (Commander, Submarine Force, U.S. Pacific Fleet) and Admiral Tofalo (Commander, Submarine Forces) will attest, I did find those limits, aggressively. In one case we actually had to pull back a little bit. I was kind of outpacing our training, which is kind of hard to do, and I'll get to that in a minute.

But a couple of things I learned in that job is that our boats really are the best in the world. You heard Admiral Caldwell yesterday mention that the USS CITY OF CORPUS CHRISTI, the USS HOUSTON, and the USS ALBUQUERQUE are all in the inactivation process and we're converting LA JOLLA to a moored training ship. So the real story there is what they were doing just before they entered inactivation and into the conversion.

They were out there deployed with me on the front lines in WESTPAC (Western Pacific) to the very last day of their operational lives. That is a testament to the platforms, the shipbuilders, those that modernize, the Admiral Johnsons of the world, the Admiral Jabaleys of the world. We keep them modern and keep them running and they do the same missions that every other submarine does until the day we retire them. It's just a colossal report card, if that's the term we're using right now.

But I also learned, and without a doubt, our most asymmetric advantage out there are our crews, the COs (Commanding Officers), the Wardrooms and the band of merry men and women that fill out the teams behind them. They run hard, they do well, and their proficiency over other navies is amazing. And here's the thing about proficiency, you can't steal it. You can't bottle it. You can't fake it. You have to actually go out there and do it and you have to do it every day. That's what our teams do, and I really do believe it's our biggest advantage.

Everyone in this room that's a submariner supporting the Submarine Force shares credit for how well these crews operate today, because they're built on your shoulders. As Admiral Padgett said yesterday, as hard as it is to swallow sometimes, they are not just a little better than we were, they're exceedingly better as these new generations of multi-taskers come up. But this

doesn't happen by accident, and as the new director, and with that as backdrop, I would like to walk you through the lens through which I look at our investments.

To that end, I'll review our guidance quickly. I'll explain what that guidance means to us as an undersea force, and then distill it down into our war fighting missions, and then provide some insight into our program.

This is the CNO's (Chief of Naval Operations, ADM Richardson's) guidance, nothing new, just pointing it out at the seminar, the design for maintaining undersea superiority. But there is actually guidance left of this guidance, and it includes our national maritime strategy and it includes U.S. Code. And it directs us, the U.S. Navy, to be able to conduct combined sustained combat operations far forward. But it also further specifically directs the undersea forces to leverage our unique advantages of the undersea domain to bring the nation an advantage and a capability that otherwise it would not have: cross-domain, covertly, both connected and independently.

So this is structured under the CNO's design for maintaining maritime superiority. When this design hit the street, I was very happy to see that *maintain* was in the title, because I really do think we're a superior navy. The rub is staying there.

Over the last days the design has been reviewed, it has been explained. We heard the CNO say it in his own words last night and we watched his video yesterday. So there's no need for me to go through all the colors at this point, but I will say—and I'm not grading the CNO's homework by any means here—but I really do believe it's good guidance. It's executable guidance, and it's fundamental for us going forward.

He is breaking us out of old-think. For those that have operated at-sea with crews, especially in the nuclear Navy, we have some pretty powerful tools out there to change the behavior of our teams. Changing that culture takes a much longer time and is a much higher task, and that is what the CNO is asking us to do.

It creates friction, friction creates heat and energy, and energy is what we live on. So I think this is a great start. It's going to take some time and I'm glad he got it out so early in his tour.

Although I work for a variety of people and I get to call myself the Director Undersea Warfare, a very lofty title, I do have some bosses. The Commander of the of Submarine Force, Vice Admiral Tofalo, I would call him the real director of undersea warfare. And then he might call Admiral Caldwell the supreme allied commander of the director of undersea warfare, as we go. So I am looking forward to all the great guidance and directorship that I'm likely going to get with these programs.

Vice Admiral Tofalo went through his guidance yesterday and it's exceedingly aligned with the CNO. It's a good survival tactic to stay aligned with the CNO. It ties to and cuts across all the gold banners of the CNO.

But here's the thing, Admiral Tofalo in concert with Admiral Roegge, pretty much had this thing written before the design came out. So when the design came out they were able to make some minor force changes just to make sure the terminology and the words aligned. But he was able to put that thing out almost immediately after the CNO's design.

If you haven't read Admiral Tofalo's guidance, it's well thought out. It's specific. It's not like he did this overnight. That is because the CNO is one of us and that's how aligned our DNA tends to be.

So we provide all this guidance to do what? That's the banner across the bottom here. This is what I'm going to walk you through and hopefully understand that lens I spoke about when I started my talk here.

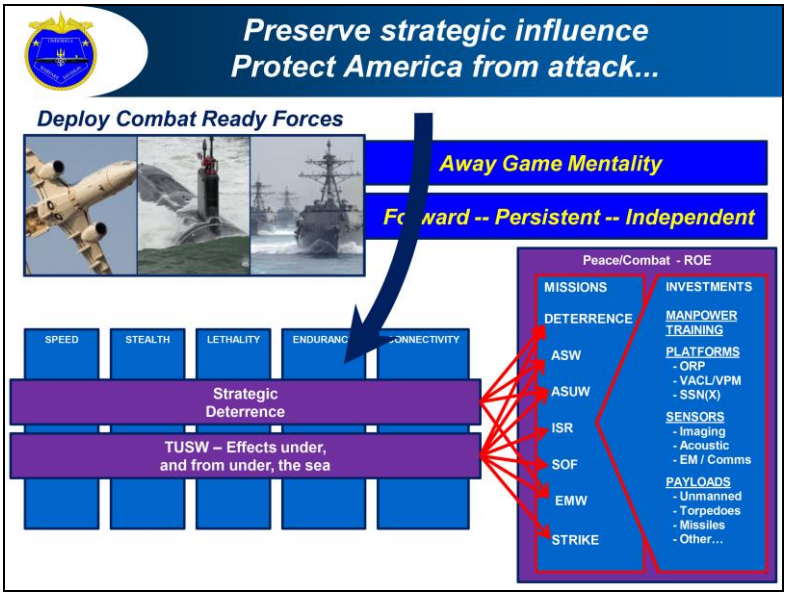
To do what has been put out in our strategy, it is to deploy combat forces. But there is more to it than that. Our maritime strategy for the last couple of centuries, both real and implied, is to first and above all else keep everything an away game. Keep the fight a home game for the bad guy.

We've done that effectively and you really do have to go back to maybe the 1800s, the War of 1812, when you can find the last time we've actually had a force-on-force naval battle within sight of our shores. I don't see this strategy changing any time soon. As a matter of fact, if you go back even further the reason we built those first legendary six frigates was to take on the pirates in the Mediterranean that were interjecting with our merchant traffic. So we're all about deploying overseas. We've literally been doing it since day one.

To do that, we need to be far forward. It's why we have nuclear-powered attack submarines and nuclear-powered ballistic missile submarines. When you distill it down, we have two fundamental missions. If this is the first you've heard this, great, but this is the way I'm going to be talking about our investments while I'm the Director.

The first is strategic deterrence. We've been doing this day-in and day-out for 70 years. We're not coming off that, and I'm going to talk a little bit more about the OHIO Replacement here in just a second.

The next is this very new term called theater undersea warfare. In the largest terms, it's kind of a collection of everything else we do. But the reason I'm rolling this up under this term—this term was initiated under Vice Admiral Connor and we've carried it through. You'll start seeing it in our publications as we continue to evolve.



But it involves things like Theater ASW (anti-submarine warfare), anti-surface warfare, strike and special forces operations. We do all that stuff for a purpose, and we do it deliberately, to do things we do better than anybody else. It is what the Fleet depends on us to do – "attrite the enemy and to provide access."

It's unlikely the Submarine Forces or the undersea forces writ large are going to win a major battle or a war. Our job is to knock down the door, provide access and enable those that will. It's a huge team effort.

If I build this out further, clearly what we do is based on our most enduring characteristics of speed, stealth, lethality, endurance, and connectivity. Where I just came from speed and lethality are everything. When you have an AOR the size of the one we're managing out there, your speed is a force multiplier. You can literally be almost in two places at one time with enough speed and enough firepower to carry out the mission when you get there.

As we look ahead to the SSN(X), or the next generation SSN, or whatever the next attack platform is going to be, from my perspective speed is going to be an entering argument and we'll diversify from there. From these two missions I should be able to map them to every sub mission that we do, and I can, and beyond that, mapping it to the investments. As long as I can do that, we will continue to provide to all our wonderful bubbleheads around the world what they need for their own personal design for maintaining maritime superiority.

In my design for maintaining a dependable program, I think that connective tissue is hugely important for building a sellable program and actually delivering the capability we need in a very fiscally constrained environment. So in that last build-out there, if you didn't notice it, one of the luxuries of what we do is that peacetime and wartime really are not a whole lot different to us. The missions are virtually the same. It's just a matter of the rules

of engagement behind it. So we are always postured to carry out the nation's business along whatever spectrum we're required by higher guidance.

So real quickly as a summary here, or an overview—unfortunately we're not quite done—but ORP, our top priority, you've heard it said many times here, it does leverage what we've been doing with the VIRGINIA-class that goes beyond just the platform or just the module. It goes to the missiles. It's a very complex, very large program, bringing in new electric drive technology.

It's going to be a little bit smaller tube-wise. It's coordination with the UK. There's a lot of moving parts, a lot of directions that we have to manage as we're building this.

But we also have to sustain the OHIO-class while we're building the OHIO Replacement. That's no small task either. We have extended the class out to 42 years. That is going to generate some surprises along the way.

We have not hit 42 years on any of these boats yet, so we are still just getting into what this is going to entail. But it's all about sustaining our presence at-sea, that survivable nuclear deterrent, with the current class while we're bringing on the new class. This is a very closely linked program as we try to get that first Ohio Replacement on patrol, in the lineup, by the fall of 2030.

Then also in the background is the VIRGINIA-class. We are building exactly one attack submarine right now. It is the heavy lifter that's going to replace the Los Angeles-class. So far, it has done extremely well.

Then we have the upcoming investments, and I'll just say a couple of words about the payloads and the unmanned vehicles in a couple of slides. But I did want to mention and circle back to what Admiral Tofalo said yesterday about the TANG enterprise. It started in the undersea community. We picked that acronym specifically for its historical context to USS TANG, and we were just happy to be able to fit the right words into that acronym, the Tactical Advancements for the Next Generation.

But you've got to understand where that came from, and that kind of process is directly in line with what the CNO is trying to

get us to do. It's a revolutionary approach to idea generation, not an evolutionary approach. For all of us that came into the Submarine Force, we were all deprogrammed and put on the conveyor belt of how to learn our sensors and our weapons. This is a generational jump to try to figure out how to get these extremely connected youth that are warriors, to help design a system that is more suited to their innate capabilities coming into the Navy.

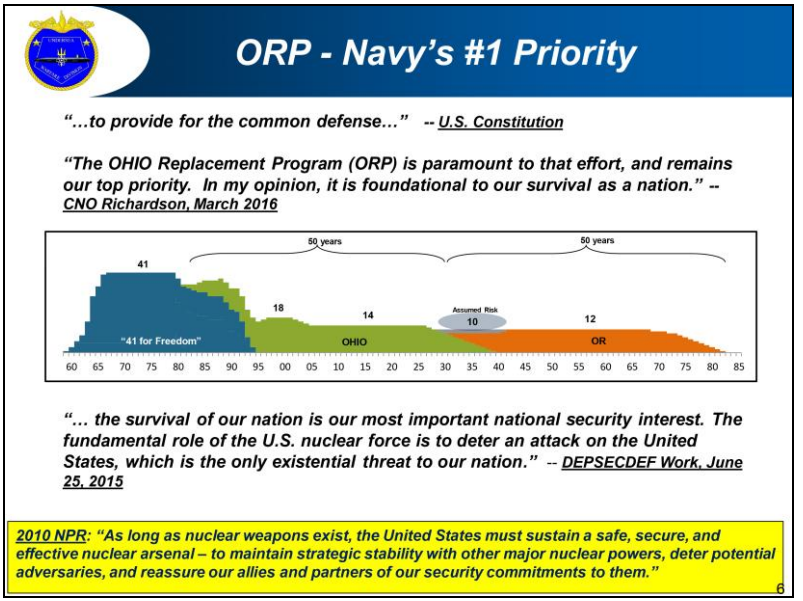
So when we did this back during my DEVRON 12 days, I rode a lot of submarines and I got a lot of feedback, and it was all pretty negative feedback about the combat systems, a lot of frustration. Dennis McKelvey was with me there when we did this. I said, alright, to hell with it, let them design it.

I wasn't particularly serious, but the within a week Johns Hopkins is knocking on my door saying, funny you should say that. They'd been pitching this idea of a seminar with a younger generation, professionally moderated by a team up in Palo Alto called IDEO, which was called the design thinking enterprise, as a way to brainstorm down into some executable ideas. And because the Navy Yard and IWS 5 (NAVSEA Integrated Warfare Systems) already had that conveyor belt of the APB (Advanced Processor Build) cycle mature, turning product within two years, we had everything in place to actually put product out that these guys came up with. A lot of it is already out in the fleet.

I really think that's the high velocity learning at a very high level that the CNO was getting at. That's our small piece and we're starting to crack that open. Expect to see more of that.

When you wrap all this up, we're the number one and two priorities in the CNO's guidance. No pressure there. That's good news and it's a little bit scary for a new director coming in. We're going to get a lot of visibility, a lot of money involved here.

But I will tell you from where I came from it is absolutely critical that we do not come off the pace of any of these programs. So much relies on our ability to perform on-call. We are the 911 force out in the world. And really, if we're doing our job right, no one can touch us. We've got to maintain that advantage.



OHIO Replacement, and these sound bites are important. They are backed by a whole lot of math and a whole lot of study. But we do this every other generation and it consistently hovers around one percent of the defense budget. From our perspective, it is infinitely affordable for what we have to do and what relies on these platforms.

This deterrence must prevail. There's a great Sun Tzu quote that says, "To win 100 victories in 100 battles, that's not the acme of skill. To subdue the enemy without fighting at all is the acme of skill," and that's what this deterrence does.

This program will be with us into the 2080s. The requirement is 12 boats. It is 12 boats. Say it with me, "12 boats."

CHORUS: "Twelve boats."

ADM. MERZ: No less. It is based on survivability and it's based

on warheads. As a matter of fact, given these quotes from the leadership, I'm actually surprised why I don't get more questions on why only 12? Why not 14 like we have today, or more? Do you, admiral, understand the consequences of failing in this mission? I assure you, I do.

So we will not come off our requirement. The requirement is based on a whole lot of math, and we love math. As I always tell my kids, math never fails you.

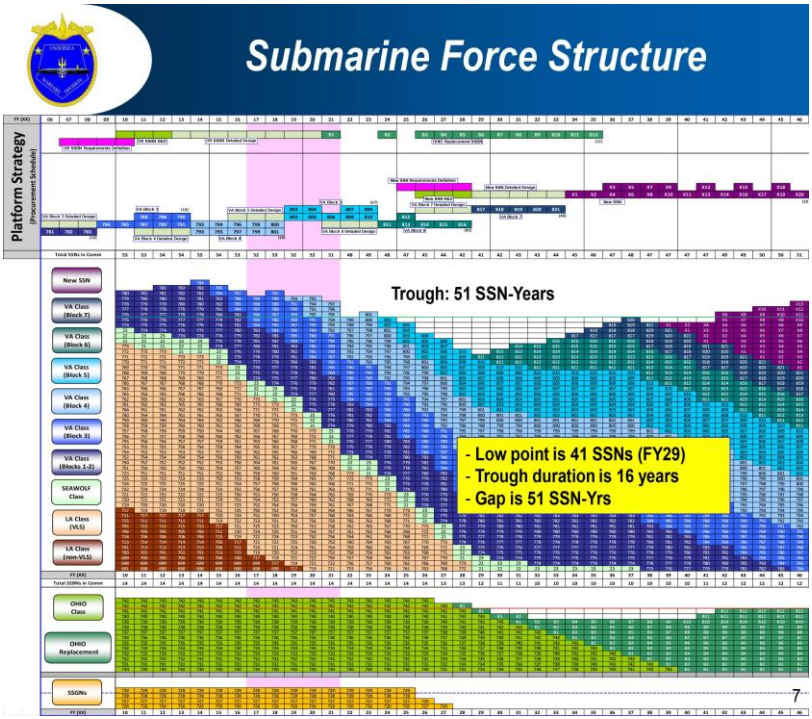
But it is about sizing the force for survivability. It's not about warheads. It's about establishing and maintaining an insurmountable problem for the adversary, and we're on track to do that.

Just recently, as I move to the next slide here, I did my first visit to Quonset Point. If you haven't been up there, it will make you feel good about being an American. You are talking about some major pieces of metal moving around at a high rate. It's really impressive, the industrial capacity, what's in play right now.

So as I move into the overall Submarine Force structure, our requirement remains at 48 SSNs, and we're above that requirement now. You guys have all seen this, I'm pretty sure. But come fiscal year 2025 is when we get below that 48, and with a low point of 41 in fiscal year 2029. The demand signal continues to rise, and that's just a reflection of the increasing threat around the world.

The trough—and you can slice this many different ways—but when you count up all the attack submarine years, it's 51 SSN-years that are unavailable. I think you've heard that number before. And it lasts for about 16 years.

I really don't have many levers to pull to lessen that trough. One of the levers we do pursue persistently is to continue that two VIRGINIA-class per year build for the life of the program. Just one more ship makes a difference, and we're going after that ship in fiscal year 2021 as we try to round out the trough.

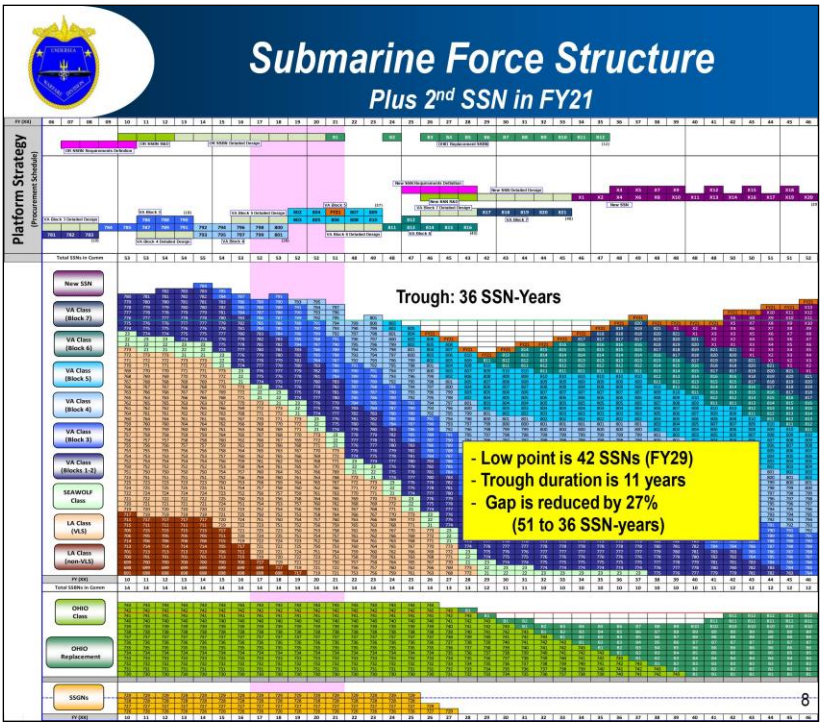


Fast forward, this is a tough build to see because it's not big, but it just adds that extra ship in fiscal year 2021 to the trough. But what that does, it shortens that trough from 51 years to 36 years, so it's a pretty significant drop. And it shortens the length of the trough to 11 years from 16 years. So when you look as it varies under the curve, that may not be immediately obvious, but it just

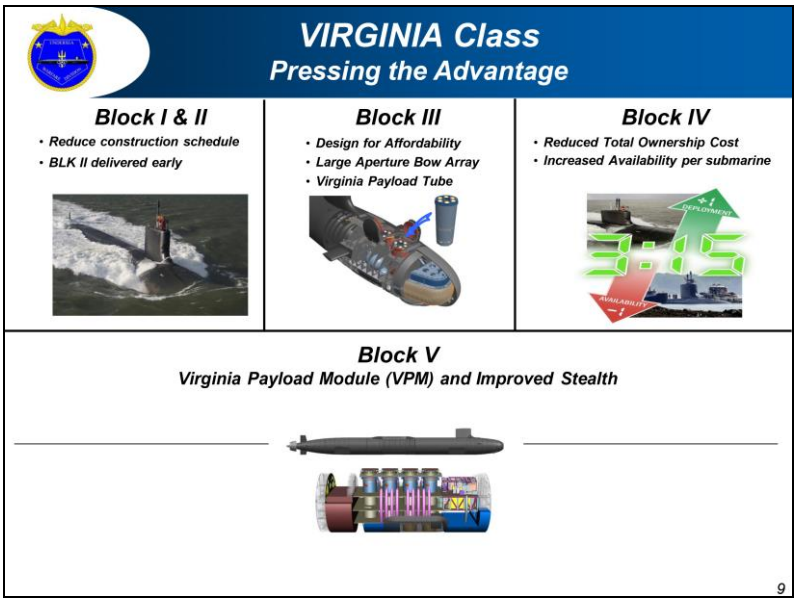
gives an example how just one platform when you're adding to a requirement that low, makes a huge percentage difference in what we're trying to achieve.

