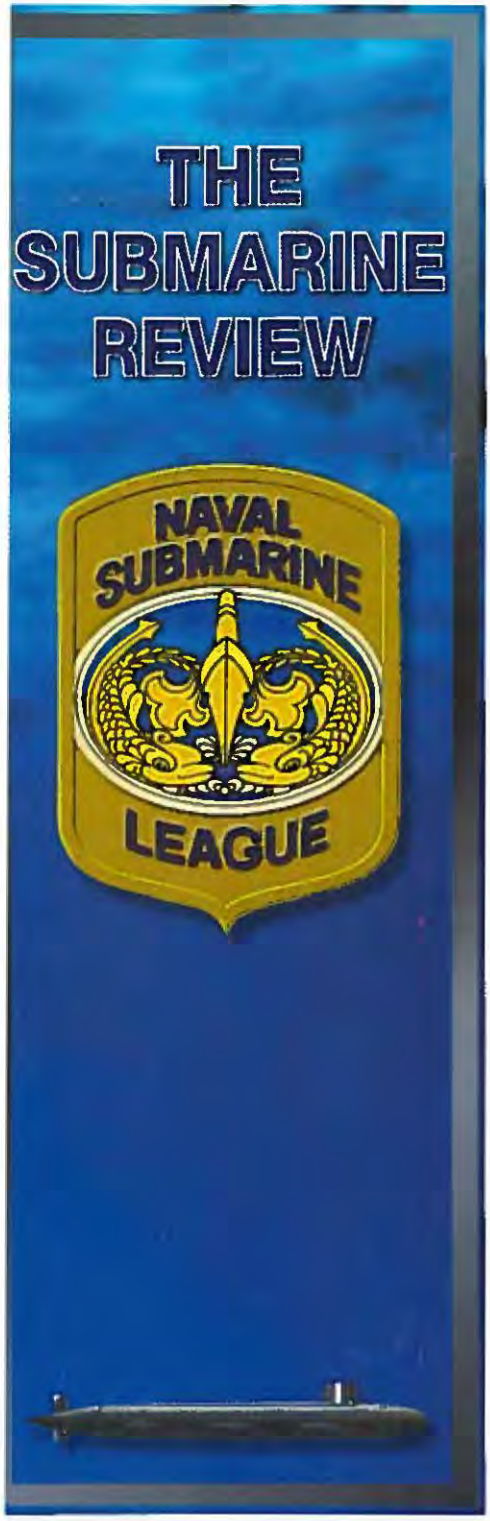

WINTER 2013


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THE SUBMARINE REVIEW: ON-LINE Memo to Members

The WINTER 2013 issue of THE SUBMARINE REVIEW follows the FALL 2012 issue on-line on the Naval Submarine League web page, www.navalsubleague.com. Both the on-line and print versions are identical in content. The advantages of the on-line presentation are the timeliness of access by members, the attractiveness of color in the graphics, of course the convenience of on-line information, and also the ease of printing out of speeches or articles, in part or in entirety.

Members are asked to visit the NSL web page and see the all-digital version for themselves. It is a very simple four step process:

1. Go to the NSL web page. www.navalsubleague.com
2. Click on NSL Login (near top right of page) Enter your member number and password. See included instructions for getting those.
3. On Administrative page click on SUBMARINE REVIEW (next to bottom of list on left of page)
4. Click on (The current issue is listed) Submarine Review

As expressed in the FALL issue, the advantages to the League in going on-line lie mainly in the long-term issues involved in keeping up with modern technology. The League wishes to serve both those who look first to the internet for news and views and to those who prefer printed material. By opening this door to the Naval Submarine League efforts *as an advocate for an effective submarine component of the US national security,* it is hoped also that our outreach will be significantly increased. Please let us know if you are able to print out and use any of the material from the on-line version of THE SUBMARINE REVIEW in your local work with civic, church or school groups. The WINTER issue includes an OpNav Brief for just such use. Any suggestions for improving the on-line version to enhance this outreach will be greatly appreciated and recognized in future issues.

We anticipate asking all members in the near future to indicate their preference for the on-line or print version of the magazine in order to simplify our distribution process.

James C. Hay
Editor

John B. Padgett III
President

EDITOR'S COMMENTS

These days of uncertain Government funding and relatively undefined national security threats are of great concern to all branches of the Armed Forces; however, the nation's submarine community may well be the most impacted by long-haul cost/benefit decisions to be made in the near term. Real time force structure projections show deficits in Attack Submarine (SSN) strength, cruise missile strike assets (SSGN) and, most critically-and importantly, in Ballistic Missile Submarine (SSBN) numbers. The Navy has programs to address those problems with the VIRGINIA class building program, the VIRGINIA Payload Module and the OHIO Replacement Program. Within the submarine community we all know the importance of those programs. As the national *spending vs. debt* debate works its way to some degree of resolution we should probably expect heated questions to arise about the cost of those programs and the need for them. We, as an informed and interested body have to be concerned about the level of knowledge, and thus commitment, within the government's policy-level, and in the general public, with regard to the answering the admittedly high cost today in terms of the critical importance in the near future of those three submarine programs.

This issue of THE SUBMARINE REVIEW presents some recent presentations regarding Submarine Force Programs with an aim to provide substance for our *informed submarine advocates* as we face those "heated questions" from critics. The emphasis here is on the Ohio Replacement Program, the submarine community's number one priority. The explanations run from Congressman Mike Rogers' speech to the Submarine Industrial Base Council outlining the **why**, to the Admirals' explanation of the **how** those programs are progressing. In addition, several excerpts from Congressional Reference Service reports to Congress are offered in illustration of the **issues** facing Congress as they prepare to make these critical **cost/benefit** decisions. These are complex times, the questions are complicated and the answers will not be easy. As a community we have to be ready for them.

Jim Hay
Editor

FROM THE PRESIDENT

2013 has delivered some good news to the Submarine Force! The President signed HR 933 which provides $779M for advanced procurement of a second VIRGINIA Class Submarine in FY14 and authorizes the Navy to enter into a contract for up to 10 additional VIRGINIA Class Submarines. It provides $10M of R&D funding for the VIRGINIA Payload Module and sustains R&D funding for the OHIO Replacement Program.

The League supported the Submarine Industrial Base Council (SIBC) meeting in Washington, DC on 5-6 March when they met for their annual update and to meet with their congressional delegations. Members were equipped with briefings from the VIRGINIA Class Submarine and OHIO Replacement Program Managers. In addition, VADM Mike Connor, Commander Submarine Forces, issued Update One to the ***Design for Undersea Warfare*** which remains the focus of the Submarine Force.

The Submarine Force leadership supported the 2013 Corporate Benefactor Recognition Days on 27-28 February with over 250 attendees at this annual event. ADM John Richardson, VADM Mike Connor, RADM Barry Bruner, RADM Dave Johnson, and RADM Terry Benedict provided updates on Submarine Force issues and programs. Congressman Randy Forbes (VA-4) provided an update on the status of Sequestration and the anticipated Continuing Resolution as they impact the Submarine Force, and former Senator Jon Kyl provided an assessment of the nation's Strategic Programs, supporting the League's position that a strong strategic deterrent posture is critical to our national defense.

THE SUBMARINE REVIEW continues to be an effective resource for disseminating information to a large audience. The on-line version of the *Review* will be available when this issue is sent to the printer. Please check out this format, as it comes in color and you can download it to any convenient electronic device. THE SUBMARINE REVIEW provides you with a forum to address topics of interest to the Submarine Force. Seize the

opportunity to express your views on subjects important to undersea warfare.

The 50th Anniversary of the loss of USS THRESHER (SSN 593) was recognized with a memorial service and dedication of two monuments in Kittery, ME on 6-7 April.

The Annual Submarine History Seminar was held at the U.S. Navy Museum Cold War Gallery on 11 April. RADM Jerry Holland selected some outstanding speakers to address the theme "SEAWOLF and the Maritime Strategy."

The 31st Annual Symposium will be held from 23 - 24 October 2013 at the Fairview Park Marriott in Falls Church, VA.

As we address the fiscal challenges that lie ahead, I ask that you continue to remind others of the importance of our Navy and our Submarine Force to our national defense posture. I look forward to continue representing you in this promotion.

John Padgett
President

OFFICE STAFF
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SUBMARINE INDUSTRIAL BASE COUNCIL

REMARKS BY
REPRESENTATIVE MIKE ROGERS
CHAIRMAN, STRATEGIC FORCES SUBCOMMITTEE
HOUSE ARMED SERVICES COMMITTEE

MARCH 5, 2013

I want to thank the Submarine Industrial Base Council for the invitation to speak here tonight. Thank you Dan [DePompei] for that gracious introduction.

I'd also like to thank Navy Under Secretary Work for attending this conference as well as Vice Admiral Burke, Rear Admirals Johnson and Bruner, Kevin Poitras of General Dynamics and Matt Mulherin of Newport News Shipbuilding.

I see Rear Admiral Benedict, with whom I've met recently; Sir, I'm counting on you to make sure we deliver the Ohio-class replacement submarine and common missile compartment on time with our British Allies.

At the beginning of this Congress, I took over the Strategic Forces Subcommittee of the House Armed Services Committee.

From that position, I oversee for the committee the nation's nuclear deterrent programs, including programs related to the three legs of the nuclear triad.

In that capacity, I have appreciated the support and expertise of men like Rich Mies, whom we all know. Admiral, I thank you for being here as well and for your leadership.

Admiral Mies has taken his time to help me work through some of the key problems that are in front of this nation today, and I'd like to talk to you about them and then take a few questions before I let you get back to your evening program.

This nation has some key decisions ahead of it.

We find ourselves in the position of having to recapitalize our entire deterrent at exactly the time that every other nation is

growing or modernizing its nuclear forces, but, we have absorbed reductions in our defense budget of $480 billion and we're now five days into President Obama's defense sequester.

Many people, including too many in the Congress, forget about this first nearly half trillion dollar cut the Defense Department has sustained.

They have become so focused on the blunt, dumb tool of sequester, that they ignore that DOD is practically the only part of the federal budget that has had to sustain spending cuts, again, half a trillion dollars before last Friday and the start of sequestration.

I wish I could tell you how this ends; I can't.

My colleagues and I on the Armed Services Committee were told this wouldn't be allowed to happen, but here we are.

Twice, we have passed legislation through the House to fix the defense sequester.

The Senate hasn't acted. The Senate hasn't even passed a budget in nearly four years.

And, President Obama can't ever seem to raise taxes enough to pay for his spending habits to find a way out of this problem.

As many of you no doubt agree, we can't tax ourselves out of a $16 trillion budget debt, with tens of trillions of dollars more in entitlement-related debt ahead of us.

But, if we can't fix this problem, we will do what Secretary Panetta described as cuts that would "decimate our defense. It would cripple us in terms of our ability to protect this country."

I agree with General Dempsey, the Chairman of the Joint Chiefs of Staff, the President's senior military advisor, by law, when he said two weeks ago before the House Armed Services Committee that the Pentagon can't afford $1 more of defense spending cuts—this was before sequestration kicked in—and do the mission.

I hope President Obama was listening to his senior military advisor.

President Obama and the Senate must take up the House-passed bills and cease holding hostage our men and women in uniform.

A great Senator, Phil Gramm of Texas, used to say, "never take a hostage unless you're prepared to shoot him."

It is beyond me why President Obama has taken the Department of Defense hostage.

As I mentioned at the outset of my remarks, the United States is in the position of having to modernize and replace its entire nuclear triad in the very near future.

For example, the Ohio-class ballistic missile submarine was first commissioned in 1981.

The Navy has testified that these boats will literally have to be pulled out of the water by 2029, which is now, thanks to last year's President's budget request, the earliest the Ohio-class replacement submarines will be available.

The Minuteman III intercontinental ballistic missile has been deployed and on-alert since 1970.

We are currently in the process of studying how to replace that missile, beginning in the 2030 time frame.

These will be sixty-year old ballistic missiles, on alert, every day.

The B-52 bomber, the *buff*, has been performing the strategic deterrent mission since 1955.

With some skill, and some luck, we will continue to fly this bomber until 2040.

By 2040, we will have B52s that are 90 years old.

Who in this room would get on an airplane at Reagan National or Dulles that was 90 years old?

But this is what we ask our airmen to fly.

I won't go into detail on the air-launched cruise missile except to say that we also have only just begun to *study* what we will do to replace this critical capability.

Every single one of these systems is essential.

They are complementary of each other because together they form a three-legged stool, our nuclear triad, that has kept us and kept our nation and its allies safe for decades now.

As General Larry Welch, former commander of the Strategic Air Command and Chief of Staff of the Air Force has stated, [it is]

> "my belief that adequate strength in each leg of the triad is even more important today than it was at the height of the Cold War. Doing away with one of these legs does violence to one or more of essential four characteristics of an adequate deterrent force. To do so would increase risk."

Think about it. Since the United States used nuclear weapons against Japan to end the bloodiest war in human history, the great nations of the world have not fought each other.

It hasn't happened.

Yet, somehow this country, or at least our current political leadership, assumes that peace and security is the status quo. Of course, it isn't.

Of course, as history has shown, it is our nuclear deterrent that is the most cost-effective and proven means of promoting the peace.

Our real and potential adversaries and competitors understand this.

Russia, for instance, has tested three new ICBMs since the New START treaty was entered into in February of 2011.

It is now developing a new *heavy* ICBM that reportedly could carry 15 warheads.

Russia is also deploying two new missile submarines, two new submarine-launched ballistic missiles, a new strategic bomber and a new air launched cruise missile.

The People's Republic of China is preparing, for the first time in its history, to put to sea a ballistic missile submarine and sea-launched ballistic missile.

It is developing and deploying three new long-range ballistic missiles capable of attacking the United States.

India is developing a sea-launched ballistic missile—the Pacific Ocean is about to get a whole lot more crowded—and Pakistan is on a path to soon surpass Great Britain as the fifth ranking nuclear weapons state.

If President Obama is right, and there is peace and security in a world without nuclear weapons, it seems every other country with nuclear weapons—or, like Iran, the aspiration to develop them—has missed the memo.

Russia's Vladimir Putin tells his people that, "[n]uclear weapons remain the main guarantee of Russia's sovereignty and its territorial integrity, it plays a key role in maintaining global and regional stability and balance".

President Obama, however, said at the State of the Union address last week that, "we will engage Russia to seek further reductions in our nuclear arsenals...because our ability to influence others depends on our willingness to lead."

He said largely the same thing at his speech in Prague in 2009.

It has been said that a leader without followers is a guy out for a walk.

I fear that the world has failed to follow our President's leadership by example.

We cannot continue alone on the path of disarmament.

I think General Welch had it right when he said that,

> "The only basis for the idea that drastically reducing the number of nukes we have would magically make us safer and help eliminate other nuclear dangers is hope. But hope is not a plan, and hope is not a basis for security. Hope does not defend us. I would ask who would be willing to rely on hope for the safety and security of their family?... Leading the world to zero nuclear weapons is, at best, a fairy tale." *(emphasis added)*

As I look ahead to the FY14 National Defense Authorization Act, my priorities are to ensure the complete and robust modernization of our nuclear deterrent, the ultimate guarantor of our security and the commitments we have made to the security of 31 allies.

Especially in this era of defense budget cuts and sequestration, it is critical we fully fund our nuclear deterrent modernization.

I agree with Deputy Defense Secretary Carter when he testified before the House Armed Services Committee that

> "nuclear deterrence is pretty important. So it's the last thing that you want to do serious damage to. So I would imagine that the Department of Energy, and the leadership there, and certainly we in the Department of Defense, will try to protect our nuclear capabilities to the maximum extent possible."

Now I want to be clear, I will resist any further reductions to our nuclear forces that do not meet the test laid out by General Scowcroft and Secretary Kissinger in their *Washington Post* op-ed last April:

> "the overarching goal of contemporary U.S. nuclear policy must be to ensure that nuclear weapons are never used. Strategic stability is not inherent with low numbers of weapons; indeed, excessively low numbers could lead to a situation in which surprise attacks are conceivable."

These are wise words borne from experience over hope and ideological rigidity.

I want to encourage you all to reach and share your advice and experience with me in the weeks and months ahead.

You all know far better than us in Washington what is needed to provide a robust deterrent, including the sea-based leg of the triad, for our nation's security.

And, you all will be on the front lines of the battle we fight to fix the President's foolish defense sequester.

I look forward to working with you in the days, weeks, and months ahead.

Thank you for letting me come here to share some thoughts and thank you for your attention.

If there are any questions, I'd be happy to take them now.

CORPORATE BENEFACTOR DAYS

COPRORATE BENEFACTOR RECOGNITION DAY
COMMANDER, SUBMARINE FORCES
VADM MICHAEL CONNOR, USN

THURSDAY, 28 FEBRUARY 2013

Fellow flag officers…

Distinguished colleagues…

Industry leaders…

I am very grateful for the opportunity to present the Undersea Force Vision 2025 in this forum. It is no coincidence that we chose this meeting with our vital industry partners to first unveil this vision outside Navy lifelines.

This past October, our CNO directed us to come up with our vision for 2025. In his direction, he stated the requirement to "define where our service is going and what it will look like in the future." Today, I will share this vision with all of you.

Also, in December he designated us as the lead for the Undersea Domain. This designation was a critical step because it helps to create unity of effort in the warfare area. This idea of an Undersea Domain commander is very much in the initial stages of planning and we are still scoping what responsibilities will be required to execute the vision, but the end goal is to create a single point of contact for all undersea activities, regardless of warfare community, to make it easier for our Operational Commanders to leverage the capabilities we currently have in the undersea domain.

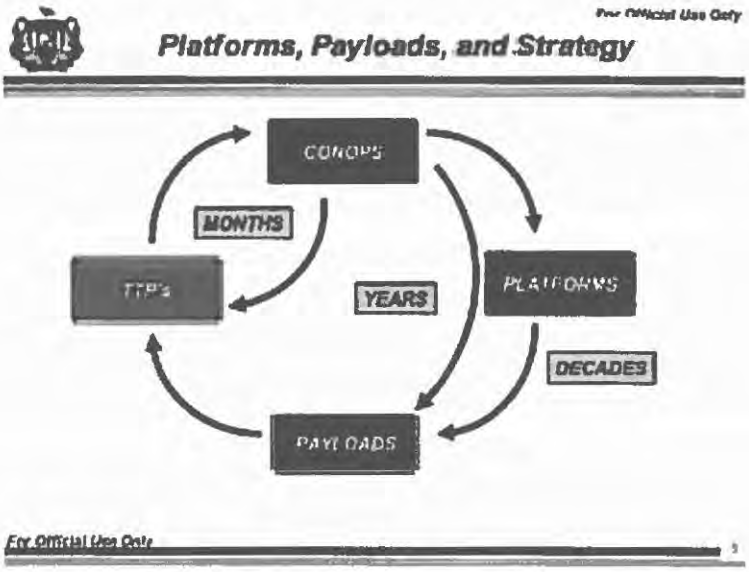
We are committed to staying ahead of the potential threats and preserve our superiority in the undersea domain. The challenge we face is how best to address essential undersea warfighting issues of a very complex world in the face of extremely tight fiscal realities. To do that we need a coherent plan.

The CNO specifically tasked COMSUBFOR to act as consultant for all programs and investments for the undersea domain, including ASW, ASUW, ISR, protection of appropriate infrastructure, and other operations under the sea. COMSUBFOR will be lead for developing operating concepts and doctrine that in turn will guide program and training development. My Executive Director Chuck Werchado is leading an IPT at the fleet stakeholder level to move ahead on this effort.

As lead for the Undersea Domain, it is my job to figure how to use our all of the unique characteristics of our various navy communities—IUSS, Surface, air, mine warfare … and sometimes SOF, —to collectively deliver military effects in the Undersea Domain. Most of the time, SOF area unique and valuable entity that stands apart from the collective Undersea Forces—Also, the Undersea Domain will support other Domain leaders—surface, air, and cyber—with Undersea Forces to deliver effects in the other domains.

The important thing to remember when thinking about Undersea Warfare, and working to maximize every bit of advantage we have, is that it's a team sport, and every member of the team has different things that they are best suited to accomplish.

In our vision of future combined-arms USW, the submarine is the best platform to be utilized within 100 fathoms of water, —closer to land—and to a minimum depth of about 20 fathoms. In water shallower than 20 fathoms up to the sea—land interface, we will leverage SOF, expeditionary forces and emerging undersea capabilities that include UUVs and distributed netted sensors. Our surface forces, IUSS forces, maritime patrol aircraft and allies are best employed for wide area search of the undersea domain.



Our acquisition processes are a proven model. And I think we are all familiar with the outer ring of this diagram. Most importantly, I think we're all familiar with the time label for the outer ring—decades.

It takes a very long time, in our normal procurement process, to adjust to changing requirements of the battlespace if the base platform—submarine, ship, or plane—has to be changed to make the adjustment.

The VIRGINIA Class is certainly our platform of the future. It provides tremendous capability. It's a model program that continues to perform under time and under budget.

The flexibility that will be provided by Block V is unparalleled and gives us the opportunity to shorten the response time to a change in the battlespace by giving us the ability to employ various payloads.

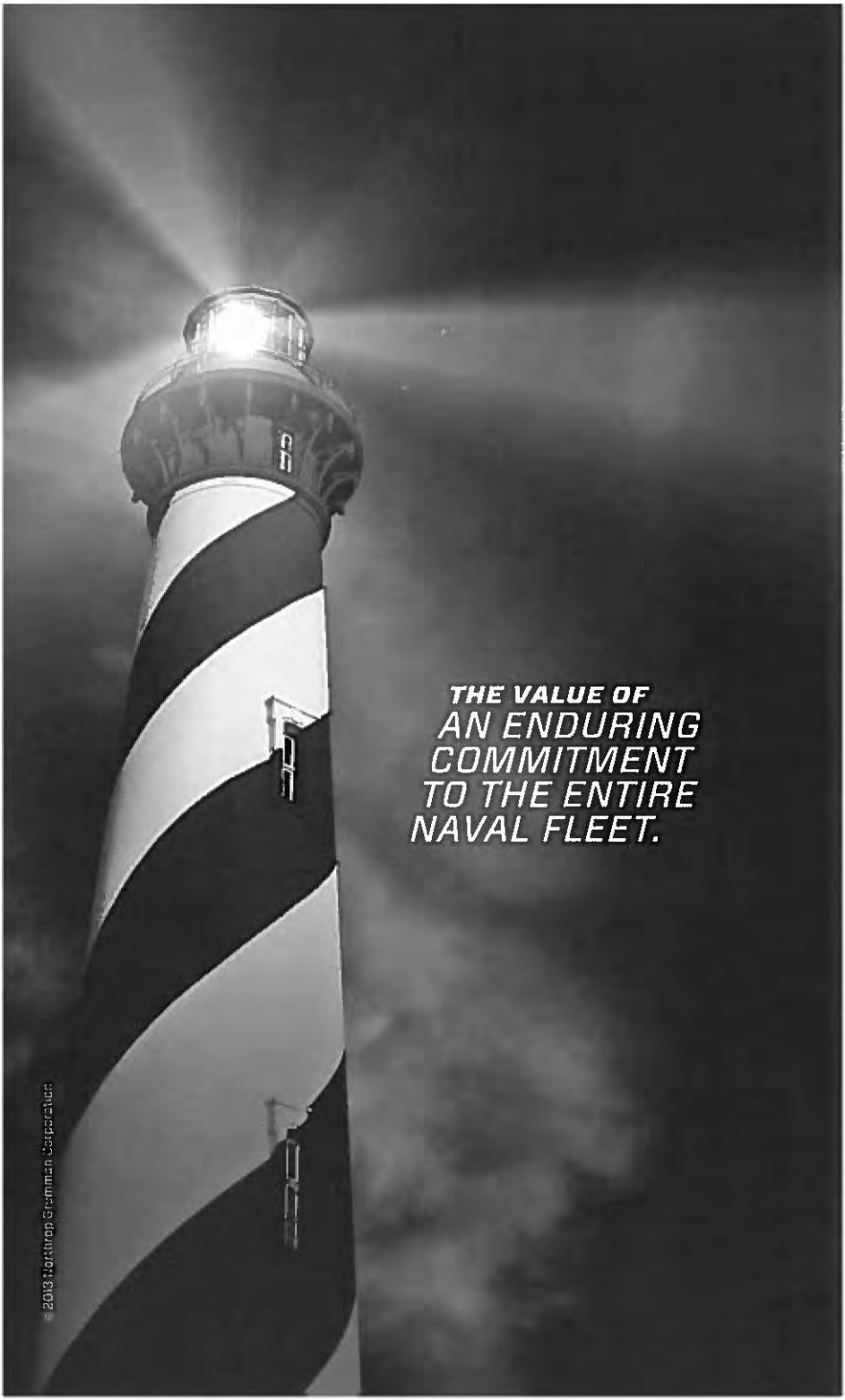
I think the real agility of our future force will depend on the ability to shorten the amount of time needed to respond to a new threat by creating, fielding, and employing payloads—UUV's,

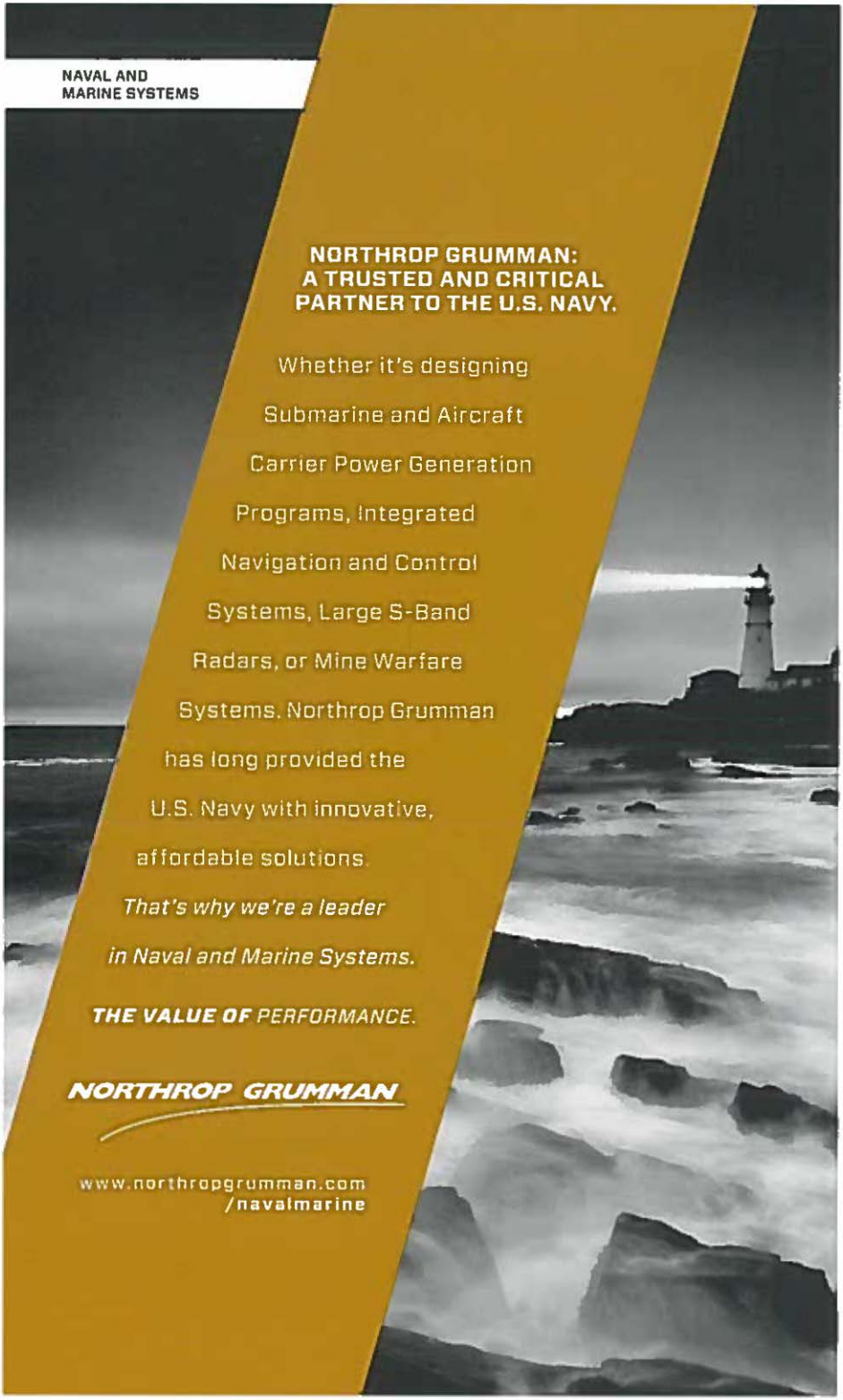
UAV's, long distance torpedoes, and distributed netted sensors—that accomplish new tasks as they are identified.

The assumptions that we are making regarding any future war is that the only part of our military that can be relied upon to get into weapons range is the Submarine Force. We have to do our job before anyone else can get in to do theirs. The VIRGINIA is definitely the platform that can execute this tasking, and the payloads that can be placed on her—the stuff that you folks here today are working on day in and day out—are what will ensure that once we get on station, we will have the tools we need to do our job as the enabler for all follow-on actions.

As you can see, it's a terrific time to be a member of the undersea force. What we provide to the force commanders has never been in higher demand, and it continues to go up. The Undersea Domain will be the battleground of the future and we are taking the necessary steps to ensure our current dominance continues well into the future.

