AUGUST 2015

SUBMARINE TECHNOLOGY SYMPOSIUM
Luncheon Address
Mr. Ron O'Rourke 7

BALTIMORE COUNCIL ON FOREIGN AFFAIRS
The New Cold War
The Honorable Franklin C. Miller 18

NUCLEAR DETERRENCE
Deterrence Still the Cornerstone of U.S. Policy
ADM Cecil Haney, USN.....30

STRATCOM Deterrence Conference – Keynote
The Honorable Franklin C. Miller 34

STRATCOM Deterrence Conference – UK View
RADM Mark Beverstock, RN.....43

IN THE BEGINNING
Admiral Rayburn's Interview
RADM Kenneth Malley, USN, Ret......53

FEATURES
Russia Stakes New Claim to Arctic
Mr. Andrew Kramer,
The New York Times 104
Seawolf Completes Six-Month Arctic Deployment
Mass Communications Specialist
2nd Class Amanda R. Gray 106

ARTICLES
Submarines: Key to Offset Strategy
RADM W. J. Holland, USN, Ret. 108

Respect for Authority — Overrated?
RADM Dave Oliver, USN, Ret. 116

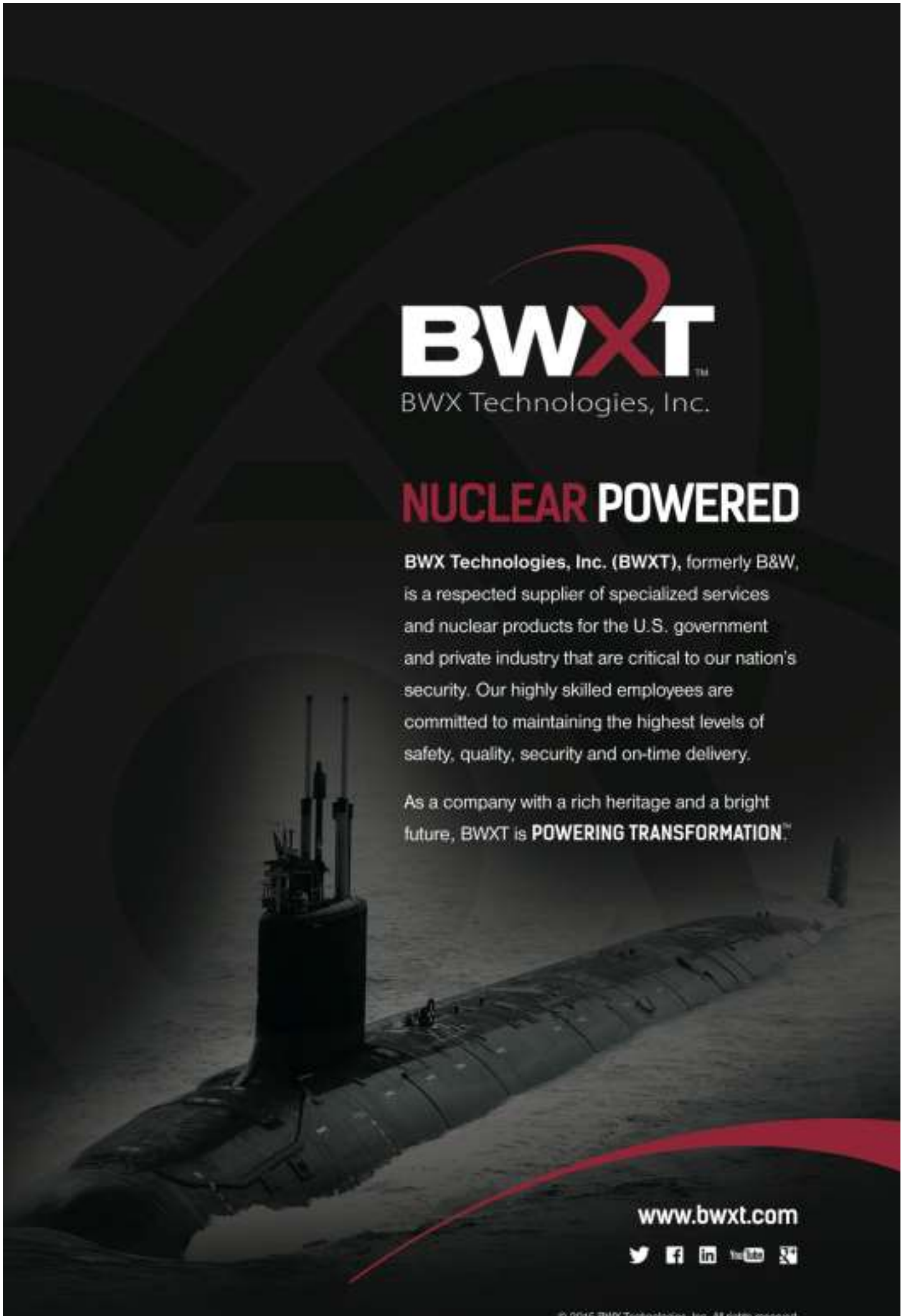
Tracking An Ultra-Quiet Submarine After Discovery
Mr. Steve Cordell.....125

Submarine News From Around the World
AMI Hot News.....131

THE SUBMARINE COMMUNITY
Neptune Award for Most SSBN Patrols
CAPT Sherman Alexander, USN, Ret. 145

RESPONSE TO:
OPEN CALL TO NSL MEMBERS
'BEST ADVICE I EVER RECEIVED'
Becoming A "Brother of the PFIN'
By Mr. Jack Townsend 150

Best Advice I Ever Received
CAPT Don Ulmer, USN, Ret.
LCDR Steve Kurak, USN, Re......155


BWXT
BWX Technologies, Inc.
NUCLEAR POWERED
BWX Technologies, Inc. (BWXT), formerly B&W, is a respected supplier of specialized services and nuclear products for the U.S. government and private industry that are critical to our nation's security. Our highly skilled employees are committed to maintaining the highest levels of safety, quality, security and on-time delivery.
As a company with a rich heritage and a bright future, BWXT is POWERING TRANSFORMATION.
www.bwxt.com

EDITOR'S COMMENTS

This issue of THE SUBMARINE REVIEW continues the emphasis on the dual-primary concerns of the American submarine community: Nuclear Deterrence, as to be practiced by the SSBNs of the OHIO Replacement Class and Forward Presence, as to be produced by the VIRGINIA Class SSNs. They are firstly the logic concern for nuclear deterrence. Additionally there is the concern for continued support for the overall submarine building programs producing the OHIO replacements, the VIRGINIA class SSNs and the Virginia Payload Module. Some observers, questioning security needs and citing projected funding levels, have recommended cutting into projected Submarine Force levels.* If it is not clear to the American body politic that those programs are absolutely necessary for the common defense in these, and probable future perilous times, the high cost of advanced deterrent and war fighting systems may not get the funding support which they need. That is the reason this magazine will keep pounding this drum.

The lead of this issue is this year's presentation by Mr. Ron O'Rourke, Naval Analyst for the Congressional Research Service, in his usual unclassified personal observations, to the Submarine Technology Symposium. His objectivity about the national security funding process, particularly for the Navy and with a focus on the Submarine Force is valued and instructive. His views about real problems facing the submarine community, and his consequent suggestions for solutions of some of them, such as the coming SSN force level gap between actual and needed numbers are worthy of the community's consideration and support.

The Honorable Frank Miller's recent presentation to the Baltimore Council on Foreign Affairs is titled The New Cold War and reflects the seriousness of worrisome trends in the international security picture. The concept of a change in the strategic era from that we experienced in the immediate post-Cold War years has been articulated before but there does not yet seem to be wide public acceptance of that change, nor notable media treatment of its cause and effect.

Several worthwhile high-level policy statements on Nuclear Deterrence were delivered at a STRATCOM conference and are presented here. It is noteworthy that the concept of deterrence is addressed in a wider form than just that provided by a credible nuclear weapons posture. It is obvious that more public discussion of the relationships between forms of deterrence is needed. That is, between domains-space, cyber, terrestrial and between modes, say declaratory and physical. In the past there was ample academic discussion of deterrence from universities and think-tanks as well as policy-level statements from officials in the business of national security. It would be useful to encourage publication of up-dated and expanded treatment of deterrence relationships.

In a very useful look at the beginning of meaningful Nuclear Deterrence within our submarine world we have the words of Admiral Rayburn, the first Director of the Navy's Strategic Systems program, about managing the advent of Polaris. He was given top priority and the authority to use it-and he did. It is arguable that the full support he was given during that advent process was as powerful bit of deterrence as the initial shots from GEORGE WASHINGTON and PATRICK HENRY. Accordingly it should be recognized that the political and academic spheres of effort, as well as the military and industrial parts played an indispensable role in bringing that deterrent force into being, and that is probably one of the most important lessons to be re-learned as we try to build a new deterrent force.