We can get there. I mean, the engineering efficiencies are in place. We continue to deliver these submarines on-time and under budget. As a matter of fact, USS ILLINOIS, which was delivered in August, is the ninth in a row delivered ahead of schedule.

But it is challenging and it's going to get more challenging for our shipyards. I really appreciated Admiral Jabaley's analogy to the tonnage. Actually it was not an analogy, it's tonnage.



It's what we're looking for into the 2020s when we're building potentially two Virginia-class submarines, the OHIO Replacement and the VIRGINIA Payload Module all at the same time. We are relying on the industrial might of our country to ramp up and meet that demand. This is Freedom Forge all over again. We've never seen anything like it.



Virginia-class, it's humming right along. The VIRGINIA Payload Module is in Block 5. We continue to improve and find efficiencies. Block 3 was probably the biggest structural change we did of going to the VIRGINIA Payload Tubes, a much simpler design, much lower maintenance costs, and a much more deliberate build cycle. We'll continue that through Block 4 and Block 5. We think we're in pretty good shape with the first one coming in fiscal year 2019, and the second ship in fiscal year 2020. So we're on track to continue the evolution of a ship that was originally designed to be entirely adaptable, and we're sticking to that.

This is what I really want to talk about, this whole theater undersea warfare thing. Before I forget everything I did out there for the last year and a half, I want to get it out to this team on how complex and how important this mission really is, and how it drives the investments I already talked about. One of the reasons I drove the boats so hard in WESTPAC was anxiety.

I had this very uneasy feeling that we were always on the road to crisis out there, and you'd better be ready to perform. You call that, from the nuclear side, healthy paranoia, which is one of my favorite tenets in our program. But you need to be ready to respond, and it's clear the undersea forces, as I said before, will be the first responders.

Really, it does transcend to our peacetime missions. How efficiently we do our peacetime mission translates directly on how effective we're going to be in war. But also, I felt this very strong desire to continue to build the depth of the bench of our Ward-rooms, by exposing them to as many of the harsh environments, as many of the challenging missions, as I could.

Not only do they enjoy being challenged, these are your return deployers. They're going to be your department heads, your XOs and your commanding officers. There's a lot going on in the world. And I'll tell you there's a fight probably coming and I want these kids to be ready for it.

Working closely with the other task forces I loosely represent there on that slide, our role is to attrite and attrite quickly in support of that larger battle force. But it really takes a team of warriors to do that, when I talk about the distances and volume of ocean I'm talking about in prosecution. And getting the right search platforms and the right tactical platforms on task. We've become so integrated, particularly in 5th and 7th Fleet, that over 50 times in 2016, my first half of 2016 before I left, we as the undersea warfare commander took tactical control of destroyers, 50 different times, where they were given over to us in a

prosecution role. So this is the undersea guy running the destroyers around, and it was a lot of fun, but it also tells you how integrated and broad we have to be.

But we also fundamentally changed our mentality out there from a defensive posture to an offensive posture. That was an order of magnitude improvement in our efficiency and carrying out our missions in the Western Pacific. I will tell you I think there's still too much defensive thinking out there. It's not a healthy thought process if you're a numerically inferior force, historically a losing proposition.

I think we've gotten a little lazy in peacetime, that we can cover more area when we take a defensive posture. I would rather take an offensive posture and shrink that area down. It has proven to be effective and we've learned this lesson over and over again. So I would ask you in industry to think offensively when you come up with your good ideas.

Moving along here, unmanned systems. I think there's real gold in unmanned systems. I'll give you my quick sound bites and thoughts on this area of investment.

Our area, our domain under the sea, is hard. This is not the same as building unmanned air systems. As a matter of fact, I would tell you I probably get more use out of the unmanned air systems right now off of submarines, than we do the unmanned underwater systems. It's a reflection of how challenging it is.

For one, we are truly unmanned. When you send these vehicles out, they work autonomously until they come back, or they don't come back. It's not a man in the loop in Nevada driving it forward. There is no man in the loop. So we kind of define unmanned across the spectrum.

It's a harsh environment that just gets harsher the longer we're in it. Technology is hard, and it's hard to get it out to sea. I spoke at the unmanned conference in Pentagon City earlier this week. We related to them that we are making progress, but I'm tired of waiting.

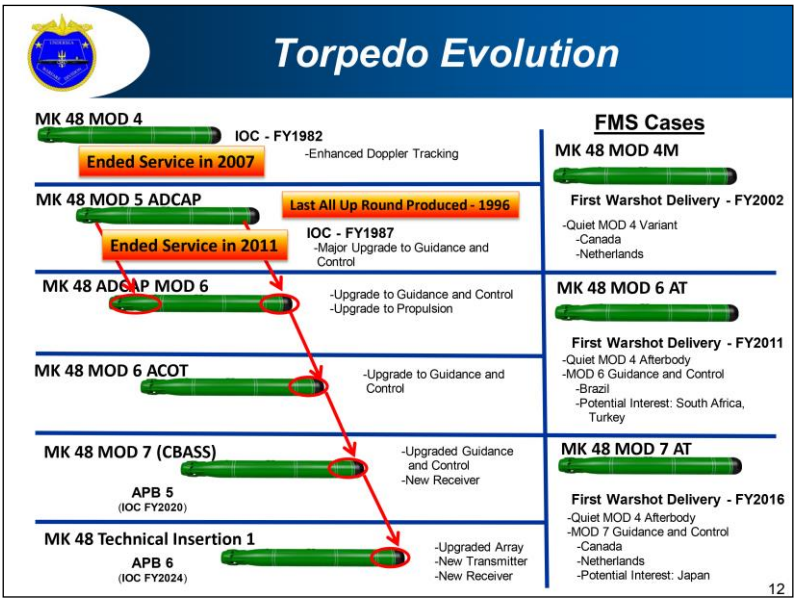
Give me what you have. I will take it to sea. I will give you feedback, and you continue to develop and evolve, and I will take that to sea and give you more feedback.

I have a spectrum of missions, from the dull, dirty, dangerous, all the way up to the Starship ENTERPRISE. I have the Starship ENTERPRISE, it's the VIRGINIA-class. I hope unmanned systems get there eventually, but until then give me what you have. I can plug holes that unburden the SSN force.

So we're very excited with the technology. I just co-signed the MOA (Memorandum of Agreement) with Admiral Tofalo for our undersea vehicles and I'm very excited to get those things out there and get them in the fleet and try out how they work. I think we need to take advantage of the fact that they're unmanned. We don't have to be as careful with them. There is rarely a case where humans are in danger when we're dealing with unmanned systems.

To give you an example, in the mineworker community we fielded the Mark 18 Mod 2. We just gave them to the sailors, the developers went with them, and put them in the Middle East working and doing real missions. We think we pretty much

skipped a whole generation of testing, evaluation and development, and the vehicles worked better than anticipated. So with that thought process, I am very committed to the unmanned systems, but I want to get them out there. I want to kick them over the side and start using them.



Then, of course, our original unmanned system with attitude is the ADCAP (Advanced Capability Torpedo), so I just wanted to give you a quick update that we have restarted the ADCAP production line. We also have it on a similar upgrade system as our APB model. It is an APB model. The numbers are a little bit different. So we've brought it back. We have it on the conveyor belt for improvements over time, and we're very excited to start chipping away at this torpedo shortfall you've been hearing about for so long

Even more exciting is we're starting to get into the world of anti-ship cruise missiles and a whole variety of missile family-type capability. In WESTPAC in particular, and actually in 5th Fleet as well, from Iran, they have anti-ship cruise missiles. They practice. They throw them up there quite a bit, and it drives an awful lot of our tactical thought out there.

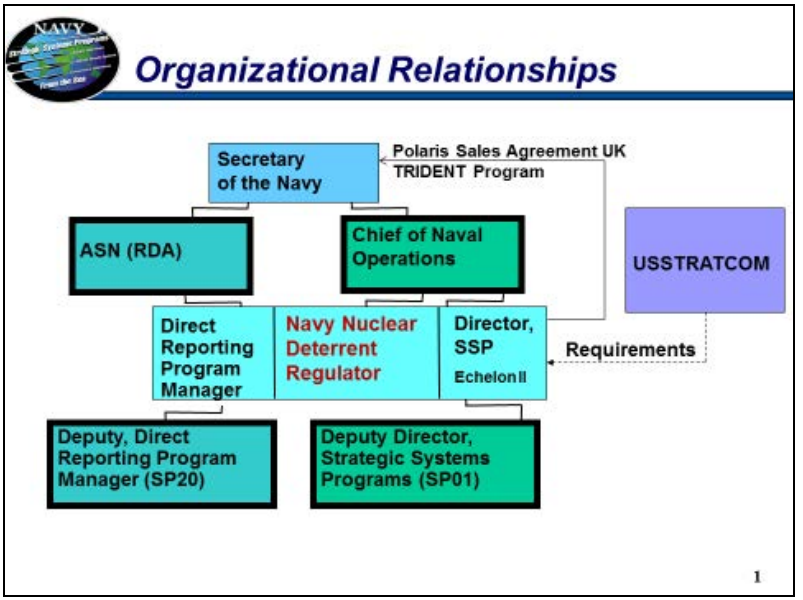
I'm looking forward to paying that back to them and giving them something to think about. I think we're on a good track there. It's very immature at this point, but you'll hear more about it as it comes along.

As I wrap up, this is my last slide. That's kind of it for now. As I settle into this job I will be talking more and more about kill chains and the investments we need on those kill chains to make sure we shore everything up. But I will tell you right now, coming fresh from the fight, we're on a good vector. Your boats are doing very well out there. The technology I see coming down the pike I think is very promising and we're very excited to have it.

NAVAL SUBMARINE LEAGUE
34TH ANNUAL SYMPOSIUM

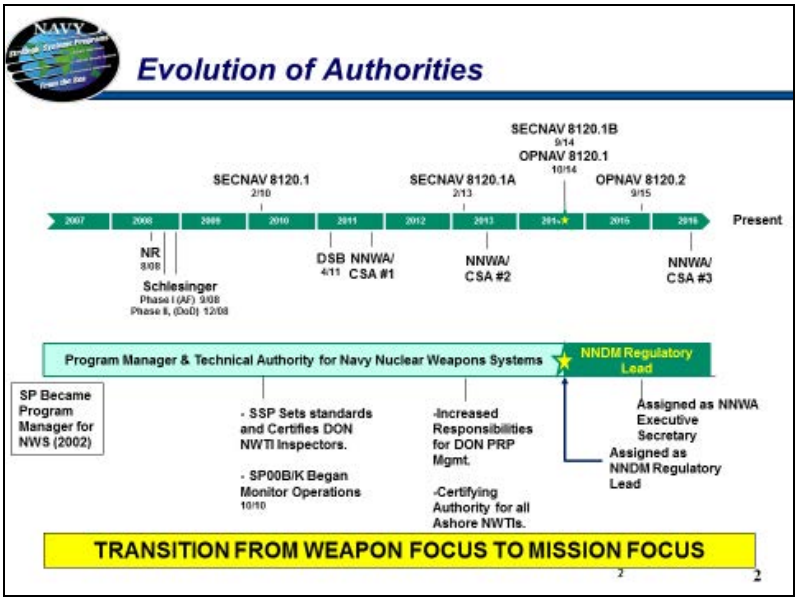
VICE ADMIRAL TERRY BENEDICT, USN
DIRECTOR FOR STRATEGIC SYSTEMS PROGRAMS

October 27, 2016



Admiral Padgett, thank you for that introduction. I want to thank the Submarine League for the opportunity to speak here today. I am going to continue my trend that I have done over the last six years while I have been the Director of SSP, and that is I use this as my report card to the community on the obligations and accountability that we have within SSP to ensure that we are properly placed and ready to support the Ohio Replacement Program as she enters into service. Let me start off by reporting something that is relatively new to what we have been doing in SSP and that is the role of the Navy nuclear deterrent regulator.

That responsibility fits nicely between the operations aspects of the program, as well as the acquisition aspects of the program.

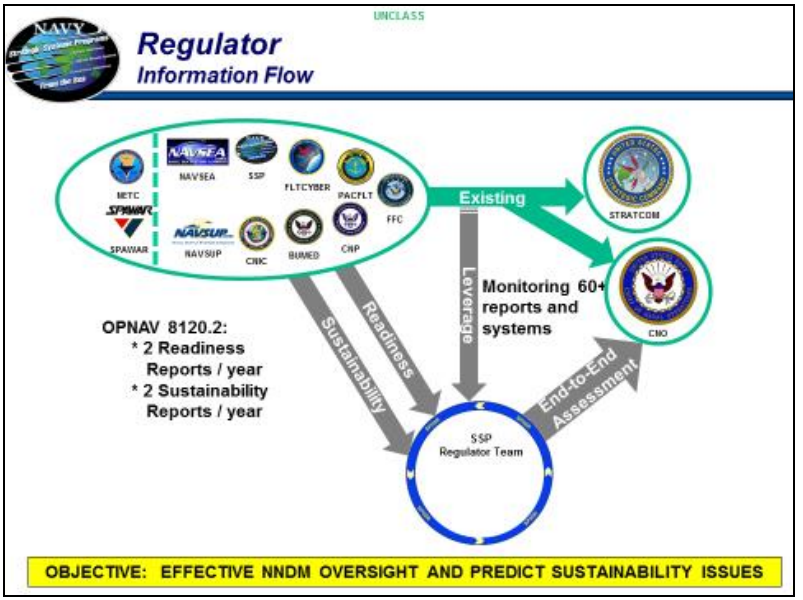


This is an evolution of authorities. In my mind, it goes back to Donald Schlesinger's review of the Navy's program after the Air Force incident that flew weapons material from Minot to Barksdale. The vision was laid out in that timeframe and it has just been a constant on the system to ensure that not only the authorities were put in place–and that is what you see on the top bar–but more importantly, the accountabilities were also put in place. As the bottom bar on the slide shows, we were assigned as the Navy's nuclear deterrent mission regulator and subsequently, we have also been assigned the Navy's nuclear weapons executive secretary. In this role I function as an integrator between all the commands that have a role in Navy nuclear weapons. In good submarine terms, I am providing the forceful backup needed to ensure that the system is accurate and reflects the balance between budget and requirements and execution.

On a bi-annual basis, we conduct a complete assessment. The assessment process begins with us assessing ourselves. After that, we turn that over to the Navy's nuclear weapons assessment process, which then looks across the entire Navy spectrum. We just completed one this summer, where we looked at over 40 commands across the Navy, ensuring that they were prepared to execute in accordance with the higher requirements. This year, we shifted the focus of that process from Navy nuclear weapons to the Navy nuclear mission.

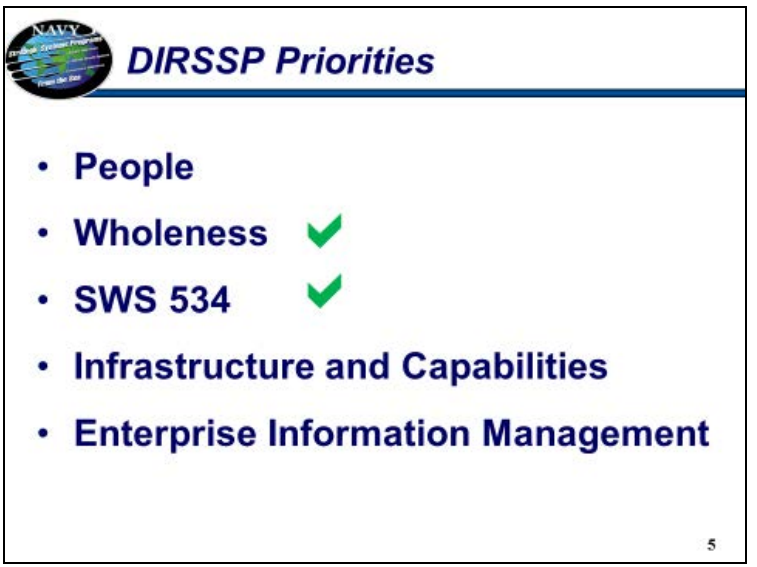
This brings in a different perspective for organizations such as Naval Supply Command, SPAWAR, or CNIC. It is the most comprehensive assessment that we have completed since we started this process. We took a hard turn on Navy command and control and communications–the NC3 piece and we took a hard look at where we stand, where the plans were moving forward, and most importantly looked to see if we were budgeted properly to ensure that the plans that we are communicating to the outside world are actually funded in the budget and ready to execute.

As we stood up the regulator effort, it was vitally important to me to have a group come in and look at our own process. To examine how we are doing in standing up the regulator effort, determine if we have a broad enough vision, and if we have the aperture set wide enough. We completed that review at the end of June and reported out to the CNO in August of 2016.



As the regulator, I asked, what are we actually doing? In the simplest terms, I am providing forceful backup to everyone that is doing their job in providing this capability for the nation. What you see in the upper left-hand corner are the commands that I am providing this type of regulatory oversight to. On the left, you see both SPAWAR and NETC. As we took a hard look at the NC3, we recognized that those two commands were not in the original concept, however, we are in the process of including them within our regulatory oversight. As we were standing this up, one of the fundamentals that I discussed with Admiral Greenert was how we

are going to do this without taxing those commands in addition to what they are already doing. What we determined is this information flow model shown in the slide. Those arrows represent the existing reports and systems that we now have access to–somewhere in excess of 60. We are reading and monitoring those to help us see what is happening. The only new requirement that we have levied on those commands are four reports per year–two readiness reports and two sustainability reports. The readiness reports are focused in the one to two-year timeframe. The sustainment reports are FYDP-type reports. As you look at requirements, your budget, and your challenges, you can identify if you have the right resources to keep out of a crisis. I recently submitted the first end-to-end assessment to the CNO in October. It is in review now and once he chops off on that, we will push that information out to the commands that were reported on. I am very pleased with where we are going. This provides value to those commands and most importantly, it provides value to the United States Navy and to the larger leadership.



I have been in this job for six and a half years now and I will probably be here for around another one and a half to two years. As I look towards the end of where I am going in the command, I want to ensure my priorities are clearly communicated to the claimancy.

First and foremost, my number one priority is people. I am very happy and proud to say that we are an organization that next month celebrates its 61st anniversary as a program. Not many commands get to do that. I am even more pleased to say that we are not even halfway done. When you look at the Ohio Replacement Program and how long that boat will be in the water, there is a requirement for SSP to be a viable command providing our mission throughout the life of that platform–to 2084. While we can focus on technology, hardware and software, nothing is going to happen if we cannot sustain a personnel model that will attract the talent necessary to execute the program's mission. I am very focused on the people. Two things in particular: one is growing the next generation. About four years ago we started two leadership institutes within SSP, a mid-level leadership for GS-12s and 13s and a senior-level leadership for GS-14s and 15s, to provide them with the tools necessary to be the workforce that we need them to be through 2084. I am pleased to report that these programs have really gained traction and are providing substantive benefits to the entire workforce.

Most importantly is the requirement that I have to ensure that I turn over the senior leadership in the program. This year we are going to turn over the technical director, chief engineer, the systems engineer, and missile branch engineer. With the exception of the technical director, which is normally a military billet, the rest of those are all senior executive service billets. John Lunney, who is my systems engineer, has 48 years of experience. It is not easy to replace someone like that. We have spent a lot of time working this out. Currently, we are in the process of identifying the right people now. I will have some time with them before I turn over, and we will maintain good stability in the turn over.

My next area of focus is wholeness. Wholeness is my way of describing how I am going to balance my budget appropriations.

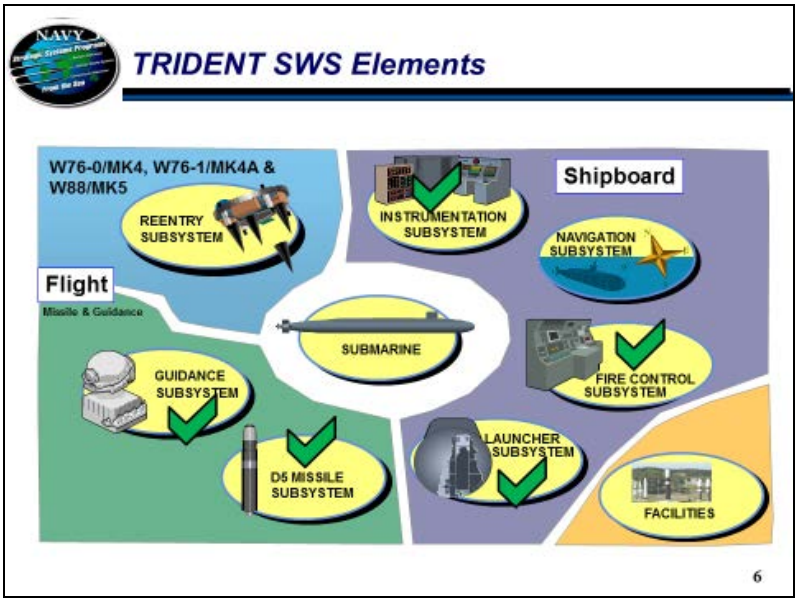
As we have come through the life extension effort, I found myself a little bit unbalanced between OMN, OPN, WPN, and R&D. We worked very closely with N-97. We briefed Mr. Stackley and got complete agreement on the way that we would move appropriations in order to ensure that we have a better risk posture going into the next FYDP. That has been approved and I've checked that off as a completed goal. Those decisions have been made and those budget executions have been enacted.