Thanks very much for your time today.

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2013 CORPORATE BENEFACTOR DAYS

Implementing IUFS in a Fiscally Pressured Environment

RADM Barry Bruner
Director,
Undersea Warfare Division

The following is a summary of RADM Barry Bruner's speech at the 2013 Naval Submarine League Corporate Benefactor Days.

1. The Design for Undersea Warfare is divided into three Lines of Effort. N97's responsibility under the guidance of VADM Connor and the Design for Undersea Warfare is the third LOE: Define the future role of undersea forces and the requirements for future platforms, payloads, payload volume, people, and posture in order to guide decisions, policy and funding. N97 developed the Integrated Undersea Future Strategy to guide resource decisions to support this LOE. Throughout the past year the IUFS has proven its worth by providing the Submarine Force a course to navigate during these fiscally challenging times. The Submarine Force priorities have remained the same over the past year – On time delivery at a responsible cost of OHIO Replacement, Two VA Class SSNs per year, and VA Payload Module and the payloads that go with them. (Slide #2)

Unclassified

Integrated Undersea Future Strategy

Summary

Slide 2

Design for Undersea Warfare

- Provide Ready Forces
- Maximize Employment Effectiveness
- Develop Future Force Capabilities

- Platform
- Systems
- Payloads
- Posture
- People

Challenges

- **Timely OHIO Replacement**
  - 12 OHIO Replacements must do same mission as 14 OHIOs
- **SSN Force Gap**
  - 22% decline over next 18 yrs
  - Low point 43 (requirement 48)
- **SSGN Retirement**
  - 60% decline undersea strike volume by 2028
  - Undersea forward presence falls 36%
- **Increasing future dependence on Undersea for**
  - Assured Access and Influence (penetration/defeat of A2AD)
  - Asymmetric exploitation of undersea forward access
  - Early offensive operations far forward
  - Subsea and undersea infrastructure operations

Recommended Steps

1. **Ensure OR SSBN delivers on time to meet strategic requirements**
   - Manage OHIO Sustainment efforts
2. **Refuel all 14 OHIO SSBNs**
3. **Pursue second SSN in FY14**
4. **Reduce build time for future VA hulls**
5. **Extend service life of selected SSNs**
6. **Add VA Payload Module (VPM) to at least 20 Block V and later SSNs**
   - Upon SSGN retirement, SSN requirement will be 52 vice 48 (20 VPM)
7. **Produce new 21-inch modular undersea weapon family**
8. **Field Large Displacement UUVs**
9. **Support Next Generation SOF**
10. **Support Conventional Prompt Strike and Integration of Advanced Missile Capabilities**
11. **Plan for D5 Follow-on Missile**
12. **Transition an additional SSN to Guam**

Strategy takes prudent, cost-effective steps to reduce risk but does not fully eliminate gaps

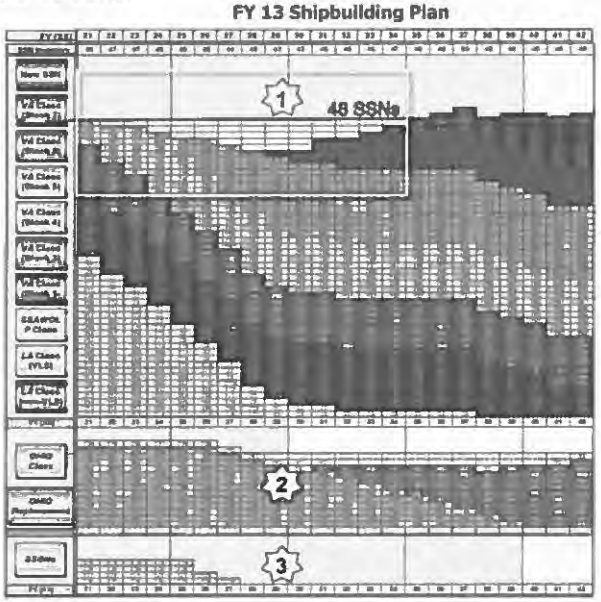
2. The SSN Force Structure Gap, sometimes called the SSN bathtub, is a 13-year span in which the SSN inventory will be less than the requirement. The low point in the SSN force structure occurs at the same time as the transition to the OHIO Replacement and the decommissioning of the SSGNs. This will make the mitigation of the SSN shortfall much more challenging. (Slide #3)

3. The number one Submarine Force priority is delivering OHIO replacement on time and at a responsible cost. Strategic deterrence is a national imperative. OHIO Replacement is the right ship to protect the country into the 2080s. A sustained, survivable strategic deterrent is not a burden, but a vital investment that will protect this country for over half of this century. (Slide # 4)

Unclassified

SSN Force Structure Gap

- The SSN inventory minimum requirement is 48 SSNs:
  - Provide global, day-to-day, GFM peacetime presence of 10.0
  - Provide surge for major combat operations
- By the current Plan of Record (FY13 Shipbuilding Plan):
  - Force structure below 48 SSN red-line for over a decade (2022-2034)
  - (1) SSN force structure gap is 38 SSN-yrs
  - SSN force structure will reach a low of 43 (2028-2030)
  - (2) Lowest SSN force structure occurs simultaneously with OHIO Replacement transition (2029-2042) and
  - (3) SSGN retirement (2026-2028)
- Steps can be taken to mitigate the SSN shortfall:
  - Adding additional SSNs to the shipbuilding plan
  - Service life extensions of selected SSNs
  - Reducing VIRGINIA Class build times



Slide 3

Unclassified

OHIO Replacement SSBN

21st Century Capability…

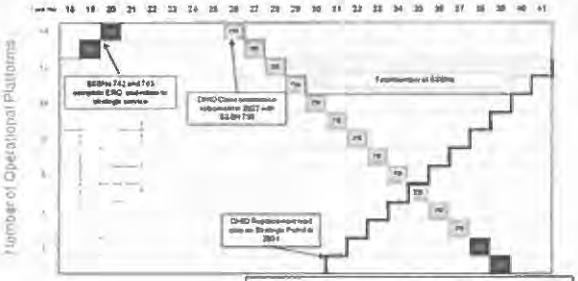
OHIO Replacement SSBN Attributes

- Sufficient payload:16 missile tubes
  - Meets USSTRATCOM requirements
  - Flexibility to handle problems across triad or degradation in strategic environment
- Sufficient stealth to address the projected threat through the 2080s
- 12 OR SSBNs to replace 14 OHIOs
  - Life of ship reactor core
  - Reduced mid-life maintenance period
- Maximize reuse of OHIO and VIRGINIA components to minimize cost

In an Affordable Package…

- Lead ship construction must commence in 2021
  - First Strategic Patrol in 2031
  - Maintains fleet of 10 operational SSBNs through transition to OHIO Replacement
- Procurement timeline meets USSTRATCOM requirements with moderate operational risk during transition period - no additional room for delay
  - Low margin for unforeseen SSBN maintenance issues or late OHIO Replacement delivery
- 12 OR SSBNs needed to meet long term requirements during OHIO Replacement mid-life overhaul period

SSBN Force Structure



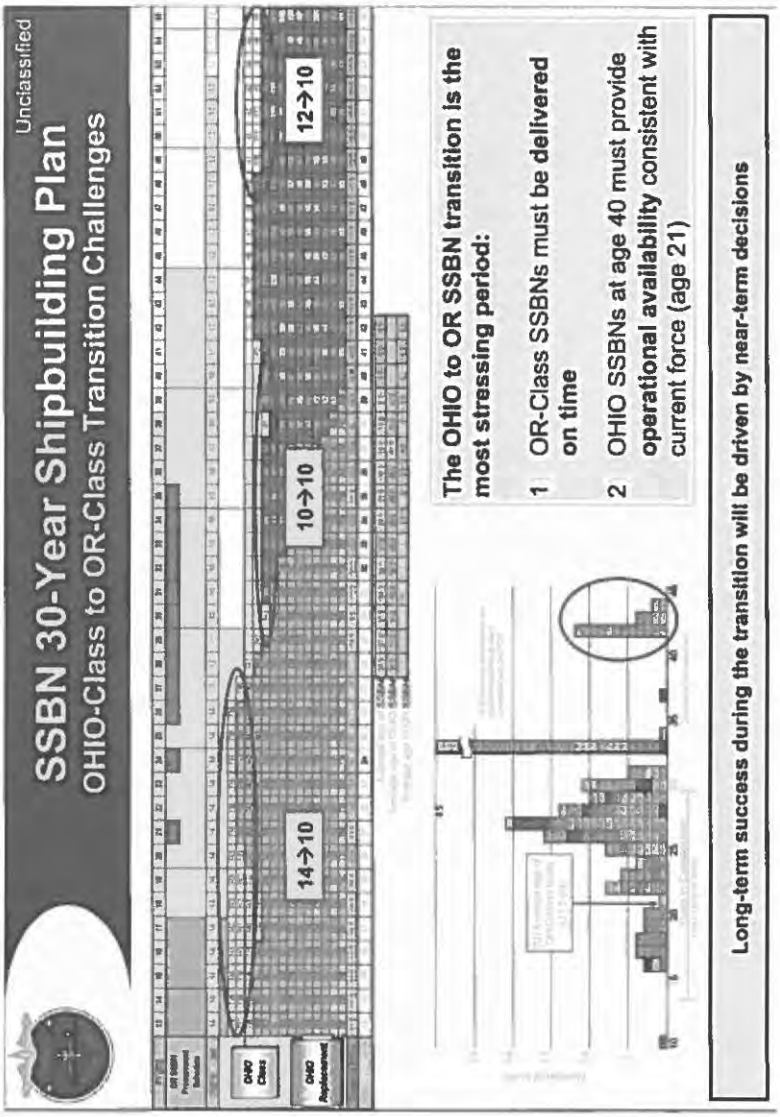
At Responsible Cost…

Unclassified

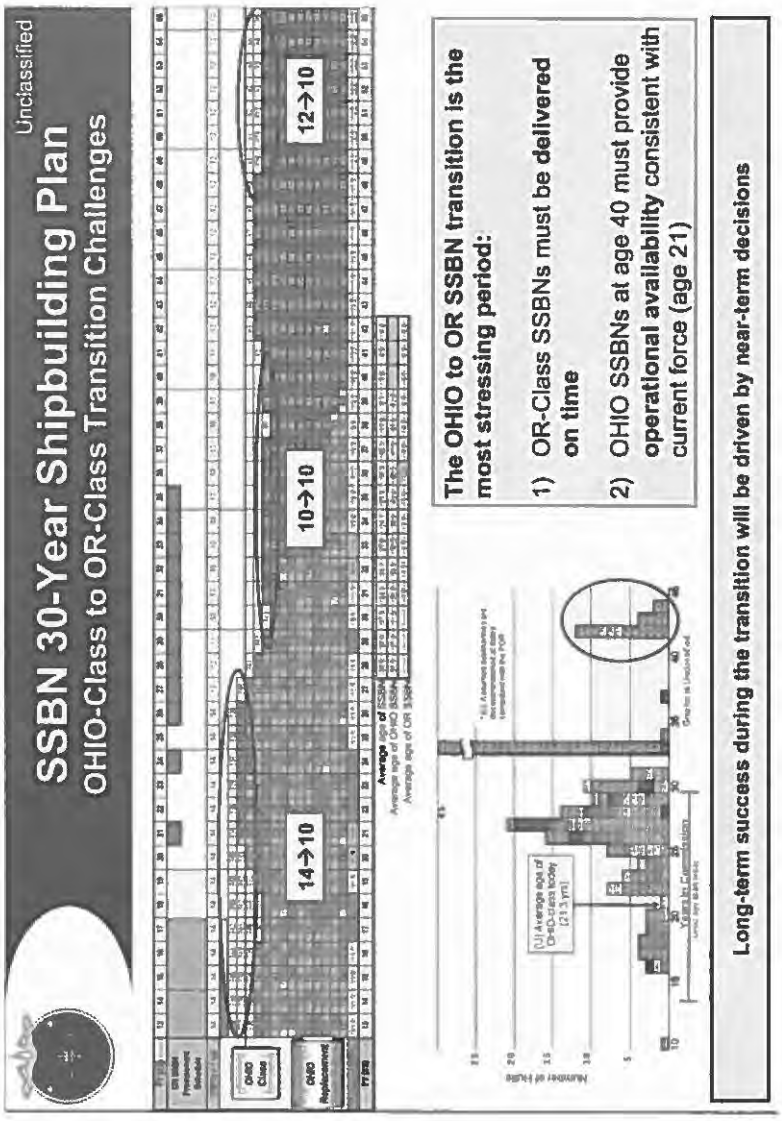
Slide 4

4. The OHIO to OHIO Replacement transition is divided into three key areas. Before the OHIO Replacement begins delivery, there will be 14 OHIO Class SSBNs following the completion of their overhauls. OHIOs will be replaced, one per year, starting in 2031. During this period, there will be only 10 SSBNs to maintain 10 operational. This is feasible since no major maintenance periods are planned early in the ship's life. When the OHIO Replacement SSBNs begin to undergo mid-life overhauls, there will be 12 ships available to maintain 10 operational. (Slide # 5)

5. The Navy continues to drive down the cost of OHIO Replacement while ensuring requirements will satisfy essential military capabilities. Significant savings have been achieved through thorough scrubs of the requirements. We are getting closer to our target cost of $4.9B. Leveraging features from the current OHIO-Class and Virginia-Class has provided savings as well. Even with proven technology, this will have to be a new ship with many components with new design to ensure the ship's success for its 42-year life. The design of this ship will ensure survivability until the 2080s by allowing flexibility to accommodate new threats as they emerge. (Slide # 6)


Unclassified
SSBN 30-Year Shipbuilding Plan
OHIO-Class to OR-Class Transition Challenges
14→10
10→10
12→10
The OHIO to OR SSBN transition is the most stressing period:
1 OR-Class SSBNs must be delivered on time
2 OHIO SSBNs at age 40 must provide operational availability consistent with current force (age 21)
Long-term success during the transition will be driven by near-term decisions

Slide 5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Slide 6

6. The primary purpose for VPM is to mitigate the lost undersea strike capacity that will occur in the mid-2020s upon the retirement of the SSGNs. Undersea strike is critically important today in countering near-peer nations' anti-access, area denial (A2/AD) capabilities that hold Joint Force air and surface forces at risk. This demand signal is expected to increase in the future as these A2/AD capabilities continue to mature and proliferate. SSGNs fill the need for Undersea Strike now; however, they will retire without replacement between 2026-2028. VPM is also critical in providing payload volume for other future payloads, allowing the implementation of the Integrated Undersea Future Strategy to more effectively employ the fewer submarines we will have in the future. Even though VPM is being designed for TLAM, the concept has been studied and determined to be capable of hosting other future payloads including other missiles, UAVs, and UUVs, as well as increasing the capacity of Virginia Class SSNs to support SOF missions. The common host infrastructure will ease the design or adaptation of these future payloads for submarine use. (Slides 7 & 8)

Slide 7

Unclassified

Undersea Payload Volume Gap

Stretching Blocks V,VI and VII with VIRGINIA Payload Module

By 2030, the FY13 Program of Record will result in:

- A 22% reduction in SSNs force size
- A 36% reduction in SSN/SSGN forward presence
- A 60% reduction in undersea strike volume

20 Stretch SSNs (Blocks V, VI, VII) would:

- Restore undersea strike volume (after an unavoidable partial gap)
- Distribute undersea strike over 20 hulls vice 4 hulls, greatly complicating adversary planning, improving deterrence and imposing costs on the adversary

Unclassified

Future Payload Concepts

Modular ADCAP Torpedo

Coverage from typical submarine operating areas

Next Generation Strike

Unmanned Systems

Survivability Enhancements

The right payload strategy will maximize the effectiveness of undersea forces in the A2AD environment

Slide 8

REMARKS AT CORPORATE BENEFACTOR'S MEETING
RADM DAVID C. JOHNSON, USN
PROGRAM EXECUTIVE OFFICER FOR SUBMARINES

THURSDAY, 28 FEBRUARY 2013

Good morning. I thoroughly enjoy the privilege of being the PEO for the world's greatest Submarine Force and the honor of presenting to that Submarine Force's strongest supporters—the corporate leaders here. Our Navy-Industry partnership is without peer in DoD and is critical in developing, fielding and sustaining our platforms, systems and weapons. Together, we deliver capability to the Fleet on time—or early—within budget and with ever improving quality and capability. Truly remarkable.

I would like to thank the Naval Submarine League for inviting me here. You've heard from the Fleet and from the Resource Sponsor—now it's the program execution side. We are indeed in interesting times—In budget terms, our Navy is operating on a continuing resolution, without a Fiscal Year 2013 budget, unsure of the duration of the continuing resolution, and not knowing if a severe cut—a.k.a. sequestration—will be enacted over FY13's last 7 months. Meanwhile, we're preparing to brief Congress on the still undefined 2014 budget and working with the resource sponsors on Program Objective Memorandum (POM) 15. Definition of insanity ?.... Maybe. Secretary Stackley, my boss, has told us to be leaders, not victims. In my view, times like these separate the leaders from the victims. If we're called on to reset our Navy and its programs, industrial backbone or technical infrastructure, that's what this Navy/Industry team will do—who else would our nation turn to? These are challenging times. Our culture of continuous improvement and affordability will stand this test and best position us to deliver capability our nation is counting on us to deliver.

I'm taking a different tack today—starting with a discussion about Team Sub and our objectives this year. I think you'll be interested in knowing what Team Sub leadership considers important. I'll follow with an update on our progress and some last thoughts on affordability.

My portfolio as a refresh. $7.3B in FY13, $43B across the PB13 FYDP. 17 ACAT programs, with two of them being #2 and #3 in DoD. We are entrusted with a considerable amount of taxpayer money and consequently have the responsibility to ensure we use every precious dollar to its maximum effect.

Where we've come since the October NSL Symposium. And when I say *we* I mean our corporate accomplishments.

VIRGINIA –

- Finished CALIFORNIA's Post Shakedown Availability and moved into TI10/APB11 Step 4 Testing
- Ellen Roughead christened MINNESOTA
- NORTH DAKOTA Pressure Hull Completed on Valentine's Day—a ship that will deliver on the shortest span ever—60 months. Amazing when you consider that 20% of that ship's design was changed and is the lead ship of Block III.
- MISSISSIPPI Completed the Class' Special Operating Forces operational test and evaluation
- We received EB/HII's proposal for Block IV—the largest shipbuilding contract ever at $15B to $20B.

OHIO Replacement—awarded an innovative research and development contract that, for the first time, incentivizes our ship designers to reduce cost across the entire program—design, construction and sustainment.

Torpedoes—completed delivery of 243 Mk 54 Production Upgrade 2 (P2U).

Surface Ship Torpedo Defense—started in-water testing of the Countermeasure Anti-Torpedo and nearly completed installation of the first hybrid prototype system on BUSH.

Integrated Undersea Surveillance System—Brought TI10 technology with ICP 4.5 onto two SURTASS ships and NOPF Whidbey Island

SWFTS (Submarine Warfare Federated Tactical Systems)—Completed 5 TI10 installations.

Towed Array—got real, at-sea experience on one of two promising technologies for the next generation Thin Line Towed Array.

Overall—a great 5 months. On the right—more to come, including the award at year's end of our Block IV contract and deployment of SSTD.

Our accomplishments link directly to the guidance provided by the Navy's senior leaders. Design for Undersea Warfare—Update One. I take my lead from VADM Mike Connor, Our Submarine Force Commander, ensuring that my programs deliver the capability he needs—today and tomorrow. Consistent guidance codified in a simple, straight forward thought piece is a leading element in making the right investments and ensuring continuity of program—a critical attribute of Affordability.

Our efforts are aligned not only with the Design for Undersea Warfare, but also with Navy Core Capabilities, CNO Tenets, and NAVSEA Goals. With their combined guidance, Team Subs leadership developed a succinct Mission Statement—Deliver and Support Reliable and Affordable Undersea Warfare Capabilities. That's simply what we do.

This mission stands on the foundation of values our Navy/Industry team lives—

- Safe, High-Quality ships, systems and weapons. We honor the 50th anniversary of the loss of THRESHER this April 10th – a seminal moment in our business.
- Integrity—in every facet of our business—Acquisition, morale, you name it. Without it, we collectively are dead.
- Capability—We NEVER want a fair fight.

That capability delivered Affordably—our cultural mindset; and

- People—we are all in the business of developing the next generation of Undersea Warfare platform, system and weapons designers, builders, and sustainers.

There are several areas we're emphasizing in 2013. The list is not comprehensive, but these are the major thrusts.

The objectives are broken out into six separate areas with the first being platforms. Our top two objectives involve SSBNs, with the first being, *Develop an SSBN modernization plan* and the second, *Meeting our affordability and cost reduction targets on the OHIO Replacement.* The SSBN modernization encompasses bringing their sonar and combat control systems into the SWFTS model—affordably.

We have three key VIRGINIA milestones flagged and objective 4 is focused on in-service with supporting USS MIAMI's and USS MONTPELIER's unanticipated repairs.

Lastly, we are working to complete an Analysis of Alternatives for Undersea Clandestine Insertion of Special Operations Forces.

Once you have the platforms, you need weapons and sensors to make them into a warship. Toward that end, we are pushing to deliver the first Surface Ship Torpedo Defense system to USS GEORGE H. W. BUSH.

My SWFTS program offices are working with Captain Elmstrom in PMS 392 on developing a plan to incorporate advanced weapons and payloads.

We are also taking into account that we now have Maritime Surveillance Systems within the PEO so we're working across IUSS, submarines, and frankly surface ship sonar programs to improve commonality between our acoustic systems.

Similarly, PMS 435 is looking to modernize our electronic warfare architecture plans, focused on Block IV and V VIRGINIA Class hulls, the OHIO Replacement, as well as relevant capability that can be affordably injected into today's Fleet.

Team Submarine has three in-service specific objectives that also include acquisition: correct VIRGINIA Class supportability issues; correct material alignment issues between submarine classes; and deliver the last part of the Submarine Rescue Diving and Recompression System. The Transfer Under Pressure capability will allow rescued submariners to go from a pressurized submarine, to a pressurized rescue module, straight to a decompression chamber.

In the Technology section, we are also looking at three objectives starting with integrating SSN and SSGN security programs into Team Sub's acquisition programs.

Next is working with our government, industry, academic, and international partners to further our acoustic superiority activities. Lastly, we want to field the Universal Launch and Recovery Module for an at-sea test with a large-diameter UUV. I think this is an important next step in getting large UUVs aboard submarines and if we can find the money I think we'll be able to learn a lot from this testing.

On the people side, we're looking at our metrics and seeing where we have holes, or the potential for gaps in key areas and how we're going to assess our workforce and then transition it to a different plan called AcqDemo.

The key here, though, is that we are actively looking at our workforce and making sure that we are training our replacements.

We are taking a close look at how we do business including how we're implementing *should cost* rules, improve how we work with the Navy's business tools. In fact, we are holding a *should cost* off site for all PEO SUB program managers and Deputy Program Managers in March.

However, I think there is one that most of you care about. We are working with NAVSEA 02, our contracting group, to reduce our contract cycle times. I think everyone here who has a contract

with Team Sub can say that at best it's not easy to get contracting actions done. We want to fix that.

So, that is a look into what Team Submarine considers as its 2013 objectives and what we are doing internally to improve how we operate and conduct business. Now to the programs.

As usual, we will start with what is considered the gold standard for major acquisition programs, the VIRGINIA Class.

If you were at my talk on the 15th, you heard me say that the VIRGINIA Class turned 20 years old last year. This program has gone from being one of the programs cited as being late and over budget to being held up as how to do acquisition the right way.

After a start that saw three of the four boats of the class delivered late, we have delivered the last five early to their contract delivery date and the seven boats now being built tracking toward early completion.

VIRGINIAs are out in the Fleet, conducting full-length deployments, capitalizing on the investments made in the class' capability. Truly phenomenal.

This has been an event-packed year in the VIRGINIA Program. We're starting construction on the last two boats of the Block III contract, laying PCU JOHN WARNER's keel on 16 March down at Huntington Ingalls in Newport News, delivering the last boat of the Block II contract, PCU MINNESOTA this spring and commissioning her in the fall. Floating off, and Katie Fowler christened, the first boat of the Block III contract PCU, NORTH DAKOTA—which, by the way, is tracking toward an early delivery despite having a redesigned bow. And we're going to start MINNESOTA's PSA and end USS MISSISSIPPI. And that's not to mention that we have already re-delivered USS CALIFORNIA from her PSA and finished SOF IOT&E aboard MISSISSIPPI and completed a Dry Deck Shelter fit-up on USS HAWAII.

Think about it this way, I mentioned several VIRGINIA Class boats by name. That's more than one-third of the boats that are commissioned, under construction, or under contract, and I had not mentioned that we're going to sign a contract for the next nine or ten ships of the class before the end of the year.

Best of all, with the exception of the Block IV contract signing, this is now what we consider an average year, and once we start getting closer to delivering the two FY11 boats, we'll be even busier and that's the way we like it—execution, throughput, and putting boats on the waterfront.

One of the primary reasons the VIRGINIA Class program is operating at such a high tempo is because of the great Navy/industry team.

We cannot lose sight of what we accomplished within the VIRGINIA Program. In 2005 the CNO challenged us to reduce costs by nearly 20%. At the time people didn't think it could be done. We had a mature design, were already in serial production—albeit only one per year, and we did not have a great track record with only one ship delivered late and another tracking toward an even later delivery.

However, we, together, came up with a plan and we executed an impressive design for affordability effort with minimal churn. Both sides knew what was at stake, we each had meaningful interest in getting this done and we did so.

The VIRGINIA Class has done an impressive job reducing costs, but we can do more. Looking across the entire submarine construction enterprise, we could have a Multi-Year Procurement contract across both the VIRGINIA Class and OHIO Replacement so that the common components can be purchased in bulk to achieve economic order quantity savings. This is a key to reducing the cost for both classes.

Once again, we have met our mark and achieved our total ownership cost reduction goals of 3:15—reducing the number of major shipyard maintenance availabilities from four to three and then increasing the number of deployments from 14 to 15. We were able to complete all the engineering required to shift from 72-month operational intervals to 96 and got it done in time to include in the Block IV VIRGINIA Class Request for Proposals. These efforts will also support the OHIO Replacement program's efforts.

However, we can't keep the team together forever and the VIRGINIA Program has lost some key members of the Design for

Affordability and RTOC Team. Thankfully, most of them ended up in the OHIO Replacement program where they can impact their wisdom and lessons learned in the next submarine acquisition program.

However, early delivery alone is not enough …

Our glide slope in terms of our average score for our INSURV trials shows improvement. As you might imagine, the first couple of boats experienced some growing pain, but we improved with each boat to the point where we're nearly at a .90—an outstanding trend.

We track the number of areas where we are graded and scored. On USS MISSISSIPPI we scored a perfect 16 for 16 green. As I said at the time of her delivery last year, which is quoted at the bottom of the slide, MISSISSIPPI was, quote, "the most complete, combat ready VIRGINIA Class submarine yet delivered."

Delivering more complete and combat ready does not mean that the newly-delivered boats are ready to deploy. We still need to put the ships through their paces and through their Post Shakedown Availabilities before they are fully released to the Fleet.

We're on the right curve to get the boats into the Submarine Force's hands sooner. As with all first of the class, we used the first five ships to conduct IOT&E and we had longer PSAs. Now, we're through IOT&E and we're cutting our PSAs down from more than a year to about six months or less.

We're getting through the construction cycle more quickly, with improved first-time quality, and into the warfighters hands more rapidly. It all goes back to what I said earlier, execution, throughput, and putting boats on the waterfront. The standard to which all others are measured.

Now, from production to contracting—we are now in negotiations for the next block of VIRGINIAs. Our goal is to award the contract this fall so as to minimize any impact to production and continue to produce on time and on budget.

The Block IV contract is a little different than previous ones because we are asking for multiple options—one for nine ships

which is the program of record and a couple for 10 boats as there exists a possibility that Congress would authorize and fund the Navy to build 10 VIRGINIAs even in these fiscally turbulent times.

That we actually have a chance to add a boat to the contract demonstrates both the trust that the Navy and Congress have in this program—a trust based on actual performance—and the need for these flexible warfighters in the Fleet. I do not know if we'll be able to get the 14-2 boat, but we are certainly working to make it happen.

For what comes after Block IV, the VIRGINIA Payload Module. Admiral Bruner did a great job talking about this effort so I won't delve too much into it.

Our guidance for the VPM states that it:

- Shall meet existing attack submarine requirements
- Shall mitigate the loss of conventional undersea strike capacity
- Should host future undersea payloads
- Should provide Special Operation Forces (SOF) undersea mobility support.

When we first started working on the VPM, we thought it would add about $500 million to the cost of a VIRGINIA Class hull and require about $1.1 billion in design work. Now, after two full cost estimates, we think we can design the VPM for about $850 million and build them for an additional $320 million per hull on average. Clearly, we're trending in the right direction, but we still have to work the costs down to the bare minimum needed so that we can afford VPM-equipped VIRGINIAs and my next topic, the OHIO Replacement Program.

Right now, we are in the Technology Development Phase and almost done with the ship specifications and moving into the system descriptions and diagrams. The program is in the detailed design for the compartment that will be used aboard the four United Kingdom SUCCESSOR SSBNs and our 12 OHIO Replacement SSBNs.