Jim Hay
Editor

*See O'Rourke *VIRGINIA Class Procurement: Issues for Congress*, page 86, THE SUBMARINE REVIEW, November 2014.

FROM THE PRESIDENT

We live in a dynamic world where chaos and potential trouble spots emerge with increasing frequency. The influx of refugees into the European Union, Russian expansion into Eastern Europe, war and insurgency in the Middle East and Northern Africa, provocative Chinese behavior in the Western Pacific, competition for access to Arctic sea lanes, and the unpredictable behavior of North Korea remind us daily of the need for strong, capable, and responsive Naval Forces.

To be effective, our Navy must be well trained, well maintained, and forward deployed with flexible combat capability to provide our Combatant Commanders the tools needed to respond to the myriad challenges they face. The US Submarine Force demonstrates effective forward deployed combat capability daily around the world and ensures US Undersea Dominance in every maritime theater.

Strategic and Attack submarines operating in diverse and demanding environments continue to excel in response to Combatant Commander tasking, and, despite a challenging fiscal environment, submarine programs continue to enjoy strong Congressional support.

The OHIO Replacement Program, the Navy's top priority program, is proceeding according to schedule, with the engineering and design effort supporting construction start of the first ship in 2021.

The VIRGINIA Class Submarine Program continues to set the standard for Defense Department program execution relative to cost, schedule, and capability. These exceptional ships are taking their rightful place in the fleet, with two ships per year being delivered to the operating forces, and their performance has been uniformly superior in every Combatant Theater.

As discussed in our NSL Updates, there have been a number of important changes in the leadership of the Navy and the Submarine Force. As these outstanding Naval Officers assume new leadership responsibilities within our Navy and our

Submarine Force, the vision of the Submarine Force remains focused and clear: Well-trained submariners will operate and maintain superb submarines, responding to Combatant Commander tasking, securing our national defense and ensuring Undersea Dominance in all the oceans of the world.

These officers will join ADM Cecil Haney, VADM Willy Hilarides and VADM Terry Benedict during the 2015 Naval Submarine League Annual Symposium to reflect upon the challenges confronting our Submarine Force as our nation and our Navy navigate a path forward in a dangerous and uncertain world. The Symposium will be held at the Fairview Park Marriott in Falls Church, VA, on October 21 - 22, 2015. The focus for this 33rd Annual Symposium is "Accelerating Innovation - Meeting the Undersea Capability and Capacity Challenges of the Future (2025 - 2035)" and should prompt thoughtful discussion relating to the Submarine Force's other areas of major emphasis: The VIRGINIA Payload Module and the payloads and capabilities that will enable our submarines to meet the challenges that will arise in the future.

Your Naval Submarine League strives to improve the quality and value to our members of our website and of our periodic Naval Submarine League Updates. Your feedback is appreciated and helps us to groom these resources to better serve you.

It is my privilege to serve with the leadership of the Naval Submarine League and I encourage you to recommend membership to your shipmates and to your friends.

Finally, as always, I ask that you keep our nation's men and women in uniform serving around the world in your prayers.

John B. Padgett III
President

THE SUBMARINE REVIEW IS A PUBICATION OF THE NAVAL SUBMARINE LEAGUE

STAFF OF THE SUBMARINE REVIEW
Editor: CAPT James C. Hay, USN, Ret.
Assistant Editor: Mrs. Kristin N. Bernacchi

NAVAL SUBMARINE LEAGUE –5025D Backlick Road, VA 22003-6044
PH:(703) 256-0891 Toll Free (877) 280-7827 Fax: (703) 642-5815 E-mail: subleague@navalsubleague.com

SUBMARINE TECHNOLOGY SYMPOSIUM

SUBMARINE TECHNOLOGY SYMPOSIUM

JOHN HOPKINS UNIVERSITY – APPLIED PHYSICS LABORATORY

MR. RONALD O'ROURKE
SPECIALIST IN NAVAL AFFAIRS
CONGRESSIONAL RESEARCH SERVICE

MAY 11, 2015

Introduction

Thank you for the introduction—and thank you for the chance to once again speak to you.

As usual, I need to issue the standard disclaimer that these remarks are my own and do not necessarily reflect the views of CRS or the Congress.

The pin on my lapel

I want to start today by noting the pin here on my lapel. It's a pin for the New Horizons spacecraft, which is NASA's mission to Pluto and the Kuiper Belt. APL put the New Horizons spacecraft together, and is running the mission from one of the other buildings here on the APL campus.

The project office was kind enough to give me a briefing on the mission three years ago, and it was at that briefing that they gave me this pin. I've been wearing it to work every day since the start of this month, because after more than 9 years of flying toward Pluto at about 30,000 miles an hour, it's now show time—the spacecraft is now close enough to image Pluto and its largest moon as something more than dots, and the actual flyby, when all kinds of discoveries will be made, will be on July 14.

I'm pointing this out not only because the mission is being run right here at APL, but because when the mission was launched in 2006, the flyby in 2015 seemed a long way off. And yet here we are, just a few weeks away from that event.

It's a reminder that things that seem to be far in the future will get here before we know it, which is a point I'll return to later in my talk.

June 2014 HASC on DOD acquisition—finding what works

But I want to start now by talking for a few moments about a House Armed Services Committee hearing that was held last June, just after my talk with you last year.

The hearing was entitled *Case Studies in DOD Acquisition: Finding What Works*, and it was focused on showcasing acquisition programs that have done well, and on identifying the reasons why they went well.

I thought it was important to hold this hearing for at least two reasons. First, you can't always identify what works in acquisition by focusing solely on programs that don't perform well, because doing well in acquisition doesn't always involve doing the opposite of what was done in poorly performing programs. It sometimes involves doing things *differently*—at some kind of right angle to what was done in a poorly performing program—and it can be hard to identify that different-but-not opposite course of action by focusing only on programs that go bad.

Second, I thought it was important to hold a hearing focusing on success stories because there are lots of hearings that focus on poorly performing programs. Holding those kinds of hearings, of course, is an important aspect of congressional oversight—and it can develop some insight into how to do things better the next time.

But holding hearings that focus on poorly performing programs without ever looking at any counter examples of programs that have performed well can encourage an attitude of

pessimism and cynicism toward defense procurement—a sense that DOD just can't do things right, and that the acquisition system is not only broken, but that there's little that can be done to fix it. I've encountered that attitude a fair amount in recent years, and in terms of actually trying to do better in acquisition, I don't think it's very helpful.

So when I was asked to be one of the witnesses at this hearing, for the purpose of talking about Navy shipbuilding acquisition success stories, I welcomed the opportunity.

My testimony presented seven acquisition success stories in Navy ship acquisition, and three of them were naval nuclear propulsion in general, the Virginia-class program, and the Acoustic Rapid COTS Insertion program.

As those of you who have heard my talks here in past years might recall, I've long felt that the ARCI program has not received the attention it deserves. But at that hearing, the ARCI program had a moment in the sun.

When I put together that list of 7 cases, I was very conscious that 3 of them were about submarines or, in the case of nuclear propulsion, closely related to submarines. I was a little concerned that the submarine community was overrepresented in the 7 case studies. But in the end, I felt that I had called it as I see it, and that all three examples were important in terms of finding what works in acquisition, and why. So I went ahead with the list as it stood.

So, if the submarine community wants to bask in the glow of accounting for 3 of the 7 examples, I say go right ahead, because the community has earned it.

And if you're curious to see the testimony, I can send you a copy, or you can download it by going to the House Armed Services Committee web site.[1]

But this isn't simply about basking in the glow of accounting for 3 of the 7 case studies, because there's a connection between those 3 success stories and the next thing I want to talk about, which is the Ohio Replacement program.

Ohio Replacement Program—a potential new approach to shipbuilding

There were a couple of notable developments concerning the Ohio replacement program on the Hill last year, and one of them was the creation of the National Sea-Based Deterrence Fund.

At the time the fund was created, a principal logic for doing so was the belief that it will help preserve funding in the Navy's regular shipbuilding account for the Navy's other shipbuilding programs, and perhaps encourage DOD to source the funding for the Ohio replacement program from across the DOD budget, rather than primarily from the Navy's budget.

To some degree, this value in creating the fund relies on what is essentially psychological mechanism—that by putting funding for the Ohio Replacement in its own separate account, people might be a little less inclined to add up the total amount of funding for all of Navy shipbuilding and manage the situation using that single combined number.

This year, however, it has become clear that creating the fund might have a second effect—an effect that has to do with how the Ohio Replacement boats will be built.

In a previous talk here, I mentioned the possibility of reducing the cost of the Ohio Replacement boats by using a joint, cross-class block buy contract with the Virginia class program. That possibility is still being studied.