My next objective is SWS-524. When we purchased the Trident II D5 at program, we had 533 available missiles. With FCET and DASO testing requirements, 533 missiles will not get us to 2084. There is a requirement for something next. Is it an "E6" missile? Is it "D5 LE2"? We have spent a number of years thinking about this. I have presented to OSD Policy, OSD Acquisition, the Joint Staff, STRATCOM, finally culminating through OPNAV and up to Mr. Stackley. We have begun what I would consider to be the extremely preliminary discussions about what follows Trident II D5. It is not an imminent build, but in this business one of the things I have learned in SSP is you do not wait to start thinking. We have spent a fair amount of time thinking about the acquisition strategy, about the technology necessary, and I now have concurrence from Mr. Stackley on a way forward. We will begin that process here in the next couple of years.

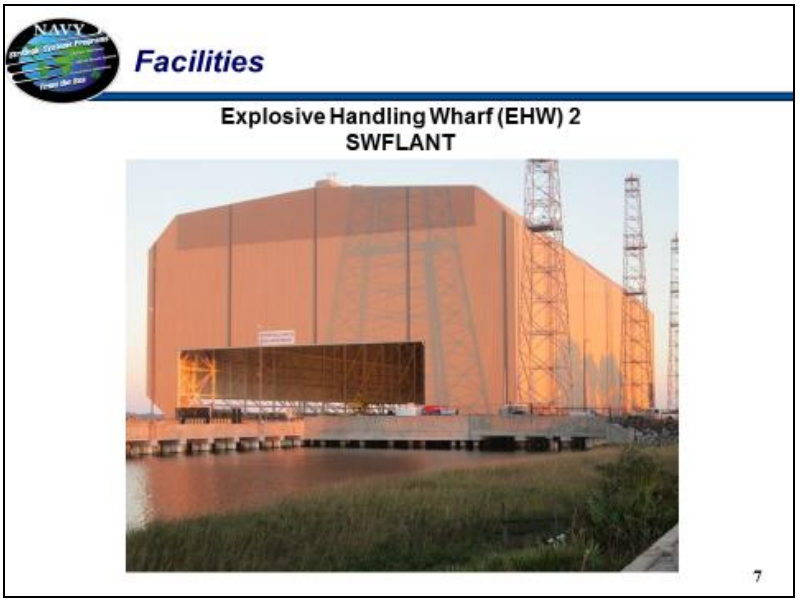
The next objective is infrastructure and capabilities. One of my initiatives in the last couple of years is to continue the work that I have had with industry on where should industry be and what we should expect as the rate structure and how can we adjust those two things to better posture the program going forward. To be specific, I have a large percentage of my business in California where the rate structure is very difficult to maintain. I also have a very capable complex down in Florida where the rate structure is significantly different. As an example, we have been shifting work from California to Florida since I was in California in 1993. This year, I made a major step. We are moving 120 people from Lockheed Martin in Sunnyvale, California to the Cape–strictly because of the cost structure and cost benefits. This goes back to my wholeness discussion with Mr. Stackley. All of these things

begin to tie together, and I will discuss more about the Cape and the capability that we are building later in the presentation. We are going to make a hard push to ensure that we have a strategic plan with our industry partners on where they should be and how that should affect their rate structure.

My final objective is enterprise information management. We are in an organization that is rigorous in our processes and our procedures. As I bring in the new people – my first initiative – where do they go to understand how we operate in SSP? SSP probably has more processes, procedures, instructions, ODs than anybody in the Navy. How do you bring that new engineer in and say, somewhere in this massive paper – if I could even put it in one room – is something you are not supposed to do? How do you have that conversation? As we look towards 2084, we need to look for ways to put that information into a format where it can be searched, adhered to, and executed. We hired Gartner to help us look at this process. One of my last, hopefully beneficial initiatives as the director, is to create an enterprise information management program within SSP that allows us to capture that information and make it available to the workforce.



I do not need to remind everyone, of the elements that make up the Trident strategic weapons system. However, what I what like you to note is that I have placed checks on some of those ball circles. Guidance and missiles, I checked because the new guidance system as well as the four missile electronics packages that are part of our life extension efforts have been certified. Launcher subsystem and its transition in architecture, as well as its transition to COTS hardware and software, has been executed. Fire control has been executed. Instrumentation has been executed. And most importantly, it is deployed today on the Ohio-class submarines going to sea, certified to launch nuclear capable missiles.



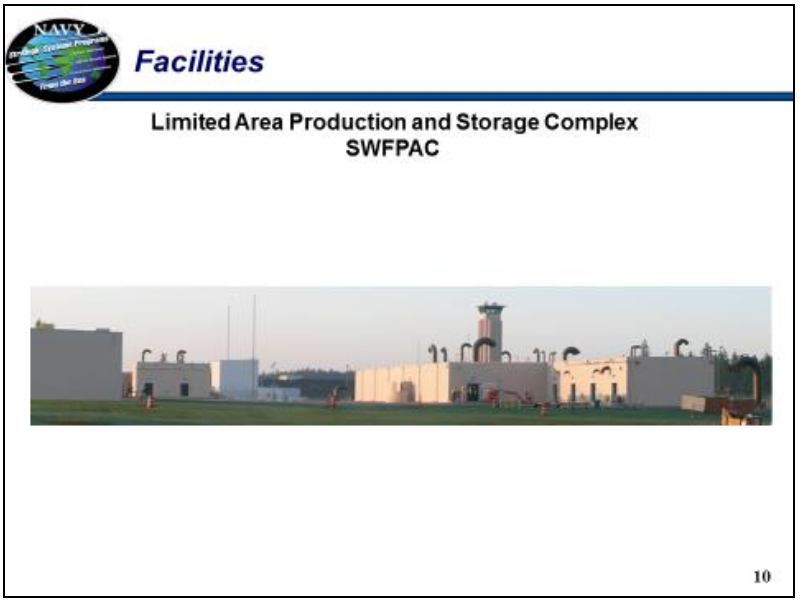
Let me spend a moment and talk about facilities. When I retire, NAVFAC should give me an honorary CEC badge. I have spent more time as an engineering duty officer building buildings, than I do building hardware that flies.

Explosive Handling Wharf Number 2 at SWFLANT. I did not build this – I just had to get it back. Originally, this program was supposed to be about two years. It ended up being just over four. The problem is when we actually started the complete refurbishment of this EHW, we identified a significant environmental issue with lead paint. As you sometimes see in houses where you have to fumigate the house and have to cover it, we had to cover that and take it down to its structural members, sand blast it, and then put it back together. As you can imagine, I have huge cranes there to lift ordnance and other assets. They sat on the rails for more than four years. Getting those things back to certification levels was not an insignificant issue. It is now operational and supporting the fleet. However, as I do that, I can look just to the left of this picture to EHW-1 and we will need do

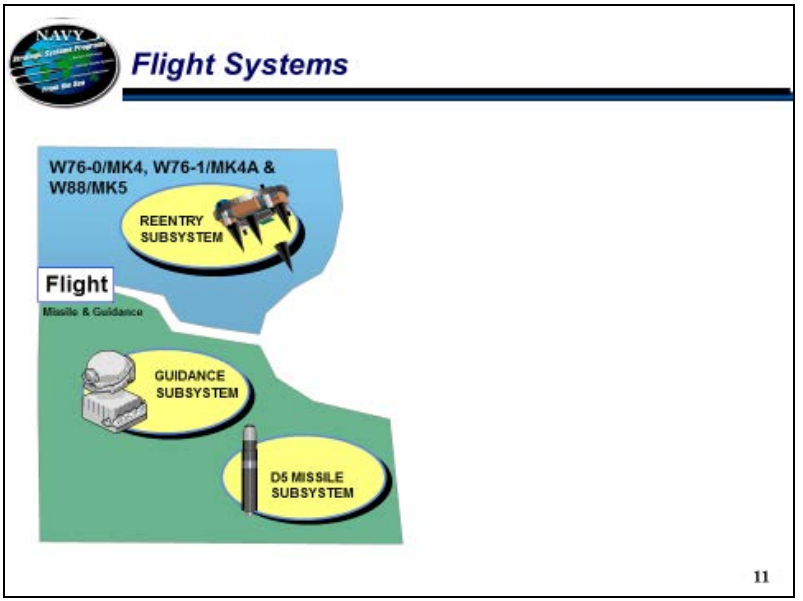
the exact same thing. However, we will use our lessons learned and hopefully it will not be a four-year process.

This one we did build. This is the latest picture from Explosive Handling Wharf Number 2 at SWFPAC, a major Navy investment in MILCON to give us the second EHW capability in the Pacific. It is moving right along. We had a couple of issues in construction, in timing, with moving barges and cranes, but we are in the endgame, inside the red zone now. It is always hard to get across the goal line with last minute issues, but we are working hard with the contractors, and most importantly with the fleet, as we will need a submarine to do the proofing. All of that is in the final discussion points.

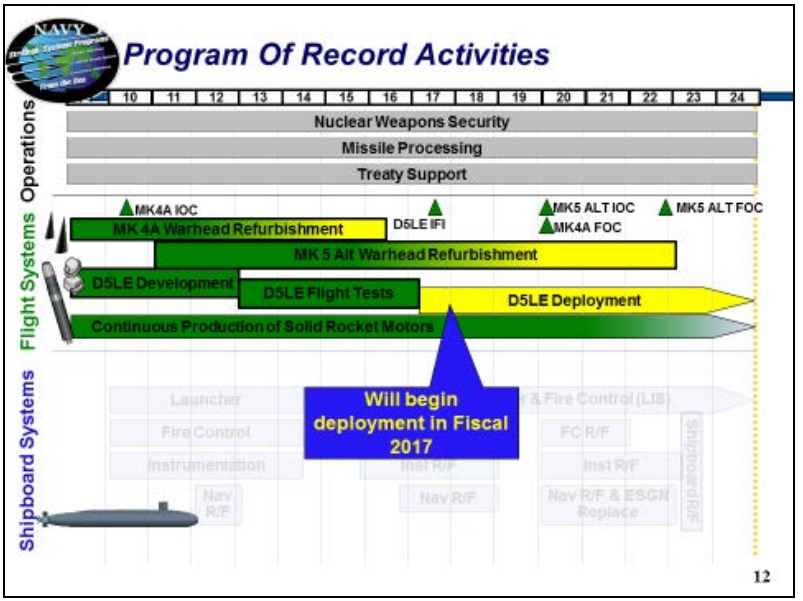
The next facility upgrade I will discuss is PIDAS or Perimeter Intrusion Detection and Assessment System. Our investment in nuclear weapons safety and security over the years has been huge. The PIDAS fence line at both SWFLANT and at SWFPAC totally encompasses the waterfront restricted area. Construction is complete and we will spend this year installing and certifying the sensors. At the beginning of 2018 we will certify that entire program as good to go, and then the entire waterfront restricted area of maintenance and operations support area will be within a nuclear weapons restricted area.



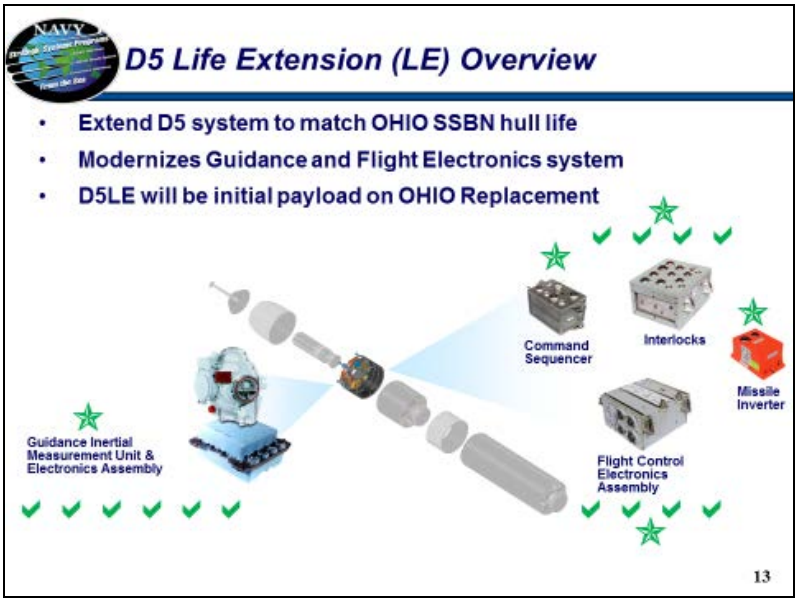
This is our Limited Area Storage Complex at SWFPAC. If you look at that picture, you should say to yourself, that does not look that hard. What you do not see, under-ground, is a super Walmart-sized complex, and that's exactly the way it's supposed to be. You do not see where the weapons are actually stored and processed. So underneath those few visible buildings is a complex, probably the most advanced and capable that this nation has built in the last couple of decades. This facility is now certified and fully operational at SWFPAC.



I will now address flight hardware. I will start in the upper left-hand corner of the slide. I was down at Pantex a couple of months ago with the Secretary of Energy and the Chairman of the House Armed Services Committee. We were there to celebrate the opening of a new building, but we also celebrated the fact that the 76-1 is now in excess of about 78 percent complete in her production run. We are right on schedule. We will complete that in fiscal 2018. That transitions right into the W-88 Mark V Alt 370 effort, which is our new arming, fusing and firing circuit, and that is right on schedule to begin initial operating capability in fiscal 2019. By 2023 both re-entry bodies that the Trident II can carry will have had life extension efforts and will be good through the early 2040s as a point in time. So we are very well supported by NNSA. They are just knocking it out down at Pantex, and so we went down there to celebrate that.

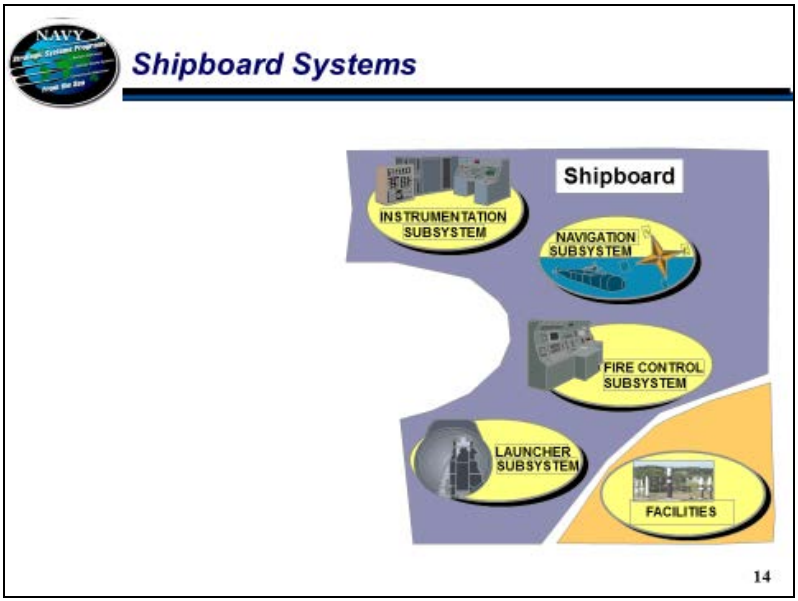


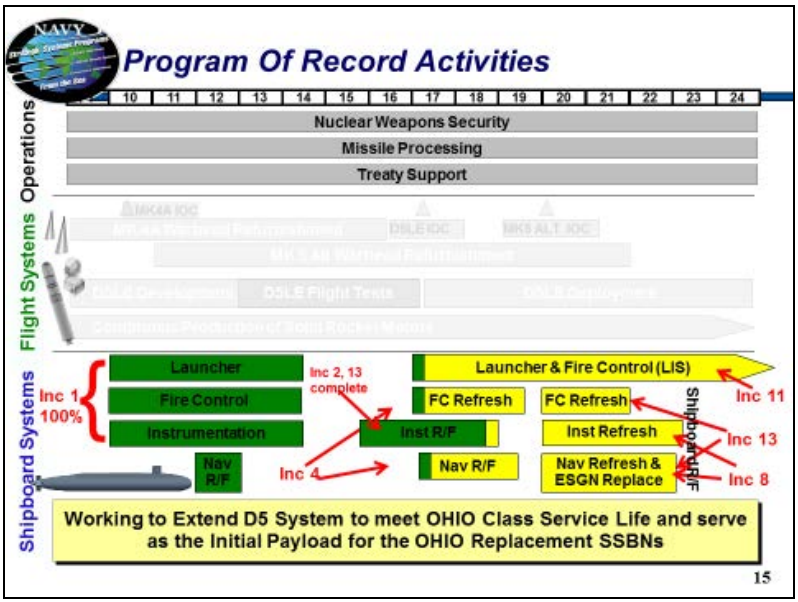
In terms of guidance and missiles, the slide shows the schedule that we set out. I will focus on the middle rows as the flight systems. We are tracking right to plan. We will begin deployment this fiscal year of our life extension efforts, both guidance and missile electronics. You see that is the D5 IFI triangle up there. We are ready to support that.



What you see here are the stars that represent certification. You also see the checks that represent the flights that we have actually flown successfully with this hardware in various configurations. Every flight fully met its flight objectives. We consider both the EA and the IMU, which make up the Mark VI Mod 1 as well as the four missile electronics packages: command sequencer, interlocks, flight controls, and inverters as certified and ready for deployment.

Again, this will go on Ohio. We will put this out on Ohio and then it will transition to Ohio Replacement. This singles up all our training, all our logistics, all our documentation. It is a very cost-effective method to move into the next platform.


Shipboard Systems
Shipboard
INSTRUMENTATION SUBSYSTEM
NAVIGATION SUBSYSTEM
FIRE CONTROL SUBSYSTEM
LAUNCHER SUBSYSTEM
FACILITIES
14


Program Of Record Activities
10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Operations
Nuclear Weapons Security
Missile Processing
Treaty Support
Flight Systems
Shipboard Systems
Launcher
Fire Control
Instrumentation
Inc 1 100%
Inc 2, 13 complete
Launcher & Fire Control (LIS)
FC Refresh
FC Refresh
Inc 11
Inst R/F
Inst Refresh
Inc 13
Nav R/F
Nav Refresh & ESGN Replace
Inc 8
Inc 4
Shipboard R/F
Working to Extend D5 System to meet OHIO Class Service Life and serve as the Initial Payload for the OHIO Replacement SSBNs
15

Now, we will talk about shipboard systems. Looking at the bottom section, everything that is totally solid is complete. At SSP we use the term Shipboard Systems Integrations Increments – roughly equivalent to the NAVSEA concept of ARCI. This is the work we are doing on the shipboard portion of the strategic weapons system. Unfortunately, they do not go Increment 1, 2, 3 4 – in chronological order – for a number of reasons. That said, INC 1 was the initial effort to a different architecture with COTS hardware and software. That effort has been completed on both the U.S. and UK boats. From that, we leverage into the next refresh cycle. For INC 2, which is an instrumentation refresh, we have completed 13 of the 14 boats. The only reason we have not completed the 14th boat is we just have not had access to her.

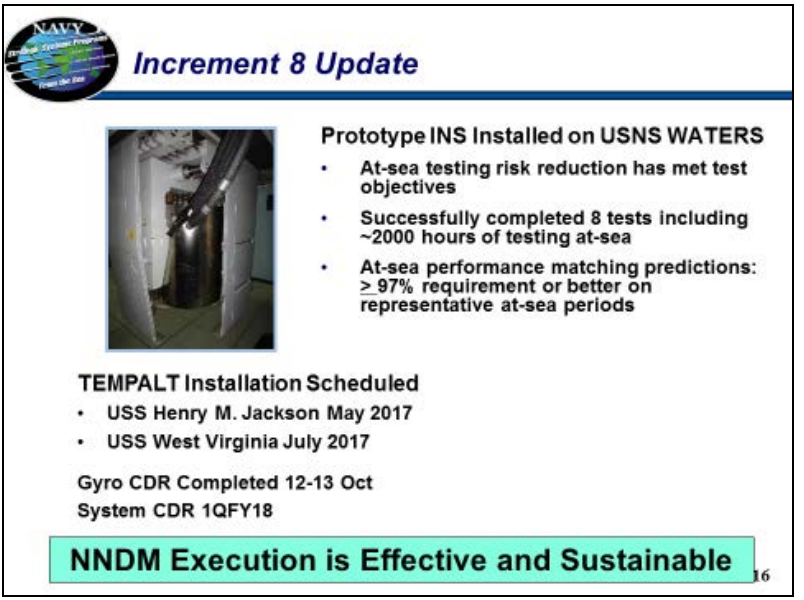
The last remaining shipboard system is navigation. The manner in which we will refresh navigation is in two major increments. Increment 4 refreshes the cabinets and electronics. INC 8 actually gets to the ESGNs and the instruments themselves and replaces the ESGNs. INC 4 is perhaps the one that I have been focused on the most over the past year. In INC 4 we are actually on USS Maryland now doing the first install of INC 4. We are 45 percent complete and staying on schedule. Once we complete Maryland, we will have a refresh for the rest of the U.S. and UK boats.