We know from VIRGINIA that the more mature the design, the more on cost and on schedule you can remain during production and we want to be further along with OHIO Replacement when construction starts in FY21 than VIRGINIA was when she started in FY97.

As we move through the Technology Development Phase we are looking at ways to control costs. While this part of the program accounts for only about 6 percent of the OHIO Replacement's total program costs, it can have lasting effects on the ship's total cost. Investing now will allow us to save over the life of the program. So, for this 6 percent investment, we will design an SSBN with SSN-like stealth at SSBN speeds, produceability and affordability, the restarting of the missile tube industrial base, the establishment of three major test facilities, and a class that provides 124 strategic deterrence patrols an SSBN operational cycle with SSN technology.

The research and development contract we signed last December is truly a unique agreement in that we are incentivizing General Dynamics Electric Boat, which is the prime on the contract, to lower costs across all three phases of the OHIO Replacement—design, construction, and Operational and Sustainment. Whereas the VIRGINIA Class conducted successful acquisition and life cycle cost reductions during production, the OHIO Replacement is baking this into the program from the very beginning. This will maximize our savings while also ensuring that the boat we design and deliver has the requisite capabilities to successfully operate into the 2080s.

The contract, and really the program as a whole, is embracing the OSD Better Buying Power initiatives by targeting affordability and reducing cost growth. This is a unique research and development contract in that it purchases both level of effort and specific deliverables in a cost-plus fixed fee incentivized contract. This is the first time that I can remember a research and design contract being incentivized to reduce total program costs starting with the non-recurring engineering work, to construction, and operating and support. By starting to look at how to make the OHIO

Replacement as affordable as possible now, we have the ability to really reduce the program's entire life-cycle cost.

The contract also dovetails perfectly with the OSD's Better Buying Power 2.0 initiatives by "**Substantially enabling and achieving an affordable program**" with effective "**cost control throughout the product life**" by rewarding contractors for reducing non-recurring engineering, acquisition, and operational and sustainment costs early in the program. It further "**incentivizes productivity and innovation**: and "**promote effective competition**" by executing competitive prototyping efforts to the maximum extent.

Affordability has been one of the OHIO Replacement's major talking points—how we are working to control costs. However, I think it is important to point out that we are still going to deliver a platform that will carry the majority of our nation's nuclear weapons. We cannot deliver a boat that can't meet its missions. This platform is too important to take short cuts, it will be the foundation of our national security, and therefore must have the right capabilities to ensure its survivability and capability. While cost is important, we will deliver the right platform, with the right capabilities, to the Fleet in 2031. Credible deterrent at the lowest possible cost. That is our mantra and I can tell you we live it every single day.

To bring our mantra to life, we are pursuing a conservative design that greatly leveraged from the VIRGINIA Class—from pumps to combat systems, but more on that later. Further, we are taking the entire TRIDENT D5 Strategic Weapons Systems and putting it on board the OHIO Replacement.

Going back to what I said earlier that affordability does not preclude capability, we are focused on providing a submarine that will carry our nation's survivable nuclear deterrent capability for the better part of this century. To do that, we will need to design and build a submarine that can operate in what will be a much different environment than we see today. To that end, we are doing R&D work to ensure the platform's survivability—that is the number one consumer of R&D at this point. For example, we're working on electric drive to reduce the number of moving

parts in our propulsion system, a new stern, and the life-of-hull core. We are also working to make these ships more maintainable as we'll only have 12 boats from which to draw.

We are taking a conservative approach to the OHIO Replacement's design. We are leveraging what we can, what does not negatively affect the boat's performance, and smartly investing in those areas in which we need to improve—most notably survivability. That is how we are balancing cost and capability. There is still much work to be done, but I think we are on the right path toward hitting our cost goals and our operational requirement.

Now to our combat systems and weapons—the real reason we're building submarines as my SWFTS program managers never cease to remind me.

Just a reminder, our Submarine Warfare Federated Tactical Systems, or SWFTS, include almost all of our submarines non-propulsion electronic systems—except for the radio.

As the name suggests, these systems are linked together to help provide our submariners with a clearer tactical picture than if they were stovepiped. We are on a biennial cycle where we deliver commercial off-the-shelf hardware every even year and open architecture software every odd year—this is our TI/APB process. SWFTS, then, is the engine that drives the Submarine Force.

As you can see, that engine is running at a very steady rate. Between 2013 and 2015, we'll begin 29 SSN and SSGN SWFTS installations. That's nearly half of the boats we have. We like to upgrade our SSNs and SSGNs about once every four years. In doing so, we make sure that they have the best capabilities possible AND we remove obsolescence issues with the hardware.

SWFTS' steady drumbeat also allows us to look into the future and determine what TI/APB build will go aboard our new-construction platforms.

We already know what TIs we'll have on our block IV VIRGINIAs and the first OHIO Replacement and they are not even under contract.

By knowing what will go aboard these boats, we are removing one of the more costly and high-risk portions of a submarine's design and construction and drastically reducing the cost and

virtually eliminating the risk. We're budgeting $338 million for the OHIO Replacement's combat system NRE. That is 17 PERCENT of what the SEAWOLF Class' BSY-2 cost and about HALF THE COST of the VIRGINIA Class's NRE.

From a capability standpoint, the SWFTS paradigm provides the Fleet with ever-improving capabilities. The Fleet drives what we work on—they give us a prioritized list and we work to deliver on those. So, not only is this a responsive construct, but it is also an exceptionally cost-effective one.

At the October Annual Symposium, I spoke a little bit about the need to restart heavyweight torpedo production and the concept of a modular torpedo or undersea vehicle.

We are currently working a three-phased plan. The first two represent re-starting torpedo production. As of now, we've gotten to the point where we are going to host an industry day this May so that we can gauge industry's capabilities and interest in pursuing this work.

On the right, that's where we start thinking about what else we can do with a MK48-type body. In the first increment, we're going to look at being able to reach out farther than we can now by adding a larger fuel tank and also examine how we can get from a copper wire to a fiber optic wire.

In the next increment, we'll look at a more modular weapon, with even greater range, new sensors, but utilizing the same form factor and warhead. As you can see, we have been working with a number of our Navy R&D organizations and we're looking to start getting some demonstrations in the water over the next couple of years. Since we have not built a full-up-round heavyweight torpedo since 1996, we have to take these efforts one-step at a time.

Clearly, the Navy and its industry partners are facing some challenging times. However, we both have jobs to do, so we must continue to work together to ensure that our warfighters have the tools they need to do their missions and the taxpayers get the most for their investment in national defense.

Toward that end, focus on the keys to provide capability and affordability. I think all of us will agree to these tenets—stable

requirements, defined goals, strong Navy/Industry team, INVESTING in affordability. Without real investments we cannot hope to achieve our cost goals. We proved what seed money can do with the VIRGINIA Class Design for Affordability. The lesson is learned and we are making sure it is not forgotten.

Lastly, we must remain persistent—we have to look past the difficulties that face us and determine to *get to yes*. There are surely tough times and hard decisions ahead of us. However, we cannot let that be an excuse for not supplying the warfighter with the ships, systems, and weapons they need to do their job. Therefore, we must embrace the culture of continuous improvement and always look for ways to deliver the right capability, at the right time, for the lowest possible cost. In the months to come, it will be easy to say no. We can't take the easy way out. We have to get to yes as often as possible.

FEATURES

COMSUBFOR AS LEAD FOR UNDERSEA DOMAIN

DEPARTMENT OF THE NAVY
CHIEF OF NAVAL OPERATIONS
2000 NAVY PENTAGON
WASHINGTON DC 20350-2000

3370
Ser N00/100087
21 Dec 12

From: Chief of Naval Operations
To: Commander, Submarine Forces

Subj: ESTABLISHMENT AS LEAD FOR THE UNDERSEA DOMAIN

Ref: (a) CNO ltr 3370 Ser N00/100066 of 1 Oct 12

1. In reference (a), I outlined the direct reporting relationship you have with me in your role as leader of the Undersea Warfare community. In that role, your vision for the 2025 Undersea Force is an essential guide in our development of undersea warfare platforms, payloads, people, and partnerships.

2. Our undersea dominance provides unique strategic and warfighting advantages that must be maintained. To sustain this dominance, I designate you as the Navy lead for the undersea domain.

3. You are hereby the Navy advocate for all undersea capabilities, whether they are hosted on submarines, aircraft, or surface ships, or in information dominance systems. Therefore, you are to be consulted on the development of all programs and investments for the undersea domain, including those for anti-submarine warfare; anti-surface warfare; intelligence, surveillance, and reconnaissance; protection of appropriate undersea infrastructure; and other operations under the water.

4. Additionally, you are responsible for developing operating concepts and doctrine for undersea operations, which in turn will guide program and training development. In this way, you will also set standards for undersea training and operational performance.

5. Navy component commanders, resource sponsors, leaders of other warfare communities, and other Navy organizations will consult with and support you in developing our concepts and capabilities for the undersea domain.

JONATHAN W. GREENERT

Copy to:
OPNAV (VCNO, DNS, N2/N6, N8, N9, N00X)
COMPACFLT
USFFC

NAVY OHIO REPLACEMENT (SSBN[X]) BALLISTIC MISSILE SUBMARINE PROGRAM: BACKGROUND AND ISSUES FOR CONGRESS A CONGRESSIONAL REFERENCE SERVICE REPORT

by Mr. Ronald O'Rourke
Specialist in Naval Affairs

Summary

The Navy's proposed FY2013 budget requests $564.9 million for continued research and development work on the Ohio replacement program (ORP), a program to design and build a new class of 12 ballistic missile submarines (SSBNs) to replace the Navy's current force of 14 Ohio- class SSBNs. The Ohio replacement program is also known as the SSBN(X) program.

Under the Navy's FY2012 budget, the first Ohio replacement boat was scheduled to be procured in FY2019, and Ohio replacement boats were to enter service on a schedule that would maintain the Navy's SSBN force at 12 boats. The Navy's proposed FY2013 budget defers the procurement of the first Ohio replacement boat by two years, to FY2021. As a result of this deferment, the Navy's SSBN force will drop to 11 or 10 boats for the period FY2029-FY2041.

The Navy in 2011 estimated the average procurement cost of boats 2 through 12 in the Ohio replacement program at $5.6 billion each in FY2010 dollars, and is working to reduce that figure to a target of $4.9 billion each in FY2010 dollars. Even with this cost-reduction effort, observers are concerned about the impact the Ohio replacement program will have on the Navy's ability to procure other types of ships at desired rates in the 2020s and early 2030s.

Potential oversight issues for Congress for the Ohio replacement program include the following:

- the reasons for deferring the start of SSBN(X) procurement by two years, to FY2021, the cost and operational impact of this decision, and whether it would be feasible

and cost effective to restore the start of procurement to FY2019, as planned under the FY2012 budget;
- the plan to design the SSBN(X) with 16 SLBM tubes rather than 20;
- the likelihood that the Navy will be able to reduce the average procurement cost of boats 2-12 in the program to the target figure of $4.9 billion each in FY2010 dollars;
- the accuracy of the Navy's estimate of the procurement cost of each SSBN(X);
- the prospective affordability of the Ohio replacement program and its potential impact on funding available for other Navy shipbuilding programs; and
- the question of which shipyard or shipyards will build SSBN(X)s.

This report focuses on the Ohio replacement program as a Navy shipbuilding program. CRS Report RL33640, U.S. Strategic Nuclear Forces: Background, Developments, and Issues, by Amy F. Woolf, discusses the SSBN(X) as an element of future U.S. strategic nuclear forces in the context of strategic nuclear arms control agreements.

ISSUES FOR CONGRESS

Two-Year Deferral in Start of Procurement

One oversight issue for Congress concerns the reasons for deferring the start of SSBN(X) procurement by two years, to FY2021, the cost and operational impact of this decision, and whether it would be feasible and cost effective to restore the start of procurement to FY2019, as planned under the FY2012 budget.

The two-year deferral reduced funding requirements for the Ohio replacement program within the FY2013-FY2017 Future Years Defense Program (FYDP); its effect on the program's total research and development cost and its total procurement cost over the longer run is less clear. As shown in Table 2, the two-year deferral would reduce the SSBN force to 11 or 10 boats for the period FY2029-FY2041.

Table 2. Navy Schedule for Procuring SSBN(X)s and Replacing Ohio-Class SSBNs

	Schedule in FY2012 Budget				Schedule under FY2013 Budget			
Fiscal Year	Number of SSBN(X)s procured each year	Cumulative number of SSBN(X)s in service	Ohio-class SSBNs in service	Combined number of Ohio-class SSBNs and SSBN(X)s in service	Number of SSBN(X)s procured each year	Cumulative number of SSBN(X)s in service	Ohio-class SSBNs in service	Combined number of Ohio-class SSBNs and SSBN(X)s in service
2019	1		14	14			14	14
2020			14	14			14	14
2021			14	14	1		14	14
2022	1		14	14			14	14
2023			14	14			14	14
2024	1		14	14	1		14	14
2025	1		14	14			14	14
2026	1		14	14	1		14	14
2027	1		13	13	1		13	13
2028	1		12	13	1		12	12
2029	1	1	11	12	1		11	11
2030	1	2	10	12	1	1	10	11
2031	1	3	9	12	1	2	9	11
2032	1	4	8	12	1	2	8	10
2033	1	5	7	12	1	3	7	10
2034		6	6	12	1	4	6	10
2035		7	5	12	1	5	5	10
2036		8	4	12		6	4	10
2037		9	3	12		7	3	10
2038		10	2	12		8	2	10
2039		11	1	12		9	1	10
2040		12		12		10	0	10
2041		12		12		11	0	11
2042		12		12		12	0	12

Source: Navy FY2012 and FY2013 budget submissions.

In explaining the two-year deferral, Secretary of Defense Leon Panetta stated on January 26, 2012, that "our review determined that we could achieve better cost control by delaying the next-generation ballistic missile submarine for two years without harming the survivability of our nuclear deterrent."

In a follow-on briefing that same day, Ashton Carter, the Under Secretary of Defense for Acquisition, Technology, and Logistics (i.e., DOD's acquisition executive), stated that the two-year deferral

> is not a strategic decision; this is a managerial decision made partly for budgetary reasons but mostly because that puts the Ohio class replacement on a more predictable and stable schedule....
>
> With respect to the schedule [for the program], the schedule as it was [under the FY2012 budget], was an aggressive one, maybe even verging on optimistic. So I—all I'm saying is this is a safer schedule; we're sure we can make this schedule. So it's a little more secure; so, from a managerial point of view, a better place to be.

At a February 16, 2012, hearing before the House Armed Services Committee on the Department of the Navy's proposed FY2013 budget, the following exchange occurred:

REPRESENTATIVE MIKE MCINTYRE:

> Admiral, I wanted to ask you, with the Ohio Class SSBNs scheduled to begin retiring in 2027, how will delaying the Ohio Class replacement program by two years affect the Navy's ability to meet STRATCOM's [U.S. Strategic Command's] at-sea requirements [for nuclear deterrent forces]?

ADMIRAL JONATHAN GREENERT, CHIEF OF NAVAL OPERATIONS:

> Well, what we'll have to do, we—we owe a certain number of submarines in a certain number of time. [sic] I can't give you those numbers specifically due to the classification. But the point here is we have to measure the ability

to meet that operational availability during that timeframe. We've done that. We've evaluated it. And it is equivalent to that—the operational availability of SSBNs that we provide today.

Today's numbers are acceptable to Strategic Command. We'll work with them in the future, but they look the same.

REPRESENTATIVE MCINTYRE:

And would you say in all candor that the delay in the Ohio Class replacement program is being done solely for budget reasons?

ADMIRAL GREENERT:

Predominantly budget reasons, but there is an advantage to this, and that is the design feature will be much more mature when we get to construction.

Potential oversight questions for Congress include the following:

- What impact does the two-year deferral have on the Ohio replacement program's estimated total research and development cost and its estimated total procurement cost?
- How much risk was there in the program's development schedule under the FY2012 budget, and how much mitigation of that risk is achieved by the two- year deferral?
- What is the potential for restoring the FY2019 procurement date for the first Ohio replacement boat, and how quickly would a decision need to be made on this issue before the potential for restoring the FY2019 date would be lost? What would be the impact on Ohio replacement program funding requirements in FY2013 and within the FY2013-FY2017 FYDP of a decision to restore the FY2019 date?

A Design with 16 vs. 20 SLBM Tubes

Overview

Another oversight issue for Congress concerns the plan to design the SSBN(X) with 16 SLBM tubes rather than 20—one of several decisions made to reduce the estimated average procurement cost of boats 2 through 12 in the program to $5.6 billion in FY2010 dollars. Some observers are concerned that designing the SSBN(X) with 16 tubes rather than 20 would create a risk that U.S. strategic nuclear forces might not have enough capability in the 2030s and beyond to fully perform their deterrent role. These observers note that to comply with the New Start Treaty limiting strategic nuclear weapons, DOD plans to operate in coming years a force of 14 Trident SSBNs, each with 20 operable SLBM tubes (4 of the 24 tubes on each boat are to be rendered inoperable), for a total of 240 tubes, whereas the Navy in the Ohio replacement program is planning a force of 12 SSBNs each with 16 tubes, for a total of 192 tubes, or 20% less than 240. These observers also cite the uncertainties associated with projecting needs for strategic deterrent forces out to the year 2080, when the final SSBN(X) is scheduled to leave service. These observers have asked whether the plan to design the SSBN(X) with 16 tubes rather than 20 is fully supported within all parts of DOD, including U.S. Strategic Command (STRATCOM).

In response, Navy and other DOD officials have stated that the decision to design the SSBN(X) with 16 tubes rather than 20 was carefully considered within DOD, and that they believe a boat with 16 tubes will give U.S. strategic nuclear forces enough capability to fully perform their deterrent role in the 2030s and beyond.

Testimony in 2011

At a March 1, 2011, hearing before the House Armed Services Committee, Admiral Gary Roughead, then-Chief of Naval Operations, stated:

I'm very comfortable with where we're going with SSBN-X. The decision and the recommendation that I made with regard to the number of tubes—launch tubes are consistent with the new START treaty. They're consistent with the missions that I see that ship having to perform. And even though it may be characterized as a cost cutting measure, I believe it sizes the ship for the missions it will perform.

At a March 2, 2011, hearing before the Strategic Forces subcommittee of the House Armed Services Committee, the following exchange occurred:

REPRESENTATIVE TURNER:

General Kehler, thank you so much for your continued thoughts and of course your leadership. One item that we had a discussion on was the triad, of looking to—of the Navy and the tube reductions of 20 to 16, as contained in other hearings on the Hill today. I would like your thoughts on the reduction of the tubes and what you see driving that, how you see it affecting our strategic posture and any other thoughts you have on that?

AIR FORCE GENERAL C. ROBERT KEHLER,
COMMANDER, U.S. STRATEGIC COMMAND

Thank you, Mr. Chairman. Well, first of all, sir, let me say that the—in my mind anyway, the discussion of Trident and Ohio-class replacement is really a discussion in the context of the need to modernize the entire triad. And so, first of all, I think that it's important for us to recognize that that is one piece, an important piece, but a piece of the decision process that we need to go through.

Second, the issue of the number of tubes is not a simple black-and-white answer. So let me just comment here for a minute.

First of all, the issue in my mind is the overall number of tubes we wind up with at the end, not so much as the number of tubes per submarine.

Second, the issue is, of course, we have flexibility and options with how many warheads per missile per tube, so that's another consideration that enters into this mixture. Another consideration that is important to me is the overall number of boats and the operational flexibility that we have with the overall number of boats, given that some number will need to be in maintenance, some number will need to be in training, et cetera.

And so those and many other factors—to include a little bit of foresight here, in looking ahead to 20 years from now in antisubmarine warfare environment that the Navy will have to operate in, all of those bear on the ultimate sideways shape configuration of a follow-on to the Ohio.

At this point, Mr. Chairman, I am not overly troubled by going to 16 tubes. As I look at this, given that we have that kind of flexibility that I just laid out; given that this is an element of the triad and given that we have some decision space here as we go forward to decide on the ultimate number of submarines, nothing troubles me operationally here to the extent that I would oppose a submarine with 16 tubes.

I understand the reasons for wanting to have 20. I understand the arguments that were made ahead of me. But as I sit here today, given the totality of the discussion, I am—as I said, I am not overly troubled by 16. Now, I don't know that the gavel has been pounded on the other side of the river yet with a final decision, but at this point, I am not overly troubled by 16.

At an April 5, 2011, hearing before the Strategic Forces subcommittee of the House Armed Services Committee, the following exchange occurred:

REPRESENTATIVE LARSEN:

Admiral Benedict, we have had this discussion, not you and I, I am sorry. But the subcommittee has had a discussion in the past with regards to the Ohio-class replacement program.

The new START, though, when it was negotiated, assumed a reduction from 24 missile tubes per submarine to, I think, a maximum of 20.

The current configuration [for the SSBN(X)], as I understand it, would move from 24 to 16.

Can you discuss, for the subcommittee here, the Navy's rationale for that? For moving from 24 to 16 as opposed to the max of 20?

NAVY REAR ADMIRAL TERRY BENEDICT, DIRECTOR, STRATEGIC SYSTEMS PROGRAMS (SSP):

Sir, as part—excuse me, as part of the work-up for the milestone A [review for the SSBN(X) program] with Dr. Carter in OSD, SSP supported the extensive analysis at both the OSD level as well as STRATCOM's analysis.

Throughout that process, we provided, from the SWS [strategic weapon system] capability, our perspective. Ultimately that was rolled up into both STRATCOM and OSD and senior Navy leadership and in previous testimony, the Secretary of the Navy, the CNO, and General Chilton have all expressed their confidence that the mission of the future, given their perspectives, is they see the environment today can be met with 16.

And so, as the acquisition and the SWS provider, we are prepared to support that decision by leadership, sir.

REPRESENTATIVE LARSEN: Yes.

And your analysis supports—did your analysis that fed into this, did you look at specific numbers then?

REAR ADMIRAL BENEDICT:

Sir, we looked at the ability of the system, again, SSP does not look at specific targets with...

REPRESENTATIVE LARSEN:

Right. Yes, yes, yes.

REAR ADMIRAL BENEDICT:

Our input was the capability of the missile, the number of re-entry bodies and the throw weight that we can provide against those targets and based on that analysis, the leadership decision was 16, sir.

At an April 6, 2011, hearing before the Strategic Forces subcommittee of the Senate Armed Services Committee, the following exchange occurred:

SENATOR SESSIONS:

Admiral Benedict, according to recent press reports, the Navy rejected the recommendations of Strategic Command to design the next generation of ballistic missile submarines with 20 missile tubes instead of opting for only 16 per boat.

What is the basis for the Navy's decision of 16? And I'm sure cost is a factor. In what ways will that decision impact the overall nuclear force structure associated with the command?

NAVY REAR ADMIRAL TERRY BENEDICT, DIRECTOR, STRATEGIC SYSTEMS PROGRAMS (SSP):

Yes, sir. SSP supported the Navy analysis, STRATCOM's analysis, as well as the OSD analysis, as we proceeded forward and towards the Milestone A decision [on the SSBN(X) program] that Dr. Carter conducted.

Based on our input, which was the technical input as the—as the director of SSP, other factors were considered, as you stated. Cost was one of them. But as the Secretary, as the CNO, and I think as General Kehler submitted in their testimony, that given the threats that we see today, given the mission that we see today, given the upload capability of the D-5, and given the environment as they saw today, all three of those leaders were comfortable with the decision to proceed forward with 16 tubes, sir.

SENATOR SESSIONS:

And is that represent your judgment? To what extent were you involved—were you involved in that?

REAR ADMIRAL BENEDICT:

Sir, we were involved from technical aspects in terms of the capability of the missile itself, what we can throw, our range, our capability. And based on what we understand the capability of the D-5 today, which will be the baseline missile for the Ohio Replacement Program, as the director of SSP I'm comfortable with that decision.

Section 242 Report

Section 242 of the FY2012 National Defense Authorization Act (H.R. 1540/P.L. 112-81 of December 31, 2011) required DOD to submit a report on the Ohio replacement program that includes, among other things, an assessment of various combinations of boat quantities and numbers of SLBM launch tubes per boat. The text of the section is as follows:

SEC. 242. REPORT AND COST ASSESSMENT OF OPTIONS FOR OHIO-CLASS REPLACEMENT BALLISTIC MISSILE SUBMARINE.

(a) Report Required—Not later than 180 days after the date of the enactment of this Act, the Secretary of the Navy and the Commander of the United States Strategic Command shall jointly submit to the congressional defense committees a report on each of the options described in subsection (b) to replace the Ohio-class ballistic submarine program. The report shall include the following:

(1) An assessment of the procurement cost and total life-cycle costs associated with each option.

(2) An assessment of the ability for each option to meet—

(A) the at-sea requirements of the Commander that are in place as of the date of the enactment of this Act; and

(B) any expected changes in such requirements.

(3) An assessment of the ability for each option to meet—

(A) the nuclear employment and planning guidance in place as of the date of the enactment of this Act; and

(B) any expected changes in such guidance.

(4) A description of the postulated threat and strategic environment used to inform the selection of a final option and how each option provides flexibility for responding to changes in the threat and strategic environment.

(b) Options Considered—The options described in this subsection to replace the Ohio-class ballistic submarine program are as follows:

(1) A fleet of 12 submarines with 16 missile tubes each.

(2) A fleet of 10 submarines with 20 missile tubes each.

(3) A fleet of 10 submarines with 16 missile tubes each.

(4) A fleet of eight submarines with 20 missile tubes each.

(5) Any other options the Secretary and the Commander consider appropriate.

(c) Form—The report required under subsection (a) shall be submitted in unclassified form, but may include a classified annex.

Subsection (c) above states the report "shall be submitted in unclassified form, but may include a classified annex." The report as submitted was primarily the classified annex, with a one-page unclassified summary, the text of which is as follows (underlining as in the original):

> The National Defense Authorization Act (NDAA) for Fiscal Year 2012 (FY12) directed the Secretary of the Navy and the Commander of U.S. Strategic Command (USSTRATCOM) to jointly submit a report to the congressional defense committees comparing four different options for the OHIO Replacement (OR) fleet ballistic missile submarine (SSBN) program. Our assessment considered the current operational requirements and guidance. The four SSBN options analyzed were:
>
> 1. 12 SSBNs with 16 missile tubes each
> 2. 10 SSBNs with 20 missile tubes each
> 3. 10 SSBNs with 16 missile tubes each
> 4. 8 SSBNs with 20 missile tubes each
>
> The SSBN force continues to be an integral part of our nuclear Triad and contributes to deterrence through an assured second strike capability that is survivable, reliable, and credible. The number of SSBNs and their combined missile tube capacity are important factors in our flexibility to respond to changes in the threat and uncertainty in the strategic environment.

> We assessed each option against the ability to meet nuclear employment and planning guidance, ability to satisfy at-sea requirements, flexibility to respond to future changes in the postulated threat and strategic environment, and cost. In general, options with more SSBNs can be adjusted downward in response to a diminished threat; however, options with less SSBNs are more difficult to adjust upward in response to a growing threat.
>
> Clearly, a smaller SSBN force would be less expensive than a larger force, but for the reduced force options we assessed, they fail to meet current at-sea and nuclear employment requirements, increase risk in force survivability, and limit flexibility in response to an uncertain strategic future. Our assessment is the program of record, 12 SSBNs with 16 missile tubes each, provides the best balance of performance, flexibility, and cost meeting commander's requirements while supporting the Nation's strategic deterrence mission goals and objectives.
>
> The classified annex contains detailed analysis that is not releasable to the public.

Likelihood That Navy Will Reach $4.9 Billion Target Cost

Another oversight issue for Congress is the likelihood that the Navy will be able to achieve DOD's goal of reducing the average unit procurement cost of boats 2-12 in the program to $4.9 billion each in FY2010 dollars. As mentioned earlier, as of early 2011, the Navy estimated that its cost-reduction efforts had reduced the average unit procurement cost of boats 2-12 to $5.6 billion each in FY2010 dollars, leaving another $700 million or so in cost reduction to reach the $4.9 billion target cost.

Measures that the Navy has taken to reduce the average unit procurement cost of boats 2-12 to about $5.6 billion include, among other things, reducing the number of SLBM launch tubes

from 20 to 16, and making the launch tubes no larger in diameter than those on the Ohio-class design. The Navy is examining potential further measures to bring the cost of boats 2-12 closer to the $4.9 billion target cost. An October 19, 2012, press report quoted Rear Admiral David Johnson, the Program Executive Officer for Submarines, as stating that in achieving the additional $700 million reduction in per-boat procurement cost, "I think one of the biggest effectors we can do is buying the ship smartly.... We can probably get somewhere in the range of $300 million-plus per ship out [of the estimated cost], just by buying the ships smartly, encouraging a long production run in industry and the vendor base."

Potential oversight questions include the following:

- How did DOD settle on the figure of $4.9 billion in FY2010 dollars as the target average unit procurement cost for boats 2-12 in the program? On what analysis was the selection of this figure based?
- How difficult will it be for the Navy to reach this target cost? What options is the Navy examining to achieve the additional $700 million or so in unit procurement cost savings needed to reach it?
- Would a boat costing $4.9 billion have sufficient capability to perform its intended missions?
- What, if anything, does DOD plan to do if the Navy is unable to achieve the $4.9 billion target cost figure? If $4.9 billion is the target figure, is there a corresponding *ceiling* figure higher than $4.9 billion, above which DOD would not permit the Ohio replacement program to proceed? If no such figure exists, should DOD establish one?