But somewhat independent of that possibility, the Navy is also now looking at a build strategy for the Ohio Replacement boats that approaches the 12 boats as a group, rather than as a series of 12 individual efforts. Under this approach, instead of building the boats in a strictly serial fashion, the boats would be built partly in a batch fashion, a bit like the way that a parent with several kids might make sandwiches for the kids' lunch bags. The boats would still be completed and enter service at a rate of one per year, but some aspects of their construction would be done on a batch basis.

This partially batch-oriented approach to building the boats is something that could be done under either a joint, cross-class, block buy contract or a stand-alone contract for the Ohio replacement program, though doing it under a mechanism that

permits joint material and component buys for both the Ohio Replacement and Virginia-class programs, and perhaps also the Ford-class carrier program, could reduce costs further.

Now, it so happens that the National Sea-Based Deterrence Fund could facilitate this partially batch-oriented approach to building the Ohio Replacement Boats.

If the National Sea-Based Deterrence Fund, like the National Defense Sealift Fund, is located in a part of the DOD budget that is outside the procurement title of the annual DOD appropriations act, then the Navy might be able to use the money in the Deterrence Fund with the same flexibility that it has employed to build sealift and auxiliary ships acquired through the Sealift Fund.

In the Sealift Fund, this flexibility has allowed the Navy, without the use of a multiyear procurement contract and associated EOQ authority, to reduce the cost of the Lewis and Clark class dry cargo ships by batch ordering components for multiple hulls in the class and cash flowing the program's funding across hulls instead of managing the funding appropriated for each hull as a separate pot of money. Partially batch building the Ohio Replacement boats could involve doing something similar with the money in the Sea-Based Deterrence Fund.

Now, in acquisition terms, this is all pretty heady stuff. I mean, think about it: Cross-class contracts, joint material buys, and partial batch building of submarines. Any part of this would constitute a major change in Navy shipbuilding—a revolution, some might say. And the question will rise: Will this work? Is it too risky? Can we trust the Navy to pull this off, or would it create a big mess?

These are all fair questions, and we'll have to see how people at the corporate Navy level, at OSD, and in Congress feel about all this. There are important considerations to take into account concerning program execution risk, the full funding policy, budgetary discipline, congressional control over annually appropriated funds, and tying the hands of future Congresses. So we'll have to see whether ideas like these will gain approval in the executive branch and in Congress.

But as policymakers consider these issues, one possible argument that might be thrown into the mix could be, well, if you're going to try something this ambitious, it might make sense to try it in the part of the Navy that successfully implemented joint production of submarines across two shipyards, and the 2-for-4-in-12 cost reduction program, and the ARCI program, which was an early example of walking the walk on open architecture.

So you see, in terms of those acquisition success stories that I presented in my testimony last year, that's not just something that can bask in the glow of, because it might also help form part of the argument for why, if you *are* going to undertake a revolution of this kind in Navy shipbuilding, submarine acquisition might not be a bad place to start.

Ohio Replacement Program—putting resiliency back into a brittle schedule

But as I mentioned a few minutes ago, the creation of the National Sea-Based Deterrence Fund was one of two notable developments on the Hill last year concerning the Ohio Replacement program.

The other was the $11-million shortfall in FY14 funding on the DOE side of the budget for Naval Reactors, and the risk of a 6 -month delay this shortfall created in the design of the fuel core for the boat's reactor plant. The issue was dealt with, but it was a reminder of how, as I pointed out last year, the Ohio Replacement program, while being the Navy's top program priority, has also, due to its lack of schedule slack, paradoxically become a brittle program, with little resiliency for absorbing instances of funding instability or shortfalls, or other unplanned events.

What this suggests is that, as the program continues to explore possibilities for things like cross-class contracts, joint material buys, and batch-building strategies, it might also be prudent to explore possibilities for creating some new slack in the schedule, so as to make the program more resilient in terms of being able to absorb unplanned events. It's risky for the program to be in a position where everything has to go right for the next 15 years in terms of funding stability and sufficiency, and unplanned events,

because disturbances like these are often not within the submarine community's ability to prevent. The idea would be to look for opportunities for creating slack at various points in the 15-year schedule, so that schedule disturbances that occur later in the 15-year period, and not just earlier in the 15-year period, could be absorbed.

Addressing the projected SSN shortfall

I want to shift now from the Ohio replacement program to attack submarines, and here I want to focus on the SSN shortfall that is projected to start in the mid-20s and extend through the mid-30s. I first warned about this shortfall 20 years ago, in testimony I gave to the House Armed Services Committee, and I've been reporting, testifying, and speaking about it every year since.

We're a lot closer to this shortfall now than we were when I first testified about it in 1995, but there's still time to do things to mitigate it. And mitigating it might be desirable not just for force-management purposes—it might also be important from the standpoint of conventional deterrence, because the shortfall is projected to reach its greatest depth around 2029, which might also be about when China concludes that that its window of opportunity for achieving its goals in its near-seas area will start to close down.

So, what are some options to consider for mitigating the shortfall? One, of course, is to move maintenance away from that period where possible, to the years before and after, so as to maximize the faction of the force that is available for presence and contingency response during those years. That wouldn't reduce the total volume of the shortfall; it would instead spread it out to the shoulder years. But by reducing the maximum depth of the shortfall, it could reduce the chances that China or some other potential adversary might see the bottom as a particularly promising time to do something aggressive.

Another option is to homeport additional attack boats at Guam and perhaps also Hawaii, again so as to maximize the fraction of the force that is available for presence and contingency response in

the Western Pacific during those years. This might require additional MilCon. That wouldn't be cheap—but it could be less expensive than building additional boats, and a lot less expensive than fighting a major conflict that occurs through a failure of deterrence. And a third option, as I've mentioned before, would be to refuel a few 688Is and extend their lives for several years, so as to help fill in the shortfall. That would be very expensive, and not very cost effective in terms of dollars spent per years of additional service, but again, one might argue that it would be less expensive than building entirely new boats, or fighting a major conflict that occurs through a failure of deterrence.

You've heard all these options before, and I imagine the Navy is already examining options for moving maintenance to other years.

Japan's Submarine Force

So now I want to talk about four additional potential options for addressing the shortfall—options that I haven't focused on before, at least not very much. One of them involves an ally, namely, Japan.

Japan's current government has been working to broaden the country's role in security affairs, and Japan and the United States have recently agreed on an updated set of guidelines for defense cooperation. Developments such as these raise a question as to whether it would make sense from a U.S. perspective to encourage Japan to help offset the U.S. attack boat shortfall by temporarily expanding the size of Japan's submarine force during the shortfall years.

Whether this would be advisable from a U.S. or Japanese perspective is not at all clear, given the political, Japanese constitutional, and operational issues involved. But it might be worth looking into, because Japan might actually be able to expand the size of its force during those years without increasing its submarine procurement rate, for reasons we can talk about in the Q &A, if you want.

Japan's submarines are conventionally powered, so additional Japanese boats wouldn't represent anything like a one-for-one

backfill for U.S. attack submarines. But that doesn't mean they'd be of no value.

Three potential options for the next administration

The three remaining options for addressing the shortfall are options for the next administration. Like the New Horizons flyby of Pluto, the next administration is no longer far in the future. The campaign, in fact, has already begun, as you can see in the news every day.

I spoke last year about how world events have led a number of observers to conclude that the international security environment is shifting from the familiar post-Cold War era of the last 20 or 25 years—also known as the unipolar moment, with the United States as the unipolar power—to a new and different international security situation featuring a renewal of great power competition and challenges to elements of the U.S.-led international order that has operated since World War II.

The last time the international security environment underwent such a shift—from the Cold War to the post-Cold War era—it led to a broad reassessment of U.S. defense plans and programs that was articulated in the 1993 Bottom-Up Review (BUR).

On that basis, it is reasonable to wonder whether a new shift in the international security environment—from the post-Cold War era to an as-yet unnamed new era of renewed great power competition—would prompt a similar reassessment of the overall terms of debate on U.S. defense plans, programs, and budgets.

Whether this will happen remains to be seen. It *can* be noted however, that defense and foreign policy have been fairly prominent topics of discussion in the early stages of the presidential campaign.

In light of this, it might make sense for the submarine community to have some options ready for responding to a request from the next president—whoever is elected, of either political party—for options for bolstering our security posture. Here are three possible options.

The first would be for increased funding for the ARCI program and other programs to improve the capability of existing attack boats, so that the boats we'll have in coming years, including the shortfall years, will be as robustly modernized as possible.

Due to budget constraints, the pace of ARCI installations has been reduced somewhat. Adding funding back into that program could increase the rate back to where it was before.

The second option would be to program funding for building all Virginia-class boats procured in FY19 and beyond, and not just some of them, with the Virginia Payload Module. There already appears to be interest in that option on the Hill.