INC 8, is the actual ESGN replacement, and I will discuss that in greater detail in a moment. That is the last major effort that we will complete, and then I will report to Admiral Goggins and Admiral Jabaley that we are ready to support the SWS installations in the Ohio Replacement Program.

The launcher and fire control and LIS, that's Laser Initiation System on the launcher gas generators, that's called Increment 11. That work is on track. We have actually done one trial install, which must be done in an empty tube. We are moving away from electrical initiators to laser initiators. This is important because as we get to Ohio Replacement in the future, it will allow us to do additional work on the tube without removing the missile. That allows us the opportunity to give the boat back to the operators

instead of requiring a missile pull every time we need to do certain types of work on the tube itself.

Increment 13 is the final refresh and with that, I consider all electronics and software ready to go for Ohio Replacement.

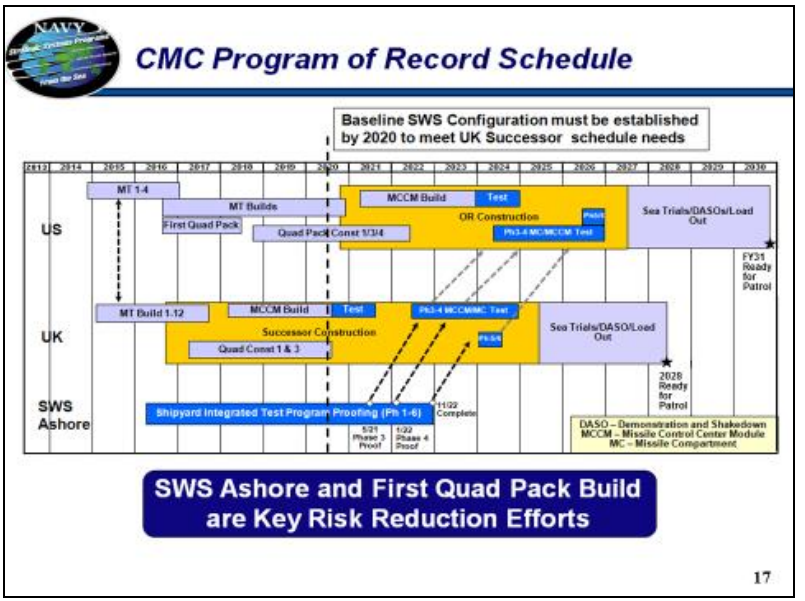


Now I would like to discuss increment 8 in a little more detail. It is a major effort replacing the ESGNs and strategic navigators. We have been working from labs to prototypes. Last January (2016) we installed a prototype INS on USNS Waters, our test instrumentation ship. We have been doing at-sea testing since then. We have accumulated over 2,000 hours of at-sea testing. It has been a very measured process and supports what we believe we should be seeing at this point.

We have two TEMPALT installs that we will complete this year on Henry M. Jackson in May and on West Virginia in July. This will include putting the third binnacle on the bedplate in the navigation center, and we will start putting a prototype at-sea, and

we'll monitor it against the performance of the two ESGNs. We will do this for over a year, gathering data and gaining additional confidence.

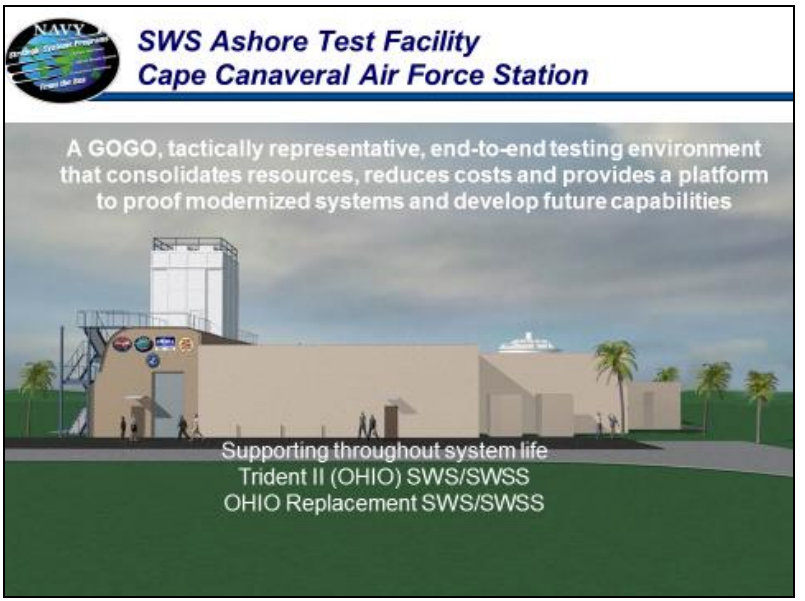
We will then move towards the actual installation with the operational fleet. The gyro critical design review (CDR) was complete and the system CDR is right on-track and we are moving towards that. We moved the system CDR out a little farther than we normally would because we wanted to come into system CDR with this data and give us the greatest confidence that when we stamp CDRs complete, we will be ready to go into production. This is a very complicated instrument to replace, but it is an absolute necessity as we move to Ohio Replacement.



Now we will look at the submarine and the Common Missile Compartment. Our concept to reduce risk not only for the U.S. but for the United Kingdom as we are partnered on a Common Missile Compartment. I would now like to discuss SWS Ashore - what that facility actually is and where we stand with it. We will do all

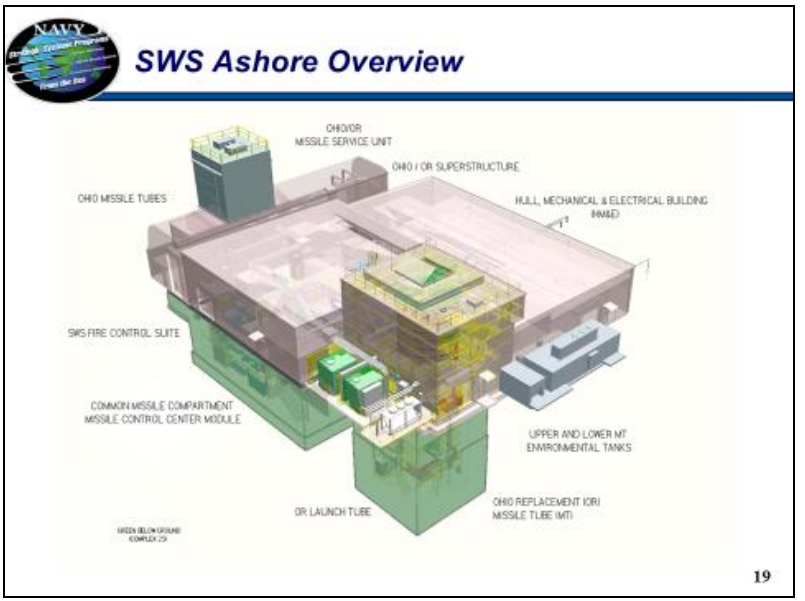
the integrated test procedures and proofing in order to execute the Shipyard Integrated Test Programs at both Electric Boat and in Barrow in the United Kingdom.

We will push those procedures to the UK as their schedule is laid out and further refine them there. Likewise, any changes there, we will move to the U.S. program as we come through the certification at Electric Boat, the major risk reduction, in order to reduce construction timelines.



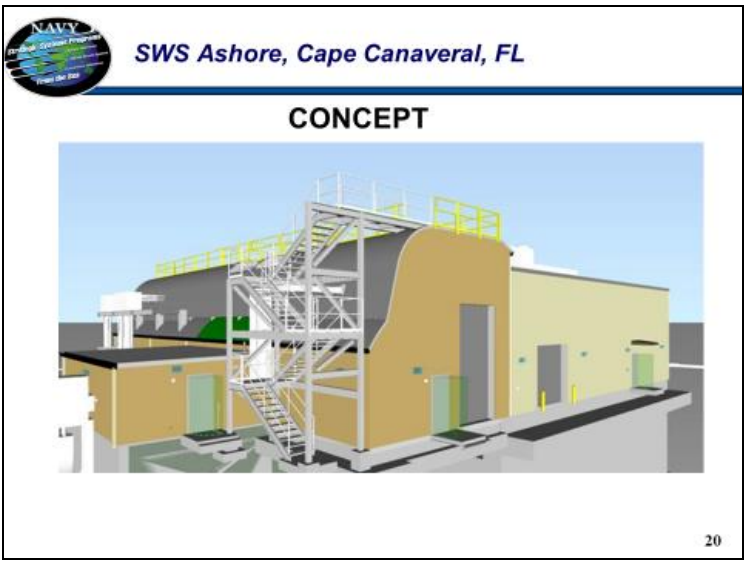
Our vision for SWS Ashore at Cape Canaveral is not only how we could use this to get the Ohio Replacement Program through the shipyard, with a higher probability of success, but also, since we are only building 12 boats for Ohio Replacement, this facility becomes our "13th and 14th " available boats. We will not have the luxury we enjoyed in Ohio where we always had two boats in availability where we could complete installations and not affect the operators. When we go to 12 boats, every boat is pretty much fully programmed for its entire life. We cannot put an alteration on

a boat and then just say, we need to take that off or modify it again. It would be a major impact to A_o and a major impact on the operations of those assets. So SWS Ashore not only gets us through the shipyard, but it becomes our final certification facility before we go and install and potentially negatively impact the operational forces.



This is a high-level diagram of SWS Ashore. We started with the former Launch Complex 25 – the launch complex we used during Polaris launches. It was vacant and filled with water. We developed a concept of how we could take that infrastructure – a significant investment if we had to start from scratch – and leverage it to build this complex around it. In the upper left, is what is called the Ohio side. Working collaboratively with Electric Boat and NAVSEA; WSSELBEF, that was at Electric Boat, we cut it in half, floated it down to Florida on barges, and reconstructed the two Ohio-class missile tubes that were in the EB facility, and installed them on the upper left-hand side, the facility in this diagram. On the lower right-hand side is the Ohio

Replacement tube that will be installed in the facility. We will have environmental chambers on the upper and lower aspects of that missile tube which will allow us to certify the various operational patrol areas and the impacts of temperature on the missile and missile tube.



This was the concept of the facility.

That's the building as it is today. I will walk you through it.

We spent the last year fit testing the various pieces of support equipment, installing the hatches, and ensuring that with those two tubes installed in the Ohio side of the building were ready to support Ohio as we move forward. All of this has been, again, risk reduction to ensure that when we work on the Ohio Replacement side, we are as high on the learning curve as we can go.

The operations control center in the middle upper row of pictures is actually the control center. We will be using this as a live test facility, as well as certification facility. It will have a Missile Control Center Module. The MCCM that will be on the Ohio Replacement will be installed between the two sides. As we operate the entire facility, opening hatches and the like, we will control those aspects–from a safety standpoint–from the operations control center. Also shown is the lightning protection that is installed and the completely refurbished Ohio missile tubes.

As we move forward into the remainder of the program supporting to 2084, the idea is to utilize Complex 30, which is an existing facility at the Cape. This shows a horizontal inert missile where we do a lot of missile testing. The thought is that we could pull that missile integration into SWS Ashore, especially, as we are moving with the next 534 program. Of course, we have always maintained Complex 46, which is where we conduct our initial shore-based testing. We are looking at how that could tie into SWS Ashore.

The other major infrastructure piece that we have been working on for the last number of years is the launch test facility at China Lake, California. We stood this facility up because the entire infrastructure that builds launch tubes has been shut down and dormant for many years. This launch test facility was the concept we developed. Here, we will perform launch shots of an inert shape.

We considered going back to the old concept–the sky catch at Hunter's Point – that we had used during the original D5 program. We found that to be a significant cost investment, so we are utilizing this as a means and a method to reduce cost. This slide shows the concept.

And this shows the facility as it is today. To the right, shows the vertical stands where we have a launch tube that is grouted in. We will launch inert shapes that will essentially pop out of the infrastructure and land in what is probably the largest gravel pit that has ever been constructed. We will refurbish the shapes after each launch and keep launching them to ensure that the design, materials, and all the other parameters are right, because the first time the Ohio replacement and Vanguard successor programs plan to launch is from a submarine.

This shows the actual filling of the gravel pit, in the upper two pictures. The bottom left-hand picture is one of four shapes. It is a cement-filled shape that matches the physical parameters of a Trident II D5 exactly. It is robust so that when it lands in the gravel pit it is not terminally damaged. We bring it out, we refurbish it, and then we are ready to launch again. The bottom right-hand is the actual launch tube that is now fully installed, grouted, certified, and in the process of being instrumented. Just after the first of the year, we will begin launching these shapes from that test facility.

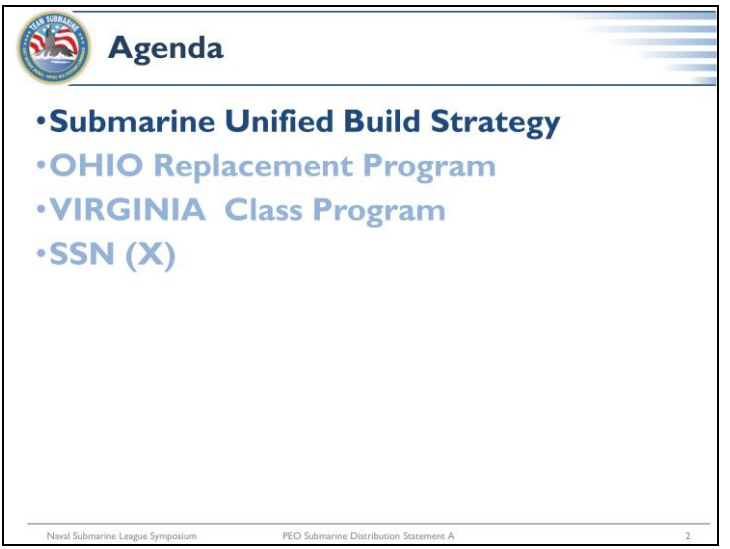
If that was not enough to be doing, over the last year we have had numerous launches. We had DASO-26 in November of 2015. That was a pretty exciting launch as we lit up the Internet as the UFO that attacked the West Coast. We then moved from DASO-26 to FCET-52 – a very successful three-missile launch from USS West Virginia. Then, under the Polaris-Sales Agreement, we supported HMS Vengeance in June off of Florida with her launch – DASO-10. And then finally, in August, USS Maryland, again off of Florida, conducted DASO-27. We put a lot of hardware in the sky over the last year. We have a four-missile FCET coming up shortly in the next calendar year and another DASO next summer on the West Coast. There is a lot going on in the program. I would hope that from this report you would leave with some confidence that we are right on track, right on budget, and meeting all our technical parameters in support of the Ohio Replacement Program, and the existing support of the Ohio Program.

NAVAL SUBMARINE LEAGUE
34TH ANNUAL SYMPOSIUM

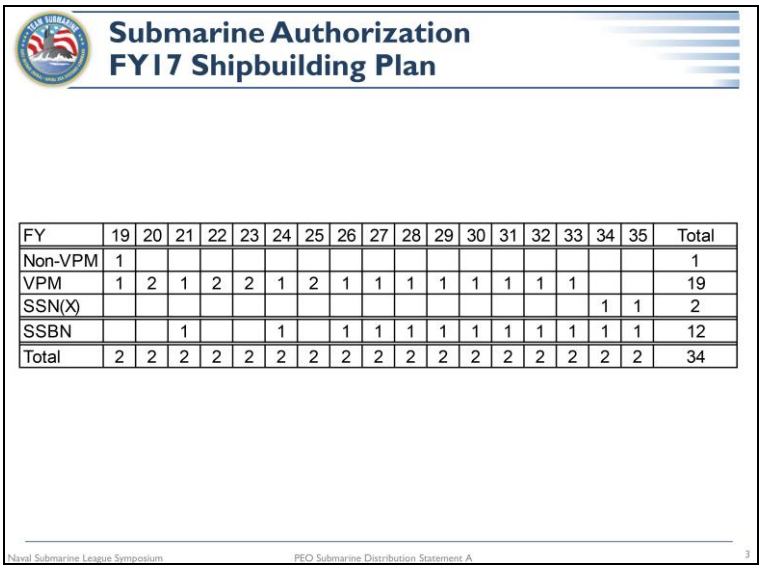
RADM MICHAEL JABALEY, USN
PEO SUBMARINES
October 26, 2016

It's a pleasure once again to talk to the Naval Submarine League. I particularly enjoy this one because not only does it represent the nearing of the end of the calendar year and the beginning of the budget season, but it's also an opportunity to see so many old friends that come particularly to this one, which is nice.

What I'm going to talk about today are a series of things that are really focused around the challenges and opportunities that are confronting the Submarine Force as we move through the next couple of decades.



I will talk about the Submarine Unified Build Strategy, giving you more information on that than we have in the past, and let you know what we've been doing over the last year to position ourselves to take on those challenges and opportunities. I will, of course, address the highest priorities of the Submarine Force, the OHIO Replacement SSBN and the two per year VIRGINIA Class submarines with Virginia Payload Module. I will then finish up with a brief touch point on SSN(X) and what we're looking for in the future beyond the VIRGINIA Class submarine.



FY	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	Total
Non-VPM	1																	1
VPM	1	2	1	2	2	1	2	1	1	1	1	1	1	1	1			19
SSN(X)																1	1	2
SSBN			1			1		1	1	1	1	1	1	1	1	1	1	12
Total	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	34

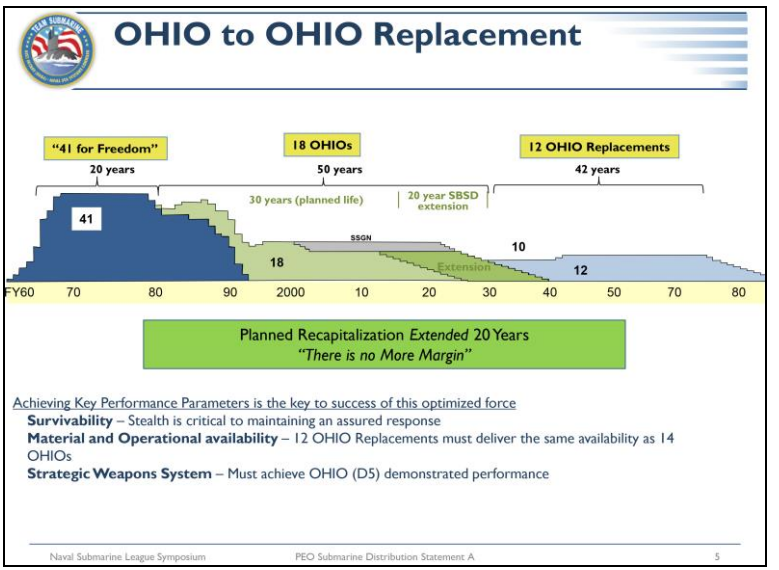
If you look at this, this is the fiscal year '17 shipbuilding plan as it pertains to submarines. It's the same as it was last year, but there are several things that you need to look at and understand as you look at the numbers on the page. The first thing I'd draw your attention to is the unbroken string of twos across the bottom of the chart.

Compared to where we have been in the past, that's a good thing. We are building two submarines every year and we will continue to do so in the future. But if you look more closely,

you'll see that every year we authorize an OHIO Replacement SSBN we are only planning to build one VIRGINIA Class submarine.

That is a significant problem for the Navy and for the Submarine Force. There's an opportunity for us to fix it, and we're working very hard to do so. I'll spend a good bit of today's remarks talking about that. The two per year VIRGINIA Class shortfalls represented by those ones in the VIRGINIA with VPM line, are one of our highest priorities for changes in the submarine build plan.

The final thing I'll call your attention to is the SSN(X) line that starts in 2034. That's one year before we authorize the final SSBN, and then that continues on after the completion of Block VII VIRGINIA Class. So we'll talk more about that at the end as well.



The OHIO Replacement is, of course, the Navy's highest priority, as the CNO has said. That was actually in the video that Admiral Tofalo played for us. Admiral Caldwell said it. Admiral

Tofalo said it. Hopefully you will hear every speaker here this week say it. It is our highest priority.

The Navy is going to build 12 OHIO Replacement SSBNs. It's my job as PEO Submarines to both make sure they are delivered on time, and then control cost and reduce it even as much as possible, to ensure that the Navy has adequate funding to build the rest of the Navy it needs. Whether that's additional VIRGINIA Class submarines or additional surface ships or additional aviation assets, it all comes out of the Navy's topline unless we get topline relief. So I have to control the cost of OHIO Replacement so we continue to afford the Navy that we need.

A couple of things, as you look at this chart, are interesting. One of the things I like to drop anchor and talk about a little bit is how well we have done at improving the product that we use in strategic deterrence. The large blue hump there, the '41 for Freedom, was our initial foray into ballistic missile launch from submarines. They were only designed for 20 years. Some of them didn't make it that long, for a variety of reasons. As a result, we needed a large number of them to carry out the strategic deterrence mission.