Accuracy of Navy's Estimated Unit Procurement Cost

Another oversight issue for Congress concerns the accuracy of the Navy's estimate of the procurement cost of each SSBN(X). The accuracy of the Navy's estimate is a key consideration in assessing the potential affordability of the Ohio replacement program, including its potential impact on the Navy's ability to

procure other kinds of ships during the years of SSBN(X) procurement. Some of the Navy's ship designs in recent years, such as the GERALD R. FORD (CVN- 78) class aircraft carrier, the SAN ANTONIO (LPD-17) class amphibious ship and the Littoral Combat Ship (LCS), have proven to be substantially more expensive to build than the Navy originally estimated.

The accuracy of the Navy's estimate can be assessed in part by examining known procurement costs for other recent Navy submarines—including VIRGINIA (SSN-774) class attack submarines (which are currently being procured), SEAWOLF (SSN-21) class attack submarines (which were procured prior to the Virginia class), and Ohio (SSBN-726) class ballistic missile submarines—and then adjusting these costs for the Ohio replacement program so as to account for factors such as differences in ship displacement and design features, changes over time in submarine technologies (which can either increase or reduce a ship's procurement cost, depending on the exact technologies in question), advances in design for producibility (i.e., design features that are intended to make ships easier to build), advances in shipyard production processes (such as modular construction), and changes in submarine production economies of scale (i.e., changes in the total number of attack submarines and ballistic missile submarines under construction at any one time).

The Navy's estimated unit procurement cost for the program at any given point will reflect assumptions on, among other things, which shipyard or shipyards will build the boats, and how much Virginia-class construction will be taking place in the years when SSBN(X)s are being built. Changing the Navy's assumption about which shipyard or shipyards will build SSBN(X)s could reduce or increase the Navy's estimated unit procurement cost for the boats. If shipbuilding affordability pressures result in Virginia-class boats being removed from the 30-year shipbuilding plan during the years of SSBN(X) procurement, the resulting reduction in submarine production economies of scale could make SSBN(X)s more expensive to build than the Navy estimates.

A July 2012 Congressional Budget Office (CBO) report on the cost of the Navy's shipbuilding programs stated (with cost figures expressed in constant FY2012 dollars):

> The design, cost, and capabilities of the SSBN(X)—the submarine slated to replace the Ohio class—are among the most significant uncertainties in the Navy's and CBO's analyses of future shipbuilding....
>
> The recent cost history of the program illustrates the uncertainty. The Navy's [FY]2007 and [FY]2008 shipbuilding plans included an assumption that the first SSBN(X) would cost $4.8 billion (in 2012 dollars) and that subsequent ships in the class would cost $3.6 billion apiece. The [FY]2012 plan, in contrast, estimated the costs of the SSBN(X) class at an average of $6.5 billion, which was down from an estimated $7.7 billion apiece under the 2011 plan. That cost history highlights the uncertainty that remains in determining how much a future class of SSBNs will cost....
>
> The Navy currently estimates the cost of the lead SSBN(X) at $11.7 billion. The average cost of follow-on ships is $6.0 billion, and the Navy has stated an objective of reducing that cost to $5.0 billion. All told, the Navy estimates that building 12 of the submarines will cost $78 billion, or an average of $6.5 billion each.
>
> In comparison, CBO estimates that the lead SSBN(X) will cost $13.3 billion on the basis of its scheduled purchase in [FY]2021. Estimating the cost of the first submarine of a class is particularly difficult because it is not clear how much the Navy will need to spend on nonrecurring engineering and detail design. The Navy spent about $2 billion on those items for the lead Virginia class attack submarine. The historical track record for the lead ship of new classes of submarines in the 1970s and 1980s indicates

that there is little difference in those items on a per-ton basis between a lead attack submarine and a lead SSBN. In addition, CBO assumed that the cost of nonrecurring items is proportional to the weight of submarines. Therefore, CBO estimated that nonrecurring items would cost about $5 billion for the lead SSBN(X), which will be approximately the size of an Ohio class submarine and thus about 2½ times the size of a Virginia class submarine. The Navy's estimate for the lead SSBN(X) reflects the fact that the service estimates that nonrecurring costs will be $4.5 billion.

Overall, 12 SSBN(X)s would cost a total of about $90 billion in CBO's estimation, or an average of $7.5 billion each. That average includes the $13.3 billion estimated cost of the lead ship and a $7.0 billion average estimated cost for the 2nd through 12th ships. Research and development would cost an additional $10 billion to $15 billion, for a total program cost of $100 billion to $110 billion. (Note that CBO's estimate under the [FY]2012 plan was an average of $7.4 billion per submarine; the estimate for the [FY]2013 plan is higher primarily because the purchases occur two years later than under the [FY]2012 plan, thus incurring two additional years of cost growth.)

Program Affordability and Impact on Other Navy Shipbuilding Programs

Another oversight issue for Congress concerns the prospective affordability of the Ohio replacement program and its potential impact on funding available for other Navy shipbuilding programs. Even with the Navy's current effort to reduce the estimated unit procurement cost of the SSBN(X) toward DOD's target figure, observers are concerned that the Ohio replacement program could crowd out funding for other Navy shipbuilding programs in the 2020s and early 2030s. The Navy's March 2012

report on its FY2013 30-year (FY2013-FY2042) shipbuilding plan acknowledges the issue, stating:

> This high cost for replacing the nation's secure, second-strike nuclear deterrent force will have a disproportionate impact on DoN [Department of the Navy] shipbuilding plans and associated costs throughout the mid-term planning period [FY2023-FY2032] and into the early years of the far-term planning period [FY2033-FY2042]....
>
> Obviously, spending $5-6B [billion] per year for a single ship over a 10 to 12-year period will strain the DoN's yearly shipbuilding accounts, since the Department must continue to build other ships through this period to maintain the overall battle force inventory at about 300 ships.

An October 19, 2012, press report stated:

> The Navy admiral overseeing submarine construction said Thursday [October 18] that if the price tag for building the newest vessels remains where it is today, there will have to be cutbacks to the Virginia-class [attack submarine] program.
>
> Newport News Shipbuilding and General Dynamics Electric Boat, along with the Navy, have already brought down the cost to build Virginia-class fast-attack subs and are in the process of doubling their production, from one sub a year to two.
>
> But when another program to replace the nation's aging fleet of Ohio-class ballistic missile subs ramps up, there won't be as much money to go around.
>
> "I don't think we get Virginia and Ohio replacement at the same time if we don't continue to press down on the cost of Virginia and keep pressing on the cost of Ohio re-

placement," said Rear Adm. David Johnson, who spoke to reporters at the Naval Submarine League's annual symposium just outside of Washington, D.C.

A March 2012 GAO report assessing major DOD weapon acquisition programs states:

> Affordability has been an early focus of the [Ohio Replacement (OR)] program. Due to its high cost, Navy officials have stated the OR program could stress Navy shipbuilding budgets in the 2020 to 2030 time frame. Program officials stated that they are trying to reduce the average procurement unit cost from an estimated $5.6 billion to $4.9 billion (in fiscal year 2010 dollars). The program is considering procuring OR [boats] as part of a block buy with the Virginia-class [attack] submarine to reduce procurement costs by an estimated 13 percent, and is lining up its production schedule to match that program in case this option is pursued. The Navy also decided to use 16 87-inch diameter tubes per submarine, which, while fewer than the Ohio-class, is expected to reduce costs while meeting the anticipated future strategic requirement based on arms reduction trends. According to the [OR] program [office], a four-way competition is ongoing to develop prototype tubes and efficient manufacturing processes for outfitting these tubes into the hull, including the use of a "quad pack" configuration that could reduce cost and construction time....
>
> [OR] Program officials said they plan to have the three-dimensional design [for the boat] complete prior to starting construction on the lead ship to minimize rework, delays, and the potential for cost growth.

A December 3, 2012, press report stated:

> The Navy is looking at a range of solutions to funding the expensive SSBN(X) Ohio-class replacement program in the coming years—including the possibility of buying other ships earlier to free up funds later on, the Navy's resources chief said last week....
>
> Service officials are mulling the option of buying some ships earlier to free up money once the Navy needs to start allocating funds for SSBN(X), Vice Adm. Terry Blake, deputy chief of naval operations for the integration of capabilities and resources (N8), said at a Nov. 27 Surface Navy Association luncheon.

In addition to making further changes and refinements in the design of the SSBN(X), options for reducing the cost of the Ohio replacement program and the program's potential impact on funding available for other Navy shipbuilding programs include the following:

- reducing the planned number of SSBN(X)s;
- altering the schedule for procuring the SSBN(X)s so as to create additional opportunities for using incremental funding for procuring the ships; and
- funding the procurement of SSBN(X)'s outside the Navy's shipbuilding budget.

Each of these options is discussed below.

Reducing the Planned Number of SSBN(X)s

Some observers over the years have advocated or presented options for an SSBN force of fewer than 12 SSBNs. CBO, for example, has at times in the past presented options for reducing the SSBN force to 10 boats as a cost-reduction measure. A June 2010 report by a group known as the Sustainable Defense Task Force recommends reducing the SSBN force to seven boats; a

September 2010 report from the Cato Institute recommends reducing the SSBN force to six boats.

Views on whether a force of fewer than 12 SSBN(X)s would be adequate could depend on, among other things, assessments of strategic nuclear threats to the United States and the role of SSBNs in deterring such threats as a part of overall U.S. strategic nuclear forces, as influenced by the terms of strategic nuclear arms control agreements. Reducing the number of SSBNs below 12 could also raise a question as to whether the force should continue to be homeported at both Bangor, WA, and Kings Bay, GA, or consolidated at a single location.

U.S. strategic nuclear deterrence plans require a certain number of strategic nuclear warheads to be available for use on a day-to-day basis. After taking into account warheads on the other two legs of the strategic nuclear triad, as well as the number of warheads on an SSBN's SLBMs, this translates into a requirement for a certain number of SSBNs to be on station (i.e., within range of expected targets) in Pacific and Atlantic waters at any given moment. The SSBN force is sized to support this requirement. Given the time needed for at-sea training operations, restocking SSBNs with food and other consumables, performing maintenance and repair work on the SSBNs, and transiting to and from deterrent patrol areas, only a fraction of the SSBN force can be on patrol at any given moment. The Navy's position is that the requirement for having a certain number of SSBNs on patrol at any given moment translates into a need for a force of 14 Ohio-class boats, and that this requirement can be met in the future by a force of 12 SSBN(X)s.

Altering Procurement Schedule to Make More Use of Incremental Funding

Another option for managing the potential impact of the Ohio replacement program on other Navy shipbuilding programs would be to stretch out the schedule for procuring SSBN(X)s and make greater use of split funding (i.e., two-year incremental funding) in procuring them. This option would not reduce the total procurement cost of the Ohio replacement program—to the contrary, it

might increase the program's total procurement cost somewhat by reducing production learning curve benefits in the Ohio replacement program. This option could, however, reduce the impact of the Ohio replacement program on the amount of funding available for the procurement of other Navy ships in certain individual years. This might reduce the amount of disruption that the Ohio replacement program causes to other shipbuilding programs in those years, which in turn might avoid certain disruption-induced cost increases for those other programs. The annual funding requirements for the Ohio replacement program might be further spread out by funding some of the SSBN(X)s with three- or four-year incremental funding.

Table 4 shows the Navy's currently planned schedule for procuring 12 SSBN(X)s and a notional alternative schedule that would start two years earlier and end two years later than the Navy's currently planned schedule. Although the initial ship in the alternative schedule would be procured in FY2019, it could be executed as it if were funded in FY2021. Subsequent ships in the alternative schedule that are funded earlier than they would be under the Navy's currently planned schedule could also be executed as if they were funded in the year called for under the Navy's schedule. Congress in the past has funded the procurement of ships whose construction was executed as if they had been procured in later fiscal years. The ability to stretch the end of the procurement schedule by two years, to FY2035, could depend on the Navy's ability to carefully husband the use of the nuclear fuel cores on the last two Ohio-class SSBNs, so as to extend the service lives of these two ships by one or two years. Alternatively, Congress could grant the Navy the authority to begin construction on the 11th boat a year before its nominal year of procurement, and the 12th boat two years prior to its nominal year of procurement.

Table 4. Navy SSBN(X) Procurement Schedule and a Notional Alternative Schedule

Fiscal year	Navy's Schedule	Boat might be particularly suitable for 2-, 3-, or 4-year incremental funding	Notional alternative schedule	Boat might be particularly suitable for 2-, 3-, or 4-year incremental funding
2019			1	X
2020				
2021	1	X	1	X
2022				
2023			1	X
2024	1	X		
2025			1	X
2026	1			
2027	1		1	
2028	1		1	
2029	1		1	
2030	1		1	
2031	1		1	X
2032	1			
2033	1	X	1	X
2034	1	X		
2035	1	X	1	X
2036				
2037			1	X
Total	12		12	

Source: Navy's current plan is taken from the Navy's FY2013 budget submission. Potential alternative plan prepared by CRS.

Notes: Notional alternative schedule could depend on Navy's ability to carefully husband the use of the nuclear fuel cores on the last two Ohio-class SSBNs, so as to extend the service lives of these two ships by one or two years. Alternatively, Congress could grant the Navy the authority to begin construction on the 11th boat a year before its nominal year of procurement, and the 12th boat two years prior to its nominal year of procurement. Under Navy's schedule, the boat to be procured in FY2033 might be particularly suitable for 4-year incremental funding, and boat to be procured in FY2034 might be particularly suitable for 3- or 4-year incremental funding.

A December 19, 2011, press report states:

> The Office of Management and Budget's Nov. 29[, 2011,] passback memorandum to the Defense Department [regarding the FY2013 DOD budget] warns that the effort to build replacements for aging Ohio-class submarines is not exempt from rules requiring each new vessel to be fully funded in a single year....
>
> Spreading the cost of a big-ticket ship over more than one year—an approach referred to as "incremental funding"—is only allowed when a program meets three criteria, OMB writes....

"OMB does not anticipate that the OHIO Replacement program will meet these criteria," the passback memo states.

Procuring SSBN(X)s Outside Navy's Shipbuilding Budget

Some observers have suggested funding the procurement of SSBN(X)s outside the Navy's shipbuilding budget, so as to preserve Navy shipbuilding funds for other Navy shipbuilding programs. Among those who have raised this idea was Admiral Gary Roughead, the Chief of Naval Operations (CNO) until September 2011. There would be some precedent for such an arrangement:

- DOD sealift ships and Navy auxiliary ships are funded in the National Defense Sealift Fund (NDSF), a part of DOD's budget that is outside the Shipbuilding and Conversion, Navy (SCN) appropriation account, and also outside the procurement title of the DOD appropriations act.
- Most spending for ballistic missile defense (BMD) programs (including procurement-like activities) is funded through the Defense-Wide research and development account rather than through the research and development and procurement accounts of the individual military services.

A rationale for funding DOD sealift ships in the NDSF is that DOD sealift ships perform a transportation mission that primarily benefits services other than the Navy, and therefore should not be forced to compete for funding in a Navy budget account that funds the procurement of ships central to the Navy's own missions. A rationale for funding BMD programs together in the Defense-Wide research and development account is that this makes potential tradeoffs in spending among various BMD programs more visible and thereby helps to optimize the use of BMD funding.

As a reference tool for better understanding DOD spending, DOD includes in its annual budget submission a presentation of the DOD budget reorganized into 11 program areas, of which one

is strategic forces. The FY2013 budget submission, for example, shows that the strategic forces program area received about $12.1 billion in funding in FY2012, and that about $10.8 billion is requested for the program area for FY2013.

Supporters of funding the procurement of SSBN(X)s outside the Navy's shipbuilding budget might argue that this could help protect funding for other Navy shipbuilding programs. They could also argue that creating a new budget account for strategic nuclear forces of all kinds could help DOD better view potential tradeoffs in spending for various strategic nuclear forces programs and thereby help DOD better optimize the use of strategic forces funding.

Skeptics of funding the procurement of SSBN(X)s outside the Navy's shipbuilding budget could argue that it might do little to protect funding for other Navy shipbuilding programs, because if DOD were to move the SSBN(X)s out of the Navy's shipbuilding budget, DOD might also remove the funding that was there for the SSBN(X)s. They might also argue that shifting SSBN(X)s out of the Navy's shipbuilding budget would make it harder to track and maintain oversight over Navy shipbuilding activities, and that creating a new budget account for strategic nuclear forces of all kinds could endanger the Ohio replacement program by making it more visible to those who might support reduced spending on nuclear-weapon-related programs.

A March 11, 2010, press report stated: "The massive cost of replacing the Navy's nuclear ballistic missile submarines will be shouldered in the coming years by diverting funds from other naval and Pentagon programs and perhaps by boosting the defense budget, but the program should not get its own special funding stream, according to Deputy Defense Secretary William Lynn."

A March 28, 2011, press report stated that SSBN(X)s

> will be funded within the shipbuilding account, not in a separate account as the sea service's top admiral has advocated, according to Pentagon acquisition chief Ashton Carter.

> "It's been in the shipbuilding account and our plan is it's going to stay in the shipbuilding account," Carter told Inside the Pentagon March 21 in a brief interview. "We just have to make it so that it is digestible for the Navy in the context of other shipbuilding needs. And we want the same things they want. We can manage through that path for decades."

At an April 13, 2011, hearing on DOD acquisition before the Defense subcommittee of the House Appropriations Committee, the following exchange took place:

> REPRESENTATIVE CRENSHAW: Dr. Carter, I want to ask about Abrams tanks, kind of the modification of the start and stop. But – but real quick, we – we talked about the ballistic missiles submarines and was encouraged to hear that we've got a handle on the cost. We spent a lot of money on the development. I think we start construction in 2019.
>
> But even—even if we—you end up with a boat that costs $5 billion and we have 12 of those, that's $60 billion. And we talked about the difficult choices that's going to present in terms of surface ships, I just want to pose the question, if—is it under consideration to consider those submarines like a national asset?
>
> For instance, we—we fund the ballistic missile defense outside of the budget of the services because it's truly a national asset. And I wondered, it's a lot of money. And—and it's—those—those submarines are one-third of our nuclear triad. Is consideration being given to consider those being funded as a national asset outside the shipbuilding program which would take away some of the difficult choice in terms of the surface ships versus the submarines?

ASHTON CARTER, UNDER SCRETARY OF DEFENSE FOR ACQUISITON, TECHNOLOLGY, AND LOGISTICS: The—the best I can do is cite something that Secretary Gates said which is that he had considered that, then was not attracted to that idea. I'm paraphrasing, but I think their basic reason was, "Look, the money is going to show up somewhere anyway. And we're not going to hide $60 billion by re-labeling. So, let's keep it in a way we've—we've done it."

And I think it was the gist of the secretary's response. So—so, Secretary Gates had considered it and was not attracted to the idea. Although he – he thoroughly recognizes the premise of your question which is there's a lot of money. And as a practical matter it will compete with those things in the defense budget.

And that's one of the reasons why we've got to get the cost down.

An August 1, 2011, press report stated:

[Admiral Jonathan Greenert, who became the Chief of Naval Operations in September 2011, told] Sen. Jack Reed (D-R.I.) discussions are still underway in the Pentagon to have the defense-wide budget share with the Navy some of the costs of the Ohio-class SSBN(X) next- generation ballistic missile submarine, which is projected to dominate the Navy's shipbuilding budget starting at the end of this decade. "If confirmed, I intend to try to continue those discussions," Greenert [said] during his confirmation hearing. "In the [2020s], we have a phenomenon, an unfortunate one, where many of the ships built in the [1980s] will now come due for retirement. That's right when the Ohio replacement comes in. So we'll work very hard to make sure we got the requirements right. We'll work very hard with the acquisition community to drive that cost down but we may even so need some assistance,

I believe, in the shipbuilding budget if we're going to meet our goals."

At a March 29, 2012, hearing before the Senate Armed Services Committee to consider the nominations of several people for various DOD positions, the following exchange occurred:

SENATOR JACK REED: Secretary Kendall, one of the issues that we have talked about is the nuclear infrastructure to create and maintain nuclear devices. There is another big part of that. That is the delivery platforms. And where you are facing a significant set of challenges, the lead procurement item is the Ohio class replacement submarine, but the Air Force is talking about the need ultimately to replace their fleet. You have to make, I presume, improvements in ground-based systems.

When the services look individually at the cost—and I have got more fidelity with respect to the Navy—these are very, very expensive platforms. They crowd out spending for other necessary ships in the Navy's case. And I think there is a very compelling case because this is a strategic issue that the services alone should not fundamentally share the burden, that in fact there has to be some DOD defense money because of the strategic nature committed to help the services. And I think the most immediate situation is in the Navy.

Can you reflect on that and share your views?

Mr. FRANK KENDALL III. Yes, Senator Reed. The Department [of Defense] basically builds its budget as a budget for the entire Department, and we do make trade-offs that sometimes cut across the Services [sic] lines in order to do that. Last fall, what we went through was a period where we formulated the strategy, the Strategic Guidance that we published, and that was used to guide

the budget process. So that was all done with regard to priorities to support the strategy. It was not about the service portfolio specifically. At the end, we came to a decision about the best mix of systems to do that, and we tried to take into account the long-term issues that you alluded to which include the 30-year shipbuilding plan which we just sent over which does show that the Ohio replacement does add substantially to that account. We are going to have to find some other way besides the shipbuilding account obviously to pay that bill.

We have put cost caps on both the SSBN-X, the Ohio replacement, and on the new bomber in order to try to control the costs and keep them within an affordable range. But there is going to be a challenge to us to do this, and it has to be done on a defense-wide DOD basis.

Construction Shipyard(s)

Another potential issue for Congress regarding the Ohio replacement program is which shipyard or shipyards would build SSBN(X)s. Two U.S. shipyards are capable of building nuclear-powered submarines—General Dynamics' Electric Boat Division (GD/EB) of Groton, CT, and Quonset Point, RI, and Newport News Shipbuilding (NNS), of Newport News, VA, which forms part of Huntington Ingalls Industries (HII). GD/EB's primary business is building nuclear-powered submarines; it can also perform submarine overhaul work. NNS's primary lines of business are building nuclear-powered aircraft carriers, building nuclear-powered submarines, and performing overhaul work on nuclear-powered aircraft carriers.

Table 5 shows the numbers of SSBNs built over time by GD/EB, NNS, and two government- operated naval shipyards (NSYs)—Mare Island NSY, located in the San Francisco Bay area, and Portsmouth NSY of Portsmouth, NH, and Kittery, ME. Mare Island NSY is no longer in operation. NSYs have not built new Navy ships since the early 1970s; since that time, they have focused solely on overhauling and repairing Navy ships.

As can be seen in the table, the Ohio-class boats were all built by GD/EB, and the three previous SSBN classes were built partly by GD/EB, and partly by NNS. GD/EB was the builder of the first boat in all four SSBN classes. The most recent SSBNs built by NNS were the George C. Marshall (SSBN-654) and George Washington Carver (SSBN-656), which were Lafayette/Benjamin Franklin-class boats that were procured in FY1964 and entered service in 1966.

Table 5. Construction Shipyards of U.S. SSBNs

	George Washington (SSBN-598) class	Ethan Allen (SSBN-608) class	Lafayette/ Benjamin Franklin (SSBN-616/640) class	Ohio (SSBN-726) class
Fiscal years procured	FY58-FY59	FY59 and FY61	FY61-FY64	FY77-FY91
Number built by GD/EB	2	2	13	18
Number built by NNS	1	3	10	
Number built by Mare Island NSY	1		6	
Number built by Portsmouth NSY	1		2	
Total number in class	5	5	31	18

Source: Prepared by CRS based on data in Norman Polmar, *The Ships and Aircraft of the U.S. Fleet*, Annapolis, Naval Institute Press, various editions. NSY means naval shipyard.

Notes: GD/EB was the builder of the first boat in all four SSBN classes. The George Washington-class boats were procured as modifications of SSNs that were already under construction. A total of 18 Ohio-class SSBNs were built; the first four were converted into SSGNs in 2002-2008, leaving 14 in service as SSBNs.

There are at least five basic possibilities for building SSBN(X)s:

- **build all SSBN(X)s at GD/EB**—the approach that was used for building the Ohio-class SSBNs;
- **build all SSBN(X)s at NNS;**
- **build some SSBN(X)s GD/EB and some at NNS**—the approach that was used for building the George Washington-, Ethan Allen-, and Lafayette/Benjamin Franklin-class SSBNs;
- **build each SSBN(X) jointly at GD/EB and NNS, with final assembly of the boats alternating between the yards**—the approach currently being used for building Virginia-class SSNs; and

- **build each SSBN(X) jointly at GD/EB and NNS, with one yard—either GD/EB or NNS—performing final assembly on every boat.**

In assessing these five approaches, policymakers may consider a number of factors, including their potential costs, their potential impacts on employment levels at GD/EB and NNS, and the relative value of preserving SSBN-unique construction skills (such as those relating to the construction and installation of SLBM compartments) at one shipyard or two. The relative costs of these five approaches could depend on a number of factors, including the following:

- each yard's share of SSBN(X) production work (if both yards are involved);
- the number of SSNs procured during the years of SSBN(X) procurement (which can affect economies of scale in submarine production);
- whether the current joint-production arrangement for the Virginia class remains in effect during those years; and
- the volume of non-submarine-construction work performed at the two shipyards during these years, which would include in particular aircraft carrier construction and overhaul work at NNS.

A January 12, 2011, press report stated:

> While the [SSBN(X)] submarine-building contracts would likely be competitively bid, [Electric Boat President John] Casey says he doubts any other company—even its attack-submarine-building partner Northrop Grumman [now NNS]—can secure the work. Electric Boat built the existing Ohio-class fleet.
>
> "We have every intention of building every one of those ships," he says. "There's no one else [who was] involved in designing and building that [Ohio-class] platform. It's up to us to convince people we can do it at the right price."

NAVY FORCE STRUCTURE AND SHIPBUILDING PLANS: BACKGROUND AND ISSUES FOR CONGRESS

Excerpted from a Congressional Reference Service Report

by Mr. Ron O'Rourke
Specialist in Naval Affairs

Summary

The planned size of the Navy, the rate of Navy ship procurement, and the prospective affordability of the Navy's shipbuilding plans have been matters of concern for the congressional defense committees for the past several years.

In February 2006, the Navy presented to Congress a goal of achieving and maintaining a fleet of 313 ships, consisting of certain types and quantities of ships. On March 28, 2012, the Department of Defense (DOD) submitted to Congress an FY2013 30-year (FY2013-FY2042) shipbuilding plan that includes a new goal for a fleet of about 310-316 ships. The Navy is conducting a force structure assessment, to be completed later this year, that could lead to a refinement of this 310-316 ship plan.

The Navy's proposed FY2013 budget requests funding for the procurement of 10 new battle force ships (i.e., ships that count against the 310-316 ship goal). The 10 ships include one Gerald R. Ford (CVN-78) class aircraft carrier, two Virginia-class attack submarines, two DDG-51 class Aegis destroyers, four Littoral Combat Ships (LCSs), and one Joint High Speed Vessel (JHSV). These ships are all funded through the Shipbuilding and Conversion, Navy (SCN) account.

The FY2013-FY2017 five-year shipbuilding plan contains a total of 41 ships—14 ships, or about 25%, less than the 55 ships in the FY2012 five-year (FY2012-FY2016) shipbuilding plan, and 16 ships, or about 28%, less than the 57 ships that were planned for FY2013-FY2017 under the FY2012 budget. Of the 16 ships no longer planned for FY2013-FY2017, nine were eliminated from the Navy's shipbuilding plan and seven were deferred to years beyond FY2017. The nine ships that were eliminated were eight

Joint High Speed Vessels (JHSVs) and one TAGOS ocean surveillance ship. The seven ships deferred beyond FY2017 were one Virginia-class attack submarine, two LCSs, one LSD(X) amphibious ship, and three TAO(X) oilers. The Navy's proposed FY2013 budget also proposes the early retirement of seven Aegis cruisers and the placement into Reduced Operating Status (ROS) of two LSD-type amphibious ships.

The Navy's FY2013 30-year (FY2013-FY2042) shipbuilding plan, which was submitted to Congress on March 28, 2012 (more than a month after the submission of the FY2013 budget on February 13, 2012), does not include enough ships to fully support all elements of the Navy's 310-316 ship goal over the long run. The Navy projects that the fleet would remain below 310 ships during the entire 30-year period, and experience shortfalls at various points in ballistic missile submarines, cruisers-destroyers, attack submarines, and amphibious ships. The projected cruiser-destroyer and attack submarine shortfalls are smaller than they were projected to be under the FY2012 30-year (FY2012-FY2041) shipbuilding plan, due in part to a reduction in the cruiser-destroyer force-level goal and the insertion of additional destroyers and attack submarines into the FY2013 30-year plan.

In its July 2012 report on the cost of the FY2013 30-year shipbuilding plan, the Congressional Budget Office (CBO) estimates that the plan would cost an average of $20.0 billion per year in constant FY2012 dollars to implement, or about 19% more than the Navy estimates. CBO's estimate is about 11% higher than the Navy's estimate for the first 10 years of the plan, about 13% higher than the Navy's estimate for the second 10 years of the plan, and about 33% higher than the Navy's estimate for the final 10 years of the plan. Some of the difference between CBO's estimate and the Navy's estimate, particularly in the latter years of the plan, is due to a difference between CBO and the Navy in how to treat inflation in Navy shipbuilding.