And the third option—and the final thing I'll mention in my talk here today—would be to put some additional Virginia-class boats into the shipbuilding plan in FY23 and prior years, so that they'd enter service in time to offset the deepest part of the shortfall. Imagine the signal of resolve and deterrence that might be generated by an announcement from the next administration that as many as five or six additional Virginia-class boats were being inserted into the shipbuilding plan.

I understand that executing such a plan, or even a plan involving a smaller number of additional boats, would raise industrial base challenges and stress the ability of the Virginia - class program to continue meeting its marks and delivering boats ahead of schedule. But I imagine that it's a challenge the industrial base might welcome.

Now, whether the next administration will ask for options for bolstering our security posture, and whether the Budget Control Act will be amended or replaced in a way that makes more funding available for defense, is not at all clear. I'm not predicting that these things will come to pass. They might very well not come to pass. I'm only saying that world events and remarks on the campaign trail suggest that they might, and that in light of this possibility, it might make sense to have the programmatics for this scenario ready to go, so that, if the request for options is sent out at the beginning of the next administration, you can say, "here they are, these things can be started right away."

Conclusion

I thought I'd finish with that option about putting extra boats into the shipbuilding plan just to get your juices flowing a little. And so, returning to this pin on my lapel, I can observe that in the 20 or so minutes that I've been talking to you, the New Horizons spacecraft has traveled about 10,000 miles. Imagine that—10,000 miles, in just 20 minutes.

And by comparison, what have I accomplished in those 20 minutes? Well, maybe not a whole lot—I mean, I've barely moved an inch the entire time I've stood here. It's enough to make me feel, you know, a little inadequate. But hopefully I've given you some ideas to think about.

When younger people ask me for advice- which is never—I tell them—well, I *imagine* telling them—that as you get older, time seems to move more quickly, and dates that look far in the future really aren't, because you'll get there before you know it.

So the key is use the time you have now, so you'll be ready for that future date when you find yourself, quite suddenly, there.

And it's in that spirit that I have offered my remarks today. I hope you found them of value. I'll be happy to respond to any questions you might have, and again, I thank you for the chance to spend these few minutes with you, as we speed into the future.

ENDNOTE

1 Statement of Ronald O'Rourke, Specialist in Naval Affairs, Congressional Research Service, Before the House Armed Services Committee on Case Studies in DOD Acquisition: Finding What Works, 17 pp. The four acquisition success stories presented in the testimony that are not related to submarines (at least not primarily) are the Aegis Ballistic Missile Defense (BMD) program, the Mobile Landing Platform (MLP) ship program, the use of Profit Related to Offers (PRO) bidding in the DDG-51 program, and the Navy's extensive use of multiyear procurement (MYP) and block buy contracting. The testimony noted that the seven case studies "are by no means the only examples that might be cited, and lists compiled by other observers would likely include different examples." The testimony is posted at:
http://docs.house.gov/meetings/AS/AS00/20140624/102377/HHRG-113-AS00-Wstate-ORourkeR-20140624.pdf .

BALTIMORE COUNCIL ON FOREIGN AFFAIRS
THE NEW COLD WAR

The Honorable Franklin C. Miller
Baltimore Council on Foreign Affairs
June 4, 2015

Franklin Miller is a Principal at the Scowcroft Group in Washington, D.C. He served in the White House as a Special Assistant to President George W. Bush and as Senior Director on the National Security Council. He also served for twenty-two years in the Department of Defense in a series of progressively senior positions under seven secretaries. During his career he had unusual influence on the evolution of national deterrence and nuclear targeting policy.

Although largely unremarked upon and little recognized by the vast majority of Americans, Russia has been engaged in a new Cold War with the United States for almost seven years. Indeed, we have not until recently acknowledged its existence or risen to the challenge of responding. But the time has come to understand what is happening, to understand why (to the best of our knowledge) this has occurred, and to understand what we should be doing about it. If you leave here this evening better armed on each of these three points than you were when you arrived then I will consider my task accomplished.

Beginning in the middle of the last decade then-Russian Prime Minister Vladimir Putin began a series of policy initiatives to solidify his control at home and to enhance Russia's power and prestige at the expense of his neighbors. Upon beginning his second term as President of the Russian Federation in 2012, he accelerated this process dramatically. In doing so, he has fanned a combination of virulent anti-Americanism and messianic Russian nationalism, all the while fostering a cult of personality. He has brutally crushed political dissent at home and has cynically

violated both solemn treaty commitments and other countries' sovereignty. And most of this has been unremarked upon here at home. So, let's review briefly what has been occurring.

Within Russia, Mr. Putin has virtually eliminated domestic political opposition by outlawing opposition parties, exiling or arresting political opponents, destroying the free press and establishing a state-controlled media system reminiscent of Soviet days. He has appropriated the firms, property, and money of political rivals and either jailed or deported them. He has forced many Western non-governmental organizations to close their Russian offices, accusing them of spying and sedition, and has placed the remainder under heavy surveillance. His secret services murdered the crusading journalist Anna Politkovskaya (2006), the muck-raking auditor Sergei Magnitsky (2009), and in February of this year the leading opposition politician Boris Nemtsov was shot to death within sight of the Kremlin. Just last week one of Nemtsov's associates, Vladimir Kara-Murza, was rushed to hospital, the victim of what is believed to be an exotic poison. Nor has Putin allowed the niceties of international law to stay his hand, sending agents to murder former KGB officer Alexander Litvienko in London in 2006 – and, last year, awarding a medal to the chief murderer. Russian tycoon Boris Berezhovskiy, once a Putin crony who then fell out with him, died in the UK under extremely suspicious circumstances in 2012. Just last week, British police announced that new test results had established that Alexander Perepilichnyy, an investment banker and whistleblower, who died in the UK in 2012, was in fact killed by an exotic poison. And, as early as 2004, Russian agents poisoned the Ukrainian politician Viktor Yuschenko, at the time the leader in a close race for the Ukrainian presidency; Yuschenko survived due to prompt medical intervention, so the Russian regime worked with allies in Ukraine to blatantly steal the election—a result which was overturned four months later in the so-called *Orange Revolution*, thereby setting the stage for the current crisis in Ukraine.

Turning to the international stage, in the fall of 2008, following a series of skirmishes between Russian troops and Georgian

forces, the Russian army invaded portions of Georgia. While Putin's forces performed poorly, they nevertheless overwhelmed the Georgians. Since then, Russian forces have occupied the Georgian provinces of South Ossetia and Abkhazia, and have supported local pro-Russian governments which have announced their independence from Tblisi. Russian troops also still occupy the Moldovan province of Transdniestria, as they have since the breakup of the USSR. The Russian military's lack of competence in the Georgian campaign prompted Putin to begin a massive rearmament campaign, the fruits of which were clearly visible last year in the lightning invasion of Crimea.

Incidentally, you will hear it said occasionally that NATO is militarily superior to Russia. That may be true theoretically, if you were to add up all of the military manpower and equipment possessed by all 28 NATO nations. In reality, however, at every point along the common border that NATO nations share with Russia—with the possible exception of the Russo-Turkish border—it is Moscow which holds a significant conventional military advantage.

And then, of course, there is that 2014 seizure of Crimea and Russia's invasion of Ukraine's eastern provinces. To this day, Russia has continued to pour military units into the Luhansk and Donetsk regions, creating the concern that before long those forces will again roll into action, driving west to capture the city of Mariupol and establishing a corridor which reaches all the way to the Crimean peninsula. Putin and his government continue to maintain, in a twenty-first century version of Hitler's *the Big Lie*, that no Russian forces are in eastern Ukraine. Tellingly, however, the Putin administration decreed last week that reporting or discussing the deaths of Russian military personnel would henceforth be a crime, and there are numerous press reports, confirmed by the chairman of the House Armed Services Committee, Congressman Mac Thornberry, that Moscow has deployed mobile crematoria to the Russian-Ukraine border. It is also important to note that Russia is taking steps to militarize the Arctic….

Nor have Putin's efforts at military rearmament and intimidation been confined to conventional forces. As I made clear when I spoke here a few years ago, Russia is engaged in a massive modernization of its nuclear forces. As we meet here tonight, Russia is building and deploying:

- Two new types of land-based intercontinental ballistic missiles (ICBMs)
- Two new types of submarine launched ballistic missiles (SLBMs)
- A new class of SSBNs, two of which are in commission and the third of which will commission this year
- A new long-range air launched cruise missile, along with upgrades to its TU-95 and Blackjack strategic bombers
- Additionally, at least two new types of ICBMs are in development, including a heavy-ICBM follow-on to the highly destabilizing SS-18, as is reportedly a new strategic bomber
- And then, of course, there is the new treaty-shattering ground launched cruise missile. In 2014, the US Government accused the Kremlin of violating the 1987 Intermediate Nuclear Forces treaty, one of the landmark treaties of the Reagan-Gorbachev era, by covertly developing and testing a new ground launched cruise missile. This system will only add to the grotesquely large Russian arsenal of so-called theater nuclear weapons, which number between 2000-4000, dwarfing by a factor of at least 10 NATO's theater-based deterrent arsenal.