It was greatly improved on by the OHIO Class submarine, the legacy OHIOs. 41 for Freedom was largely delivered in the 1960s. OHIOs were largely delivered in the 1980s. They were intended to be a 30-year platform, which meant that we would have been required to start recapitalizing them with deliveries in the 2010s, where we are right now. Because of great design work at Naval Sea Systems Command, our engineering director was able to verify that the ships would be adequate to be extended another 12 years, from 30 out to 42 years, which is a tremendous accomplishment to do, an extension of that magnitude, and still be able to safely operate and certify those ships for continued at-sea patrols.

In addition, due to a variety of reasons including arms treaty talks, we reduced the force from 18 SSBNs down to 14 SSBNs. That allowed, in essence, a further extension because we didn't have to recapitalize the first four SSBNs. We converted those to SSGNs. We are now recapitalizing them by introduction of the

Virginia Payload Module, but because they're no longer SSBNs that allowed us to delay the OHIO Class recapitalization even further.

So with all of that, we will be delivering the OHIO Replacement SSBN Class, a force of 12 submarines, in the late 2020s and into the 2030s and early 2040s. The impact of this is that we can't extend the OHIO any more. We cannot delay recapitalization any more. It is our obligation now to recapitalize this force to allow the nation to continue its reliance on SSBNs for the strategic deterrence mission.

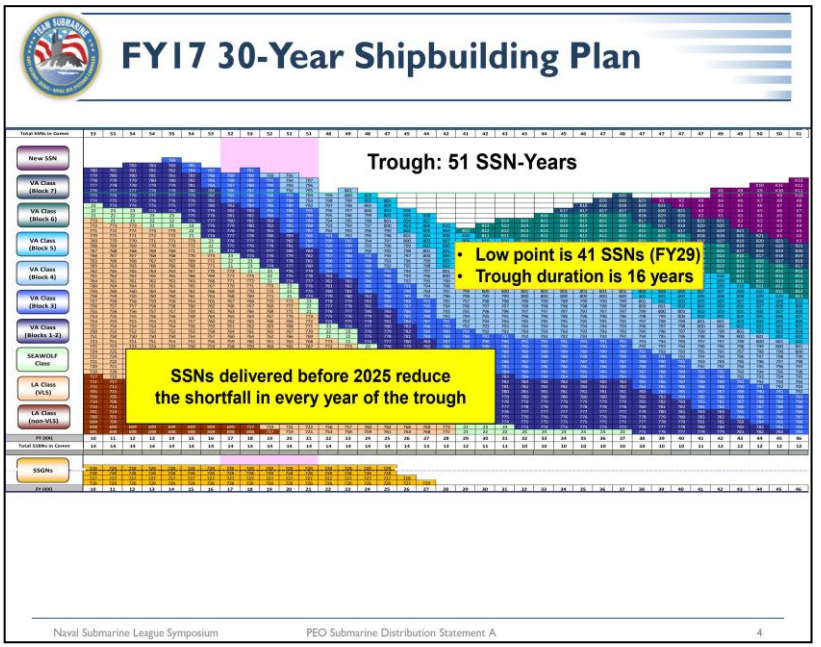
It is possible that we are able to do this only because of the engineering advancements that Admiral Caldwell talked about, the life of the ship's reactor core. That allows us to go from 14 OHIOs down to 12 OHIO Replacements. As Admiral Tofalo said, though, 12 is the number. You cannot say, can't I just put more warheads on fewer submarines and accomplish the same thing? The answer to that is absolutely not. The reasons would quickly get classified, but as Admiral Tofalo said, the survivability of the force, the ability to operate in two oceans, the ability to ensure that an adversary cannot reliably target your force, all of that relies on a dispersed strategic deterrence, and the numbers add up to 12 SSBNs.

Now we were originally planned to start construction in 2019. We took a two-year slip to 2021 several years ago due to budgetary reasons. That took all of the margin out of the program. We have to deliver these submarines on time in order for that force of 12 submarines to be able to continue.

You will notice that there's a period where we actually do go down to 10. That's only possible because we're not yet into the years where the OHIO Replacement will have their depot-level maintenance availabilities, and we're already beyond the years where the OHIO legacy class goes through its final depot maintenance availability. So we have an unbroken string of years there where we will have 10 operational submarines.

But normally it takes 12 to make 10 because two are either going into or coming out of depot-level maintenance. Even

without the refueling overhaul, we still have to get the maintenance done. So 12 is the number and the number shall be 12.



So that's the SSBN environment. The SSN environment remains the same. We are still facing a trough where we go below the requirement of 48 SSNs. If you read the coverage of Congressional testimony earlier this year, you heard two of the Department of Defense's combatant commanders, Admiral Harry Harris in the Pacific Command, and General Philip Breedlove in the European Command, an Air Force general, both say that their highest priority was additional attack submarine presence. We don't have enough submarines right now to fulfill the requirements of the combatant commanders, and it gets worse.

As you see there, the trough, starting in about 2025, takes us down to a low of 41 SSNs before we begin to climb back out of it. This is the result of the high construction rate of LOS ANGELES-class submarines during the '80s and the inevitable decommissioning of those same submarines years later. We have mitigation steps that we're working on, but they cannot remove all of this impact. The only thing that you can do to fill in that trough is build additional submarines. That's why the first opportunity on the force structure chart of 2021, when we authorize the first OHIO Class Replacement submarine, is to take that year and put the second VIRGINIA back in and instead build three submarines in that year. A VIRGINIA Class submarine authorized in 2021 will deliver in 2025 or 2026, which is about when the trough starts.

So that one submarine will fill in one of those empty boxes every single year that that trough exists. In fact, it completely removes that four-year extension off to the right where we briefly have 48 and then go back to 47. That part goes away with that one submarine because it is delivered at the beginning of the trough, an incredibly valuable submarine from the force structure perspective, and it's an opportunity for us to achieve efficiencies in construction as well.

I'll let you in on one of the worst kept secrets in the U.S. Navy. As you know, the Navy has been executing a force structure study. In testimony earlier this year Congress asked the CNO, Admiral Richardson, where he thought the new numbers would end up. In particular, one of the Congressmen asked him if he was willing to bet his paycheck on whether or not the numbers would

go up. Admiral Richardson said yeah, I'd probably bet my paycheck that the numbers are going to go up.

Secretary Mabus gave an interview a couple of weeks ago and he was asked the same question. He said, yeah, I'd probably bet the CNO's paycheck that the numbers are going to go up.

So I'll just put my chips on the same bet. I think that the numbers are going to go up. I think that the Attack Submarine Force Structure numbers are going to go up. Obviously, until the Navy releases the study, nothing is definite. But the point is, this trough below 48 SSNs is not going to get better and in all likelihood it's going to get worse.

So we have to do everything we can to execute our principle mitigation steps, which we defined years ago as delivering the VIRGINIAs earlier than we had been. The first one was about an 86 or 87-month construction span. We have gotten that down to—the low point, on MISSISSIPPI, which was 62 months.

So we've taken a full two years out of the amount of time it takes to build the submarines. That gets each submarine to the Fleet two years earlier than it would have been had we remained static, which we were never going to do. But continuing to reduce that construction span as much as possible gets those ships there incrementally earlier.

Incremental life extension for selected 688-class submarines, the second mitigation step. Any time that we get about five years away from a planned decommissioning, we start to look at that submarine and say, okay, how much gas is left in the tank? Is the reactor adequate to continue operating in that ship beyond what we had originally planned? What about the material condition of the ship, the ballast tanks, the non-pressure hull, the internal tanks, the normal fuel oil tank, all of the things that require significant maintenance effort to maintain and certify that ship for continued operation?

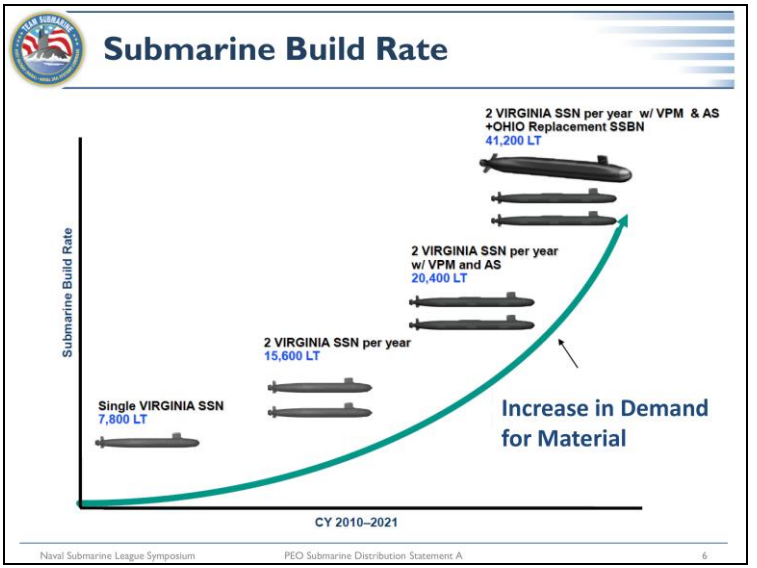
And then we look at the actual deployment schedule. You say, okay, that one, she's coming back 18 months before the end of her life, as currently planned. Well, if we can extend her for six months we could conceivably get an additional deployment out of

that ship before we decommission her. So every ship, again, as it nears decommissioning, we go and do that math.

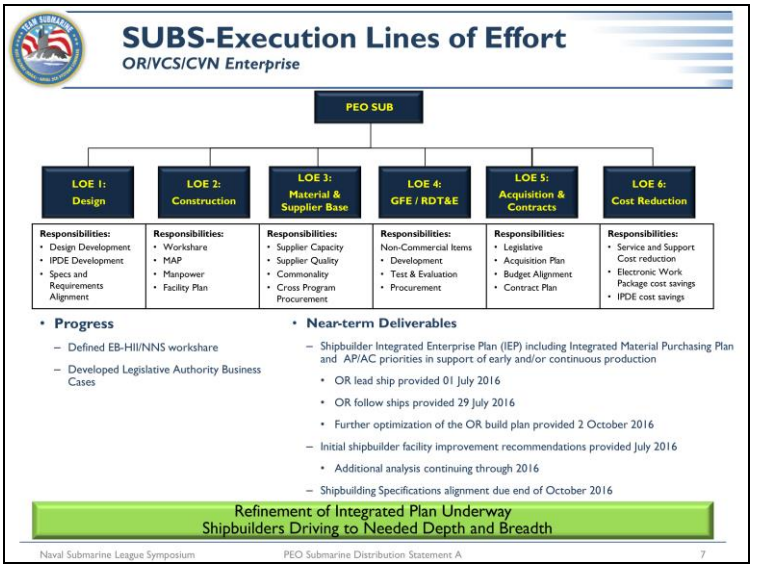
But again, the most that we can do is get one additional deployment out of that ship. That's great from a presence standpoint. It helps us during peacetime, but it doesn't mean that that ship will be available a year after that. And if that's the time that we have to surge to protect our nation and engage in worldwide interests, then it's not much help.

Then the final one, again a similar impact, selected extensions of deployments. We want to maintain deployments at six months, but there are times when the world conditions require that we extend a ship on deployment. Again, you look at the operating cycle of the ship and if we have to we do that.

So those were the three mitigation steps we defined when we first recognized the trough that was ahead of us: earlier delivery of VIRGINIA Class submarines, selected life extension of the 688 attack submarines, and selected extensions of deployments beyond six months. In doing so we have prepared ourselves to manage our way through the trough, but we haven't even gotten into the meat of it yet. So it is, again, incredibly important. The only way you can really impact that white space and fill in those boxes is building additional submarines, and because of the timing, that second VIRGINIA in '21 is the most valuable.



So to kind of put up a pictorial view graph, not to scale, not mathematically accurate, but if you just look at where we started in the early 2000s to where we're headed in terms of shipbuilding, and the long tons of submarines that we are intending to produce every year, you can see that there is a significant amount of work facing our enterprise in the future. Again, that presents both challenges and opportunities. So given the environment that I've laid out and given the problem that you're staring at right now, what are we doing about it?



To confront both the challenges and opportunities, we have worked with our industry partners and our government partners to put together the Submarine Unified Build Strategy. Because the acronym is SUBS, it's a good name. I will say that it's not 100 percent accurate because it also includes a little bit of nuclear aircraft carrier impact, because that is again an opportunity.

So this is a management construct that we developed that defines fixed lines of effort. Those lines of effort are geared towards attacking the challenges and capitalizing on the opportunities. So let me spend a minute and walk through each one.

The first line of effort is design. We are embarking on—we are actually well into—a significant era of submarine design. The OHIO Replacement SSBN design, the Virginia Payload Module design, and the acoustic superiority design, all three of those efforts are well underway. Acoustic superiority is, in fact, nearing completion.

In design, we are using a fundamentally new design tool, as compared to what we used on the VIRGINIA Class back in the

'90s. We've transitioned from CATIA, which is a 3D model product, to what we call the Integrated Product Development Environment, based on commercial products from Siemens NX team center. I don't want to say modified, but adapted to the particular uses that we need, this design tool is foundational to our ability to design the ship on-time and achieve cost savings in the design stroke itself.

Like CATIA, it is a three dimensional model, but it is so much more because it seamlessly links all of the products you need to design the ship and then go build the ship. As we continue to fully complete the use of IPDE, we do expect significant cost returns from it and we are already beginning to see the improvement in the design effort on OHIO Replacement.

Line of effort Two is perhaps one of the biggest of the six because it's construction. This involves the actual methodology and plans for ensuring that the companies are ready to build the submarines. So Electric Boat, at their sites both in Groton and Quonset Point; and then Newport News at their site in Newport News, Virginia; each have detailed plans for everything that you need to do to build the VIRGINIA Class submarine with VPM and acoustic superiority, and the OHIO Replacement at the same time.

So we're talking about the facilities expansion that has to take place, a detailed plan for what buildings you have to build, what fixtures you have to design and procure, when all of that has to get built, how you reconfigure the infrastructure of your site in terms of power lines and everything else that goes into the building, moving roads, in the case of Quonset Point, to accommodate new buildings. The manpower plans, where are you going to find the thousands of construction workers that you're going to need to tackle this mountain of work? How are the communities and the academic institutions going to produce the quality of high school graduates or college graduates that you need so that you can train them to be the welder or the pipe fitter or the electrical engineer or the designer in order to do this work? Again, you can't underestimate the expansion, if you think back to that curve, of the work that we are facing and the additional number of people that you're going to need.

And then finally the spatial flow itself. How do the sections, the super modules of each submarine, move through those sequential sites in a manner that doesn't conflict with the others, and ensures that all of the prerequisites come together to support that flow, so you can get to a final hull complete in either Groton or Newport News and delivered on time?

Line of effort Three is one of the most aggressive ones from the term of cost savings. It's the material and supplier base. Again, we looked at the mountain of work facing us and said, we have to capitalize on this. We, the government, have to get the volume discount that should accrue by the combined purchasing of all the things you're going to need for the two different classes of submarines, and here's where the carrier comes in, because a lot of the components are similar or identical on the carrier when you get to the nuclear power plant and nuclear shipbuilding concerns.

In this line of effort, we perform targeted vendor analysis and cost comparison, and say okay, can we align the specifications for the OHIO Replacement submarine such that it matches up very well with the VIRGINIA Class submarine, such that when it's time to buy 10 ship sets of a chill water pump for the VIRGINIA, we're buying the exact same pumps for the OHIO Replacements that are building at the same time? And if that pump is used in a similar or identical capacity on the aircraft carrier, we can buy all of that at the same time. Again, that's a volume discount price that we need to take advantage of.

In order to do that, we have to reinforce with our vendor base that this mountain of work is facing them as well and that they need to ensure that their quality, their cost and their capacity is ready to accomplish that. So this line of effort is going out and doing targeted analyses of the top 25 suppliers to the shipbuilders to make sure that they understand and are ready to execute the work, and that we can work with them to get the best price as we go forward.

I may not have mentioned, most of these lines of effort have participation from the shipbuilders as well as the government. It is a unified attack on the mountain of work ahead of us.

Line of effort Four is one of the ones which is government only, because it deals with government furnished equipment and the RDT&E necessary to do the technology development that the government supports. So these are things like the propulsor design. As we've talked about already, this class, the OHIO Replacement, will be in existence until the 2080s. In order to meet the stealth requirements over that long period of time, it has to be as quiet as possible. It's a much bigger submarine than the VIRGINIA, so we can't just scale the VIRGINIA propulsors up to the size necessary to propel the OHIO Replacement. So we are designing a new propulsor. We have several designs that we will down-select in the next several years. But this line of effort is similarly important because we have to make sure—in this case, we're supporting the shipbuilder. We have to make sure that the government furnished equipment gets to them on time and that it's adequate to do the job.

This also includes the SWFTS systems, non-propulsion electronic systems. Admiral Tofalo was talking about the sonar, the combat control, imaging, ESM. All of that, again, a direct pull from VIRGINIA. The same systems that will be provided to VIRGINIA we'll be providing to OHIO Replacement at the time.

Line of effort Five deals with acquisition authorities in contracts. This again is an important aspect of what we're doing and in order to do it we have to mesh very tightly both the VIRGINIA and the OHIO Replacement Program offices.

This line of effort puts together the business case analyses necessary to provide justification to our Congressional stakeholders to give us the authorities we need for a non-standard way of doing business when we procure these ships. So this includes several things, chiefly among them, one that we're already working very hard and anticipate to be able to start executing next year, the continuous production of missile tubes. So the 87-inch missile tube, 16 of which will go on the OHIO Replacement; we're also buying 12 each for the UK Successor SSBN-class; and then 87-inch tubes form the four payload tubes in the Virginia Payload Module, as well as the two tubes in the bow on each Block III and beyond VIRGINIA.

That's a significant amount of work for 87-inch tubes. What do we want to do? Well again, we want to get a volume discount for the amount of work that we're going to be doing, but we also want to make sure that the ramp-up for that work is smooth and gives you the best efficiency from the industrial base perspective.

If you only did it the year that each of the submarines was authorized, you would have some wild saw tooth swings because the first OHIO Replacement is in '21, then we take a two year gap, then there's '24, then a one year gap, and then we finally get to one per year. So continuous production authority says, okay, we're going to use an investment amount of money to start this work and we're going to ramp it up and reach a stable base. Now we'll actually be building some tubes ahead of when the submarine that they're going to end up going on gets authorized, and that's why we need Congressional authority to do it.

So we're working very closely with our partners in Congress on this to ensure that we get the authority. We're working within the Navy and OSD to ensure that we get the funding, because you do have to pull money earlier in the budget to do this. But it does two things.

Number one, again, it helps the industrial base tremendously, which allows us to get cost savings in the way we do it. And then it de-risks the schedule, and that's incredibly important because as we've discussed, the need of the OHIO Replacement to deliver on time and get out on patrol before the OHIOs decommission, is primary.

The final line of effort is cost reduction. This is similar to the 2 for 4 in '12 effort that we all remember so fondly. On the VIRGINIA Class when we needed to get to two per year we had to take 20 percent out of the cost of the ship to get to $2 billion per year for two ships a year (as measured in '05 dollars). This reinstitutes that effort - the design for affordability or design for cost reduction, while we're early in the design phase and can still maximize the advantage of the design opportunity to reduce construction costs.

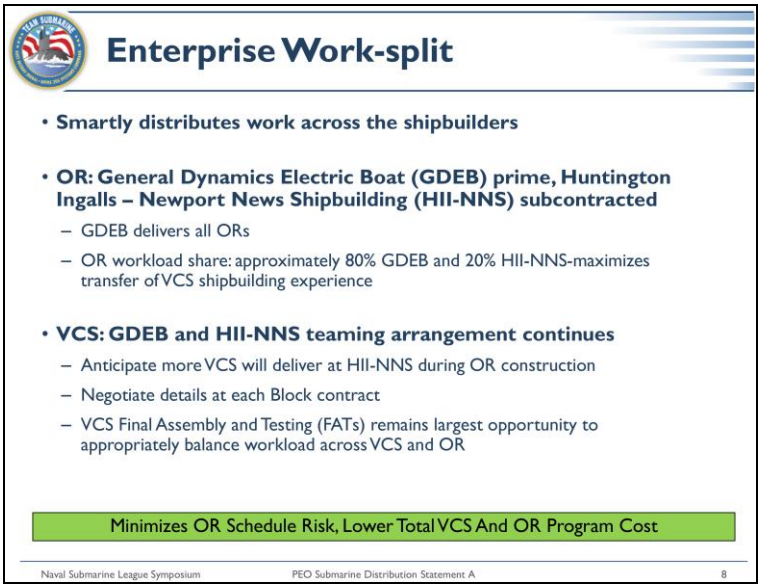
So what has all this done for us, this Unified Build Strategy? We have successfully presented the business case for continuous

production. That is in process, making its way through the approval chain, and I'm very confident that we'll see that embedded in the program on a go-forward basis. We are continuing to work other initiatives: acceleration of significant components of the ship.

Again, the biggest problem that we have is there's no margin between the decommissioning of OHIOs and the delivery of OHIO Replacement. Anyone who has been involved in a shipbuilding program knows that there will be unknowns that pop up and cause delays to the schedule. So my job is to try to buy margin back into that schedule so that when the inevitable unknown presents itself it's not a fatal collision within the construction plan.