CRS REPORT: STRATEGIC NUCLEAR FORCES—EXTRACT

Ms. Amy F. Woolf
Specialist in Nuclear Weapons Policy

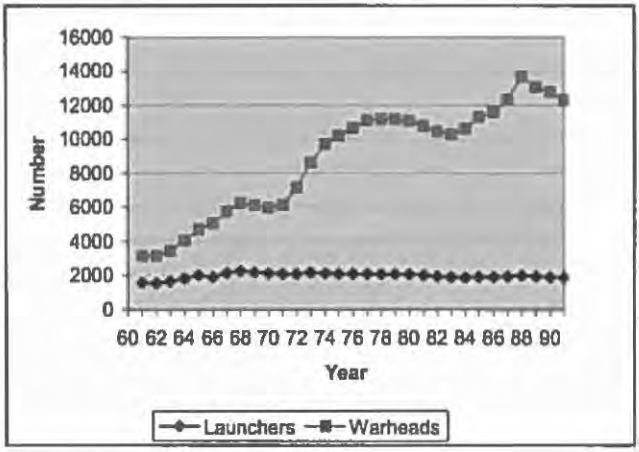
Issues for Congress

This report focuses on the numbers and types of weapons in the U.S. strategic nuclear force structure. It does not address the broader question of why the United States chooses to deploy these numbers and types of weapons, or more generally, the role that U.S. nuclear weapons play in U.S. national security strategy. This question is addressed in other CRS reports. However, as the Obama Administration reviews and possibly revises the plans for U.S. nuclear force structure, Congress could address broader questions about the relationship between these forces and the role of nuclear weapons.

Force Size

The Bush Administration argued that, because the United States and Russia are no longer enemies, the United States would not size or structure its nuclear forces simply to deter the "Russian threat." Instead, nuclear weapons would play a broader role in U.S. national security strategy. The Obama Administration, in contrast, noted that there is a relationship between the size of the U.S. arsenal and the size of the Russian arsenal. The 2010 NPR states that Russia's nuclear force will remain a significant factor in determining how much and how fast we are prepared to reduce U.S. forces. Because of our improved relations, the need for strict numerical parity between the two countries is no longer as compelling as it was during the Cold War. But large disparities in nuclear capabilities could raise concerns on both sides and among U.S. allies and partners, and may not be conducive to maintaining a stable, long-term strategic relationship, especially as nuclear forces are significantly reduced.

Figure 1. U.S. Strategic Nuclear Weapons: 1960-1990



Source: Natural Resources Defense Council, Archive of Nuclear Data.

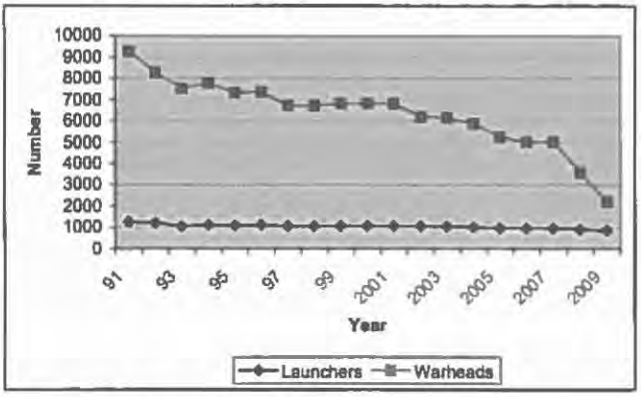
The Bush Administration's 2001 Nuclear Posture Review determined that the United States would need to maintain between 1,700 and 2,200 operationally deployed nuclear warheads. The Bush Administration also indicated that the United States would maintain in storage many of the warheads removed from deployed forces, and would maintain the capability to restore some of these warheads to the deployed forces to meet unexpected contingencies. The Obama Administration concluded that the United States could reduce its forces to 1,550 deployed warheads, and agreed to do so under the New START Treaty, but it also plans to retain the capability to restore warheads to its deployed forces. It also plans to retain many warheads in storage, although it has indicated that the size of the total stockpile could decline as the United States reduces its deployed forces to the New START limits.

The Obama Administration has indicated that the United States may be able to reduce its numbers of deployed and nondeployed warheads further, but that it should do so in parallel with Russia. It indicated, in the 2010 NPR, that "large disparities in nuclear capabilities could raise concerns on both sides and among U.S. allies and partners, and may not be conducive to

maintaining a stable, long-term strategic relationship." The Department of Defense is currently conducting a new study, as a follow-up to the NPR, to determine how deeply the United States might reduce its forces, and how it should deploy the remaining forces.

Press reports indicate the Pentagon is reviewing a number of alternatives in this study, including one that would reduce U.S. nuclear weapons to between 1,000 and 1,100 warheads, one that would reduce it to between 700 and 800 warheads, and one that would reduce it to between 300 and 400 warheads. According to Secretary of Defense Panetta, the planned New START force structure, with 1,550 warheads, is also an option for the future. In addition, according to the press reports, the United States would pursue these reductions through an arms control agreement with Russia, they would not come through unilateral cuts in the U.S. arsenal. When the study is complete, the Pentagon will present the alternatives to the President for his decision.

Figure 2. U.S. Strategic Nuclear Forces: 1991-2010



Source: Natural Resources Defense Council, Archive of Nuclear Data.

Some analysts have questioned why the United States must maintain such a large force of nuclear weapons. They have questioned whether the United States would attack with such a large number of weapons if its own national survival were not at risk, and they note that only Russia currently has the capability to threaten U.S. national survival. They assert that the United States could likely meet any other potential contingency with a far smaller force of nuclear weapons. Some have concluded, instead, that the United States also could maintain its security with a force of between 500 and 1,000 warheads. Others, however, dispute this view and note that the United States has other potential adversaries, and, even if these nations do not possess thousands of nuclear warheads, some may expand their nuclear forces or chemical and biological capabilities in the future. Some have argued that the also needs to assure its allies of its commitment to their security, and this goal could require a force of significant size, regardless of the number of potential targets an adversary nation might possess.

Force Structure

When the Bush Administration announced the results of the 2001 Nuclear Posture Review, it indicated that the United States would retain a triad of ICBMs, SLBMs, and heavy bombers for the foreseeable future. The Obama Administration also offered continuing support for the retention of the strategic triad. Nevertheless, as the Obama Administration has outlined plans to modernize and replace the delivery vehicles in all three legs of the strategic triad, many analysts have begun to question whether the United States can afford to retain the triad and whether it can retain a robust deterrent without one of the current types of strategic delivery vehicles.

The Obama Administration indicated, in the 2010 NPR, that the United States would convert some of its bombers to conventional-only missions. This is consistent with the view, among some analysts, that, in the future, the bombers may be more important in the conventional mission. As was noted above, most discussions about the bomber force focus on how many bombers, and what types of bomber weapons, the United States needs to

bolster its conventional long-range strike capability. There is little, if any, discussion about the role that bombers may play in either nuclear deterrence, or, if deterrence fails, in the launch of U.S. nuclear weapons. It is not surprising that some in the Air Force and Pentagon, and some outside government have questioned the continuing need for nuclear-capable bombers.

The Obama Administration has indicated that the United States will retain up to 420 ICBMs under the New START Treaty. Each will be equipped with a single warhead. Analysts have often argued, and the 2010 NPR affirmed, that single-warhead ICBMs bolster crisis stability, and discourage efforts by an adversary to launch a disarming first strike, because the cost of the strike, as measured by the number of attacking warheads, would exceed the benefits, as measured by the number of warheads destroyed. But this calculus is not dependent on the number of ICBMs in the fleet. Moreover, these missiles will remain deployed at three ICBM bases.

Table 1. U.S. Strategic Nuclear Forces Under START I and START II

	Deployed under START I (2001)		Planned for START II	
System	Launchers	Accountable Warheads[a]	Launchers	Accountable Warheads
Minuteman III ICBMs	500	1,200	500	500
Peacekeeper ICBMs	50	500	0	0
Trident I Missiles	168	1,008	0	0
Trident II Missiles	264	2,112	336	1,680
B-52 H Bombers (ALCM)	97	970	76	940
B-52 H Bombers (non-ALCM)	47	47	0	0
B-1 Bombers[b]	90	90	0	0
B-2 Bombers	20	20	21	336
Total	1,237	5,948	933	3,456

a. Under START I, bombers that are not equipped to carry ALCMs count as one warhead, even if they can carry up 16 nuclear bombs; bombers that are equipped to carry ALCMs count as 10 warheads, even if they can carry up to 20 ALCMs.

b. Although they still count under START I, B-1 bombers are no longer equipped for nuclear missions.

The Obama Administration has indicated that it plans to retain 14 Trident submarines, at least through 2015, and then may reduce to 12 submarines. Moreover, the New START Treaty allows the United States to continue to reduce the warheads on each missile. It also allows the United States to eliminate some of the launch tubes by simply removing the gas generators that assist in the launch of the missiles. As a result, the United States will have a significant amount of flexibility in apportioning warheads among its SSBNs, and will almost certainly not have to eliminate any submarines to meet the new START limits. As a result, with its ability to remain invulnerable to detection and attack, and with the increasing accuracy and reliability of its missiles and warheads, the Trident fleet will continue to represent the *backbone* of the U.S. nuclear force.

The United States does not plan to alter the basic structure of its Trident fleet; it will continue to deploy its submarines at two bases, with a portion of the fleet deployed in the Atlantic Ocean and a portion deployed in the Pacific Ocean. However, if the United States reduces the size of its nuclear arsenal significantly below the limits in the New START Treaty, the United States may find it difficult to retain its *triad* of nuclear delivery vehicles. Presidents Obama and Medvedev have pledged to reduce nuclear weapons in a *step-by-step* process, with additional reductions coming in a future treaty. Most analysts who propose deep reductions, to perhaps 1,000 nuclear warheads, readily acknowledge that these reductions could affect the U.S. triad, and support changes in the U.S. force structure.

Table 2. U.S. Strategic Nuclear Forces under New START

Estimated Current Forces and Potential New START Forces

	Estimated Forces, 2010		Possible Forces Under New START, 2017[a]		
	Launchers	Warheads	Total Launchers	Deployed Launchers	Warheads
Minuteman III	450	500	420	400	400
Trident	336	1152	280	240	1090
B-52	76	300	74	42	42
B-2	18	200	18	18	18
Total	880	2152	792	700	1550

Source: CRS estimates.

a. This force assumes that the United States retains 14 Trident submarines with 2 in overhaul. In accordance with the terms of New START, the United States will eliminate 4 launchers on each submarine, so that each counts as only 20 launchers. In this case, the United States could retain 420 total and 400 deployed Minuteman III ICBMs.

Some argue that the United States should retain only the warheads on its Trident submarines. It could convert its bombers to conventional missions and perhaps eliminate its land-based ICBMs. However, the United States might also have to reduce the size of its Trident fleet, from the current 14 submarines to perhaps 8 or 10 submarines, if it reduced to 1,000 warheads. And, with so few submarines, the United States might have to eliminate one of its submarine bases, leaving it with submarines based only in the Atlantic or only in the Pacific Ocean. This change may not be consistent with current submarine operations and employment plans. President Obama and the U.S. military may want to consider the implications of these basing, operational, and policy changes, before deciding whether or not to reduce to 1,000 warheads, as opposed to choosing the warhead number first then deciding later how to base and operate the remaining nuclear forces.

OHIO REPLACEMENT
MEETING AMERICA'S ENDURING REQUIREMENT FOR SEA-BASED STRATEGIC DETERRENCE

Why Recapitalize Our SSBN Force?

"As long as these weapons exist, the United States will maintain a safe, secure, and effective arsenal to deter any adversary, and guarantee that defense to our allies..."

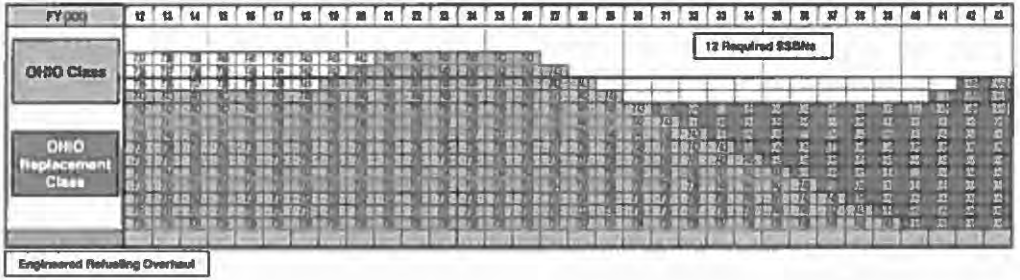
President Obama (April 2010)

- U.S. Strategic Deterrence Promotes Global Stability
  - Deterrence relies on the credible threat to impose unacceptable consequences
  - A survivable deterrent retains the ability to impose unacceptable consequences even after being attacked
  - Reduces the number of nuclear weapons in existence and promotes non-proliferation
- SSBN Force is a reliable and survivable leg of the U.S. nuclear triad
  - 2010 Nuclear Posture Review confirmed the enduring requirements to maintain a secure and survivable sea-based deterrent
  - SSBNs will be responsible for ~70% of deployed nuclear warheads under New START
  - Impeccable record of 142 successful flight tests
- Effective Sea-based Strategic Deterrent
  - Must have adequate range to allow operation far from adversaries, in broad ocean areas to promote survivability
  - Must have requisite stealth into the 2080s regardless of advances made by near-peer navies (stealth enables a smaller force to provide assured response)
  - At-sea SSBN requirements dictated by U.S. Strategic Command

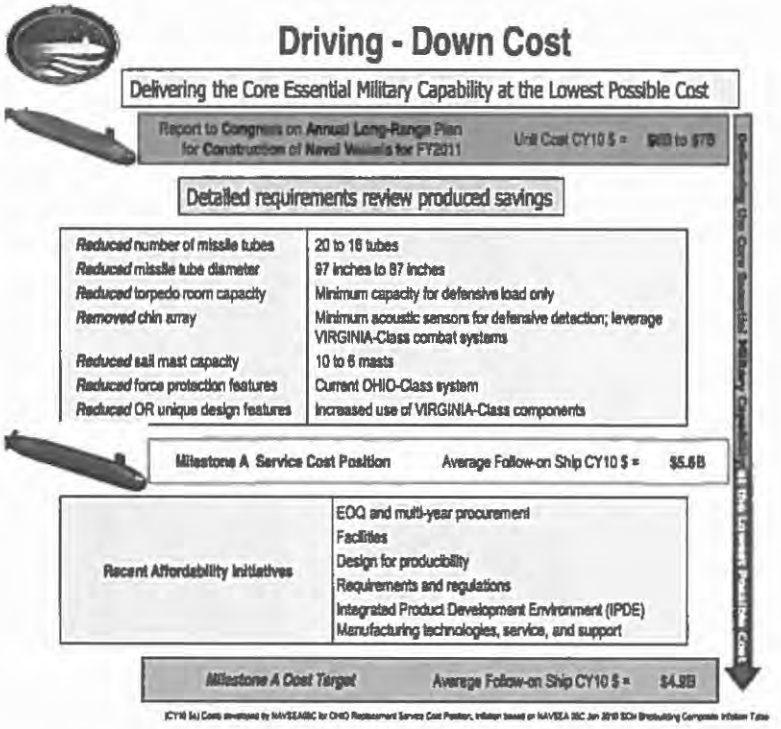
SSBNs provide nation's most survivable nuclear deterrent

Why Now?

- Current OHIO Class is reaching the end of its operational life
  - Designed in 1970, commissioned between 1984 and 1997
  - Operational life already extended from 30 years to an unprecedented 42 years
  - OHIO Class will begin to retire in 2027
- Lead OHIO Replacement (OR) construction must commence in 2021
  - There is no additional margin to further extend OHIO Class
  - Maintains fleet of 10 operational SSBNs through transition with moderate risk
  - 7-year lead ship construction schedule is aggressive
    - Same as VIRGINIA-Class Lead Ship despite twice the displacement
  - Lead ship strategic patrol required by 2031 to avoid gap in strategic deterrent commitments
  - Lead ship unique treaty requirements must be completed
- Common Missile Compartment (CMC) and Strategic Weapons System (SWS) designs synchronized with UK
  - Supports UK continuous at sea deterrence
  - Reduces U.S. development costs

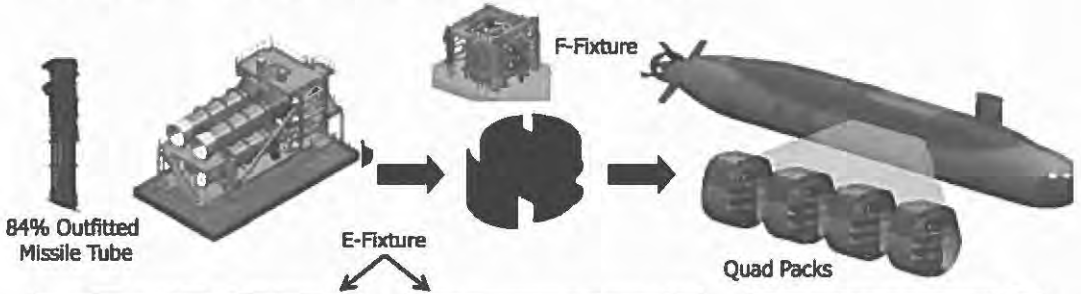



Delivering Required Capability at the Least Cost
Re-host Trident II (D-5)
Most Reliable Strategic Nuclear Weapon System
Strategic Launched Ballistic Missile (SLBM) leg responsible for ~70% of operationally deployed warheads under New START
Long range of D-5 enables operations in broad operational areas, assuring survivability with smaller SSBN force
Leverages D-5 Life Extension and Modernization investments
Avoids cost and risk of new weapon system development
OHIO Replacement
System and Component Reuse
New Development
VIRGINIA Class
OHIO Class
X Stern
Electric Drive


Driving - Down Cost
Delivering the Core Essential Military Capability at the Lowest Possible Cost
Report to Congress on Annual Long-Range Plan for Construction of Naval Vessels for FY2011
Unit Cost CY10 $ = $6B to $7B
Detailed requirements review produced savings
Reduced number of missile tubes
20 to 16 tubes
Reduced missile tube diameter
97 inches to 87 inches
Reduced torpedo room capacity
Minimum capacity for defensive load only
Removed chin array
Minimum acoustic sensors for defensive detection; leverage VIRGINIA-Class combat systems
Reduced sail mast capacity
10 to 6 masts
Reduced force protection features
Current OHIO-Class system
Reduced OR unique design features
Increased use of VIRGINIA-Class components
Milestone A Service Cost Position
Average Follow-on Ship CY10 $ =
$5.6B
Recent Affordability Initiatives
EOQ and multi-year procurement
Facilities
Design for producibility
Requirements and regulations
Integrated Product Development Environment (IPDE)
Manufacturing technologies, service, and support
Milestone A Cost Target
Average Follow-on Ship CY10 $ =
$4.9B

State-of-the-Art Construction Processes Minimize Cost and Save Time

OHIO Replacement "Quad Pack" Construction Process



Reduces missile compartment costs and construction time

Strategic Partnership with UK

- US and UK strategic deterrence cooperation has underpinned UK SSBN systems since the 1963 Polaris Sales Agreement (PSA)
  - UK deploys Trident II (D5) system
  - Missiles shared from a common pool
  - UK SSBN force constitutes 100% of the UK's national nuclear deterrent
- UK VANGUARD-Class SSBN force begins retirements before OHIO Class.
  - UK Successor IOC's in 2028, two years prior to OR IOC
  - Vanguard Class cannot be extended further

Common Missile Compartment
(12 tubes & MCCM Raft)

- Common Missile Compartment (CMC) developed under cost share arrangement
  - UK funded CMC efforts in 2008 to meet UK Successor SSBN schedules
  - CMC designed to be constructed by either nations' submarine build yards
  - Offers cost savings and economic order quantity opportunities
- U.S. committed to meeting UK SUCCESSOR need date (2028)

Common Missile Compartment efforts critical to both U.S. and UK Strategic Deterrence

Why Not Rebuild an OHIO Class?

Advantages:

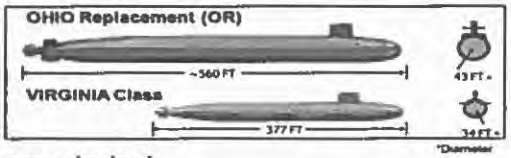
- Lower procurement cost per boat (~10-13% less than new design)
- Lower design cost (~14% less than new design)
- Less technical risk than VIRGINIA-Insert

Disadvantages:

- Vulnerable against projected threats
  - Insufficient stealth at patrol and transit speeds - survivability risk against a committed future adversary
- Requires reconstituting OHIO construction capability
  - OHIO-Class production line shutdown in 1990s
  - Cannot take advantage of modern modular construction techniques
  - Obsolescence issues of legacy OHIO technology necessitates redesign
  - Would require upgrade to meet modern construction requirements (e.g. environmental regulations)

OHIO does not pace expected threats and requires extensive re-design

Why Not Build a VIRGINIA With an Insert?



Advantages:

- Lower procurement cost per boat (~16-17% less than new design)
- Lower design cost (~28% less than new design)
- Leverages ongoing VIRGINIA-Class production line

Disadvantages:

- Largest force structure for equivalent strategic presence – 3 additional platforms required
  - VIRGINIA-Insert variant would require refueling; hull life extension required → increased force structure
  - VIRGINIA Class was not designed with SSBN maintenance philosophy → increased personnel and maintenance costs
- Highest total force life-cycle cost (estimated 12% greater than New Design)
- Acoustic signature vulnerable to projected threats – lacks survivability
- Freeboard and ballast issues would require substantial redesign

VIRGINIA SSBN variant has a higher class cost with less capability

OHIO Replacement Ensures Strategic Deterrence into the 2080s

- **The U.S. will retain nuclear weapons for the foreseeable future**
  - Other nations are modernizing their nuclear systems
  - NPR 2010: "As long as nuclear weapons exist, the United States must sustain a safe, secure and effective nuclear arsenal…"
- **The Triad (SSBNs, ICBMs, Bombers) provides effective nuclear deterrence and assurance**
  - Each leg of the Triad brings its own unique benefits
  - Result: flexibility, responsiveness, survivability
- **Deployed U.S. strategic warhead numbers have decreased significantly, however majority are now carried by SSBNs**
  - Reduced by more than 75% since 1989 peak
  - Paralleled by Russian reductions
  - SSBNs now carry ~70% of deployed warheads under New START
- **The SSBN force provides the U.S. with a survivable assured response capability**
  - CJCS "…the SSBN fleet is the most survivable leg of the Triad, I consider it indispensable"
- **SSBNs use adaptability to cope with change**
  - 50+ years of design and operational experience
  - A history of adaptation to changes in targets, payloads, defenses, ASW and diplomatic/basing constraints
- **The current OHIO Class SSBN force is reaching the end of its operational service life**
  - The OHIO SSBN service life has already been extended from 30 to 42 years (unprecedented for a nuclear submarine)
  - Additional OHIO life extensions are unrealistic
  - OHIO will begin to retire (at a rate of 1 per year) in 2027
- **Further delays in the OHIO Replacement SSBN would gap at-sea strategic requirements**
  - Two-year delay to 2021 improved design maturity and produced manageable risk during SSBN transition
  - Additional delays are not manageable and will gap requirements
- **OHIO Replacement SSBN meets the 21st century requirement for survivable strategic deterrence at minimal cost**
  - Employs proven OHIO D5 Strategic Weapon System
  - Sufficient stealth to address the projected threat through the 2080s
  - Delivers the at-sea presence of 14 OHIO SSBNs with only 12 OHIO Replacement SSBNs
  - Cost-effectively recapitalizes SSBN force
  - Incorporates VA systems and cost control lessons
  - Designed for affordability, reduced life-cycle costs, and improved availability

OHIO Replacement leverages 50+ years of SSBN design and operation experience and combines it with the cost-control lessons of the VIRGINIA-class SSN to provide an assured response capability for the future in a lean and cost-efficient manner

The OHIO Replacement SSBN is a cost-effective recapitalization of our Nation's sea-based strategic deterrent

KEEL LAYING OF USS JOHN WARNER (SSN 785)

USS JOHN WARNER, SSN 785
KEEL LAYING CEREMONY
MARCH 25, 2013

THE HONORABLE SEAN STACKLEY
ASSISTANT SECRETARY OF THE NAVY FOR RESEARCH, DEVELOPMENT AND ACQUISITION

In chronicling the often turbulent truly incredible history of the twentieth century, Tom Brokaw coined a phrase that captured our imagination, while capturing the story in the character of American's who came of age in an era marked by equal measures of sacrifice and commitment and achievement. He called these Americans the greatest generation. Now who earns the right to be numbered among the greatest generation? So let me take you back to the darkest hour of the last century.

In the aftermath of the Imperial Navy's attack on Pearl Harbor and the fall of Wake Island and Guam and Singapore and with the Philippines under siege with Hitler's army stretching from the coast of France to the gates of Stalingrad. President Roosevelt went on the radio to deliver one of his fireside chats. He told the nation, this generation of American's has come to realize that a present and personal realization that there is something larger and more important than the life of any individual or any individual group, something for which a man will sacrifice, and gladly sacrifice, not only his pleasures, not only his goods, not only his associations with those he loves but his life itself. In time of crisis when the future is in the balance we come to understand with full recognition and devotion what this nation is and what we owe it. Those words, that night at that hour of darkness would foretell the turning point in the war and serve as a call to arms to a generation of young Americans.

And today, in this magnificent shipyard which itself gains renown for its role in building the navy that waged the battle in the Atlantic and won the war in the Pacific. We pause from the toil of shipbuilding to pay tribute to one who answered President Roosevelt's call and signed on to defend freedom. Now in telling the story of the extraordinary career of service and achievement of Petty Officer third class, Captain, United States Marine Corps, Undersecretary, Secretary, Commissioner, Senator, Chairman, Statesman John Warner. Today's distinguished speakers have told a story or our nation from that second great war of the last century to Korea to Vietnam throughout the cold war to Iraq and Afghanistan near seven decades.

And today Senator, returning to your beloved Navy, to lay the keel of a ship, a submarine, that in bearing your name, in service through the middle of this century, for more than a hundred years after that young 17 year old first answered the call. You are forging a link to the generations of sailors who yearn to follow in your footsteps, a strong link and a long chain of Americans who understand with full recognition and devotion what this nation is and what we owe it.

Senator Warner, I have been blessed to witness you, with your hand on the helm of our ship of state, our armed services in rough seas. Your determination to put politics aside to always act in the best interest of our country, taught us, your passionate care for our men and women in uniform for our wounded warriors moved us. Your leadership alongside your fellow veterans in the senate in passing that landmark legislation, the Webb, Hagel, Lautenberg, Warner GI Bill inspired us. I think I speak for all of us here today, in saying that if you were the only member of your generation it would still be the greatest generation.

USS JOHN WARNER, SSN 785
REMARKS BY SENATOR JOHN WARNER

MARCH 25, 2013

Thank you Secretary Stackley, I want to digress a minute, you'll note I don't have any prepared remarks because I'd rather speak from the heart, say what comes to my mind. I remember a great old Senator, Senator John Stennis, he was chairman of the Senate Arms Services Committee and I was a brand new member and he gave me some good lessons. He said, "Senator, just get up there and grab the microphone and put your hand on the stand and look at them and let them look at you because there's only one hundred of us but 300 million Americans and we decide the rest of the world too, then you can start talking and maybe you will think of something to say." Well I've been thinking a great deal about what I'd like to say, I have a lot on my heart and my mind, but Sean Stackley, I want to say something about you, you started on our staff, on the Armed Services Committee, as a matter of fact, the Chief at that time is here, I'm not going to go through names because I just won't finish and we'll never get this submarine to sea, we have in this audience a wonderful group of the civilian staff that worked with me on my personal staff in the Senate, the armed services committee staff, but you exemplify all the great qualities of how you can go through that training in this Senate and come up and do marvelous things in your second and third careers. I thank all the staff that are here today.

I turn now to thank very sincerely, President George Herbert Walker Bush and President George W. Bush. 41 was a sailor, I mean a real one, 18 years old, he was in the Naval Air corps. Flying in the Pacific. I actually signed up for the Naval Air corps. in the fall of '44 but the pipeline was so jammed up and I wanted to get in so I shifted. On the 20th of January 1945 I enlisted in the Navy. People say, oh, you enlisted in the Navy, that took a special courage. I've got to tell you folks, all us 17 year old kids seeing

the old boys coming back from the battlefields, frankly we wanted to get the hell out of Dodge and get there with them as fast as we could, so that's why we enlisted. With no disrespect to the Army, we weren't thinking about getting drafted and going in the infantry, we wanted to fly, be in the Navy and do those things, so I enlisted at 17. Literary hundreds and hundreds and hundreds of thousands of that generation did the same thing. And it was a marvelous period in my life, and I'll come back to it. But back to the Bush family, the two President's; I'm proud with humility in my heart to say that I have been friends with them and together with Bob Gates they made this day possible for me and my lovely wife, whom I get to introduce. So as I sit here and fumble my remarks I'm thinking how I do that right. But I'll get there. I've had the privilege of working with many Presidents but I particularly owe gratitude to those that made possible this day. And to my colleagues in Congress; you all got up and talked very respectfully about the old boy, I want to thank you. But I want to tell you, I laid the keel for some of these guys particularly this guy right here (*Ed. Note: He indicated Senator Mark Warner D-VA*), he comes out of nowhere when I have a campaign going on and there's nobody out there opposing me and he comes charging into it. As a result of the bruising I gave you, that laid your keel brother, your keel got laid. I see my other colleague, Senator Kaine, very properly sitting next to his lively wife, I owe a great deal to Linwood Holton, we came out of the Navy in World War II, I'd been a Petty Officer Third Class and I was proud of it, he had been a Lieutenant, actual submariner in the United States Navy in the old diesel boats. He is very modest about it but you can read it in his book, he saw it as it is, for submarines. Linwood, you have been a great friend of mine all these years and we ran against each other for a seat in the United States Senate and guess who won? Warner... but with only your support at a key time of the convention did I get that nomination.