Sadly, Putin's decision to violate the INF treaty is just the latest in his government's actions demonstrating contempt of international agreements. Today Moscow stands in violation of:

- The Helsinki Final Act (Russia is in violation of at least Articles 1, 2, 3, 4 and 6)

- The Istanbul Commitments of 1999 (Russia is in violation of its commitment to remove its military forces from occupied parts of Moldova and Georgia)

- The Presidential Nuclear Initiatives of 1991-92 (Russia is in violation by continuing to deploy nuclear SRBMs and by continuing to deploy nuclear-tipped naval cruise missiles on general purpose submarines)

- The Budapest Memorandum (Russia has violated its commitments to respect Ukraine's territorial integrity) and also

- The CWC (Russia is in violation of the intent of the treaty by inventing and deploying *Fourth Generation* chemical agents which evade the Treaty's specific restrictions but which are nevertheless chemical agents).

But it is important to recognize that Putin's nuclear adventurism is not confined to building new systems and violating treaties. The Putin Administration is guilty of nuclear saber-rattling in a manner that has not been seen since the days of Nikita Khrushchev. This saber-rattling has taken three forms:

- first, the Russian military has engaged in a series of nuclear forces exercises which deliberately simulate nuclear strikes on Poland and the Baltic states
- second, Russian nuclear bombers have been engaged in increasingly dangerous forays into airspace adjacent to Alaska, California, the UK, Norway, Denmark, Sweden and Japan. These flights, taking the form of attack formations, are now occurring on many occasions with the bombers' safety of flight transponders turned off, thereby endangering civil aviation and causing near collisions on multiple occasions. For the record, Russian military aircraft have in the last year also taken to buzzing US and Canadian warships at very low altitudes, and conducting dangerous maneuvers close aboard US reconnaissance aircraft.

Finally, listen to some of the outrageous statements the Russian leadership has been making:

- "In a situation critical for national security, we don't exclude a preventive nuclear strike at the aggressor." (Gen Nikolai Patryushev, head of Russia's Security Council, June 2010)
- "Let me remind you that Russia is one of the world's leading nuclear powers... It's best not to mess with us" (Putin, August 2014)
- "Our nukes are always ready for action". (Putin 2015)
- "If Denmark joins the American-led missile defense shield…then Danish warships will be targets for Russian nuclear missiles." (Mikhail Vanin, Russian Ambassador to Denmark, March 2015)
- In a retrospective this year on the invasion of Crimea, Putin stated "We were ready to do this [put our nuclear forces on alert]"… It's worth noting that Putin did put Russian nuclear forces on alert during the Georgian crisis of 2008.

The intent of these actions is clear: they are designed to intimidate and cow Russia's neighbors. There should be no place or tolerance for this kind of rhetoric and activity in the twenty-first century. Unfortunately, western governments have not reacted publicly or privately to this nuclear saber rattling until quite recently.

At this point in the evening you should be asking "why is all of this happening?" and "What has caused this downturn in Russia's relations with the West?"

I would suggest to you while there is no single causal factor in international affairs, much of the onus for what has occurred rests with Vladimir Putin himself. I believe we can draw tremendous insight from the comment he has made on several occasions to the effect that "the demise of the Soviet Union was the greatest geopolitical catastrophe of the [twentieth] century." Pretty strong words when you consider all that happened in the last century. So

if you take that as a starting point, you then need to understand that the political and economic situation in Russia in the 1990s, following the demise of the USSR, was somewhat chaotic. The attempt by western-oriented Russian politicians to create a western-style democratic political system, foundered—producing coups and confusion. President Yeltsin's often clownish behavior was an embarrassment. In addition, the introduction of market economics was a disaster, due in large part because the transformation of a government directed system to a free market system was undercut by the fact that State run factories were producing sub-standard goods few Russians wanted, and the loss of the Union destroyed much of the market and supply system which kept the old system afloat. Add to this the fact that during the Yeltsin years, unscrupulous politicians and their cronies (including Yeltsin's family and friends) methodically manipulated the sale of State assets to the private sector, impoverishing millions while enriching themselves. All of this produced resentment of the West because, in a classic case of Russian paranoia, rumors were spread that Western governments (rather than home-grown avarice and incompetence) were to blame for the ills that had befallen Russia. Enter Vladimir Putin, who emerged from obscurity to a position of dominance in two short years.

And Putin was among those who believed the West was responsible for Russia's decline. If you have not done so, I urge you to read his speech of March 18, 2014 to the Russian Parliament on the occasion of the vote on the annexation of Crimea. It is an enormously revealing document. Let me read you a few quotes:

- Speaking about the breakup of the Soviet Union and Crimea's subsequent inclusion in the newly emerged country of Ukraine, Putin had this to say: "…when Crimea ended up as part of a different country…Russia realized that it was not simply robbed, it was plundered". "Millions of people went to bed in one country and awoke in different ones, overnight becoming ethnic minorities in former Union republics, while the Russian nation became one of the biggest, if not the biggest, ethnic

group in the world to be divided by borders." I would pause for a moment here to point out to you that the "former Union republics" he refers to include Latvia, Lithuania, and Estonia, now members of NATO and therefore whose independence and territorial integrity the United States is treaty-bound to defend.

- Putin continued: "Russia…was going through such hard times then that realistically it was incapable of protecting its interest. However the people could not reconcile themselves to this outrageous historical injustice."
- Putin then launched into an attack on the United States and its allies on a wide variety of issues, noting that the US and its allies "are constantly trying to sweep us into a corner because we have an independent position, because we maintain it and because we call things like they are….:
- And then come the warnings: "But there is a limit to everything. ….If you compress the spring all the way to its limit, it will snap back hard. You must always remember this. …Today it is imperative to accept the obvious fact: Russia is an independent, active participant in international affairs; like other countries, it has its own national interests that need to be taken into account and respected."

All of this brings to mind Churchill's remarks about another dictator: "This wicked man, the repository and embodiment of many forms of soul-destroying hatred, this monstrous product of former wrongs and shame…."

So, we have now discussed, however briefly, the *what* and the *why*. Now we come to the hard question: "what can and should we do about this?"

The first step is to recognize, publicly and within government circles, that this problem exists and to alert the American people about it. Those of you who heard me a few years ago know that I began sounding the warning even then. More recently, over the

past six months, US Air Force General Phillip Breedlove, NATO's Supreme Allied Commander, has been highly vocal on the subject. And last week, in a speech at the Brookings Institution, Vice President Biden weighed in. Let me repeat two of the points he made:

- "Russia is taking actions to weaken and undermine its European neighbors and reassert its hegemonic ambitions."
- "President Putin is also trying to scare our allies and partners with the threat of a new and aggressive Russia. Terms we haven't heard in a long time, terms relating to nuclear arms."

And the message is beginning to be broadcast elsewhere. Last Friday, the New York Times, not known for taking a strong position against the Kremlin, responding to the story about the poisoning of Nemtsov's young aide, spoke of "Russia's murderous regime" in an editorial which also included the following:

- [We find] "staggering the complacency Western governments exhibit toward the crude attacks on peaceful opponents in a country that wishes to be, and often is, treated as a global power. Apart from North Korea, it's hard to think of a nation where political murder is as much of a hazard as it is now in Russia. Yet Western leaders have said little about the slayings and go on treating Mr. Putin as if he were a civilized statesman and potential partner...".
- And just two days ago the *Times* followed up with another editorial condemning Putin's new decree criminalizing discussion of combat deaths, and yesterday, in another editorial, it condemned Russia's nuclear saber rattling and INF Treaty violation.
- Just today, Chatham House, the Royal Institute of International Affairs, released an important new study on Russia. The authors observe:
- "Moscow and the West have competing, conflicting and entirely incompatible agendas."

- "Putin is a fundamentally anti-Western leader whose serial disregard for the truth has destroyed his credibility as a negotiating partner."

These represent a good start. More is needed.

The second step—really the most important step—is to realize that the United States must continue to be the leader of the world's democracies. We are the indispensable nation. No other government can fill our role. Despite our many flaws and foibles, and despite the snide criticisms we sometimes hear from our allies, at the end of the day they understand that only the United States can provide the glue that holds the NATO Alliance together. For our part, we must remind ourselves that keeping NATO, the most successful military alliance in history, strong and secure is vital to our national interest.