So to buy that margin back into the schedule we're looking at targeted elements of the ship where we can accelerate the construction through the use of Advance Procurement funding or Advance Construction authority, to start those parts earlier and de-risk that schedule. That, again, requires taking money out of full funding down the road and pulling it earlier into Advance Procurement, Advance Construction authority. But it provides a significant benefit from schedule de-risking.

I also talked about that multi-program material procurement, the ability to buy components for OHIO Replacement, VIRGINIA Class submarine, and even the CVN program. That is additionally one where we want to be able to combine the money into single purchase orders through the companies and provide the cost savings back to the government. So those are the ones where we're continuing to work and expect to be presenting those for approval over the next year or two. But the overall effort of the Unified Build Strategy has taken us significantly beyond where we were a year ago, in particular in terms of the construction readiness on the part of the team for building the OHIO Replacement while we continue to build VIRGINIAs.



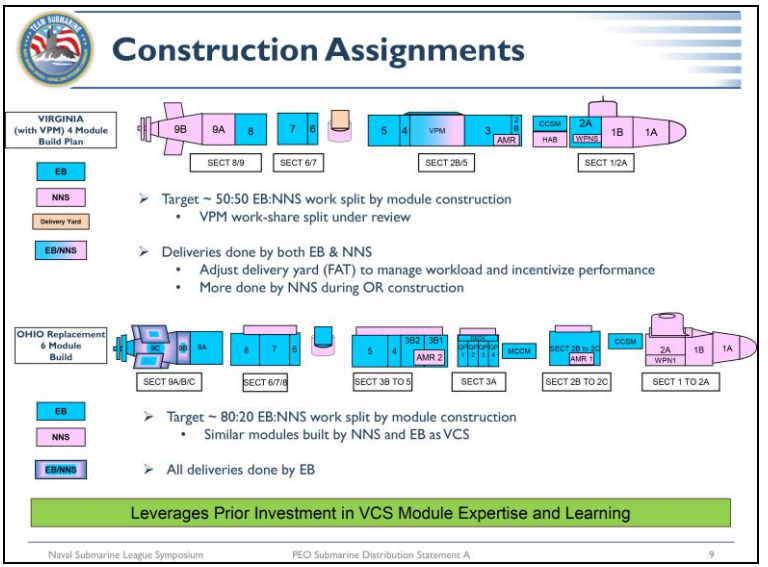
Some of the things we have determined and defined as a result of this work. We announced earlier this year, back in March, that we have determined that all of the OHIO Replacements will be delivered by Electric Boat. That is principally a result of the desire to minimize the amount of additional facilitization that would have to be done in order to deliver a ship of this magnitude.

So EB will deliver all the OHIO Replacements. The work share is going to be approximately 80 percent at EB and about 20 percent at Newport News. It's actually a little bit more like 78-22, but all of that will be defined as we move forward and closer to a construction contract.

A teaming arrangement similar to what we have on VIRGINIA is anticipated to continue. Again, this will all be defined in the construction contract. But because this is a unified strategy, we are able to really maneuver levers on both classes to achieve a common good.

So given that EB will deliver all the OHIO Replacements and is doing a significant amount of the work on those, it's inevitable that some of the VIRGINIA Class submarines will shift to

Newport News to evenly spread the workload over the next several decades. The Final Assembly and Test - the delivery of that submarine really is probably the lever that has the most impact on the overall work split and because of that we will negotiate each subsequent block VIRGINIA contract.

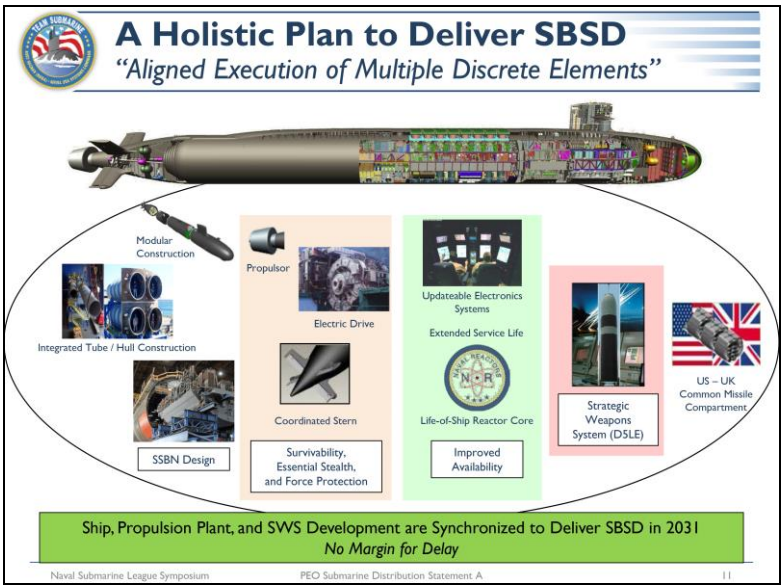


As we get more and more into the fully formed design of the ship, we are better defining exactly where the portions of the ship will be built. This shows the VIRGINIA Class submarine on the top and the OHIO Replacement on the bottom. As you can see, it's not 100 percent identical, but we're following the dictum of you do the similar work in the same place.

So Newport News is building the bows for each of the VIRGINIA Class submarines. We anticipate that they will build the bow for the OHIO Replacement. They build the sterns for the VIRGINIAS. They will also build most of the OHIO Replacement

stern. There are some particular things in the OHIO Replacement stern that may make it better to be finished at EB as a result.

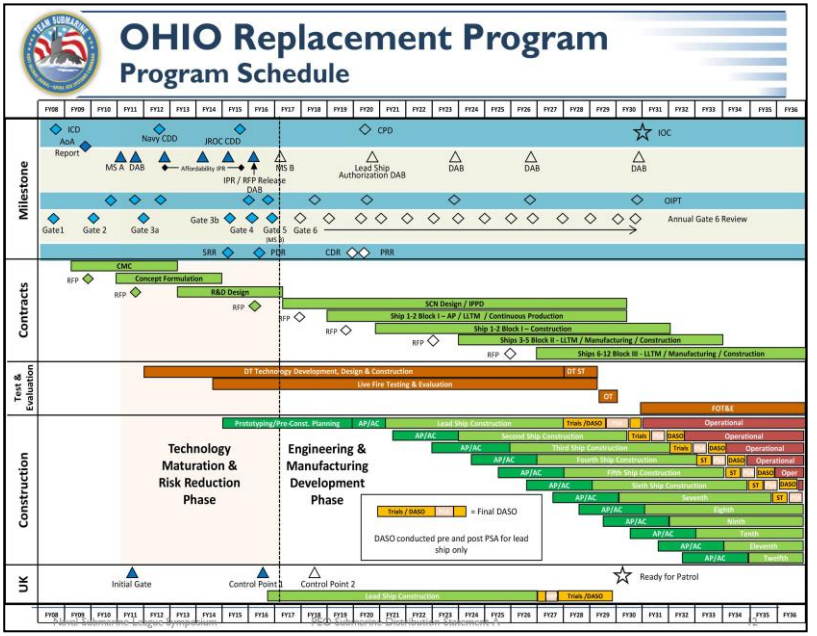
You can see the work split. But the key here, again, is relying on what has already become a center of excellence in one location and continuing to focus on that.



Some specifics on OHIO Replacement next. We've talked about this before. This is a holistic gathering together of several different streams. The design: pulling from VIRGINIA as much as possible; making technological advances where you need to—and primarily that's in order to maintain the stealthiness of the submarine out through the 2080s; the improved availability due to the life of the ship's core; and then the reuse of the D5 with life extension weapons system. So you're really pulling together efforts from the program office, from Naval Reactors, from the design community, from Strategic Systems Program, and then we

throw in the cooperation with the UK just to keep things interesting.

So all of that together has to proceed down at the same pace and come to fruition in the fully designed submarine. So where are we?



This is a programmatic start and really I'll only draw a couple of things to your attention. You see the Milestone B decision there just to the right of today's dash line. As Admiral Caldwell said, early in November is when we anticipate that milestone. It is a meeting scheduled and run by the Office of the Secretary of Defense, so we are working with them to complete the milestone process.

You see below it, in the contracts line, that we're also lining up for the SCN design. Here's the analogy that I use to describe this, and it's the four horsemen or the four horses. It's not the Four Horsemen of the Apocalypse, because that would be a depressing analogy.

But this is like the old Western movies where we're driving the stagecoach and have four horses pulling the stagecoach. In this case, they're yoked together, but not very tightly. So here are the four horses.

Milestone B approval, that's when OSD says yes you are an ACAT-1D program, the highest acquisition category, defense-level oversight, and we are giving you permission to proceed beyond Milestone B. The second horse is the contract award, in this case the contract is for the IPPD, the Integrated Product and Process Development contract to complete the design. The third horse is the transition from R&D funding for that design to SCN funding. And then the fourth horse is the funding itself.

So Milestone B, that's nearly in hand. We're going to go to the Defense Acquisition Board in early November and present the program to OSD and answer their questions and get approval. The contract award, we're working very hard with our shipbuilding partners in getting to a contract award, because that is a negotiation. I'm not going to talk any more about that.

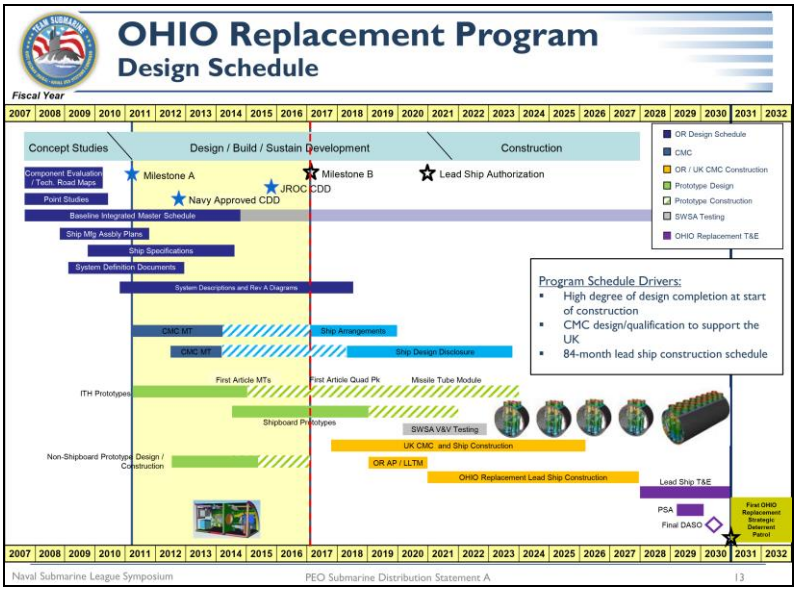
SCN funding, that's wrapped up in the continuing resolution. An appropriations bill for this year would have included $773 million in SCN funding to do SCN-funded design, the detailed design that you need to build the submarine. Because we're under a continuing resolution, I don't have the SCN funding.

We have remained flexible and we're continuing to support the design effort on things that we can spend R&D funding on,

which I do have. I can do that until about the first of next year. But on 1 January I will have exhausted all remaining flexibility and the ability to use R&D funds to continue the design.

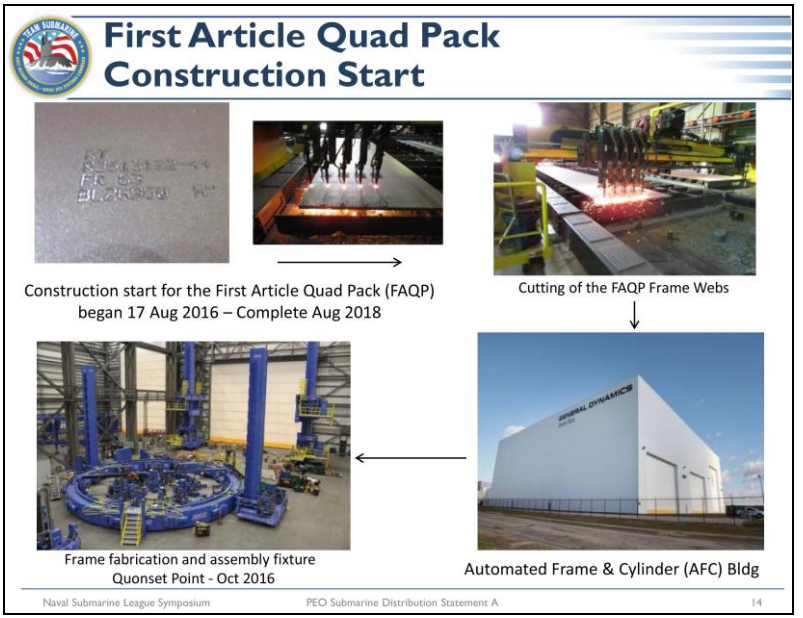
So if we don't get an appropriations bill or a subsequent continuing resolution with an anomaly to fund SCN for the OHIO Replacement Program, we will be in a position where we will have to go redefine things in order to continue the design. It is unlikely for that to be approved and the alternative is that you slow down the design. If I slow down the design on this ship, then it is a greater than day-for-day delay once we do get funding and start it up again. So it is a perilous situation that I am hopeful will be resolved either in the next continuing resolution or with the passage of an appropriations bill.

One final thing on the Milestone B. I do want to clarify something that Admiral Caldwell said on the cost of the SSBN. Our CDD requirement for the average cost of follow ships on the OHIO Replacement is a threshold of $5.6 billion and an objective of $4.9 billion. So when he said that the cost will be around $5 billion, he was referring to the average follow ship cost, not the lead ship cost. Once OSD approves the Milestone B and issues the actual cost projection of the ship, I am very confident that we will be closer to that $4.9 billion number than we will to the $5.6 billion number. So that's a good news story. Those were cost targets that were set years ago. We're going to come into Milestone B and explain why we feel that we're between the threshold and objective.



So in the need to get the ships designed and built on time, one of the ways that we're doing this is through an aggressive prototyping scheme. The way to read this chart is that the solid colors are design stroke, and then the hash colors are prototyping. So where you see the quad packs, those four sections of the Common Missile Compartment, each of them with four tubes, all of the efforts leading up to that lead to the ability to build those on-time.

As Admiral Tofalo said, we are already building pieces of this ship. It's through R&D funding of prototype efforts that those prototype articles will be consumed in the first ship. So we're already doing the integrated tube and hull pieces for the missile tubes. The missile tube vendors are already building the missile tubes and those will be combined into the first missile tube module and then the Common Missile Compartment.

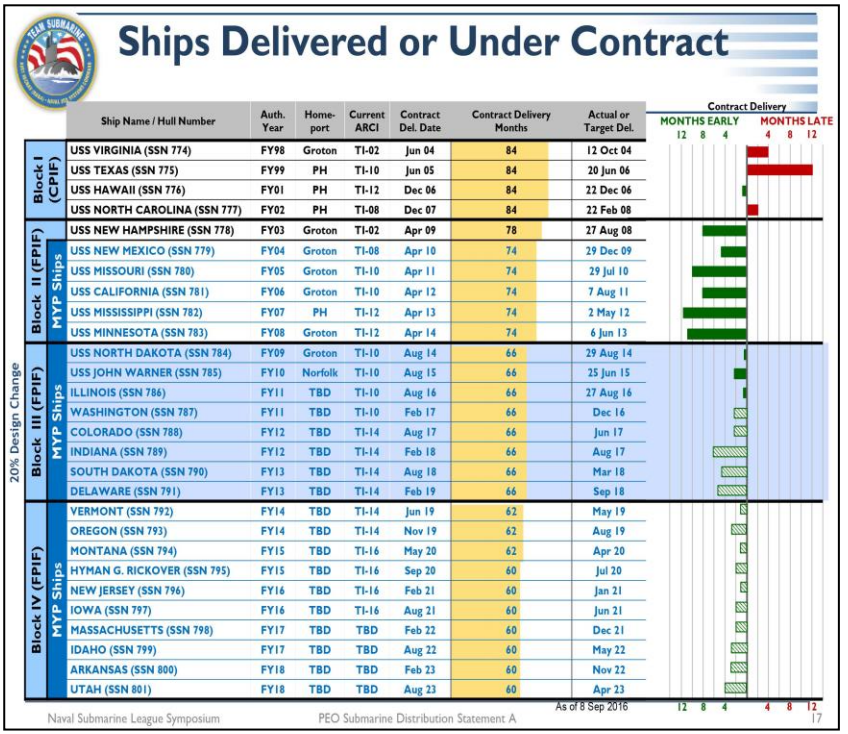


These are actual pictures from Quonset Point of the cutting of the first steel for the first article quad pack. Those are the frame webs in the upper right hand corner. They get sliced into long, rectangular pieces and then bent in the lower left corner, into a circular shape for welding against the hull surface itself. Again, that's one of the facilities that was long in that plan for facilitization and moving into it.

Let's talk about VIRGINIA. We'll go through this pretty quickly. I know I'm running short on time. But the VIRGINIA Class, again, a tremendous success story.

If you look at the focus on the first four blocks, blocks I and II together, we're figuring out how to build the ship and getting it down to a reasonable span in time; block III was the design for affordability, the two for four in '12 that redesigned the bow of the ship, put in the large aperture bow array replacing the sonar sphere, and the 2 Virginia Payload tubes instead of the 12 missile tubes. Block IV was focused on reduction of total ownership cost. The design for that is complete.

In the submarines that we are building in the next couple of years you will get the full effects of that, which is fewer depot level availabilities and an additional deployment over its life. And then block V and later, the Virginia Payload Module and increased undersea influence effects, so that ability to make sure the submarine is relevant through the rest of its life.



Ships Delivered or Under Contract

		Ship Name / Hull Number	Auth. Year	Home-port	Current ARCI	Contract Del. Date	Contract Delivery Months	Actual or Target Del.
Block I (CPIF)		USS VIRGINIA (SSN 774)	FY98	Groton	TI-02	Jun 04	84	12 Oct 04
		USS TEXAS (SSN 775)	FY99	PH	TI-10	Jun 05	84	20 Jun 06
		USS HAWAII (SSN 776)	FY01	PH	TI-12	Dec 06	84	22 Dec 06
		USS NORTH CAROLINA (SSN 777)	FY02	PH	TI-08	Dec 07	84	22 Feb 08
Block II (FPIF)		USS NEW HAMPSHIRE (SSN 778)	FY03	Groton	TI-02	Apr 09	78	27 Aug 08
	MYP Ships	USS NEW MEXICO (SSN 779)	FY04	Groton	TI-08	Apr 10	74	29 Dec 09
		USS MISSOURI (SSN 780)	FY05	Groton	TI-10	Apr 11	74	29 Jul 10
		USS CALIFORNIA (SSN 781)	FY06	Groton	TI-10	Apr 12	74	7 Aug 11
		USS MISSISSIPPI (SSN 782)	FY07	PH	TI-12	Apr 13	74	2 May 12
		USS MINNESOTA (SSN 783)	FY08	Groton	TI-12	Apr 14	74	6 Jun 13
20% Design Change Block III (FPIF)	MYP Ships	USS NORTH DAKOTA (SSN 784)	FY09	Groton	TI-10	Aug 14	66	29 Aug 14
		USS JOHN WARNER (SSN 785)	FY10	Norfolk	TI-10	Aug 15	66	25 Jun 15
		ILLINOIS (SSN 786)	FY11	TBD	TI-10	Aug 16	66	27 Aug 16
		WASHINGTON (SSN 787)	FY11	TBD	TI-10	Feb 17	66	Dec 16
		COLORADO (SSN 788)	FY12	TBD	TI-14	Aug 17	66	Jun 17
		INDIANA (SSN 789)	FY12	TBD	TI-14	Feb 18	66	Aug 17
		SOUTH DAKOTA (SSN 790)	FY13	TBD	TI-14	Aug 18	66	Mar 18
		DELAWARE (SSN 791)	FY13	TBD	TI-14	Feb 19	66	Sep 18
Block IV (FPIF)	MYP Ships	VERMONT (SSN 792)	FY14	TBD	TI-14	Jun 19	62	May 19
		OREGON (SSN 793)	FY14	TBD	TI-14	Nov 19	62	Aug 19
		MONTANA (SSN 794)	FY15	TBD	TI-16	May 20	62	Apr 20
		HYMAN G. RICKOVER (SSN 795)	FY15	TBD	TI-16	Sep 20	60	Jul 20
		NEW JERSEY (SSN 796)	FY16	TBD	TI-16	Feb 21	60	Jan 21
		IOWA (SSN 797)	FY16	TBD	TI-16	Aug 21	60	Jun 21
		MASSACHUSETTS (SSN 798)	FY17	TBD	TBD	Feb 22	60	Dec 21
		IDAHO (SSN 799)	FY17	TBD	TBD	Aug 22	60	May 22
		ARKANSAS (SSN 800)	FY18	TBD	TBD	Feb 23	60	Nov 22
		UTAH (SSN 801)	FY18	TBD	TBD	Aug 23	60	Apr 23

Contract Delivery
MONTHS EARLY 12 8 4 — MONTHS LATE 4 8 12

As of 8 Sep 2016

Naval Submarine League Symposium — PEO Submarine Distribution Statement A — 17

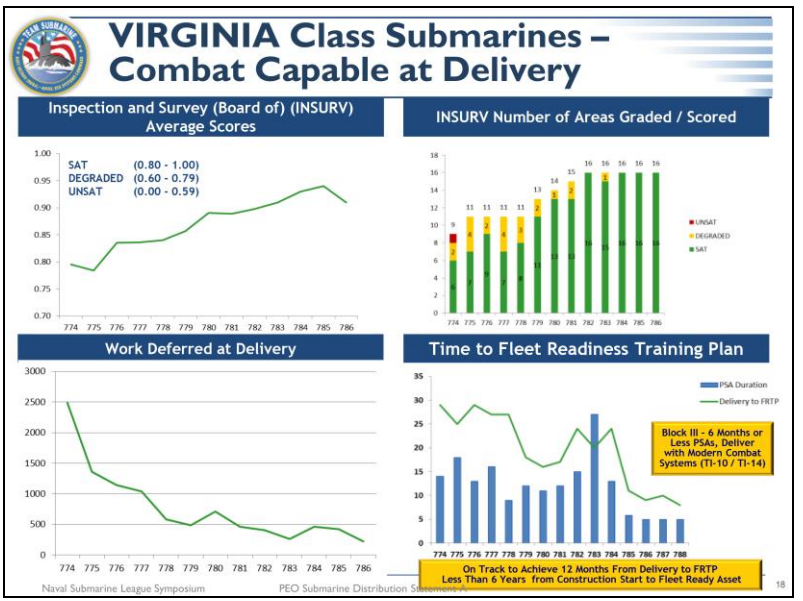
So where are we on this? If you look at this chart and you look at the color bars on the signpost on the right, on early ships those long bars were overruns in construction schedule. Starting with the fifth ship every ship since then has been delivered early to contract schedule. If you look at the block two, they're as much as 12 months early.