Now I got to get back on track here, I just want to thank my Congressional people, the President's and others. But I want to turn now and talk a little bit about the men and women in uniform. I had the privilege of talking to these fine officers and gentlemen

yesterday, and you all can break ranks and look over here a little bit, I got the podium. But I want to tell you, through you, tell all others, I wouldn't be here today had it not been for what the United States Navy did for me in training me in World War II. Those were serious times, during my boot camp was Iwo Jima, during my A school for electronics was Okinawa and we were all shown raw footage of the battlefront to sober up 17 - 18 year olds and we were told "You are going to be a replacement for the last great battle." Well we thank god that didn't happen. But we are a free nation because you and your predecessors, beginning with George Washington, have given your lives and your careers at various times to make the finest traditions of the country what it is. So I always salute the United States Navy and the United States Marine Corps for putting in the foundations on which this straggly old teenager finally got his sea legs and went on in life to do whatever it is I've done. So think of that on the tough days that, guess what, some day you may be standing here, each one of you.

Thank you.

But I want to add a little bit more about the World War II experiences and the seriousness of what this mission will be for this submarine. We draw on those times, we basically knew who the enemy was, what our nation and our allies had to do to defeat that enemy and to establish freedom for the world. But today this ship and its design and its sister ships are one of the most invulnerable platforms in the entire arsenal in our military. It has in it, every single bit of high technology that can be brought to bear by the magnificent manufacturing base, educational base, and laboratory base in this country. Nothing has been spared such as the crew of the ship, for years and years and decades to come can help preserve our nation's most valued treasure; and that is freedom.

So this is a special day for all of us and I'm proud to say that that signature will not come off that ship inside, because you see, quietly as we used to say the old submariners say, run deep and run silent carrying out those missions. And it takes a special type of individual to be a submarine sailor. I remember when I was in boot camp, they came through trying to recruit some of us to sign

up and get out of boot camp and go right to sub school. And it was tempting because they offered us $10 more a month, we were then getting $50.00 a month, we went to $60.00 and they committed to us that we would have ice cream three times a week aboard the submarine. Now I hope, Commander Caldwell, that that tradition is carried on to this day. But back to the World War II brethren that Linwood and I and maybe there are one or two others here who served with that generation and the Korean generation. They gave me the strength to go through chapters in my life. When Linwood and I were in school together I guess 70% of them were World War II veterans, we all came home to colleges and universities that were empty and they filled up beginning in 1946 and 1947 with those veterans. And we moved there to law school, at University of Virginia Law School, I'd say 80% of my class were World War II. Then as I went into the workplace we always gravitated together. Then when I got to be the Navy Secretary, almost to the man and woman (I appointed the first woman Admiral in the Navy; that was little turbulence you see but we got it done). Almost all of the admirals, and general officers of the Marine Corps were World War II veterans. So my entire life, I have been working with, and trained by and learned from that generation, to achieve such as I have been able to achieve in this great country. So my speech today is basically to say thank you to all those who made it possible that I can stand here, made it possible for this magnificent ship to bear my name and with my lovely wife's initials there and I'll finish by having a word about her.

It is essential to remember those who made it possible. I want to say a word about Admiral Hyman Rickover. I was Secretary, he was there, came in to greet me quite properly and we began to form a friendship and it really stuck all through those years. I remember one day, Secretary Laird, Secretary of Defense, said "Bring down the Admiral, I want to have a word with both of you." So we went down and went through some preliminaries, we were talking about the 688 class at that time and we were going to change the name of the ballistic missile program from ULMS to Trident program and a few other things. Because Laird was a

World War II sailor and he had been on a destroyer and had been through the thick of it in the Pacific, he even had a piece of shrapnel in his fanny and on damp days we knew he would be in a mean temperament. Anyway, he said to Admiral Rickover, "Now look here Admiral, you have a wonderful tradition about naming submarines, well Secretary Warner and I want to tell you that we think you ought to make a change in that tradition." The Admiral said "Well what's the problem? We talk about nautical themes, the fish and everything else". Laird said "That is the problem, fish, these submarines are all named for fish, he said, "Dammit, I sit here day after day trying to get appropriations, fish don't appropriate and fish don't vote, so stop calling them fish". Well, Rickover exploded, you know, finally we got around to it. I could go on and on but I know that the day is coming to a close.

I want to thank my family, they are here and I am very proud of a family that have given me support for all these many years through the different jobs that I have. And you mentioned the USS VIRGINIA, a nuclear cruiser, well that little girl who was 12 years old is here today. Will the sponsor of the USS VIRIGNIA nuclear cruiser stand please. Thank you.

I want to again, thank this great nation for all that it has done for me; it is a land of opportunity, second to none in the world, to enable a person such as myself, such as each of you to achieve your goals. And it's only because of the military that we are able to continue our strong leadership elsewhere and keep that freedom for this country.

So I turn now to my lovely wife, and folks it's a challenge, first I want to say that I've known her for many years and her husband was a very dear and valued friend. Her husband was in the Naval Reserves in the Intelligence part of the Naval Reserves and he worked up from Bull Ensign in that job to a Captain in the United States Navy and proud of it, she is a Navy wife through and through. It was hard for a Petty Officer Third Class to convince her to start all over again with me but she did it and that took courage. They can see in your face the love, kindness and understanding that you have not only given me but my children and the children of so many of her friends. Today she is joined by

her matrons of honor up here, friends, this woman is admired universally. Not just by me, but universally.

Like married people we have some differences now and then and the other day we were having a discussion and the voice level began to rise and I was sort of quickly recycling the facts and came to the conclusion that I am now on defense. So I turned to her and I said "Well you are acting like the Chief of the Boat", we just met the Chief of the Boat and his lovely wife, Chief of the Boat, USS JOHN WARNER. I said, "your acting like one" and she looked at me and she said "you know, you're right, I'm going to be the Chief of Boat in this house from now on" and now that is the Chief of the Boat.

Let's go back in history and talk about why it is a woman who is the Sponsor and throughout the maritime tradition, a woman does these things. And I, with you, so many times have sung that song, *Eternal Father, strong to save* and it concludes, "for those in peril on the sea" intuitively we all know a woman can impart caring and it is that very, very important function that is a tradition of the United States Navy since the first wooden keel was put down. And the antecedent was the Phoenicians, the fisherman, who would go out on long voyages and many never returned or other sailors who sailed the seven seas in the masted sailing ships, many gone for long times, leaving to the wife to care for the family and that same instinctive, unique care this wonderful woman will bring to this ship. I now give you, the *Chief of my Boat* Jeannie Warner.

After Mrs. Warner's talk, and the welding of initials on a steel plate to be put on the keel, Senator John Warner removed the World War II Honorably Discharged lapel pin he was wearing and asked the ship's Commanding Officer to incorporate it into the ship in honor of those who served in that war.

ARTICLES

FORCE AND COUNTERFORCE: THE DEVELOPMENT OF ANTI-SUBMARINE AIRCRAFT

by CDR William J. Bard, USN

The contents of this paper reflect my own personal views and are not necessarily endorsed by the Naval Postgraduate School or the Department of the Navy.

Evaluated by: Winford G. Ellis, Rear Admiral, USN (Retired)
Director, Undersea Warfare Research Center
Chair Professor, Undersea Warfare
Naval Postgraduate School
Monterey, California

Executive Summary

This paper is reflective of the content of Naval Postgraduate School course, Undersea Warfare: Yesterday, Today & Tomorrow. Specifically, a force and counterforce concept is examined which frames how the diversely different inventions of the submarine and aircraft evolved over time, each bearing some influence on the other. History demonstrates that the development of new weapon technology closely follows operational requirements. This may be due to apprehension of impending vulnerability as shown in the case of British Admiralty calling for ideas to use aircraft against submarines in the years just prior to World War I. It may also be in direct response to an ongoing crisis, demonstrated in the implementation of the Tenth Fleet for the purpose of countering the U-boat threat and protecting Allied merchant shipping during World War II. The unforgiving laboratory of warfare accelerates the pace of such development, expending human lives, expertise and national treasure in order to gain an advantage. The art of anti-submarine warfare reached a pinnacle during the Cold War when air, surface and subsurface platforms integrated efforts, capitalizing on available intelligence.

Twentieth century warfare illustrated how new technology can transform the way in which warfare is conducted, challenging traditional doctrine. The continuous pressure to obtain an advantage drives the technology in ways that might not be duplicated in times of peace. The twenty-first century will likely bear the continuation of this axiom as growing nations invest in submarines to protect their interests in the maritime domain. Maritime assets, both manned and unmanned must work closely together to counter the inherent advantages of modern submarines. The U.S. is wise to continue its investment in Undersea Warfare so that it can maintain or in some cases regain advantage in the anti-submarine warfare arena. Losing advantage in the undersea domain is a very heavy price to pay.

Introduction

The twentieth century brought rapid change in the realm of maritime warfare.[1] Technology reached a point at which it began to produce machines that fulfilled the visions of earlier creative thinkers and engineers. Dreams in which humans traversed the sky as well as under the sea became reality thanks to engineering feats of the day. As early as 1912, the British Admiralty sought ideas to counter the emerging threat of submarines. A uniquely qualified British submarine officer named Hugh Williamson (who also learned to fly aircraft at his own expense) responded with an innovative and perceptive paper. In addition to the description of a well-suited aircraft and crew, Lieutenant Williamson intuitively described a means of neutralizing submarines so groundbreaking that it would be used during both World Wars of the coming century.[2] He described how an aircraft could prevent a submarine's access to the surface by forcing it to submerge. He even described rudimentary means in which an aircraft might attack a submerging boat with bombs. His concept of an anti-submarine weapon and description of timed fusing for specifically designed bombs proved to be a revolutionary concept and demonstrated exceptional forward thinking even in an age of rapid technological advancements.[3] In addition to written appreciation from the

Admiralty, Lieutenant Williamson qualified in both the submarine and aviation branches of the Royal Navy.[4]

The onslaught of World War I in late 1914 thrust these technological advances forward, challenging traditional naval doctrine.[5] Maritime platforms, including aircraft rapidly advanced as weaponry, reliability and range continuously improved under the relentless pressure of armed conflict. Differences among submarine, surface, and airborne platforms are quite apparent. The submarine relies upon stealth to offset its relatively low speed in the hunt for targets. As the primary target of submarines, surface ships had little advantage and urgently sought an adequate countermeasure to the emerging threat. Meanwhile, aviators sought ways to exploit speed and the vantage point of altitude to compensate for noisiness and lack of stealth. The remainder of the twentieth century saw the evolution of the naval platforms through two World Wars as well as the Cold War with the former Soviet Union. Throughout the twentieth century, submarine platforms became an ever more formidable naval force and significantly impacted naval doctrine. Surface ship and aviation platforms diligently strove to develop countermeasures, leveraging science and technology to offset the threat brought by modern submarines. Need drives military technology; future advancements in Undersea Warfare are likely to support this axiom.

Discussion

In mid-1914, the navies of Britain, Germany, France, Russia, Austria-Hungary, Italy, and the United States all possessed submarines. The fact that future participants in World War I operated submarines made their expansion as a maritime weapon inevitable. As observed in Admiral Alfred Thayer Mahan's writings, "The submarine possesses in high degree the power to strike a blow deadly as the rattlesnake or cobra, and of as little warning."[6] This threat could not be ignored. Anticipating the expansion of submarine usage in maritime conflict, the U.S. Navy broadened its investment in long-range submarines and awarded a contract to build two ships to the Electric Boat Company in 1914.[7] Assistant Secretary of the Navy and future U.S. Commander in

Chief, Franklin D. Roosevelt stated that the submarine had "taken its place not as the sole weapon in naval offense and defense, but as an adjunct to other weapons."[8] This decision greatly impacted U.S. maritime development and doctrine and continues to resonate to this day.

The sea confrontations of World War I quickly proved that submarines significantly impact the balance of maritime power. Shortly after the onset of hostilities, a German U-boat sank the light cruiser HMS PATHFINDER in the first event of a submarine sinking a surface ship since the American Civil War.[9] In the following weeks, both German and British submarines met success against enemy surface warships. To underscore the impact of submarines further, the German Kaiser gambled and authorized unrestricted U-boat warfare in early 1917, blurring the line between traditional combatants and non-combatants.[10] The decision created a devastating impact to the island nation and caused the loss of about 6 million tons of British shipping in 1917 alone.[11] The grave effect on Great Britain threatened the outcome of the war. These maritime confrontations revealed that traditional naval vessels and defenses had little immediate means to counter the threat brought by submarines. Both British and German submarines took advantage of concealment and stealth inherent in their design. However, German U-boats demonstrated the most significant impact, successfully employing submarines as strategic weapons to choke desperately needed supplies from Great Britain. Meanwhile, the British experienced great difficulty in finding an effective anti-submarine warfare weapon.[12] Seemingly, the entry of the United States to the war in 1917 shifted the outcome to the eventual favor of the Allies despite never completely countering the threat of German submarines. Of course the Armistice of World War I did not close the chapter on German U-boats.

Naturally, the Allies made a concerted effort to counter the success enjoyed by the Germans. The airplane, a more recent invention than the submarine became one of the tools used to offset the inherent advantages of vessels relying on concealment. However, the impact of aircraft as a counterforce was much less immediate, hampered by the challenges of locating and attacking

targets that occupied an entirely different physical domain.[13] Although difficult to locate submarines operating in a different domain, the separation did protect aircraft from submarine attack, in contrast with naval and merchant ships not enjoying such advantage. Submarines had the ability to hide themselves under the sea; aircraft transited the skies at relatively high speeds, but unable to peer directly into the depths that concealed the submarine platform. Nonetheless, military officers worked diligently to develop tactics and procedures in a quest to counter the concealed threat from below the sea. The German Zeppelin, *L*-5 conducted the first-recorded attack by an aircraft upon a submarine when the airship harmlessly dropped two bombs on the ocean surface in an attempt to hit the British submarine, *E*-11 in December of 1914.[14] However, the first successful *kill* of an enemy submarine did not occur until September of 1917 when aircraft from the Austro-Hungarian Naval Air Arm spotted the shape of a submarine, transiting clear waters in the Adriatic Sea. The position contained no known friendly submarines and the flight of two flying boats dropped a total of four bombs upon the target.[15]

Three of the weapons caused significant damage to the French submarine FOUCAULT, damaging her batteries and forcing her to the surface. Determining his position to be hopeless to the presence of attacking aircraft, the French Captain ordered his ship to be abandoned and scuttled her to the bottom. Making the historic tale even more remarkable, the Austrians jettisoned their remaining weapons, set their flying boats upon the calm waters and rescued the French crew without the loss of a single life.[16] This event changed the concept of using aircraft to locate and kill submarines from theory to a demonstrated capability.[17]

As the science of aviation rapidly advanced in the years of World War I, the submarine commanders became aware of the legitimate threat of an air attack. Although aviation assets never sank submarines in great numbers, aircraft presence affected submarine commander behavior. From this perspective, the success of anti-submarine aircraft is better measured by the number of friendly ships saved than by the number of enemy

submarines destroyed.[18] Rapid technological developments in aviation such as engine reliability, aircraft range and advances in weaponry further enhanced the capability of the aircraft as an anti-submarine warfare tool. Exploring military uses for such improvement, the Allies developed innovative concepts to defend the newly implemented convoy system in coastal regions. The presence of blimps affected the behavior of U-boats and often posed enough of a threat to clear them from Allied merchant shipping paths.[19] In April of 1917, flying boats with obviously faster speeds than blimps employed *Spider Web* patrols which consisted of octagonal-shaped tracks by which aircraft systematically patrolled a four thousand square mile area that straddled the English Channel.[20]

To summarize the concept of force and counterforce during World War I, the submarine used its stealth to gain advantage while aircraft used presence and the persistent threat of lethal attack to counter submarines. The effect of anti-submarine patrol aircraft is generalized by the writing of a British submariner who wrote that "aircraft were an infernal nuisance".[21] If a submarine spotted an aircraft, the commander assumed the advantage of stealth lost with potential targets well protected.[22] Thus, anti-submarine aircraft prevented enemy submarines from mission accomplishment, just as Lieutenant Williamson recommended in 1912. Aircraft had the advantage of speed and the ability to patrol a large area from the sky, while submarines enjoyed the advantage of stealth. Meanwhile, aircraft still had little means to detect submarines while submerged and relied upon diligence and binoculars to spot submarines operating on the ocean surface.

During World War II, the force, counterforce dynamic between submarines and other maritime platforms continued. The Royal Navy immediately returned to a convoy system for merchant ships from September of 1939 and onward. In response, the Germans implemented the *Wolf-pack* tactic in which radio-coordinated U-boat attacks might challenge the effectiveness of convoys, requiring a high degree of coordination and High Frequency (HF) communication. Soon after warfare returned to Europe in 1939 the Royal Air Force commenced patrols of the

North Sea with orders to attack German U-boats on sight.[23] However, early British air attacks on submarines proved unsuccessful. The aircraft lacked an effective bombsight to employ against enemy submarines, requiring them to release from a lower altitude to achieve any hope of hitting their target. Bomb shrapnel caused more damage to the attacking aircraft than its target.[24] Military technology languished between World Wars without an operational need for air dropped anti-submarine weapons. Ironically, the usage of *Scarecrow* aircraft in support of convoys proved just as effective as the armed aircraft in the earliest part of World War II. The Scarecrow patrols mostly sighted and reported submarines, forcing them to submerge and deterring them from their mission. The patrols contributed to the uncertainty felt by the submarine commanders and could only consider effectiveness by the number of ships *not* sunk by U-boats, although a difficult metric to measure.

Throughout the war, technologies began to develop that would assist aircraft and surface ships in the pursuit to become more effective submarine hunters. Improvements to High Frequency Direction Finding (HFDF) equipment enabled the Allies to geometrically plot bearings and locate the position of U-boats communicating via HF radio transmissions.[25] Control stations vectored fast surface ships or aircraft to intercept and attack the U-boat, thwarting Admiral Doenitz's Wolf-pack tactic.[26] Advances such as Radio Detection and Ranging (RADAR), sonobuoys, Magnetic Anomaly/Airborne Detection (MAD) and improvement in radio communications developed relatively quickly with the ongoing need to gain an advantage.[27] The British gained an invaluable advantage by capturing code books, cipher documents and a complete German Enigma coding machine from *U 110* in 1941.[28] This also assisted the Allies in gaining an upper-hand over the U-boat threat.

As anti-submarine warfare capability developed, it became clear that aircraft demonstrated their greatest effectiveness when operating in cooperation with other maritime assets. Throughout the course of World War II, anti-submarine aircraft significantly improved from a poorly armed daytime nuisance to an effective

submarine killer at all times during the day and night.[29] This impressive increase in capability occurred due to massive resources employed as a direct response to the U-boat menace.[30]

The technologies borne in the demanding environment of World War II would prove to be significant tools used by future aircraft throughout the course of the Cold War years. North Atlantic Treaty Organization (NATO) countries honed anti-submarine skills throughout the Cold War against relatively loud submarines. Anti-submarine warfare proved most effective when approached beyond the perspective of individual components or platforms.[31] Net effectiveness depended on how well individual components and platforms worked together as a system. In the 1980's integration of anti-submarine warfare effort among surface, submarine, aircraft and intelligence entities developed the ability to locate and track Soviet submarines into an art form. The U.S. and NATO reached a relative pinnacle of anti-submarine warfare though the integration of effort. Application of maximum strain and uncertainty on an exposed adversary constituted the most effective anti-submarine campaign.[32]

However, this advantage significantly eroded due to the espionage activities of John A. Walker.[33] According to former Secretary of Defense Casper Weinberger, Walker's espionage provided Moscow "access to weapons and sensor data and naval tactics, terrorist threats, and surface, submarine, and airborne training, readiness and tactics." As a result, the integrated anti-submarine campaign suffered. Fortunately, despite the damage done by treasonous activity, the U.S. prevailed in the Cold War.

After the collapse of the Soviet Union, calls to cut military spending and produce a peace dividend negatively impacted the effectiveness of air anti-submarine warfare. The direct threat of adversary submarines to the United States abruptly came to an end. Subsequent reductions in defense spending did not exempt anti-submarine warfare platforms, resulting in reduction in both capacity and capability. This series of events supports the thesis that advances in technology mirror threats, and that the loss of capability was inevitable in the absence of a credible threat from adversary submarines. However, emerging and growing militaries

with significant investment in submarines make the argument seem short sighted.

As the twenty first century advances, the Navy is again emphasizing anti-submarine warfare. Emphasis on integration of anti-submarine warfare leadership and activity is instrumental to success, as demonstrated by the creation of Tenth Fleet in World War II and combined efforts employed during the Cold War. Nowadays, Chinese pursuit of an Anti-Access/Area Denial strategy complicates the operational problem. Additionally, worldwide investment in maritime capability and an expanding submarine force again compel the argument for a counterforce. However, the reality of shrinking the U.S. defense budget coupled with exponential increases in platform and weapon costs make the solution particularly difficult. Innovative ideas applying new technology will have to be part of the solution. Concepts employing unmanned aerial, surface and subsurface vehicles will continue to be explored, pushing the art of the possible. The U.S. Navy must strive to be innovative so that it can employ modular platforms such as the P-8 and Littoral Combat Ship (LCS) in order to take full advantage of current and future technical advances. These platforms should evolve with integration of effort with other platforms in mind, striving to place the adversary submarine in a situation that maximizes uncertainty and stress, interrupting its mission. The Navy of today and tomorrow must integrate and innovate in order to provide a legitimate counterforce to the expanding numbers of submarines worldwide.

Conclusion

Maritime platforms significantly impacted the face of warfare over the twentieth and twenty-first centuries. Platform technological advances challenged traditional thinking and brought the creation of new strategy and tactics. Submarines continue to take advantage of their inherent concealment and ability to operate covertly. Aircraft leverage their ability to cover large distances quickly and coordinate their efforts with other platforms. Threats and the need to counter those threats will continue to drive technology in the realm of Undersea Warfare. The increasing

endurance and persistence of Unmanned Aerial Vehicles (UAVs) and Unmanned Surface Vehicles (USVs) provide another iteration of the long march to counter the threat of manned submarines. The system of systems must develop synergy from manned and unmanned airborne, surface, subsurface and even netted undersea platforms. The need to counter threats and address crisis will continue to drive military technology as demonstrated by history. Budgetary constraints complicate the problem, but offer the opportunity for innovation.

ENDNOTES

1. Alfred Price, *Aircraft Versus Submarine in Two World Wars* [Aircraft versus submarine: the evolution of the anti-submarine aircraft, 1912 to 1972], 3rd ed. (Barnsley, South Yorkshire, England: Pen & Sword Aviation, 2004), 242.
2. Ibid.
3. Ibid.
4. Ibid.
5. Ibid.
6. Louis Gerken, *ASW versus Submarine Technology Battle* (Chula Vista, Calif.: American Scientific Corp., 1986), 753.
7. "General Dynamics Electric Boat." http://www.gdeb.com/about/history/ (accessed 12/7/2012, 2012).
8. Gerken, *ASW Versus Submarine Technology Battle*, 753.
9. Price, *Aircraft Versus Submarine in Two World Wars*, 242.
10. Jan S. Breemer, Naval War College. Press and Naval War College. Center for Naval Warfare Studies, *Defeating the U-Boat*, Vol. 36 (Newport, R.I.: Naval War College Press, 2010), 87.
11. Ibid.
12. Price, *Aircraft Versus Submarine in Two World Wars*, 242.
13. Ibid.
14. Ibid.
15. Ibid.
16. Ibid.
17. Ibid.
18. Ibid.
19. Ibid.
20. Ibid.
21. Ibid.
22. Ibid.
23. Ibid.
24. Ibid.
25. Gerken, *ASW Versus Submarine Technology Battle*, 753.

26. Ibid.
27. Ibid.
28. Ibid.
29. Price, *Aircraft Versus Submarine in Two World Wars*, 242.
30. Ibid.
31. W. J. R. Gardner, *Anti-Submarine Warfare*, 1 English ed., Vol. 11 (London; Washington: Brassey's, 1996), 160.
32. J. R. Hill, *Anti-Submarine Warfare*, 2nd ed. (Annapolis, Md.: Naval Institute Press, 1989), 128.
33. The Navy's Biggest Betrayal | U.S. Naval Institute." http://www.usni.org/magazines/navalhistory/2010-06/navys-biggest-betrayal (accessed 12/7/2012, 2012).

Selected Bibliography

"General Dynamics Electric Boat", accessed 12/7/2012, 2012, http://www.gdeb.com/about/history/.

"The Navy's Biggest Betrayal | U.S. Naval Institute ", accessed 12/7/2012, 2012, http://www.usni.org/magazines/navalhistory/2010-06/navys-biggest-betrayal.

Breemer, Jan S., Naval War College. Press and Naval War College Center for Naval Warfare Studies. *Defeating the U-Boat*. Naval War College Newport Papers. Vol. 36. Newport, R.I.: Naval War College Press, 2010. http://purl.fdlp.gov/GPO/gpo8959; http://www.usnwc.edu/Publications/Naval-War-College-Press/Newport-Papers/Documents/36-2.pdf.

Gardner, W. J. R. *Anti-Submarine Warfare*. Brassey's Sea Power. 1 English ed. Vol. 11. London; Washington: Brassey's, 1996.

Gerken, Louis. *ASW versus Submarine Technology Battle*. Chula Vista, Calif.: American Scientific Corp., 1986.

Hill, J. R. *Anti-Submarine Warfare*. 2nd ed. Annapolis, Md.: Naval Institute Press, 1989.

Owen, David. *Anti-Submarine Warfare: An Illustrated History*. Annapolis, MD: Naval Institute Press, 2007. http://www.loc.gov/catdir/toc/fy0803/2007933201.html.

Price, Alfred. *Aircraft Versus Submarine in Two World Wars* [Aircraft versus submarine: the evolution of the anti-submarine aircraft, 1912 to 1972]. 3rd ed. Barnsley, South Yorkshire, England: Pen & Sword Aviation, 2004.

AUTEC/FORACS: THE USN'S OTHER "SILENT SERVICE"

By Mr. Robert LeDuc and Mr. John B. "Jay" Ostaffe

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As the Battle of the South Atlantic reached its peak in the spring of 1982, Argentine commanders were increasingly perplexed and frustrated by the inability of the Type 209 submarine, SAN LUIS, to close the fight to the enemy, despite near-perfect attack opportunities. Six errant runs by six separate torpedoes went *haywire* and *ran all over the place*, a clear indication that the submarine—not the torpedoes—had a problem.[1]

What turned out to be synchro-misalignment meant that incorrect bearing information was transmitted from the periscope to torpedo fire control—but no one was aware of this problem. When the commanding officer had a target in his crosshairs, the torpedo data computer *thought* it was somewhere else and misdirected the torpedo—six times. After-action analysis showed that during a pre-conflict maintenance availability wires had been transposed, reversing polarity in the torpedoes' gyros and causing them to tumble and lose orientation. Had SAN LUIS conducted a weapon systems accuracy check during her pre-war availability, this would likely have determined *the true health and readiness of the weapon system,* and perhaps changed the outcomes of the engagements with the Royal Navy.

U.S. Navy submarines have avoided such problems by conducting regular force operational readiness and accuracy checks at the NATO Naval Forces Sensor and Weapons Accuracy Check Sites (FORACS) range at the Naval Undersea Warfare Center's (NUWC) Atlantic Undersea Test and Evaluation Center (AUTEC). One of the U.S. Navy's best-kept secrets, AUTEC has increasing importance for America's Submarine Force. In a sense, AUTEC is becoming a silent service for the U.S. Navy's Silent Service. For instance, all new Virginia-class boats are required to complete complex sensor accuracy testing at the FORACS/AUTEC range prior to fleet deployment.

Consider it the *gold shield of warfighting approval* that is essential to assuring the Submarine Force's weapon systems readiness.

Unfortunately, very few people outside the Submarine Force test and evaluation community knew this was—and is—going on.

Inventing FORACS/AUTEC

The NATO FORACS/AUTEC provenance goes back to submarine-launched torpedo problems encountered during tests in Puget Sound's Dabob Bay in the late 1960s. "Sonar inputs to the fire-control solution were often incorrect," according to Dr. James Mercer of the University of Washington Applied Physics Laboratory, "sometimes as much as 20 degrees. An external accuracy test was deemed necessary."[2]

These *challenges* continued to dog the U.S. Submarine Force. "Even though today's systems are computer-based, false alignments, imprecise inertial navigation and other systematic errors can exist," Mercer said. For example, because fresh water and saltwater have different densities, "we discovered that fresh water in sonar domes can create significant bearing errors, and handover from one preformed beam to another can create erroneous speeds in fire-control solutions."