Third, we, the United States, must continue to rebuild our deterrent strength in Europe. Please remember that weakness is provocative. Weakness and indecision can cause Moscow to calculate that we really do not mean to stand by our commitments. Compounding this, both the George W. Bush Administration and the current one have overseen a precipitous withdrawal of US forces from Europe; unfortunately these actions, coupled with the current Administration's "Pivot to the Pacific" initiative, has inadvertently created an impression both in Moscow and in some allied capitals that we are no longer as committed to the defense of NATO Europe as we once were … and that is very dangerous. Our red lines must be real and must be perceived by the Kremlin to be real.

Fortunately, in the past six-to-nine months the Administration has begun returning forces, particularly infantry and armored units, to Europe—placing rotational forces in the Baltic states and forward deploying some fighter units, also on a rotational basis, to Poland. These deployments should continue as long as they are necessary, and be augmented if need be, … and obviously we need to halt further withdrawals of US forces. We also need to continue

to press our allies to meet their pledged contributions, financially as well as in terms of increased levels of readiness and capability. Our goal must be twofold: to ensure Putin and his cronies understand that NATO will defend itself successfully against any aggression, thereby deterring that aggression in the first place, and to reassure nervous allies that we are there for them. Please remember: NATO's *Article V* commitment, our pledge to defend our allies if they are attacked, is only as strong a deterrent as Putin believes it is.

Fourth, we need to work with those same NATO allies to ensure that—if Russia continues to fail to carry out fully the provisions of the Minsk accords setting forth the conditions for the cessation of hostilities in eastern Ukraine—the economic sanctions imposed by the United States and the European Union remain in force. If the situation worsens, that is if Russian forces break out of the Donbass region and move on Mariupol and towards the Crimean peninsula, the US and the EU need to impose additional, harsher, sanctions to make clear that it is unacceptable to use military force to change existing international borders. This task will not be easy. As Vice President Biden observed last week: "the Kremlin is working hard to buy off and co-opt European political forces, funding both right wing and left wing … parties throughout Europe".

Fifth, the United States must move forward to implement its plans to modernize our strategic forces. We must do so because:

- First and most obviously, our strategic submarines are aging, our Minuteman ICBMs are becoming superannuated, and the air-launched cruise missiles carried by our B52s are increasingly unreliable.
- Second, Putin and his cronies place great stock in nuclear weapons. And, therefore, our deterrent must be credible in his eyes to prevent him from miscalculating .
- The bottom line is that the Administration and the Congress must work together to ensure that all three legs are renewed.

Sixth, we need to put an end to the silly idea, still active in some parts of the Department of State and in the non-governmental arms control community, that we need to begin negotiations with Moscow on a new round of strategic arms reductions. We cannot afford to enter into any new agreements which we would respect and Russia would violate. And, that, put simply, is why there should be no future arms control with Russia until Moscow decides to respect the agreements it has signed previously and return to compliance with them. And we must continue to press Moscow to return to compliance in those instances where it is now in violation. And, it should be obvious, that offering to enter new negotiations while the Russians are violating existing agreements sends the signal that we are not really serious about having them carry out their obligations and is perceived in Moscow as a sign of American weakness and lack of resolve.

Seventh, we need to continue to press the Putin Administration to halt its nuclear saber-rattling. The overblown rhetoric employed by Mr. Putin and his cronies have no place in the twenty-first century, and the dangerous activities undertaken by Russian bombers carry within them the seeds of crisis and tragedy.

I wish that I could close my remarks on a more uplifting note. There are some tough times ahead. But history demonstrates that it costs far less in treasure and in blood to deter an aggressor than to defeat him on the battlefield. And that is particularly true in the nuclear age. This is a task we accomplished successfully for almost five decades a short while ago. There is every reason to believe we can do it again.

NUCLEAR DETERRENCE

DETERRENCE STILL CORNERSTONE OF U.S. STRATEGY, HANEY SAYS

by Mr. Jim Garamone
DoD News, Defense Media Activity

WASHINGTON, Aug. 6, 2015—Even in an age of terror groups like the Islamic State of Iraq and the Levant and al-Qaida, deterrence remains at the heart of America's security strategy, said Navy Adm. Cecil D. Haney, the commander of U.S. Strategic Command.

The key to deterrence, any adversary has to understand "that they cannot escalate their way out of a failed conflict," he said during an interview at the Washington Navy Yard Aug. 4.

The admiral spoke following a stakeholders meeting at the Navy's Strategic Systems Program—the folks who maintain the Navy's submarine-launched ballistic missile program.

Any attack directed at the United States "would be very costly for them and they will not get the benefits they are trying to achieve," he said.

Successful deterrence, he said, compels an adversary to acknowledge that "restraint is a much better option."

Nuclear Deterrence

Nuclear deterrence is the one aspect that most people are familiar with and that is a main concern for Haney.

"We have to be aware of the fact as long as we have countries like Russia and China that have developed this kind of nuclear capability and are deploying this kind of capability," the admiral said.

Haney emphasized that deterrence is more than nuclear weapons or even the military. "We are not locked into one domain thinking," he said. "If you take on the United States of America, we will use the appropriate tools out of our kit to associate with that particular business."

Sometimes a response will be diplomatic, the admiral said. Other times it will be economic or informational. All "are backed by sufficient military capability," he said.

"At the end of the day, it is my job to deter a strategic attack against the United States of America and its allies," Haney said, "and to provide the president the decision space and options if deterrence fails."

Improvements for Nuclear Enterprise

Some past issues involving the nuclear enterprise have been reviewed and improvements are being implemented, Haney said.

"We were able to identify specifically each area we needed to improve in," the admiral said. STRATCOM has been working with the Air Force and Navy in all areas, he said, to institutionalize the improvements suggested by the reviews. These run from changes in training, manning and equipping the associated forces and how the services employ them.

There is no end point to these improvements, the admiral said.

"You have to continue to assess where you are and to work on improving things, either because your adversaries are improving or because you want to do it in a more efficient and effective way," he said.

All components and members of the nuclear enterprise will build this continuous improvement into their battle cycle, the admiral said. Since the reviews, the command has done another review of the nuclear command and control capability. That review pointed to areas that needed attention, and the command and the services are addressing them, he said.

Nuclear Triad

The nuclear triad of ICBMs, submarine-launched ballistic missiles and manned bombers needs attention, the admiral said. These systems need to have the right attributes and performance factors to work today and in the future, Haney said.

Looking ahead, the peak funding for the nuclear triad will be in the mid-2020s and should constitute about six to seven percent of defense total obligation authority, Haney said.

There really isn't a choice, he said. Haney used the ballistic missile submarines as an example.

"When we decommission it, [the Ohio-class submarine] will have 42 years of service life—well beyond the 30 years it was designed for," Haney said. "The good news is we've been able to extend that platform, but we can't do it any further so it has to be replaced."

There's a program for the bomber and for the ICBM force, he said.

"As we work these, we still have to be thoughtful and look at our requirements to ensure we can save where we can," he said. "One area is the commonality that we can have, and generate a synergistic effect ... in looking at what things we can have that are common between the intercontinental ballistic missile and the submarine-launched ballistic missile program."

Haney said a letter signed by himself, Navy Assistant Secretary for Research, Development and Acquisition Sean J. Stackley and Air Force Assistant Secretary for Acquisition William A. LaPlante, highlights this move to commonality and savings.

Warhead fusing components are a collaborative effort between the Air Force, Navy and Department of Energy labs, he said.

"It doesn't mean they all look the same, but there are common parts and pieces and common methodologies so we can avoid paying bills twice," Haney said. "Where we can have common designs that makes sense given the technological and advantages we have today."

Visiting 'Strategic Warriors'

Haney spends a lot of time visiting what he calls "the strategic warriors" in their foxholes—the silos, subs and planes.

"These folks are passionate about getting the mission right for the United States of America and I'm proud of each and every one of them," he said. "I find in my frank discussions with them ... that they are in there to serve our country, do the mission right and I do sense an improvement in morale."

Haney addressed deterrence in the cyber world, saying it is much like any other realm of combat.

"Any adversary that wants to take us on in [cyber or space] domains must understand that we not only work on the defensive aspect, but our national leaders can pick what methodology they want to use, not restricted to a particular domain," he said.

They need to understand, they won't get the benefits they hope to achieve with a cyber or space attack, the admiral said.

"We have to be able to differentiate between working against a cybercrime that occurs rather than a strategic attack using the cyberspace domain," he said.

The United States will not spell out what will happen to those who launch cyberattacks, the admiral said, and that is fine because some ambiguity is necessary.

"The whole of government approach that our country uses has to be thoughtful and tailored to the right answer," he said.

STRATEGIC COMMAND DETERRENCE SYMPOSIUM

THE HONORABLE FRANKLIN C. MILLER

KEYOTE ADDRESS
JULY 29, 2015

Thanks to Admiral Haney and the Strategic Command staff and to the Conference organizers for inviting me to speak.