Then you look at the block three and they're not as early. But that's actually a good news story because if you look over two columns to the left, the contract delivery span was reduced from 74 months down to 66 months. So we're challenging ourselves and the shipbuilders to do a better job, and then holding them to that in the contract.

If you look at that with a little more granularity and go, okay, 784 and 786 just barely ahead of 785. So what was wrong with 84 and 86? The answer is nothing.

What was great about 785 is the question. 785, the USS John Warner, is a phenomenal ship. Not only did she deliver early, but then we turned around and did the shortest PSA in history on her and got her out to the fleet in a phenomenal fashion.

Some of this is just the vagaries of shipbuilding. Again, you don't know what unknown is going to present itself and cause you trouble in the delivery stroke. With 785 everything went right. No unknown popped up and bit us.



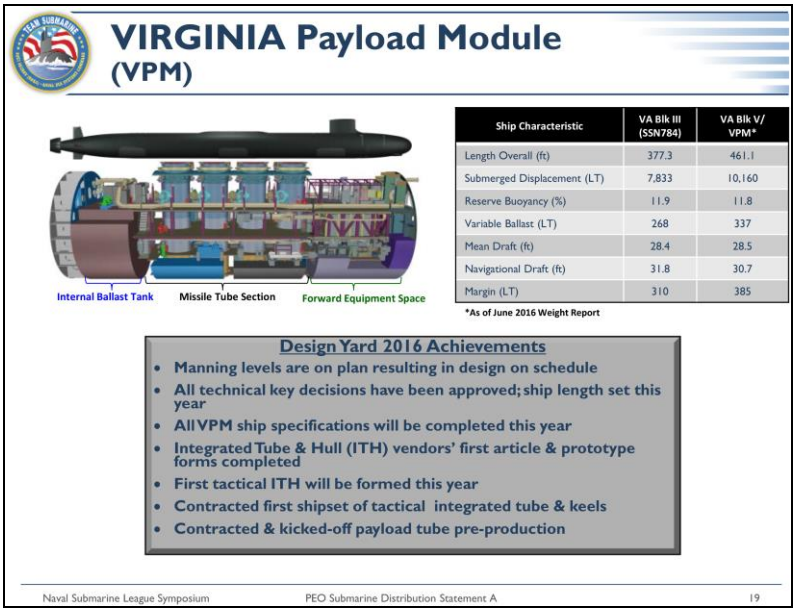
There are other metrics that we use to ensure that the quality is continuing to improve. The INSURV Board, Board of Inspection and Survey, this is the Navy's independent organization that goes out and makes sure that we got what we paid for when we buy a ship. If you look at that line, it has continually increased upward to where it's in the .9, the .95, area, which is a phenomenal performance on an INSURV.

INSURV is just a snapshot, one day in the life of a submarine. You're going to have something break. But as you can see, we've had fewer and fewer things break. Again, it's not a dig on 786. Really it's what a phenomenal ship 785 was. I expect it will oscillate in the 9.0 to 9.5 range going down the road.

In the upper right, INSURV Number of Areas Graded and Scored. We've been all green on the last three ships and four out of the last five. These are the critical operational abilities that are tested by the INSURV Board. And again, to have all green on that many ships in a row is phenomenal.

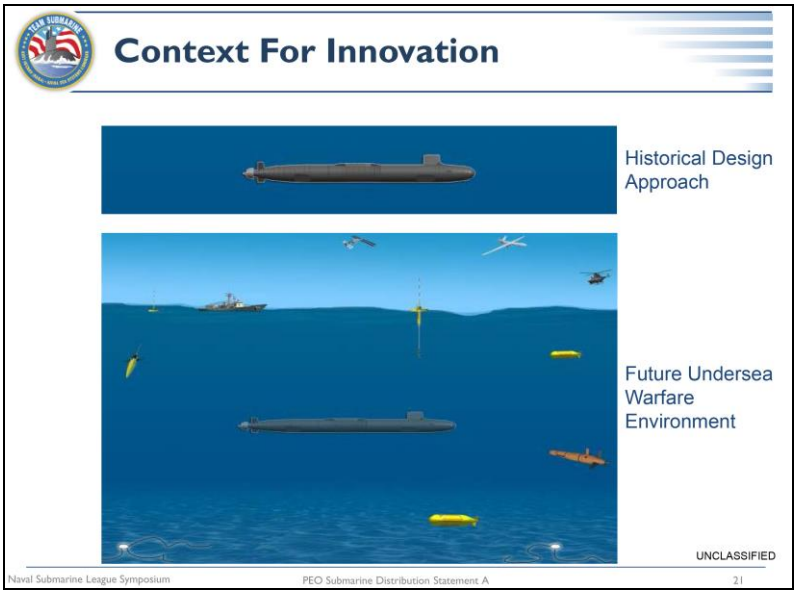
The lower left hand corner, work deferred at delivery. These are the small things that you just couldn't get done and it wasn't worth holding up the ship from sea trials to finish. But again, a phenomenal improvement over the years in the number of things that we had to defer past delivery.

Then in the lower right, time to the fleet. This combines both the construction span and the PSA. As we have gotten into the block three where the hotel services to provide the SWFTS are all embedded in the ship already, we don't have to do a long PSA to upgrade those. We are continuing to see improvement in the time that we provide those to the ship—or provide those ships to the fleet.



Virginia Payload Module, again very well in hand on the design here, proceeding very well. We will finish all of the VPM ship specifications this year. There's really only one left and it may actually be done this week, depending on whether we get the final approval or not.

We have set the ship's length, the module, the additional VPM module, 83 feet, nine inches and three-quarters. That's how much additional length we're putting in. This is a stroke that has gone very well.



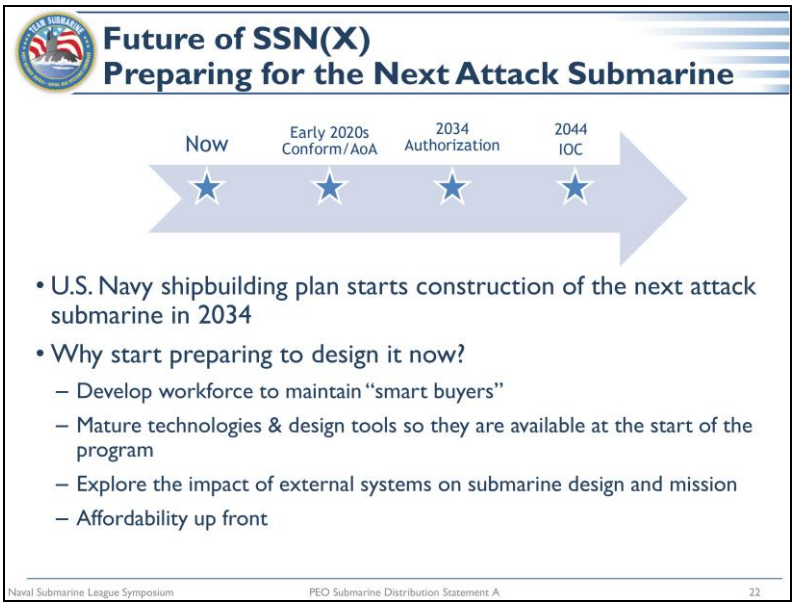
Let me close with just a few remarks about SSN(X). Admiral Caldwell talked about the need to aggressively pursue this and the work that the Future Capabilities Group is doing to set the environment. The historical design approach for an attack submarine before now has always been okay, what are the missions that it has to perform? How do you wrap that up in a submarine package? And then, let's go build it.

We really have to think about this one differently. Several speakers have already talked about it and it's a continuing topic of conversation. But this submarine, more than any before, has to be plugged into the environment in the undersea domain.

We have to have the ability to work with unmanned undersea vehicles and unmanned undersea systems: for example, the FDECO, the Forward-Deployed Energy and Communications Outpost. That's a node on the bottom of the sea floor that is connected back to a power source so that a UUV can go plug in

there and charge, communicate, and operate without over-watch. But someone has got to get that UUV there and someone has got to be able to continue to support the systems.

So in this design effort what we're doing right now is working hard to number one, make sure that we have the right people and design tools ready to do this design. Then we're using those people to explore the opportunities and define the area where we want to be able to focus on in the design of the ship. And what that will lead us to is an analysis of alternatives.



Really, we don't start doing that analysis of alternatives until we get into the early- to mid-'20s, so we're still about eight years away from that and working hard now to do the studies that will inform those AoAs. So we've talked in the last couple of months -- and there's been some discussion about this, we may not do an

SSN(X). We may build an eighth block of VIRGINIAs. That is always an option, but I don't want anyone to think that we aren't aggressively approaching the SSN(X) because the need for this type platform is significant.

Now, when will it actually be to the fleet? Well, as you saw from the shipbuilding profile, we're talking about authorizing it in 2034, so it's really about 10 years later after you build the ship, take it through PSA, take it through the initial operational test and evaluation, before you get it operating in the fleet. So we're looking 30 years down the road and trying to anticipate what we're going to want to do with this ship then.

I go back to the two things that I've always said that SSN needs to be focused on, in addition to all the other things you focus on in a new submarine: first, the ability to seamlessly integrate, deploy and employ unmanned vehicles. We have for years used any available interface on the submarine to get a UUV off the ship, whether it's torpedo tubes, three-inch launcher or trash disposal unit. We have to get beyond that. There has to be a better way to design this submarine from the ground up to seamlessly employ UUVs.

I'm talking transformational stuff. I testified before Congress earlier this year and I said, you know, it's like the Remora, that little sucker fish that attaches itself to the shark or the whale as it goes along. Maybe that's the answer. Maybe there's some way to figure that out.

But that's the kind of forward looking thinking that Admiral Caldwell was talking about, casting the net wide, going out to industry, to small business, to academia, to our research partners at ONR and the UARCs and the warfare centers, and finding those really weird ideas that everybody says, that will never happen. Yeah, but maybe there's a part of it that can and maybe that part you can pair with a part from something over here, and before you know it you have something useful. So that seamless employment of UUVs is the first one.

The second one is, all the work that we're putting into OHIO Replacement to make it stealthy out into the 2080s is significant and it's hard and it's challenging, but at some point we have to go

beyond that too. It may be time to go beyond that rotating thing at the back of the ship, the propeller or propulsor, to get it through the water. So that, again, type of transformational propulsion system is something that we have to look at, whether it's the caterpillar drive from "Hunt for Red October," or it's biomimicry, we don't know.

But again, we have to cast that net wide and figure out what is going to protect our submarines well beyond the 2080s and how do we get that into the SSN(X). So although continuing to build VIRGINIA is always an option, we are aggressively pursuing the far-reaching concepts that will allow us to do an analysis of alternatives in the early- to mid-'20s with an eye towards building SSN(X) starting in 2034. With that, I'm done. I don't know if we have time for questions or not.

NAVAL SUBMARINE LEAGUE
34TH ANNUAL SYMPOSIUM

MR. MARK GORENFLO
Director of Academics
Evening and Weekends MBA Program
University of California, Berkeley
Haas School of Business

October 26, 2016

Mr. Gorenflo was with the Defense Innovation Unit-Experimental (DIUx) at the time of the NSL Symposium

Admiral, thanks so much. It's great to be here with shipmates, shore mates, submariners, old friends, and to be able to discuss DIUX with you today. When Admiral Padgett, for whom I've had the privilege of working twice in my past, called and asked if I would be willing to come and speak at the Naval Submarine League annual symposium, you know what the right answer is. It's yes, especially given his new role as Sean Connery's body double.

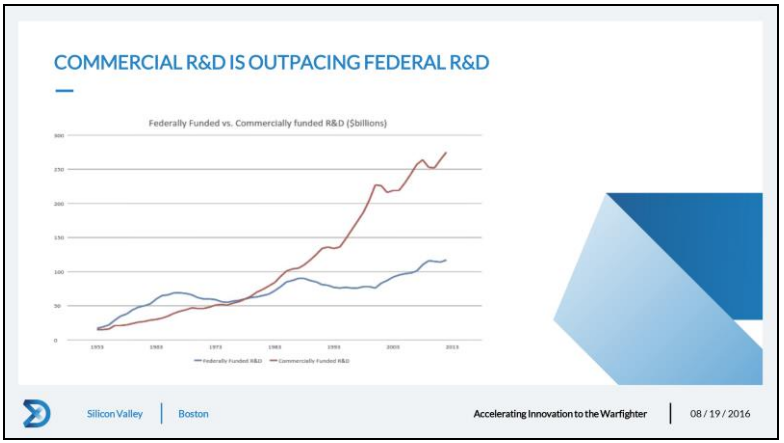
You don't want to disappoint him. Then as I was making my preparations to come here and sitting through some of the other presentations this morning, it became clear that I'm kind of the pinch hitter in the wrong uniform, amidst all the other folks who are doing presentations. To continue in the theme of constructive disappointment—constructive dissatisfaction—I certainly had some of those feelings as I was packing for this trip and came to the realization that I could not appear here in my standard Silicon Valley uniform of jeans and polo shirt. When I broke out the suits and dress shirts that I had put away in mothballs when I put the Pentagon in my rearview mirror, I found that they had about as much margin as the Ohio Replacement Program Schedule.

So with that in mind, I'm going to run you through the thesis behind DIUX, give you some of what we've achieved to date, why we're doing it, how we're doing it. I hope to do that and get us back on schedule. My slides are not as dense as some of our other slides we've seen today.

While the slide is coming up—this is a great segue for why technology is a great thing to integrate into our military.

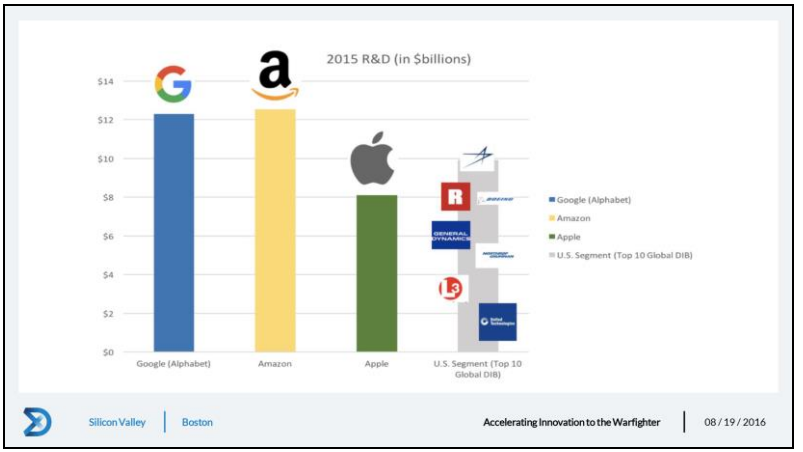
I've been promised flying cars and good collaboration tools. Here we go. Basically the thesis that Secretary Carter had when he wanted to start up the Defense Innovation Unit Experimental in Silicon Valley is fairly straight forward and one that submariners would understand. That is, for the United States military to maintain its qualitative superiority over adversaries, actual and potential, we need to tap into all sources of technological superiority and innovation that are available in the United States.

For many years almost all of those sources were available inside what you could consider the cone of silence of the Department of Defense: the RDT&E enterprise, the engineering centers and laboratories, our colleagues in the defense industrial base, and the universities that we work with. The money that was spent there produced great results for the United States.



If you used R&D spending as a proxy—and it's not a perfect proxy but it's a good and interesting proxy for innovation and technological development—you can see that innovation was led by the Department of Defense through the first half of the Cold War. Then you see that R&D spending by corporations starts to exceed the trend line that's available for the Department of Defense. Now some of that is where the Department of Defense is a victim of its own success. There are technologies that we created inside the DOD, like the Internet and GPS and space technologies, that were transferred to the private sector and became great sources of economic value, which private companies were able to make great profits off of, create huge businesses, employ a lot of people, and deliver great capabilities to average citizens. All those are great things, which we should not begrudge at all.

But when Secretary Carter saw these trends, and he did see them in the interregnum between his tenure as DEPSECDEF and SECDEF when he was a fellow at the Hoover Institution in Silicon Valley, he wanted to get another tool in the DOD's toolkit to be able to tap into this source of innovation, and to take advantage of the investments the private sector had made, and bring those investments back. Go to the next slide. This is illustrative of how some of the huge high technology firms that you find in Silicon Valley—these are public companies—do their R&D spending.

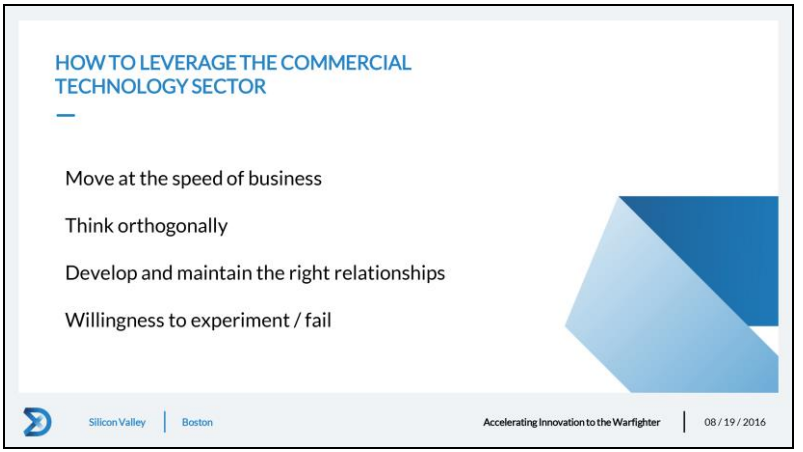


Despite the fact that Apple is up there, this is not an apple to apple comparison. If you were to dig down into these numbers you would find that they're not exactly comparable. But they're illustrative of the amount of money that high technology firms in Silicon Valley are willing to spend to create products and services at the cutting edge of technology that give them a competitive advantage and deliver great experiences and services and products to their customers around the world.

So how do we leverage this surfeit of investment? If you look at it, there's about a $200 billion delta between what private industry spends on R&D and what the federal government does. About $58 billion of that is in venture capital. More than half of that venture capital is employed in Silicon Valley.

So with that as the prologue, that's why Secretary Carter established DIUX. He announced it in April of 2015 at the Drell lecture at Stanford University. The first employee showed up in August of 2015. I got there in October. We did kind of a reboot in May of this year and we've been kind of building the airplane as we're flying it and pushing as hard as we can ever since we stood up the organization.

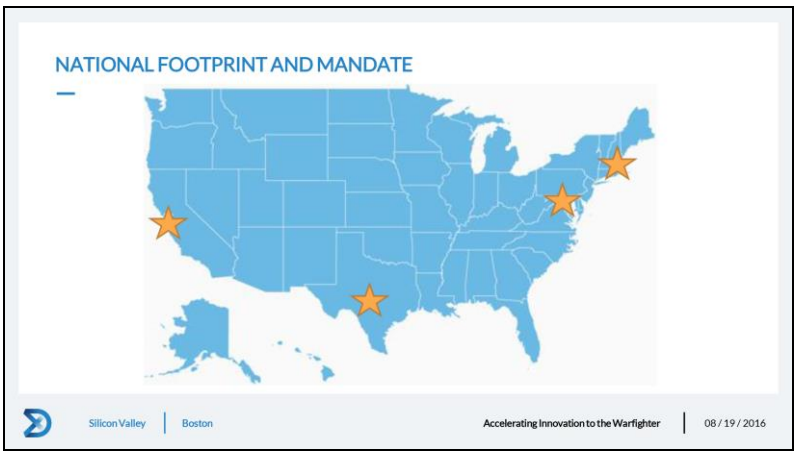
So what is our mission and how do we do it? If you'd go to the next slide? Basically our tasking from Secretary Carter is in Silicon Valley you do these four things.