Mercer also personally contributed to the design and establishment of what the USN then called FORACS—for "Fleet Operational Readiness Accuracy Check Sites"—ranges, the training of operators, design and installation of artificial targets,

and the development of the accuracy standards manual by which the performance of systems being tested was assessed. "Proper testing required adherence to the master 'Precision of FORACS Measurements' document, he explained, "and close attention to the specifications for each individual U.S. FORACS range on the U.S. east and west coasts.

Fast-forward to early 2013, and the sensor and weapons accuracy testing enterprise is now conducted at an international level, embracing all manner of naval and maritime forces, not just submarines.

NATO FORACS/AUTEC Today

The NATO FORACS program office located at NATO Headquarters in Brussels, Belgium, is responsible for the executive management of the project. Three NATO FORACS ranges are located in Stavanger, Norway, Souda Bay (Crete), Greece, and the third is co-located within the U.S. Navy's Naval Undersea Warfare Center's AUTEC facility in West Palm Beach, Fla., and on Andros Island, Bahamas.

NATO elected to base its FORACS technical requirements on those that the USN had put in place for AUTEC in the early 1970s, with the plan to conduct accuracy, alignment and performance trials supporting naval weapon engineering development for all NATO navies and maritime forces. In 1974, seven members—Denmark, Germany, Greece, Italy, Norway, the United Kingdom and the United States—signed a memorandum of understanding to establish the FORACS project as a multinational NATO activity. In 1994, Canada became the eighth member-nation in the project. Friendly non-NATO navies and maritime forces can take advantage of the ranges, too.

The primary FORACS mission is to perform precision, dynamic calibration measurements of the accuracy of target and navigation sensors against a common geographical reference to satisfy national requirements and meet NATO material readiness standards. Each year, FORACS collects and analyzes accuracy data on scores of naval units to enable large-scale data integration.

Data security is paramount. FORACS test results data are owned by each government and not shared between countries.

FORACS/AUTEC tests are statistically repeatable scientific tests that measure the bearing, range, heading and positional errors of sensors on surface ships, submarines and fixed- and rotary-wing aircraft; active, passive, dipping and towed-array sonars and mine-hunting systems; search and fire-control radars; peloruses, periscopes, optical sights and rangefinders; infrared laser and TV sensors; inertial navigation systems, Global Positioning System equipment and gyrocompasses; and radio-direction finding and electronic systems measures.[3] FORACS/AUTEC ranges can test new ships, submarines and aircraft that have just completed upgrades and modernization or that are making-ready for deployments. This is a cost-effective means for verifying the accuracy and readiness of their systems.

"We act as an independent third party," Trevor Kelly-Bissonnette, NATO FORACS project manager and technical director in Brussels commented. For example, Operational Capability Confidence Checks (OC3s) assure that a platform's combat system is fully mission-capable. "The OC3 involves a real-time, combat system-level check within a realistic, theater-specific tactical environment," Kelly-Bissonnette noted. "This enables explicit tactical development, including realistic engagement timelines, to be exercised and developed, as well as checking the technical performance of the combat system itself. It also provides operators with a better understanding of their systems and enhances commanders' confidence in their units' performance in the real world."

Understanding the value of such testing, the United Kingdom has actually mandated that every Royal Navy platform undertaking operations east of Suez will conduct OC3s, usually at the NATO FORACS facility at Souda Bay, Greece. This assessment and evaluation check, assembled in a coherent package and structured approach, provides the ship's commanding officer with an accurate and timely assessment of material capabilities and limitations prior to entering the operational environment. The OC3 has proven so successful that the Royal Navy has considered

applying this process to all RN ships no matter where they deploy.[4]

While the United States uses the NATO ranges, there is also a U.S. FORACS In-Service Engineering Agent (ISEA) program within the Naval Sea Systems Command (NAVSEA), according to Kelly-Bissonnette. "The FORACS ISEA organization is focused on unique test issues to the United States, not NATO. For example, developing the 'shipalts' [ship alterations] or 'tempalts' [temporary alterations] required us to bring test equipment onto ships; or test procedures for U.S.-only systems. In other NATO nations," she said, "these functions are conducted by their materiel commands. NATO FORACS funds the U.S. FORACS ISEA for technical consultations, which improves harmonization between the programs."

Virginia Class Embraces FORACS/AUTEC

The NATO FORACS test range at AUTEC provides the *Virginia*-class submarine program Test and Evaluation Program a valuable testing capability that complements NAVSEA and fleet weapon systems certifications. All newly constructed Virginia-class submarines are required to complete complex sensor accuracy testing on the AUTEC range prior to fleet introduction—not during a post-shakedown availability. It truly is a national asset and fundamental to NAVSEA and SUBFOR's anti-submarine and anti-surface warfare test programs.

The U.S. Navy agreed to the NATO FORACS approach to sensor testing, which was empowered by SEA05, to ensure the operational effectiveness of the *Virginia* class. NATO FORACS offers a capability that the Submarine Force leveraged to do detailed runs, collecting reams of data and comparing it to *Ground Truth* to determine whether the systems work as intended. This is the only time during the submarine construction and acquisition process that the service can determine that the systems meet standards.

The critical need for this has been highlighted by two facts of life. First, the various sensor systems are increasingly complex and inter-connected. Prior to the introduction of the local area network

on board submarines, the various systems were stovepiped with limited or non-existent interface requirements. Now, everything is interconnected in the Virginia class, making systems testing more complex as well.

Second, the Navy is putting in place increasingly tight and streamlined submarine construction schedules to meet fleet force level requirements and deployment commitments. This, in turn, is driving the need to do more testing prior to delivery of new-construction SSN rather than wait until afterward.

"The FORACs Team is charged with ensuring accuracy of the systems they test, and the Virginia class is required to deliver certified combat systems to the Fleet," according to Edwin Rahme, of the Virginia Program Office, PMS450. "PMS450 challenged NUWC Codes 40 [Platform and Payload Integration Department] and 70 [Ranges, Engineering and Analysis] to combine their efforts, complement their strengths, and eliminate duplication to ensure the enterprise as a whole was making the absolute best use of the resources provided. The results have been outstanding," he continued, "and we have been able to ensure that we are making the best use of each taxpayer dollar we are entrusted with when it comes to operating ranges and delivering submarines."

The real story is that a team of experts is *mated* with a *Virginia*-class submarine, resulting in a highly successful program. FORACS/AUTEC provides seasoned military and civilian personnel with a high level of expertise to go out with the ship to acquire and evaluate the data. They know that they are *guests* and the submarine is in essence the crew's home, so they work to create a *win-win* situation. In essence, by having highly skilled and experienced testers on board, the crew learns more about their systems' performance. Thus the crew's knowledge base increases and the C.O. uses this experience as an opportunity to *raise the bar*.

"One-Stop" Shop for USW Supremacy

NATO FORACS facilities are one-stop shops for all Submarine Forces warfare sensors. Tests can be tailored to individual needs. Far from just a technical testing capability provided by an

engineering test bed, FORACS ranges deliver real and tangible assessments that ensure U.S. submarines are operationally ready to deploy.

Patricia Hamburger, the Director of the Naval Sea Systems Command (NAVSEA) Integrated Warfare Systems Engineering, underscores AUTEC's value, and not just for the Submarine Force. "The leadership and commitment of NAVSEA 05H and Naval Undersea Warfare Center (NUWC) enable the U.S. Navy to sustain this vital sensor accuracy test service," she noted in a May 2012 interview, "As the U.S. Navy's sole provider of sensor accuracy testing, the NATO FORACS AUTEC Team and test capabilities are certified annually to ISO 9001 standards. We measure and assess reality, not what we think or hope might be the case."

Reason enough why the *Virginia*-class program has wholeheartedly embraced FORACS/AUTEC testing, to ensure that the boat is ready for its number-one mission: warfighting![5]

ENDNOTES

1. Captain Charles H. Wilbur, USN (Ret), "Remember the *San Luis*!" U.S. Naval Institute *Proceedings*, March 1996, pp. 86-88.
2. Edward Lundquist, "Accuracy is Everything," *Seapower*, April 2012, pp. 76-80.
3. *NATO FORACS Strategic Plan 2012* (Brussels, Belgium: NATO FORACS Office, September 2012, https://diweb.hq.nato.int/).
4. Lt CDR Steve Lee, RN, "Operational Capability Confidence Checks (OCCC), *RNEE Journal*, Vol 61 No 3, Spring 2008, pp. 31ff.
5. Adm. Jonathan W. Greenert, USN, Chief of Naval Operations, "CNO's Sailing Directions" and "CNO Navigation Plan 2013-1017," Washington DC, January 2012. He stated that the Navy's number-one responsibility is to "deter aggression and, if deterrence fails, to win our Nation's wars" and that "warfighting is first."

POSTSCRIPT TO MISSING MAGICS MACHINE MATERIAL—TRIBUTE TO A GREAT SUBMARINER: CAPTAIN EDWARD BEACH US NAVY

Dr. Anthony Wells
Chief Executive Officer
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The April 2003 edition of THE SUBMARINE REVIEW published my article, *Missing Magics Machine Material. New Insights on December 7, 1941 and Relevance for Today's Navy*. This article was dedicated to the memory of a great Submariner, Captain Edward Beach, US Navy. Captain Beach was a distinguished author, writing amongst many publications *Run Silent, Run Deep*, and the authoritative defense of Admiral Kimmel at Pearl Harbor, *Scapegoats: A Defense of Kimmel and Short at Pearl Harbor (1995)*. My article sought to support Captain Beach's defense thesis by reference to data and issues associated with the Magics Machine that was exchanged by the US Navy for a British Enigma Machine from Bletchley Park. Captain Beach sadly passed away on December 1, 2002 before he could read the final transcript of my article. Readers may recall that I was limited in some key areas because the British had still not released much highly classified material with which I was familiar as a result of work done with my mentor earlier in life, Professor Sir Harry Hinsley, a critical Bletchley Park team member and later Vice Chancellor of Cambridge University. The good news is that the British have since released more data, not all by any means, but data that is very important for supporting Ned Beach's defense thesis, and also augments my article.

A very fine Australian mathematician at Sydney University, Professor John Mack, assisted by Dr. Peter Donovan, has published an article in the Royal United Service Institution Journal in November, 2012 analyzing the newly released information. What I will do below is to summarize the new data in Professor Mack's article, and then draw several key conclusions for both the

Beach thesis and defense and also how it impacts my original article.

First, the data reveals that the British had made great strides in deciphering and using data from the main Japanese Navy code (JN-25) in 1939-1940, and then *jointly with the US* in 1941-42. JN-25 was not changed until July, 1944 with a new code (JN-25N62) that was much more powerful, a code that fortunately was soon replaced by a less capable code. The genius behind the breaking of JN-25 at Bletchley was John Tiltman. Professor Mack's article provides in considerable detail the mathematical basis for the breaking of JN-25. Key point—the British had broken the critical Japanese naval code *before the exchange of the two machines.*

The British National Archives house the record of all this and Professor Mack provides the references. What is most revealing is the direct connection between the British Far East Combined Bureau (FECB) in Singapore and Bletchley Park, together with two other pillars of an interconnected highly classified SIGINT consortium, the Australian SIGINT unit in Melbourne and OP-20-G in Washington DC. In June, 1939, for example, the British had already intercepted 920 Imperial Japanese Navy messages within just the first three weeks of operations. From then on a series of new special highly sensitive Codes books were produced by the brilliant team led by John Tiltman at Bletchley, working in close liaison with FECB in Singapore. For reasons Tiltman explains OP-20-G made decisions that meant that the US Navy Station *Cast* in the Philippines was the only station working Jn-25. Station *Hypo* in Hawaii was preoccupied with another high level IJN code.

The next key point is that the British and Americans agreed in *early 1941 to share information and collaborate.* The Commander of the British Pacific Fleet and the British Director of Naval Intelligence authorized full and total cooperation. The British official data has been coupled with several critical oral histories—proving the great value of oral histories. Professor Mack writes, "By mid 1941 the collaboration between the FECB and Cast was in full operation, with a secure radio link used for transmitting both message intercepts and new information obtained from the

code breakers." This is a critical statement given that we are now five months from December 7, 1941. Bear in mind too that Bletchley Park at this time was benefiting from the massive technological break-through in computing by Alan Turing at Bletchley Park. Most significant of all—the new data shows that the Japanese did not change the "B" code book of JN-25 after Pearl Harbor—ergo the British were reading the IJN JN-25 "B" code book right up to the attack on Pearl Harbor. March and May of 1942 saw the great victories at the Coral Sea and Midway—both "B" Code book JN-25 derived victories.

What then should we conclude? First of all the Japanese cryptographers, as Professor Mack observes, were incompetent. Bletchley Park and the FECB were all over JN-25. Breaking and reading the B code Book of JN-25 persisted through December 7, 1941 to May 1942 when the Japanese replaced the B code book. Much of the detailed substance has yet to be revealed. In the open archives to date we know that several thousand intercepts had been made by December 7, 1941. More may be released as the years progress. The most important observation is this: Enigma and British derived data based on the *Missing Magics Machine* was extraordinarily highly compartmented. Enigma data was treated like gold—with access only to a few key military and civilian leaders, in addition to the Bletchley Park, FECB and Double Cross operatives, and within the ranks of the British SIS (MI6) and Security Service (MI5) just a very small few, with "C" himself controlling access for the chosen few in MI6. Winston Churchill and Vice Admiral John Godfrey, the Director of Naval Intelligence, treated Enigma as their single greatest warfighting asset. Any form of compromise was regarded as disastrous. It was not until 1974 that the British first even allowed the existence of Enigma to be known by the public, several years after I had worked on data with Sir Harry Hinsley. We know that Prime Minister Churchill will have discussed the data in detail with President Roosevelt. As the clock ticked to denouement on December 7, 1941 Admiral Kimmel remained totally oblivious to all the above—kept totally in the dark. He was not read into the US-UK special programs and had no knowledge even of the

existence of Bletchley Park, and the material that Op-20-G controlled. He had deployed his carriers, and his submarines were on patrol—his key assets, together with mine sweepers and airborne patrols. His battleships were in port—his single biggest oversight perhaps. However, as the losses of HMS Prince of Wales and HMS Repulse demonstrated off Malaya to Japanese dive bombers, shortly after the attack on Pear Harbor, battleships were already in large part naval dinosaurs with the exception of their naval gunfire support role. In the case of the Kriegsmarine, as commerce raiders, though all of Admiral Raeder's pocket battleships were destroyed over time by the Royal Navy—it would be the aircraft carrier and the submarine that would carry the day in the Pacific war, together with amphibious assault and the courage and fortitude of the US Marine Corps. The submarine would be the dominant asset, inflicting more damage by far than any other single naval or military asset or force, with the possible exception of the war ending strikes in August 1945. The Commander-in-Chief of the US Pacific Fleet's critical and subsequent war winning units were at sea on the day of the attack on Pearl Harbor.

The issue has never been whether Admiral Kimmel should have been relieved and replaced by an extraordinarily capable replacement, Admiral Chester Nimitz, to reinvigorate a critical command after a major defeat, but more his personal vilification, summary reduction in rank, and almost drumhead retirement without due process or recognition. Perceived and actual failure in command by a senior Commander is the prerogative of the Commander in Chief, the President of the United States, but not outright dismissal and denigration as a scapegoat when Admiral Kimmel was clearly denied access to critical intelligence.

Captain Edward Beach took the fight to the enemy in the Pacific with great valor and distinction as a young officer, winning ten decorations for gallantry and the Navy Cross, and came through to perform outstanding service in the postwar nuclear submarine Navy. During World War Two he served aboard USS TRIGGER, USS TIRANTE (he was Executive Officer to Captain George Street who was awarded the Congressional Medal of

Honor during TIRANTE's first war patrol), and commanded USS PIPER.

We owe him a great debt for his honorable quest to search out the truth and defend the tarnished reputation of Admiral Kimmel. The above goes a little further to help what Captain Beach wrote. The full and final story has yet to unfold, and perhaps before the 100th anniversary on December 7, 2041 the public records will finally show what was fully known. I may not be here, but I feel sure that Admiral Kimmel will be finally exonerated. Captain Beach would want this.

THE SUBMARINE REVIEW

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

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

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

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

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

SECRETARY WHO?

by RADM Joseph F. Callo, USN(Ret.)

Though virtually forgotten by History, William Jones was instrumental in creating the U.S. Navy that stunned Britain's Royal Navy in the War of 1812.

The Following Article Appeared in the November 2012 Issue of Military History Magazine. Republished from the November 2012 issue of Military History.

Naval history is replete with stirring tales of brave captains and stalwart crews, of swift and deadly warships, and of furious sea battles that changed the course of history. The War of 1812 offers particularly colorful examples of maritime warfare, including the Battle of Lake Champlain, USS CONSTITUTION's victory over HMS GUERRIERE and Master Commandant Oliver Hazard Perry's victory on Lake Erie.

As astonishing and important as these battles were, however, much of the credit for America's naval successes in that second war with Britain—and in the subsequent rise of American sea power—must go to a man who not once during the conflict set foot aboard a warship. He made his contributions from behind a desk in Washington, D.C., where he served as Secretary of the Navy between January 1813 and December 1814. His name was William Jones, and you may be excused for never having heard of him.

Figure 1. Thanks in large part to Jones' foresight in ordering the construction of two small but capable warships at Presque Isle, Pa., the U.S. Navy squadron under Oliver Hazard Perry defeated British forces in the Sept. 10, 1813, Battle of Lake Erie.

The organizational development of American sea power was inconsistent, at best, before Jones' appointment as its civilian leader. The Continental Navy, established in 1775, was a hastily formed force, and its very existence was not a settled issue: In 1785 Congress mandated the sale of the frigate ALLIANCE, the last remaining ship of the wartime fleet, and for nine years after, the United States actually had no navy at all. The ad hoc composition of the Revolution-era Navy carried over to its rules and regulations. Continental Navy captains often secured appointment on the basis of regional politics, and state navies competed with the Continental Navy for good seamen. While Captain John Paul Jones had made noteworthy efforts to introduce professionalism to the service, legislators largely ignored his efforts.

In March 1794, responding to the depredations of the Barbary corsairs, Congress authorized the construction of six frigates to protect America's rapidly growing maritime commerce. Even then the lack of a well-organized naval department was a stumbling block, as was a pervasive political ambivalence about maintaining a standing navy. In his American Naval History, author Jack Sweetman summarized the political debate over establishment of the U.S. Navy:

A Congressional resolution calls for the establishment of a navy to protect American shipping from the Algerines. Supported by Alexander Hamilton's Federalist Party, which speaks for the Northeastern mercantile and maritime community, the bill is bitterly purposed by Thomas Jefferson's Republicans, who represent the Agarian South and inland areas. The latter fear that a navy will be a ruinously expensive, aristocratic institution, subversive of democratic ideals, whose glory-hungry officers will drag the country into unwanted adventures overseas.

Figure 2. While such early successes as USS CONSTITUTION's December 1812 victory over HMS JAVA, above bolstered U.S. morale, Jones' saw commerce raiding as more strategically vital.

Among those opposing a standing navy was William Maclay, a Jeffersonian Republican from Pennsylvania who argued that it was cheaper to pay ransom for American sailors held by the Barbary pirates than to establish and maintain a navy. Another congressman who opposed the idea of a permanent navy warned that if such a force was established, "this country may bid farewell to peace; because you thereby organize a class of society who are

interested in creating and keeping up wars and contention." Others worried that a standing navy would prompt a pre-emptive attack by Great Britain akin to the Royal Navy's attack on Copenhagen in 1807.

In such an environment it was not surprising that the management of the U.S. Navy that emerged during the Barbary Wars and the 1798-1800 Quasi-War with France continued to be problematic. Compounding the problems at the onset of the War of 1812 was a thoroughly ineffective Secretary of the Navy, Paul Hamilton. Appointed by President James Madison in 1809, Hamilton is aptly characterized in recent histories of the War of 1812 by such terms as "ineptitude," "vacillation" and "defeatism".

William Jones reluctantly accepted the appointment by Madison as Secretary of the Navy at the beginning of 1813. During the American Revolution, Jones had served in a company of volunteer infantry at the Battles of Trenton and Princeton, then sailed as a privateer in the Continental service under Thomas Truxtun. In the latter capacity he was twice wounded and twice captured by the British. Following the war Jones had sailed in the merchant service, founded a successful shipping company and served in Congress.

Despite his lengthy public service Jones then had little interest in becoming a political appointee and had turned down Jefferson's earlier offers of the job. But Jonathan Roberts, a former colleague in Congress, wrote a compelling letter to Jones, appealing to his patriotism: "The nation and the Navy point to you as the fittest man we have, and what is to become of us if the fittest man will not come forward in a moment of public danger?"

Jones was aware of the ugly side of Washington politics and understood his predecessor was leaving behind a nonfunctioning office. Yet America was facing a conflict with the country possessing the most powerful navy in the world. Jones swallowed his misgivings and stepped forward to become the Navy's civilian head. The *organization* he inherited was squeezed into three small rooms in a brick building just west of the White House. On hearing of Jones' appointment, friend Captain William Bainbridge commented: "You mentioned the inorganized[sic] state of your

department.... There never was any system in it, and for the want of it great abuses have crept in." After just one day on the job Jones wrote to his wife about "the Herculean task I have to encounter." He addressed that task with considerable energy and intelligence, and an estimably organized mind.

Jones promptly replaced the office's chief clerk with Benjamin Homans, a former merchant ship captain who shared the Secretary's understanding of the challenges ahead. Jones then issued a stream of orders and correspondence that addressed such basic management issues as personnel and shipbuilding. Historians have described his writing style as verbose and overbearing, but it also reflected his scrupulous honesty and dedication. His authoritative tone provoked some senior naval officers, who felt that Jones' new regulations compromised their authority as captains. Jones persevered, formalizing such administrative matters as transfers, promotions, officers' complaints and the redeployment of the ineffective gunboat fleet created by Jefferson. Jones established a correspondence system that adhered to the chain of command, enjoining, for example, junior officers from writing directly to the secretary.

On the matter of ship construction Jones brought his management skills to bear, establishing uniformity in design, effective control of construction and maintenance costs, and oversight of the recruitment and retention of skilled shipyard workers. At one point he wrote to two captains in charge of construction and maintenance, showing his determination to bring order to what had been a haphazard process:

> *Herewith you will receive the dimensions of masts, spars (etc.) for the sloops of war building under your inspection, to which you will please call the builders strictly to adhere, as well as to the precise position of the center of the masts, as designated in the draft in the gun deck line.*

Jones' methods might today be termed micromanagement, but they brought positive results: While he was Secretary, the

government-owned yards constructed the first U.S. ships of the line, several heavy frigates and a number of sloops of war designed for commerce raiding. In addition the government contracted local yards to build the ships on-site that later carried the day for the Navy at the Battles of Lake Erie and Lake Champlain.

Jones' administrative innovations were a big step toward establishing a functional department, but his most significant wartime efforts focused on America's naval strategy. "His primary energies had to be devoted to the immediate business of fighting," wrote naval historian Christopher McKee in his 1901 book *A Gentlemanly and Honorable Profession*. The strategic naval situation facing the United States at the beginning of the War of 1812 was, to say the least, challenging: the Royal Navy had deployed more than 100 warships on the North American Station, including 11 ships of the line and 33 frigates. Opposing the British, the U.S. flotilla comprised 16 ships, none larger than a frigate, and many in need of repairs.

That imbalance of the opposing forces made clear the need for a naval strategy of asymmetrical warfare. Fortunately for Jones, Madison and most of the Navy's captains already agreed on the essentials of a realistic strategy: Attack the British sea lines of communication with single ships while establishing and controlling the lines of communication on the Great Lakes and Lake Champlain. Commodore Stephen Decatur articulated the first element of that strategy in a letter to Jones' predecessor, Paul Hamilton:

> *[The] best use of the Navy would be to send single ships out with [a] large store of provisions so that they can cruise at a distance from the United States, and no more than two frigates together.*

Jones himself spelled out the second element of the naval strategy to Commodore Isaac Chauncey, senior naval commander in the Great Lakes region:

It is impossible to attach too much importance to our naval operations on the lakes—the success of the ensuing [land] campaign will depend absolutely on our superiority on all the lakes—and every effort and resource must be directed to that object.

Jones' primary achievement in the strategic area was, however, in applying the strategy dictated by the President, and doing so with consistency and clarity. In a February 1813 letter to the commanders of Navy ships then refitting he wrote:

Our great inferiority in naval strength does not permit us to meet them on this ground [in squadron action] without hazarding the germ of our national glory. We have, however, the means of creating a powerful diversion and of turning the scale of annoyance against the enemy. It is therefore intended to dispatch all our public ships now in port as soon as possible in such positions as may be best adapted to destroy the commerce of the enemy from the Cape of Good Hope to Cape Clear and continue out as long as the means of subsistence can be procured abroad in any quarter.

Figure 3. Knowing that control of the Great Lakes was vital to the U.S. war effort, Jones ordered the brigs Lawrence and Niagara to be built at Presque Isle, above, to the same design, top.

If anything can draw the attention of the enemy from the annoyance of our coast to the protection of his own rich and exposed commercial fleets, it will be a course of this nature.

In prosecuting this element of the U.S. naval strategy, Jones' merchant marine experience was a plus, as he was able to advise his captains on the best locations at which to intercept British merchant ships. The most significant outcome of commerce raiding by U.S. Navy ships—in combination with hundreds of American privateers—was the capture of thousands of British merchantmen during the war and the ensuring pressure from those in Britain whose livelihoods were based on ocean commerce (as well as their insurers) to end the war with the United States. The result was a softening of the British bargaining position at the peace negotiations in Ghent (in present-day Belgium) that began in August 1814.

The astonishing victories of the U.S. Navy in single-ship actions—including those between USS CONSTITUTION and

HMS GUERRIERE in August 1812, USS UNITED STATES and HMS MACEDONIAN that October, and USS CONSITITUTION and HMS JAVA in December—were a most welcome byproduct of commerce raiding. But if the American public focused on the dramatic one-on-one victories, Jones kept those unexpected combat successes in perspective. "I like these little events," he wrote to Madison at one point. "They keep alive the national feeling and produce an effect infinitely beyond their intrinsic importance." It is clear Jones well understood the broader naval strategy, while recognizing the importance of civilian morale during war.

Figure 4. Jones' actions toward creating and maintaining an effective logistical capability for the navy helped ensure America's September 1814 victory in the Battle of Lake Champlain.

Jones actively supported the strategic effort to control the Great Lakes and Lake Champlain, although his stance was for the most part, inappropriately defensive. It seems he had a strategic blind spot about the lakes and an approach at times out of touch with events on the water and in the surrounding regions. At one point Jones wrote to Madison emphasizing the importance of events in the Atlantic over those on the Great Lakes and Lake Champlain:

One-fourth of our naval force [is] employed for the defense of a wilderness, while our Atlantic frontier—our flourishing cities, towns and villages, cultivated farms, rising manufactories, public works and edifices—are deprived of the services and protection of this valuable body of men, the loss of whom by any casualty would be to the nation a deep calamity.

Jones evidently believed that by early 1814 the British were not in a position to threaten American control of Lake Champlain. But on Sept. 11, 1814, U.S. Navy Master Commandant Thomas Macdonough engaged in a sharp naval action on the lake and defeated a British naval squadron. That victory, combined with Perry's earlier victory on Lake Erie in September 1813, turned out to be strategically crucial. Many consider Macdonough's victory the tipping point in the war, the point at which U.S strategy got inside the British decision cycle. No less an authority than Alfred Thayer Mahan, the American prophet of sea power, stated unequivocally, in his book Sea Power in its Relations to the War of 1812, "The battle of Lake Champlain, more nearly than any other incident of the War of 1812, merits the epithet 'decisive."

But while Jones may have had a blind spot about the importance of the Great Lakes and Lake Champlain, he remained unflagging in the logistic support he provided for on-site construction of the fleets that fought and won the battles on both lakes.

Although Jones has gone largely unrecognized for his exceptional service as Secretary of the Navy during the War of 1812, it is clear upon examination of his record that he played a critical

role. Neither a strategist nor a charismatic leader, Jones nonetheless forged the essential link between Madison's strategy and the naval means of executing that strategy. His management skills provided a conduit between Madison's policies and the courage and skill of the U.S. Navy's increasingly professional leaders. Thus he was the enabler for such successful naval officers as Isaac Hull, James Lawrence, Bainbridge, Decatur, Perry and Macdonough.

Moreover, Jones did far more than help bring the war to a more satisfactory conclusion for the United States. By his actions in organizing the office of the Secretary of the Navy, he strengthened the concept of civilian control of the military that remained, for the United States, a work in progress during the conflict. And with his organizational abilities he established the office as the means of effectively applying sea power during war and as an instrument of U.S. global influence. William Jones was, in plain terms, exactly the man the United States needed as Secretary of the Navy at an important juncture in its history.

For further reading Joseph Callo recommends The Navy Department in the War of 1812, by Edward K. Eckert; A Gentlemanly and Honorable Profession: the Creation of the U.S. Naval Officer Corps, 1794-1815, by Christopher McKee; and Perilous Fight: America's Intrepid War With Britain on the High Seas, 1812-1815, by Stephen Budiansky.