It has been a while since I delivered a *keynote speech*…. This morning, I am going to take that tasking seriously, and, instead of launching off on a topic of great interest to me (but perhaps no one else here) I am going to give a real keynote speech. The dictionary defines a keynote speech as one *delivered to set the underlying tone and summarize the core message or most important revelation of the event*. Since my remarks were originally intended to follow Admiral Haney's presentation this morning, some of the topics I will address have already been raised, but they are important enough to hit again. So here we go…

We are gathered here to discuss *deterrence*. *Deterrence* is not a new concept. The Romans wrote about it. George Washington wrote about it. Essentially it's about raising the barrier to aggression to the point that would-be or real enemies are convinced they would not succeed in an attack, and therefore pursue other policies. The fundamental problem with using only conventional forces to provide a deterrent shield, however, has been that throughout history leaders bent on aggression have come to believe that their military genius can overcome seemingly impregnable defenses. The Nazi thrust into the Ardennes, thereby nullifying the Maginot Line, is the poster child in this regard. Margaret Thatcher is famously (if apocryphally) quoted as saying, in reference to memorials honoring the dead of World War I, "there are monuments to the failure of conventional deterrence in every European village".

The creation of nuclear weapons changed all of that. No longer could aggressors count on their military genius to deliver

victory: nuclear weapons gave a nation on the brink of battlefield defeat the ability to destroy the opponent's homeland, turning the fruits of victory into the ashes of defeat. War against each other became too dangerous for the great powers to indulge in. That is not to say that our nuclear weapons are an all-purpose deterrent. Their role is *to deter, to forestall, to prevent* direct attacks, including massive conventional attacks, against our *vital interests* and those of our allies. They are not and were never intended to fill an *all purpose* role. And although they may be useful affecting the leaders of states sponsoring terrorism, they are indeed not useful for deterring terrorists, or piracy, or cross-border drug trafficking, or even low-level insurgencies. They are arguably of marginal use in deterring all but the most catastrophic cyberattacks or attacks against our space assets. They were not designed to do so. And it's just a cheap rhetorical trick, as Global Zero and organizations of their ilk are wont to do, to suggest that nuclear weapons have outlived their usefulness by pointing to attacks such as 9/11, or 7/7, or cyber intrusions they *failed* to deter when they were not intended or deployed to prevent such attacks. Other tools need to be used to deter and defeat such threats, and I urge you to consider that in your deliberations here.

But back to nuclear deterrence. Once upon a time we were, as a nation, very sophisticated in our thinking in this area. I fear, however, in the twenty-five years since the fall of the Berlin Wall and the break-up of the USSR, that we have, collectively, grown sloppy in our thinking, our analysis, and our approach to nuclear deterrence. I hope that you will correct some of that over the next day.

First of all, as a former Secretary of Defense wrote some time ago, "deterrence is dynamic, not static. Our capabilities must change as the threat changes and as our knowledge of what is necessary to deter improves." Unpacking this a bit, we discern the following truths:

- We need to understand our potential enemies and how they think. Deterrence is mostly about what goes on in

their heads, not in ours. We need to be certain they understand what we will fight for and what we consider our vital interests to be. They must understand we have the capability to destroy the things and assets they value most, and that we have the will to do so if we are attacked. This principle applies not only to potential nuclear-armed adversaries such as Russia or China but equally to possible enemies who are potential proliferants or threshold nuclear states. I fear that our—and I include the Intelligence Community in *our*—scholarship on and understanding of what foreign leaders' consider to be their most valuable assets is generally poor and un-informed across the board—and in some cases it is wholly speculative. This affects our declaratory policy (which is almost invisible today) and other signals that we send, advertently or inadvertently. And the combination of this is that we may appear weak or indecisive to some foreign leaders. Remember that weakness is provocative. Weakness and indecision can cause potential enemies to calculate that we really do not mean to stand by our commitments or protect our vital interests.

- Part of demonstrating resolve is to recognize when one's policies have failed and then to change course. In 2009 the President famously called on the world's nuclear weapons states to reduce the role nuclear weapons played in their national security postures. Only the US and UK did so. Russia and China, and indeed other nuclear weapons states, moved in exactly the opposite direction: they increased the prominence of nuclear weaponry in their policies. Continuing to reassert our moral rectitude in light of other capitals regarding it with contempt is not a successful path forward in maintaining global peace and stability. Accordingly, we need to stop talking about *nuclear zero* and nuclear disarmament and begin talking about the importance of nuclear deterrence and the need to prevent ma-

jor war between the great powers. It is important because we need to make certain potential enemies understand we take their threats seriously. And it is important because unless we talk about these subjects it is difficult to get Congress and the American people to understand why nuclear weapons and nuclear deterrence are critical to global stability

- Demonstrating resolve also involves carrying through on promises to use our precious tax dollars to rebuild and modernize our strategic deterrent forces—both because those forces are aging and because Moscow and Beijing are embarked upon massive nuclear force modernization programs regardless of our restraint. If we fail to modernize our own forces, our determination to protect ourselves and our allies from nuclear threats and intimidation also will be called into question. Mr. Putin and his cronies place great stock in nuclear weapons and therefore our deterrent must be credible in his eyes to prevent him from miscalculating. *I trust Panel 4 will be in the same place I am on this.*

- In a similar vein, we need to put an end to the silly idea, still active in some parts of the Department of State and in the non-governmental arms control community, that we need to begin negotiations with Moscow on a new round of strategic arms reductions. I assume this sophisticated audience is well aware of the long list of treaty commitments that Moscow has violated. There should be no future arms control negotiations with Russia until Moscow decides to respect the agreements it has signed previously and return to compliance with them. And we must continue, in public and in private, to press Moscow to return to compliance in those instances where it is now in violation. It should be obvious that offering to enter new negotia-

tions while the Russians are violating existing agreements sends the signal that we are not really serious about having them carry out their existing obligations; again, it is perceived in Moscow as a sign of American weakness and lack of resolve.

- Also, and heretically, I would make the following point for your consideration today and tomorrow: the 2010 NPR, and the New START treaty which is based upon its conclusions, [and for good measure the British Government's 2006 *White Paper on the Future of the United Kingdom's nuclear deterrent* and the subsequent 2010 UK Strategic Defence and Security Review] envisioned a wholly different and far less threatening international security environment than the one we now face. As the Putin Administration continues to rattle its nuclear saber, seeking to intimidate us and our allies, and as Beijing continues to demonstrate aggressively its designs on the sovereign territory of our friends and allies in the South China Sea and the Pacific, we need to ask ourselves "are the weapons limits imposed by New START still consistent with our own and our allies national security requirements?" Is it prudent from the standpoint of our own and our allies national security to believe that nuclear reductions should proceed inexorably in spite of military requirements, and that there is no possibility of ever reversing this trend? I am not suggesting, and do not impute to me and call your friends in the arms control community to tell them that I am suggesting, withdrawing from New START; I am suggesting, however, as we look to the treaty's eventual expiration, we undertake a long and serious examination—one which is not dominated by the dogma and high priests of the nuclear reductionists—as to whether our security can afford a strategic arsenal capped at limits which were based on an alternate reality. I would expect Strategic Command to play a major role in such a review.

- A critical, indeed perhaps the most critical, element of a deterrent is the threat to destroy things of immense value to the enemy. This cannot and must not be based on mirror-imaging. There was a time several decades ago when the US Navy's proposed response to a Soviet nuclear attack on a US aircraft carrier would be to retaliate against a Soviet carrier. But the Soviets would have gladly traded their surface fleet for ours in a nuclear war at sea, because our navy was vastly more important to us than theirs was to them. As a result, US policy made clear that Soviet nuclear strikes at sea would draw nuclear responses against land-based assets of high value to Moscow. Deterrence works when the enemy leadership understands it will lose more as a result of our retaliation than it would gain through its aggression. This must always guide our deterrent policy and planning. Where this gets really tricky is when we place higher value on certain types of assets, for example the surface navy, than the adversary places on similar assets. Retaliation in kind becomes counterproductive in such situations and we may need to consider *cross domain deterrence*. Again, this also returns to the point that it is vital we understand the value structure and hierarchy of potential enemy leaderships. *Panel 5: I wish you the best of luck in grappling with that verity as you address your stated task.*

I'd like to turn now to what we have called for decades *the flip side of deterrence*, that is to say *assurance*. Assurance is all about providing allies credible guarantees we will protect them against threats of nuclear intimidation, blackmail, and attack, all of which have re-entered the Russian lexicon in a manner unseen or unheard since the Khrushchev era. Assurance begins by listening to our allies. It's all about what's in allies' heads and what they fear. It's not about telling them that there is no threat or that if one of their neighbors has offensive capabilities and has made intimidating threats *not to worry* because that neighbor has no intention to attack. It is about having genuine consultations about potential

threats and potential responses and how we can best both deter and assure. In practice, it means keeping deterrent systems in place in Europe as long as allies find their forward presence vital even if we have other means of carrying out retaliatory strikes using central strategic systems—even while those same central systems play a key role in underpinning NATO's deterrent. And it means consulting with allies in those regions where we do not base nuclear forces about how we can assure them that they are covered by our extended nuclear deterrent. Strategic Command already plays an important role in this regard and, I predict, it will increasingly get drawn into that discussion.