First of all, we need to find ways to move at the speed of business. One of the things that we found in Silicon Valley when we started off there originally or just meeting people and chatting with them, is that there was a great reluctance to do business with the Department of Defense because we can be a tough customer to work with, not because we're demanding but because many of our processes take an extraordinary amount of time. If you're a start-up firm or a high tech company, where your product life cycles are six months and the half-life of your technology is six months, you can't afford to wait a year or year and a half for your government interlocutor to decide to make a decision, and then another year or year and a half where your government interlocutor to actually make a decision and deploy capital, when you can go to a venture capital firm on Sand Hill Road, get the money that you need and go to market with your product. So we had to find a way to move at a speed that's at least sort of the same order of magnitude of what the folks in Silicon Valley are familiar with.

The second is we have to kind of allow some orthogonal thinking to go along. What do I mean by that? I guess the best example I can give of that is when we deal with our customers from the Department of Defense who want to come and work with us, we ask them to tell us what problem are you trying to solve. Don't come to us with a requirements document. Come to us with, what's the use case and what problem are you trying to solve. There could be many different ways of attacking that problem that you haven't thought of, but that folks here in Silicon Valley—when I say here, where we work in Silicon Valley and the other places where DIUX is located—have already solved that problem from a different vector that for whatever reason you just weren't exposed to.

The third thing is we have to develop and maintain the right relationship with academia, with venture capitalists, with the established public high tech companies, and with the start-up firms who have products that are ready to go to market. And we need to be able to—and this has been talked about before here in the symposium—we need to be willing to experiment and fail and learn from those failures and move on with that learning to try and serve our customers more effectively in the future.



So we started in Silicon Valley. We established—we also have an office in the Pentagon, because there's a lot of interest in what's going on at DIUX. We need folks at the Pentagon to help us engage with our stakeholders inside the Department of Defense, as well as on Capitol Hill and in the White House.

We established an office in Boston and we established a presence in Austin. The center of gravity of the number of people is in Silicon Valley. There's probably going to be about between five and 10 in Boston, probably between three and four in Washington, D.C., and the Austin presence now is two folks. We're trying to look at a model which leverages the reserve assets that are available in the Austin area to try and improve our presence there.

This is not to say that there aren't other great innovation ecosystems in the United States. There are plenty of them. We have heard from the governors and mayors and congressmen and senators and folks who want us to establish presences elsewhere. I think that will be dependent on how successful we are in our mission to date and how we can leverage the assets that we have available to deliver for the war fighter, which is our primary focus.

So what are the arrows that we have in the quiver and how do we go about doing our mission? First of all, we're looking to work with interested customers inside the Department of Defense. There isn't a 'one to n' list of integrated priorities that we get from anybody. There isn't a vetted process of problems to solve that we get from the Pentagon. But we do have direction from the SECDEF and the DEPSECDEF on areas that they want us to focus on, broad technology areas, and we do have folks who come to us with problems to solve that they haven't been able to get solutions that they're happy with elsewhere.

We work with them using the teams that we have in the organization. It's principally uniformed military folks. Those folks come from both the active component and the reserve component and the National Guard and Air National Guard. We have government civilians and we have contractors, including folks who bring expertise as entrepreneurs and business leaders who can help us work our way through problems.

We have a commercial solutions opening contract vehicle. That's a fancy name or a different name for a contract vehicle that uses other transaction authorities, which are available throughout the Department of Defense. It wasn't created specifically for DIUX. We've just leveraged it for our particular needs. And we have co-investment funds. We got $20 million in RDT&E in FY '16. The president's budget '17 has $30 million, subject to negotiation, of course, and approval by our partners on Capitol Hill in the authorization and appropriations committees.

We got all of these put together in May when the organization was rebooted by Secretary Carter to give us the tools that were needed to achieve the results that he wanted to achieve with establishing the organization.

You could call these levels of effort or lines of effort or teams, whichever you prefer. The distinction is a little bit artificial, but we do have kind of three ways that we go about doing what we do. The first is kind of a venture team with a venture line of effort where we work with DOD customers. We try and understand what problem they're trying to solve. We do market research to see what potential solutions there are out there, what companies are working on that and what's the maturity of both the companies and their solutions.

We work with venture capitalists as well. We do due diligence on the technology that they are presenting to us. Then we work through advertising the problem on our web site, getting solution briefs in from companies who have technologies that could possibly solve the problem.

We do this in partnership, so we're not a contracting organization ourselves. We do this in partnership with the Army Contracting Command in New Jersey, which are the pros from Dover, actually the pros from Picatinny, and have the other transaction authority contract vehicle. They have agreement officers on-site with us that work with us to work through the other transactional authority contracting process.

We evaluate the solution briefs that are submitted. The briefs are very simple. They could be a five page white paper or a 15-slide slide deck. Based on those, we typically ask the companies whose solutions seem the most promising to give an in-person presentation. They give a presentation either in-person or via Skype or some other type of collaboration software tool.

Then we negotiate agreements with those companies whose solutions seem most appropriate for the problem that has been given to us by the customer. Our internal goals are, from the closing of the commercial solutions opening problem statement, to when we identified companies and solutions of interest, is 30 days. From the beginning of the negotiations with those companies to the signing of an agreement, is another 30 days. We've done it as quickly as 31 days. Our average is between 50 and 60 days for those two parts of the process.

The foundry team or the foundry effort is for those problems for which there isn't necessarily an existing kind of off the shelf or more or less existing technology solution that's out there. Maybe it's something where we have to kluge together two or more kinds of technologies to try and figure it out. But it's an active prototyping opportunity and skill set and capability that we bring to our customers to help them work through what the solution would look like. It's also an opportunity for a war fighter in residence to get paired with an entrepreneur in residence to work on this project. Those are two entities that we're trying to bring together.

And then finally we've got a big engagement effort that's going on. As you can imagine, echoing what Admiral Tofalo said, what the Secretary of Defense finds interesting, all the people that work with him find fascinating. So we've had any number of people who have noticed that the secretary has been out to visit Silicon Valley probably four or five times. So they figure, kind of like how the CNO during World War II came back from a meeting with General Marshal and said, I don't know what this logistics is but I want more of it.

We've got a lot of folks in the Department of Defense who say, I'm not quite sure what this innovation in Silicon Valley is,

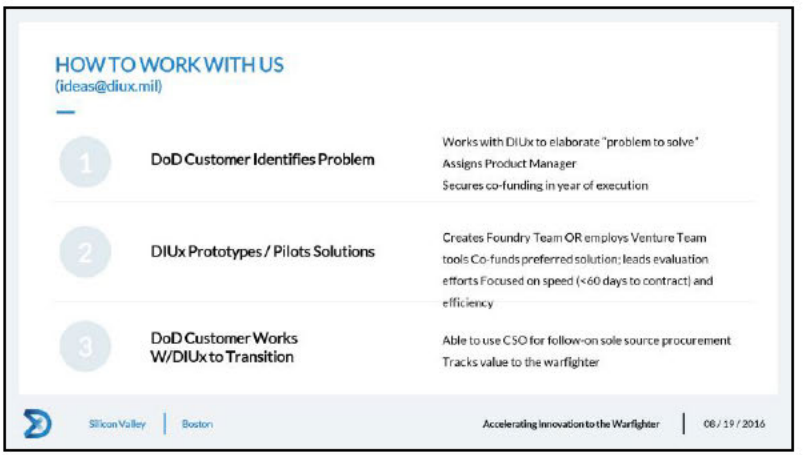
but I want more of it, and I'm going to go visit. So we've had a lot of interest in coming out and arranging visits. We're trying to figure out a way to do that that is useful for our DOD stakeholders and doesn't take up unnecessarily time and bandwidth of the folks in Silicon Valley who are proud Americans and patriotic. But they have businesses to run, and endless meetings with no prospect of that turning into a business relationship just so they can explain how they do innovation, is not something that they want to continue to do without an end-point in sight.

So we're looking for ways to kind of regularize that engagement and make it useful for both parties. But also so the folks in Silicon Valley can get a better sense, in return, of what are the problems that leaders in the DOD are trying to work on. So if they have technologies or portfolio companies or other assets, maybe that would be something that they could vector towards trying to work on those particular problems.

This is the quick slide which gives the delta between the commercial solutions opening other transaction authority contract and a typical FAR-based contract. It's a much simpler solicitation. Our internal goal is less than 60 days to award. The award itself is unprotestable.

We can negotiate—there's all kinds of things that you can negotiate when you work on this agreement with a company. You're negotiating with the company on all of those things: payment milestones, terms and conditions, intellectual property data rights. They can use commercial accounting standards instead of the accounting standards imposed by the federal government.

We haven't had the opportunity to actually use this yet, but there's a section of the 2016 NDAA which—and I'm going to get this wrong because I'm not a lawyer and I'm not staying in the Holiday Inn Express, but basically if there is a program of work authorized under an OT contract that is viewed as successful by the customer, the customer meaning the Department of Defense, then the customer can use that record of success by itself as justification for a follow-on sole source contract award. So we think that's a potentially very powerful authority that we in the future want to take advantage of.



So working with us we think is pretty simple and straightforward. Come to us with a problem, not a requirements document or a list of specifications. Tell us what problem you're trying to solve. If you need some help thinking about the problem we have ways of helping you do that as well. Then we'll work with you to

develop prototypes and pilot solutions.

What we ask when you come to us is that you bring the following to the table: First of all, commitment, that it's a problem that you really want solved; dedicated personnel to be from your customer side, a program manager or project manager; and we ask for a co-investment on the commercial solutions opening contracting effort. Typically it's gone anywhere from 50-50, in other words DIUX puts in 50 percent and the customer puts in 50 percent, to where the customer puts in significantly more than we do.

By the way, any color of money can work with the CSO. It just depends on what the CSO is being used to procure. The vast majority of awards that we've given to date have been using RDT&E funds.

We just released our first quarterly report where we executed—I'm going to have to use my reading glasses here to make sure I get the data correct, because I wouldn't want to quote incorrect numbers. Between the time when we got the money and a contracting vehicle in May to the end of the fiscal year, we've put $36 million on award, $8.3 million of that was from DIUX and $28 million was from the customers we were working with. The

projects included a couple of cyber security software instantiations which are going to be tried out in various DOD networks. One is an endpoint security solution, another is a virtual machine security solution. And that basically exhausts my knowledge of how these things work, so you can ask me more questions on those, and I'll try and answer them.

We also worked with a company to get a high speed drone that kind of supports some prototyping efforts on having drones work with fourth and fifth generation tactical aircraft. We have also an unmanned maritime surface vehicle. It's basically a small sail and solar powered drone. The damn thing is pretty much indestructible and can provide a long-term fairly low profile presence on oceans around the world. This thing can gather all kinds of data, especially oceanographic and bathometric data.

We've contracted with a company to get an autonomous indoor tactical drone which could be used by special forces to go and map the insides of buildings before they go and try and get inside them. And we have a network change detection and processing software instantiation. Basically it is for the Internet of Things what Google is for the Internet of web sites. And again, that exhausts my level of knowledge of this cyber security thing, but feel free to ask.

So that's my story and I'm sticking with it. I wanted to get us back on time and leave more time for questions. I'm happy to answer any questions you might have on what we're doing, how we're doing it, and with whom we are doing it. Thank you for the opportunity to speak to you today.

2017 NAVAL SUBMARINE LEAGUE CORPORATE MEMBERS

5 STAR LEVEL

Bechtel Nuclear, Security & Environmental
BWX Technologies, Inc.
Delphinus Engineering, Inc. (New in 2017)
General Dynamics Electric Boat
L-3 Technologies, Inc.
Lockheed Martin Corporation
Newport News Shipbuilding a Division of Huntington Ingalls Industries
Northrop Grumman Navigation and Maritime Systems Division
Raytheon Company

4 STAR LEVEL

Booz Allen Hamilton
General Dynamics Mission Systems
Leidos
NTT Data Services Federal Government

3 STAR LEVEL

Adaptive Methods, Inc.
AECOM Management Services Group
Boeing Company
Curtiss-Wright Corporation
DRS Technologies — Maritime and Combat Support Systems
Engility Corporation
Metron, Incorporated
Oceaneering International, Inc.
Progeny Systems Corporation
Ultra Electronics – 3 Phoenix, Inc.
USAA

2 STAR LEVEL

Advanced Acoustic Concepts, LLC
Alion Science & Technology
American Systems Corporation
Applied Research Laboratory – Penn State
BAE Systems Integrated Technical Solutions
Battelle
Cunico Corporation & Dynamic Controls, Ltd.
General Atomics
Hunt Valve Company, Inc.
In-Depth Engineering Corporation
Innovative Defense Technologies
Liquid Robotics, Inc.
Marotta Controls, Inc.
Moog, Inc.
MYMIC, LLC
Nord-Lock/Superbolt, Inc.
Nuclear Fuel Services, Inc.
Preferred Systems Solutions, Inc.
Securitas Critical Infrastructure Services, Inc.
Sonalysts, Inc.
Systems Planning and Analysis, Inc.
TE Connectivity
Ultra Electronics Ocean Systems, Inc.
UTC Aerospace Systems
Xator Corporation

1 STAR LEVEL

Aerodyne Alloys, LLC
AMADIS, Inc.
Applied Mathematics, Inc.
Business Resources, Inc.
C. S. Draper Laboratory, Inc.
Capitol Integration
CEPEDA Associates, Inc.
Globe Composite Solutions
Gryphon Technologies, LC
HII Technical Solutions
Hydroid, Inc.
Imes
MIKEL, Inc.
Mikros Systems (New in 2017)
Murray Guard, Inc.
OceanWorks International
Orbis, Inc.
Pacific Fleet Submarine Memorial Assoc., Inc.
PREVCO Subsea Housing
PRL, Inc.
Rite-Solutions, Inc. (New in 2017)
RIX Industries
SAIC
Sargent Aerospace & Defense
Schaefer Electronics, Inc.
SSS Clutch Company, Inc.
Tech-Marine Business, Inc.
Treadwell Corporation
VACCO Industries
VLP Financial Advisors
Westland Technolgies, Inc.

NAVAL SUBMARINE LEAGUE
2016 Fleet Award Winners

RADM JACK N. DARBY AWARD
CDR Patrick B. Clark, USN

MASTER CHIEF FRANK A. LISTER AWARD
LSCM (SS) Kevin M. Gibbs, USN

CHARLES A. LOCKWOOD AWARD
LCDR Nathan D. Luther, USN

CHARLES A. LOCKWOOD AWARD
MMAC (SS/SW) Jason F. Davis, USN

CHARLES A. LOCKWOOD AWARD
ETN2(SS) Darren L. Ensley, USN

FREDERICK B. WARDER AWARD
LCDR Jonathan V. Ahlstrom, USN

LEVERING SMITH AWARD
LCDR William C. McBride, USN

VADM J. GUY REYNOLDS AWARD
CAPT Bradford S. Neff, USN

GOLD DOLPHIN AWARD
CAPT Nathan H. Martin, USN

SILVER DOLPHIN AWARD
MTCM(SS) Christopher J. Perreault, USN

2016 SUBMARINE REVIEW LITERARY AWARD WINNERS

1ST PLACE

Mr. Joe Buff

NO COLD WAR TO END ALL COLD WARS

November 2015/August 2016

2ND PLACE

CDR George Wallace, USN, Ret.
and Mr. Don Keith

EXCERPTS FROM
DANGEROUS GROUND

August 2016

3RD PLACE

CAPT Don Ulmer, USN, Ret.

CAMELOT

August 2016

BEST ACTIVE DUTY AUTHORS

LCDR Krysten Ellis, SC, USN

WHY I VOLUNTEERED FOR SUBMARINE DUTY

August 2016

LCDR Joel Holwitt, USN

SUBMARINE HISTORY READING LIST

August 2016

NAVAL SUBMARINE LEAGUE NEW LIFE MEMBERS

Mr. John Barkley
Dr. James Craig
ADM Jonathan W. Greenert, USN, Ret.
Mr. Keith MacDowall
Mr. Jack Miller
RDML James Pitts, USN
Mr. William Reed
Mr. Leland Henry Tanner
Mr. Philip Tuckey
RADM Miles Wachendorf, USN, Ret.

IN MEMORIAM

RADM Lawrence Burkhardt III, USN, Ret.

VADM Edward W. Cooke, USN, Ret.

CAPT Max C. Duncan, USN, Ret.

Mr. Alan S. Lloyd

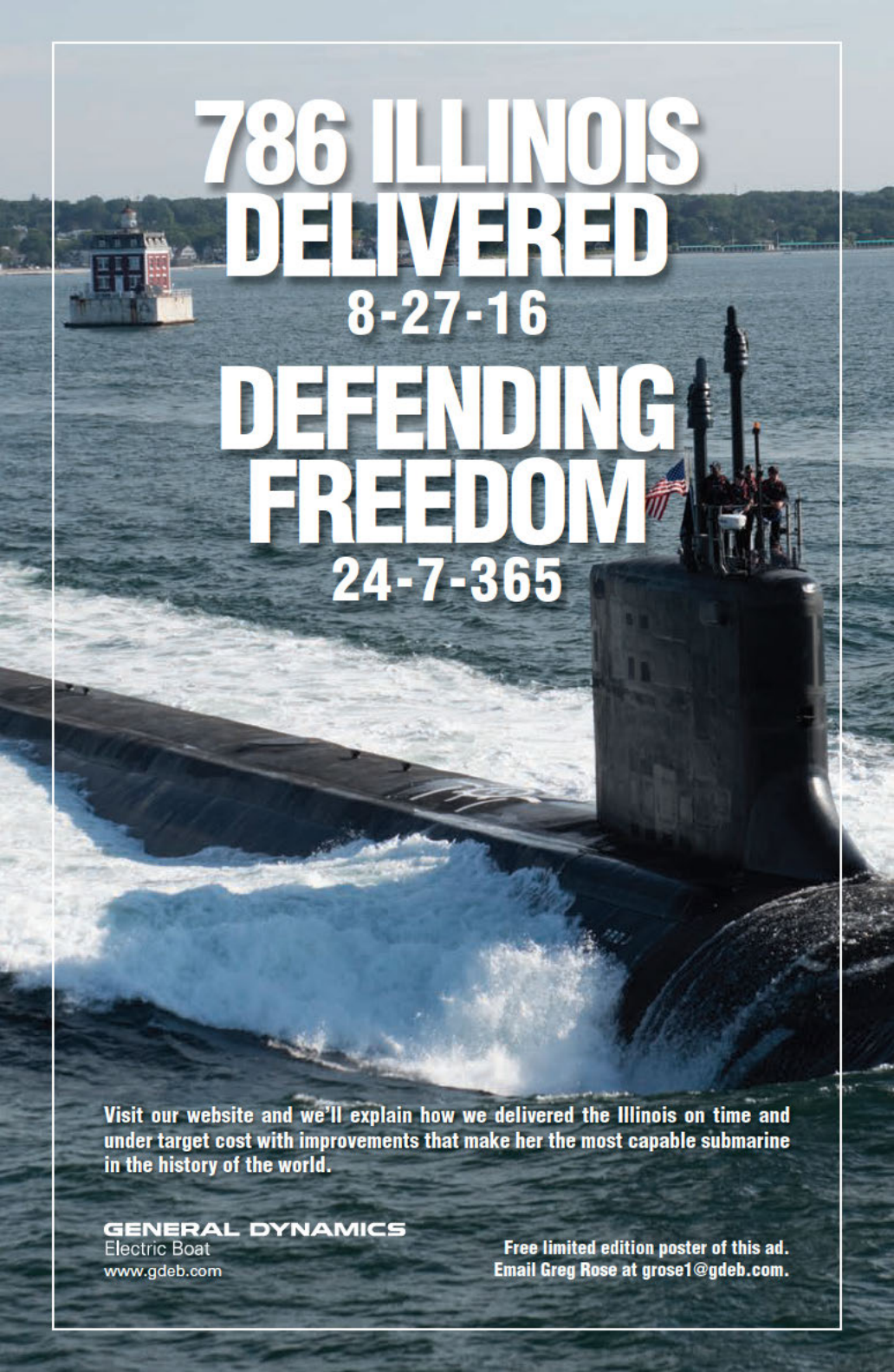
2016 PHOTO AWARDEES

1ST Place
USS ALEXANDRIA (SSN 757)
Sunset in the Bahamas
By SCPO(SS) Greg Foerster, USN

2ND Place
The Coming Storm:
USS WEST VIRGINIA
(SSBN 736)
By Mr. Mark Turney

3RD Place
Korean Sunrise Over the Badfish
Sunrise over the USS BREMERTON (SSN-698) during a port visit in Chinhae, South Korea in 2013.
By P02(SS) Rigo Baca, USN

Honorable Mention
Honoring Our Country
By Mr. Jim Cleveland



Visit our website and we'll explain how we delivered the Illinois on time and under target cost with improvements that make her the most capable submarine in the history of the world.

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