SUBMARINE NEWS FROM AROUND THE WORLD

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From the November 2012 Issue

UNITED KINGDOM—Additional Funding for Successor SSBN Design Phase

In late October, British Defense Secretary Philip Hammond announced an additional investment of US$559.8M for further design work for the Successor Class Nuclear Powered Ballistic Missile Submarine (SSBN) Program. This follows the May 2012 funding of US$537.9M for the start of the design phase and the 18 June 2012 award to Rolls Royce a US$1.38B contract to produce new reactor cores for the sea service's current and future nuclear submarines. The new reactor cores will be for the seventh and final Astute class SSN that will begin construction around 2014 and for the Successor SSBNs.

Also on 06 September 2012, the US Navy announced that it had formalized key specifications for the Common Missile Compartment (CMC) for the US and Royal Navy (RN) SSBN Programs. The formalization of the CMC is a major design and construction milestone for both programs (as both programs are now in the design phase with construction expected to start around the end of the decade).

Even though the Main Gate decision is not until 2016, it appears with the latest investments and milestones that the RN is getting close to the point of no return for the Successor SSBN Program. Although still politically sensitive, the Ministry of Defense (MoD) and RN continue forward with the acquisition of a new SSBN force to replace the Vanguard class currently in service.

EGYPT—Navy Orders Two Type 209s from HDW

On 01 November 2012, AMI received information from various sources indicating that the Egyptian Navy (EN) has

ordered two (contract finalized and signed) Type 209 submarines from ThyssenKrupp Marine Systems (TKMS) Howaldtswerke Deutsche Werft (HDW).

This follows mid-September 2012 press reporting that indicated that the EN had already ordered two Type 209 submarines. On 31 August, Egypt's new navy chief, Vice Admiral Osama el Gindi also publicly made the announcement concerning the submarines that the sea service had ordered as part of a general modernization effort.

With the contract now in place, the submarines could begin construction by early 2013 with delivery occurring in 2017. Egypt has been looking at replacement submarines for over a decade for the four aging Chinese-built Improved Romeo (Project 033) class submarines that were built in the 1960s. Since the EN has four existing submarines that need to be replaced, it could order two additional Type 209s from HDW following the delivery of the first two.

The submarines will more than likely be an all German solution with Atlas Elektronik providing all sensor and weapon systems and Tognum providing the engineering plant for the program.

If need be, the EN could probably also procure used Type 209s from Turkey or South Korea as both countries will begin replacing their current Type 209 forces in the near term.

AUSTRALIA—Emphasis of New Whitepaper

In late October 2012, the Australian Department of Defence (DoD) announced that it was currently outlining a long-term strategy to position Australia to benefit from the opportunities of the Asian Century, while managing future challenges. Part of this strategy is the development of a new white paper, "Australia in the Asian Century".

The white paper will be released in the first half of 2013 and will outline the government's national objectives and pathways to building sustainable security in the region. It will consider in detail the implications of the changing strategic circumstances in the regions for Australia's defense and national security including:

- The ongoing strategic shift to the Asia Pacific and Indian Ocean Region.
- The US re-balance to the Asia Pacific and Australia's practical cooperation with the US pursuant to the 60-year old alliance.
- The ADF's operational drawdown from Afghanistan, East Timor and Solomon Islands.
- Australia's own Force Posture Review – the first in 25 years.
- The ongoing adverse effects of the Global Financial Crisis, which have continued to have a significant impact on the global economy.

The Australian Government will also continue to increase its efforts in the future to deepen defense cooperation with friends and partners in the region, a key theme for the 2013 Defence Whitepaper.

From the December 2012 Issue

NORWAY – Submarine RfI Released; Responses Due End of Year (2012)

As of early December 2012, AMI continues to receive information concerning the Future Norwegian Submarine program. Responses to the Request for Information (RfI) that were released to specific shipyards are due back to the Norwegian Ministry of Defense (MoD) by the end of December 2012.

The MoD RfI sought information from industry on investment cost, life cycle costs, production time, performance and other important aspects related to new submarines. The information will be used to help make a determination as to whether the Royal Norwegian Navy (RNoN) will move forward with a new construction program or continue to update the six units of the Ula class. In November 2011, the MoD announced that the RNoN should maintain a submarine capability past 2020 with the only options being a new build replacement for the Ula or the service life extension of existing hulls. The cost differential between the two options is expected to be substantial—on the order of 2-3

times more expensive for new build replacements compared to modernization of existing Ulas. The new build/modernize decision is expected in 2014.

In regards to new construction, the shipyards that received the Rfl are:

- DCNS
- Fincantieri
- Navantia
- ThyssenKrupp Marine Systems (Kockums and HDW)
- Daewoo Shipbuilding & Marine Engineering (DSME)

Running in parallel with the Rfl, the MoD is working on feasibility aspects, cost and uncertainties that may be associated with a service life extension of the Ula class. Domestic and external expertise has also been consulted in regards to the Ula modernization effort.

If a new construction option is selected, AMI believes that a design will be chosen in 2015 with a construction Request for Proposals (RfPs) released in 2016 and a contract in place by 2017. Like the Ula class, Norway would probably construct some of the modules in country with final assembly at the foreign partner's yard.

If the modernization path is chosen, the oldest unit, ULA, commissioned in 1989 could enter its extended overhaul (probably around 18 months) by 2014. The entire class could see service through 2035.

AZERBIJAN—Navy Orders Caspian Sea Mini-Submarines

In late November 2012, AMI received information that the Azerbaijan (Azeri) Navy (AN) had ordered new submarines for operations in the Caspian Sea. Although the types and numbers of submarines were not disclosed, AMI believes that the AN has ordered mini-submarines in order to counter the Iranian conventional and unconventional threat in the Caspian Sea in addition to providing a platform to transport its own special forces teams.

In the past, the AN utilized the Russian built Triton 2 mini-submarines for special forces operations. However, these vessels

were built in the 1960s and are no longer operational. Although the builder and number of units has not been disclosed, AMI believes that the Italian COSMOS MG110 would be the most likely candidate and a maximum of four hulls were probably ordered.

It could be that despite past familiarity and use of Russian-origin equipment, Azerbaijan was seeking better capability through Italian or other foreign submarine designs although the cost would be significantly higher than a Russian solution. The new submarines are expected to enter service in 2015.

The COSOS MG110 is 28 meters (91.8ft) in length with a displacement of 110 tons. It can carry two torpedoes and two – four mines and can deploy up to eight special forces personnel.

Modernization & Ship Transfer Newsletter

ECUADOR-Shyri (Type 209/1300) Shyri (Type 29/1300) Class Diesel-Powered Submarine (SSK): In late November 2012, Ecuador announced that it had funded US$125M to complete the modernization package for the second Shyri class submarine, HUANKAVILKA (S102). HUANKAVILKA began its refit at Chile's ASMAR Talcahuano Shipyard in November following the completion of the first unit, SHYRI (S101) on 19 October.

The following will be included in the modernization package:

- Hull, Mechanical and Electrical (HM&E) work.
- Replacement of batteries.
- Replacement of both periscopes.
- Installation of the DCNS Submarine Tactical Integrated Combat System (SUBTICS) with assistance from Chile's SISDEF.
- Integration of the MBDA SM-39 Exocet submarine-launched, anti-ship missile (ASM).
- Integration of the Thales S-Cube sonar suite.
- Integration of the WASS Black Shark heavyweight torpedo.

The overhaul of HUANKAVILKA is scheduled to be completed by February 2014.

AUSTRALIA-Collins Class Submarines: On 14 November 2012, Australia's Defence Material organization (DMO signed a US$23.2M contract with Thales Australia for the upgrade to the Scylla sonar suite on all six units of the class.

The custom designed processing boards for the sonar will be replaced with commercial alternatives. This will allow for fewer processing boards while improving overall capacity and overall sonar performance. The software upgrades also allow for easier future maintenance and reduces subsystems that are no longer manufactured.

The work will be performed by Thales Australia, the original manufacturer of the sonar as well as the holder of the in service support contract. A shore based system upgrade will be tested in 2013 and will be followed by the first submarine sonar suite upgrade in 2014. All six submarines could receive the modification by 2017.

INDIA-Project 75I Submarine RfP in the Near Term

As of December 2012, several of AMI's sources continue to indicate that a Request for Proposals (RfPs) for the Vertical Launch Submarine Project (Project 75I) (also known as the second submarine line) will be released in the near term. In September 2012, AMI received information that Project 75I had already been approved by the Indian Defense Acquisition Council (DAC) and estimated that the RfP would be released by the end of 2013. The Indian Navy (IN) estimates that the program for six units will cost around US$15B.

Also in December 2012, India's Secretary of Defence for Production, Shekar Agarwal, confirmed that two of the six hulls will be built in a foreign yard with the final four units at Mazagon Dock Limited (MDL) and Hindustan Shipyard Limited (HSL). MDL will build three units and HSL the remaining indigenous hull.

AMI estimates and public documents indicate that the four leading foreign contenders for this program are:

- DCNS of France with a Super Scorpene variant (AIM-2000).

- ThyssenKrupp Marine (HDW) of Germany with a new Type 216 design.
- Rubin of Russia with the Amur 1650 (with vertical launch humpback).
- Navantia of Spain with a variant of the S80 design.

Three of the four primary candidates have built or are building submarines for the IN. Russia delivered ten KILO class SS to India from 1986 through 2000, and modernization of the Indian KILOs continues at Russian shipyards. Germany executed a *split build* program to supply four Type 209s to India from 1986 through 1994. French builder DCNS continues to support a contract for six Scorpenes building in India with some modules fabricated in France.

Of the four leading contenders, only Spain would represent a new/non-traditional supplier for India. However, India's goal to diversify its supply lines to void depending on any one country or manufacturer would support serious consideration of a Spanish offer.

Two of the primary capabilities that are expected to be *must haves* for the chosen design are the ability to launch land attack missiles and Air Independent Propulsion (AIP). Germany's Type 216 design features a mission payload module that would support land attack missiles, while the AMUR design would also permit larger missile loads. All the candidate suppliers could supply torpedo-tube launched missile capability.

AMI's sources indicate that selection of the supplier will be solely on the basis of compliance with the requirements in the RFP, and historical association with past Indian sub acquisitions will not weigh on the selection process.

Assuming that the RfP is released by mid-2013, a construction contract could be in place by 2014 and the first unit commissioning in 2019.

CHINA – PLAN Considering the Russian Amur Design

On 22 December 2012, AMI received information that the People's Liberation Army – Navy (PLAN) is considering the

procurement of four Russian Amur-1650 conventionally-powered attack submarines (SSK).

This information comes only several months after reports that the majority of the Chinese-built Yuan (Type 041) class SSKs have returned to the shipyard for repairs due to a lack of performance. It also appears that construction of new units has slowed considerably or even stopped all together.

Designed by the Rubin Central Design Bureau, the Amur-1650 displaces about 1750 tons and has an overall length of 66.8 meters (219.2 feet). It is armed with six 533mm (21 inch) torpedo tubes for 18 torpedoes or mines. The 533mm tubes are also capable of firing the SS-N-27 Sizzler anti-ship missile.

The contract, worth a reported US$2B with Rosoboronexport, is said to be held for signing until 2015 at the earliest in order to prove out a new propulsion system for the Amur class submarines, the export variant of the Russian Lada class. The Lada class program has been terminated in Russia due to a lack of performance of its propulsion system.

AMI anticipates that if the contract is indeed signed in 2015, unit one could commission by 2018, followed by one unit per year through 2021. It is likely that, if the Amur-1650 proves to be effective for the PLAN, a second batch of four units could be ordered at a later date; similar to the procurement of the Kilo class by the PLAN early in the mid 1980s.

It appears that the PLAN's two latest diesel boat programs, first the Song class (Type 039) and now the Yuan class, have not been very successful, which is why the PLAN will have to continue with its two track policy of ship procurements; a mixture of indigenous construction and select foreign procurements in order to meet its requirements.

ASIA REGIONAL UPDATE

INDIA: In late December 2012, AMI received information that the Indian Navy's (IN) first Nuclear-Powered Ballistic Missile Submarine (SSBN), ARIHANT, will begin sea trials in the first half of 2013. Sources indicate that the nuclear reactor will go critical in the next several months following several years of

setbacks. The IN is calling for a commissioning date of 2014 for ARIHANT, however, this assumes all trials go successfully.

VIETNAM: In late December 2012, the first Kilo Class (636) Submarine for the Vietnam People's Navy (VPN), Ha Noi (HQ-182) has commenced factory trails in the Baltic Sea. The Vietnamese crew will begin training by February 2013.

The second unit, HO CHI MINH CITY (HQ-183), was launched the first week of January in 2013. Six Kilos will be built for the VPN and are scheduled to be in service by 2018. Hulls three through six named as follows: HAI PHONG (HQ-184), DA NANG (HQ-185), KHANH HOA (HQ-186) and BA RIA-VUNG TAU (HQ-187).

WORLD MISSILE DEVELOPMENTS

RUSSIA: In December 2012, AMI received information that the Russian Navy (VMFR) intends to modernize its fleet of ballistic missile submarines (SSBN) that are currently armed with the Sineva submarine-launched ballistic missile (SLBM) with the Liner SLBM.

The liquid-fueled Liner missile is a modernized version of the Sineva, is more capable and carries a larger payload by nearly double than that of the solid-fueled Bulava that equips the new Borey class SSBN.

The first submerged tests of the Liner occurred from the Northern Fleet SSBN YEKATERINBURG on 20 May 2012; just 11 years after the program initially began. Officials of the Makeyev State Rocket Center stated that the new Liner missile will allow current Project 667BDRM (Delta IV) class SSBNs to remain in service through 2030.

VARIOUS DID YOU KNOW?

RUSSIA: On 20 December 2012, the third Borey Class (Project 941) Nuclear-Powered Ballistic Missile Submarine (SSBN), VLADIMIR MONOMAKH, was floated out at Sevmash Shipyard. The first unit of the class, YURI DOLGORUKIY, was

commissioned into the Russian Navy on 21 December. The second unit, ALEXANDER NEVSKY, is currently conducting sea trials.

UNITED KINGDOM: On 22 December 2012, the second Royal Navy (RN) Astute Class Submarine, HMS AMBUSH (S 95), was launched at BAE Systems, Barrow in the United Kingdom.

AUSTRALIA: In late December 2012, Damen Schelde Naval Shipbuilding (DSNS) of the Netherlands was contracted to build the Submarine Rescue Ship (RGS9316) for the Royal Australian Navy (RAN). The new vessel will be built at Damen's facility in Vietnam and will be delivered to Australia in 2016.

From the January 2013 Issue

Modernization & Ship Transfer—BANGLADESH

Song Class Diesel Electric Submarines: On 03 January 2013, AMI received information that the Bangladesh Navy (BN) had concluded a deal with China concerning the procurement of two used Song class submarines from China. Source indicates that both submarines will be modernized prior to transfer.

The submarines will probably be overhauled at either Wuhan Shipyard or Jiangnan Shipyard where all of the submarines were built. The Song class began construction in the early 1990s and is being replaced by the more modern Yuan class, making them available for transfer. Both units could be overhauled and delivered to the BN by mid-2014. The BN will require extensive training as the sea service has never operated submarines in the past. The procurement of submarines is part of the three dimensional naval force consisting of air, surface and subsurface units announced by the Minister of Defense in 2009.

SINGAPORE—Archer Class Submarine: On 31 December 2012, the Republic of Singapore Navy's (RSN) second Archer-class submarine, RSS SWORDSMAN, arrived at the main naval base at Changi. RSS SWORDSMAN, an ex-Royal Swedish Navy Vastergotland class submarine, was launched in Karlskrona Sweden on 20 October 2010.

RSS SWORDSMAN is the second of two units acquired from Sweden in 2005. Both units have been refurbished and tropicalized for operations in the equatorial region. Both crews have been undergoing training in Sweden since 2008.

From the February 2013 Issue

SOUTH KOREA- DSME Awarded Contract for First Two KSS-3 Submarines

In early February 2013, AMI received confirmation that South Korea's Daewoo Shipbuilding and Marine Engineering (DSME) signed a US$1.56B contract on 26 December 2012 for the detailed design and construction of the first two KSS-3 3500-ton submarines. Both units will be in service by 2022. The basic design was completed in July 2012 allowing for the program to enter the next phase in December 2012.

AMI's source indicates that the Critical Design Review (CDR) for the submarines' sonar and combat system will be conducted from April through October 2013 in order for the fully evolved combat system to be ready for installation prior to the first unit entering the water around 2018.

It appears the majority of the combat system will originate from South Korea with Combat Management System (CMS) originating from Samsun Thales. The sonar system will probably be based on an Atlas Elektronik system with the towed array possibly being an indigenous system being developed by Hanwha. As a note, South Korea has been developing its own indigenous sonar at LIG Nex1 but apparently has met with mixed results and may not be ready in time for the CDR. In this case, the Republic of Korea Navy (ROKN) would have no choice but to continue its reliance on Atlas sonar systems.

This KSS-3 Program apparently will rely solely on South Korean produced systems including LIG Nex1 White Shark heavyweight torpedoes and Sea Star SSM-700K anti-ship missiles (ASMs). The torpedo tubes will be capable of launching torpedoes, ASMs and mines.

The KSS-3 will be unique in the ROKN in that it will have a vertical launch system (VLS) known as the Vertical Multi-Purpose

Locks (VMPL). The VMPL will be able to launch up to 12 Sky Dragon Land Attack Cruise Missiles (LACMs), the first time South Korea will be able to launch LACMS submerged.

Up to nine total KSS-3 hulls will be built through 2029. Like the KSS-2 program, this program will probably also be completed between DSME and Hyundai Heavy Industries (HII) with the seven remaining units split between the two yards.

THAILAND—SUBMARINE OPTIONS

In late January 2013, AMI received information that the Royal Thai Navy (RTN) was still interested in the procurement of two submarines. AMI source indicated that the RTN is currently considering lease options as an interim step prior to the acquisition of new construction hulls. It appears that the Type 209 or Type 214 hulls may be the most favored options at this time.

The procurement of submarines for the RTN has been under consideration since 1997 with the most recent initiative for the procurement of used German Type 206A submarines being cancelled in 2011 by the Thai Parliament due to its high cost. A submarine program has appeared in the last two procurement plans, Mega Project 2005, which called for two submarines by 2017 and the latest plan, the 2011-2020 procurement plan (*Plan to Develop and Strengthen Thai Military Capabilities*). Under the 2011-2020 plan, the procurement of submarines was listed as the third highest acquisition priority following the acquisition of frigates and three additional units of the Krabi class offshore patrol vessels (OPVs). This is in addition to a major upgrade to the two Naresun class frigates that involve a new Saab CMS System as well as the addition of the Evolved Sea Sparrow Missile (ESSM).

New construction for the foreseeable future is surely out of the question with a possible lease scenario as an interim measure. AMI believes that the new construction scenario is still several years down the road as the RTN has committed funds for the Naresuan modernization effort and in late 2012 US$972M for the procurement of the first two four frigates (two in the next decade (2020-2030).

In regards to the lease and later purchase of Type 209s or Type 214s, there may be several options available including South Korea and Turkey. Both will have type 209s coming free over the next several years and both have built Type 209s under license and are building Type 214s under license. Both of these countries are expanding their export market and would probably be able to offer an attractive lease/buy option. Greece could also lease type 209s and Type 214s (when completed and operating satisfactorily) and could also build more Type 214s in the event that the RN would choose this option.

A final lease/buy option may exist with China as part of a larger package as China has offered the Type 054A (Type 054T) as a solution to the RTN Frigate Program and could expand the deal to include the leasing of Song class submarines and new construction Yuan class submarines at a later date. Although the price would be extremely attractive, the RTN would prefer Western sourced submarines more, although the RTNs budget limitations could make a Chinese solution the more practical choice.

DID YOU KNOW?

RUSSIA: On 13 January 2013, the Russian Navy (VMFR) announced that the keel for the third Yasen (Project 885) class nuclear powered attack submarine (SSN) would be laid in July at Sevmash Pedpriyatie Shipyard (Northern Center).

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1521 Montclair St.,
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USS Casimir Pulaski's (SSBN 633) Fourth reunion. It will be held on July 26-28th 2012 in Eugene, Oregon. Former shipmates can contact the boat's website for further information at www.usscasimirpulaski.com.

USS Ronquil (SS-396)
Dates: Oct. 1-4, 2012
Location: Emily Morgan Hotel, San Antonio,TX For More Information: Contact Richard "OZZIE Osentoski, 734-671-3439 or ussronquil@yahoo.com

THE SUBMARINE COMMUNITY

SAVE THE CLAMAGORE

By CAPT. Don Ulmer, USN (Ret.)

USS CLAMAGORE veterans' effort to raise three million dollars for repair of their ship continues. A Cold War veteran submarine and National Historic Landmark, CLAMAGORE resides at Patriots Point Naval & Maritime Museum, Mount Pleasant, SC. Nearly $40,000 has been raised, a fraction of the funds needed to restore her. Patriots Point Museum currently explores options for disposing of CLAMAGORE by either finding a new home or sinking her to form a reef.

On the veterans' journey to tell the story of the USS CLAMAGORE, author and former Commanding Officer of the USS CLAMAGORE, Don Ulmer, exchanged letters with famed author Clive Cussler on the plight of this ship. Mr. Cussler is no stranger to maritime adventure. He is founder and chairman of the real-life National Underwater and Marine Agency. Mr. Cussler released the following statement for publication.

> *In a letter dated Oct. 12, 2012, Cussler endorsed and gave his public support for efforts attendant to saving the Cold War veteran submarine, USS Clamagore, currently an exhibit at the Patriot's Point Marine Museum at Mount Pleasant, SC. Per the staff at Patriots Point, Clamagore's deteriorating condition could cause the ship to sink alongside its dock possibly posing an environmental hazard. Repair costs are estimated to total $3M. The Clamagore Veterans' Association (CVA) attempts to raise these funds in a campaign depicted at the website http://www.savetheclamagore.com/. Pending receipt of*

funds for needed repairs, Patriots Point staff currently explores options for disposing of the vessel with a target date of the June, 2013 beginning of the hurricane season.

The Clamagore Veterans Association is forever grateful to Mr. Cussler for his support. These veterans will continue making every effort to keep their proud submarine afloat. This historical landmark provides immeasurable value for gaining insight into the Cold War submarine past.

LETTER TO THE EDITOR:

Re: The loss of SURCOUF: Solving an old mystery /Comment published in THE SUBMARINE REVIEW, 2012 Summer Edition, p.138 by CDR John D. Alden

Commander Alden is right to be frustrated with the lack of source material printed with my article. It was very long, so had to be divided into two installments. It would have been much longer and encrusted with footnotes had I listed the sources of every definitive statement. Suffice it to say that if I had been writing a history book I would have done so. A magazine article demands abbreviation, and the reader must rely on the integrity of the author. I made no statement nor drew any conclusions I was not prepared to defend.

In the absence of hard proof of SURCOUF's fate, speculation is all we have. But, in my opinion, informed speculation which takes into account all available facts ranks higher than the sort which resulted in the conventional wisdom of the THOMPSON LYKES collision, which has been repeated endlessly. Ditto for the purported aircraft attack the day after THOMPSON LYKES (for which there is no evidence) and the suggestion of the U-502 torpedo attack which assumes that an ace U-boat skipper would confuse SURCOUF with a small tanker.

I think it unlikely that Captain Blaison would have attempted a trim dive in deep water, having lived through the perils of serving with Captain Ortoli. For a U.S. submarine, trim dives are an essential part of operational readiness. Not so with SURCOUF. She made no trim dive on her February '42 trip to Bermuda from Halifax when the chances of encountering a U-boat were at least as high as when she left Bermuda. As a matter of fact, Admiral Kennedy-Purvis had sent a message to Admiral Horton suggesting that SURCOUF not return to Bermuda because of the submarine threat. And with the high speed of advance Blaison had been ordered to maintain en route to Panama there was no time for a trim dive.

The *simpler hypothesis* offered by CDR Alden leaves a number of facts unaccounted for. First and foremost, the debriefings of two St. Lucia PBY aircrews. LTJG E.N. Chase and his co-pilot saw "the biggest submarine he had ever seen... over 300' long." A Type VII U-boat was 220' long. A Type IX was 251' long. Mr. Chase knew what he saw was unusual. Later that same day, LTJG Binning had two radar and two visual contacts on a surfaced submarine which had a noticeable *oval contour to the front of the conning tower* and a *white cross* marking. He attacked during the second encounter, and ultimately received a Navy Cross for his action.

No U.S., German, or British submarines were sunk that day. Either both aircrews were hallucinating or there was some other submarine present that day.

Secondly, the *simpler hypothesis* leaves unexplained the very peculiar antics of U-69 during the same time period. Having completed a successful patrol, she was heading back to St. Nazaire when she made a right angle turn, entered a tiny fishing port on the east side of Martinique, remained there for three days, then went out to one of the few spots shallow enough to anchor about 40 miles west of Martinique and stayed there for a week. Why was anchoring involved? I believe she intended to remain at a designated rendezvous point, and there is a steady one-knot westward current in that part of the Caribbean.

Of course, as CDR Alden suggests, something else could have happened to SURCOUF, but to me this seems to best comport with the evidence currently available. It will be interesting to see if any more evidence is discovered.

F. H. Hallett

MEMORANDUM:

To: The Naval Submarine League Membership

From: CDR John D. Alden, USN(Ret.)

I am in the process of thinning out my library in anticipation of moving into smaller quarters, and would like to offer them first to fellow members. If you are interested, please send a self-addressed stamped envelope to me at 49 Tamarack Dr., Delmar, NY 12054-2919 for a list of the books and terms of sale.

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BOOK REVIEW

TURN THIS SHIP AROUND!

L. David Marquet
Austin, Texas: Greenleaf Book Group Press, 2012.
250 pp., $24.95

Reviewed by Lieutenant Ryan Hilger
Submarine Student at the Naval Postgraduate School

I have been a student of leadership for nearly fifteen years. I have read more books on leadership and management than I can count. To say that David Marquet's new book, *Turn This Ship Around!*, is the best book on leadership that I have read would be an understatement. Captain Marquet brings a unique perspective on empowerment and creating leadership at all levels that THE SUBMARINE REVIEW readership will find both refreshing, accessible, and readily executable.

Turn This Ship Around! chronicles the personal development of Captain Marquet's unique leadership style over the course of his career, from the first time he felt truly empowered as an officer of the deck during his division officer tour, to a department tour on a ship known as a *graveyard of officers' careers*, to the incredible turnaround story of his command, USS SANTA FE (SSN 763). Captain Marquet shares anecdotes from his career, mostly during his time in command, which will resonate with all submariners and sailors. Current submariners will find the origin of some of the phraseology now in use, such as "I intend to...," and the real power behind it if fully accepted and unleashed.

These stories, while entertaining on their own, serve to highlight the foundations of his leadership approach. Captain Marquet focuses on creating mechanisms that will enable control, competence, and clarity in any organization. His goal onboard SANTA FE was to change the culture from leader-follower—one so well-known to sailors—to leader-leader, where personnel at all

levels are empowered to make decisions affecting operational readiness or a business' bottom line. Pushing effective decision making to lower levels requires pushing the control to make those decisions lower as well. Watch officers or managers become better decision makers with the increased authority to make decisions. It offers them the chance to think critically about the proposed course of action, instead of leaving that to the commanding officer.

Effective decision making by more junior personnel also requires them to have greater competence to fully understand all aspects of the decisions they make. In many military and business organizations, operations are driven from the top down. The planning, deconfliction, and effects of an evolution are done by the leadership element and the junior sailors simply carryout the order, without much thought to the consequences. The transition period from leader-follower to leader-leader will be rocky, to say the least. Personnel will make mistakes as they discover their true level of competence at their job. Captain Marquet cautions against overreactions against these mistakes, focusing instead on using them as learning opportunities for all involved. Indeed, his time on USS WILL ROGERS (SSBN 659) proved that point. A single mistake by junior personnel resulted in the collapse of his attempt at empowering the Engineering Department. He spent the remainder of his tour abiding by the *old ways* that sailors are accustomed to.

Finally, for our junior sailors, or junior personnel in any organization, to make these decisions, they need to have the clarity of the organization's purpose. As a division officer on an SSBN, I saw the effects of both sides of this point first hand. Sailors working in the engineroom rarely had any idea as to what the ship was doing, why they were out there, or how their job and watch station affected the overall mission of the ship. Once they realized the control they had been given to run their watch stations and competently understood the larger picture, their requests become significantly more thought out and planned. These sailors understood how a minor maintenance action or procedure could affect the ship's readiness. Captain Marquet emphasizes that

understanding organizational purpose is not limited simply to the strategic direction and mission of an organization, but to day-to-day operations as well. Knowing what the organization was doing in the next few hours or days allowed sailors to take better care of their ship and improve readiness.

His journey was not smooth. It took a lot of time and a supportive chain of command to implement the leader-leader culture. But in the end, Stephen Covey, after riding SANTA FE to see what all the hype was about, called it "the most empowered organization he had ever seen" after watching the boat conduct a short-notice surfacing. Captain Marquet did not issue an order during the evolution. He allowed sailors at all levels to state their intentions and reasons for it, and allowed them to go on their way. *Turn This Ship Around!* provides a concise, clearly written manual for empowering people in any organization. His lessons are very prescient for current submariners looking to change their command's culture as well as any leader in business looking to unleash the potential of their organization.

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