Speaking of NATO and extended deterrence raises another point. It's hard to think about where we should be going in the future if one is utterly ignorant as to how we arrived at where we are today. I was recently in a meeting where an individual, who until only a short time ago was a very senior national security official in the Obama administration, remarked that the Russian *escalate to de-escalate* strategy was the silliest new idea he had heard in a long time. What he meant was that *he* could not imagine a situation in which nuclear weapons might be used in a limited way. Well, there are two things wrong with such a world view.

- First, this individual evidently was unfamiliar with flexible response, the guiding principle of NATO's nuclear strategy from the mid-1960's to the end of the Cold War. All of us in the business during the Cold War at one time or another learned the catechism response that "NATO, if its conventional defenses were failing, would use nuclear weapons to indicate to the Soviet leadership that it had badly miscalculated NATO's resolve, and that Moscow needed to cease its aggression and withdraw its forces lest the situation escalate out of control". In other words, escalating to de-escalate. We need to study and understand our past policies, practices, and operational plans if we are to be able to think cogently about the future. This does not mean that we need to re-create or replicate them

now; it does mean we need to understand why we did what we did in response to which deterrent threats and assurance challenges.

- Second, Moscow is using an entirely different definition of *escalating to de-escalate*, employing the threat of selective and limited use of nuclear weapons to forestall opposition to potential aggression. What is important here, yet again, is not what we think, but whether the other side is thinking seriously about using nuclear weapons selectively and if so how do we deter such use.

This brings us to Panel 6, which has the provocative task of asking "are there more effective ways to achieve deterrence, assurance, and stability objectives?" I am uncertain what this means. If it means "are there better ways to operate inside the current nuclear deterrence construct?" the answer is almost certainly yes. In fact, I provided a few ideas just now. If it means "can we create a safer world by eliminating nuclear weapons?" I have given you my view on that too. We have since 1945 twice displayed rosy-eyed optimism that the great powers could work in peace and harmony. That vision broke up on the rocks of Soviet behavior in the years immediately following World War II and again as Putinism arose in the early years of this century. We have already discussed relying solely on conventional deterrence—a concept that has failed time and again throughout history. That leaves nuclear deterrence. It may be uncomfortable, but it has provided the longest sustained period of peace between the great powers since the treaty of Westphalia created the modern nation state in 1648.

The longest sustained period of peace between the great powers since the treaty of Westphalia created the modern nation state in 1648. Those of you who are a part of our strategic forces need to take a great deal of credit for that. The motto "Peace is our Profession" however hackneyed and trite cynics consider it, remains accurate and honorable. Our nuclear weapons prevent war. And that is why I find it particularly galling to observe the

activities and rhetoric of the self-proclaimed *Humanitarian Initiative* that seeks to develop an international treaty banning nuclear weapons. Some 10 million combatants died in World War I, as did another 7 million non-combatants. An estimated 20-25 million combatants perished in World War II, along with an additional 50-55 million non-combatants. Was that *humanitarian*? Is it *humanitarian* to assert we should return to that world? These activists and their governments, shamefully including some allies who seek shelter under our nuclear umbrella, have no role in assuring global stability or halting aggression. They have no responsibility to deter war. Their crusade could result in creating the conditions for war and for massive bloodshed. The real humanitarians, I offer, are here, and in our missile silos, our SSBNs, and in our bombers. And it's about damn time that we have the courage to start saying that and exposing the current effort to delegitimize and ban nuclear weapons as the dangerous and destabilizing effort it is.

STRATCOM SYMPOSIUM ACDS(NUC CB) KEYNOTE
RADM MARK BEVERSTOCK, ROYAL NAVY
USSTRATCOM
DETERRENCE SYMPOSIUM
JULY 29, 2015

Introduction

Good evening, General Kowalski, fellow delegates, it is a huge honour for me to be invited to speak here tonight, and I would particularly like to thank the Commander, United States Strategic Command, Admiral Cecil Haney, for allowing me the opportunity to do so.

I would like to take the opportunity to pay tribute to the vital work done by US STRATCOM, its senior leadership, the Headquarters staff and the JFCC Components, for their energy, inspiration and initiative, both in their execution of the routine day-to-day operational deterrence and assurance mission and through sponsoring a myriad of enriching activities, including this Deterrence Symposium. When taken together this provides the foundational principles and proper context for the safe, secure and effective delivery of cross domain deterrence capability, which has served to safeguard the continued global peace, security and prosperity that we all enjoy.

I would also like to thank the symposium team and the La Vista Conference Centre for their outstanding organisation and delivering such an impressive event.

And before I start, I would like to give my congratulations and warmest wishes to the Deputy Commander, US Strategic Command, Lieutenant General James "Killer" Kowalski for his forthcoming retirement after giving 35 years of exemplary service to the international community. We first met during the missile test firing for HMS VIGILANT.

He was the only senior officer who brought his gym bag for the long day at sea, and I was impressed with his unrelenting enthusiasm and energy. I know that I speak on behalf of everyone here tonight in wishing you and your family the very best for your next adventure, whatever that may be. We are all humbled that

you have been able to make this symposium your last official duty before handing over to Lieutenant General Wilson.

Thank you again, Sir, for your service and may you enjoy *fair winds and following seas* in the many years ahead.

Overview

Those of you that were here last year heard Mr. Julian Miller our Deputy National Security Advisor outline the challenges that faced the United Kingdom. We were towards the end of a 5 year term of a coalition government and while government policy on the nuclear deterrent was clear, one of the agreed points of departure was the Liberal Democrats were allowed to make the case for alternatives to Trident. We were also approaching a historic referendum on Independence for Scotland. Well, they say that a week in politics is a long time; a year therefore is an eternity and the UK is now in a very different place.

Firstly, the Scottish people voted to remain part of a United Kingdom. Secondly on 7 May 15 the British people returned a single party to power with a clear majority for the next 5 years. The Conservative manifesto was clear that nuclear deterrence remained an essential part of the UK's security strategy and they would seek to replace the ageing Vanguard class with 4 Successor submarines and that they would continue to deploy them operationally in a posture known as Continuous At Sea Deterrence.

The government also committed to a full Security and Defence Review, a process which they institutionalised in the previous parliament. This is underway and is due to report in November.

Another major commitment was made in the Chancellor's recent budget speech to maintain Defence spending at 2% of GDP fulfilling the pledge the Government made at the Welsh NATO summit and demonstrating clearly that it believes that defence is the first priority of any Government.

Now I am sure that there are those who will criticise and say that the Government are redefining what constitutes Defence spending, but be in no doubt of the significance of this announcement. The UK Government is increasing the Defence budget from

next year by 0.5% in real terms through until 2020…. is putting aside an additional £1.5 billion for a Joint Fund to be used by the Armed Forces and security and intelligence agencies……and, above all, is meeting NATO's pledge to spend 2% of GDP on defence every year of this decade….. we are sending a very strong signal to our allies and adversaries regarding Britain's resolve and determination to continue doing what is right, and to stand shoulder-to-shoulder with our allies to defend our way of life. It also means that the financial envelope is known before the Security Defense Systems Review (SDSR) which I am sure will lead to a very different analysis.

As far as the Deterrent is concerned, we can expect a Parliamentary approval process leading to a decision next year to commit to the next stage in the Successor programme.

The Government has already committed some 4 Bn pounds on the Successor SSBN programme which is proceeding well. The design includes a joint UK/US design for a Common Missile Compartment for Successor and the Ohio replacement programme and we have already ordered the long lead items such as the first set of missile tubes and the Reactor Pressure vessel. We have made major investment in the programme to extend the Vanguard class and also to invest in the UK submarine building facility infrastructure at Barrow-in-Furness. This is a clear sign of our commitment and excellent news for the UK submarine programme.

Back in 2006, when the Government published its White Paper on the future of the nuclear deterrent, the strategic landscape was very different. At that stage, the government believed that given its inability to predict the future, and the long procurement timescales to replace the components, that it would be prudent to retain a nuclear deterrent. That strategic picture looks very different now ... and with the opportunity of the Security Defense Systems Review, we are looking towards making a shift in the way that we manage and assess security threats.

Deterrence is not limited to the realms of nuclear…..nor is it limited to cyber and space…..and it is not constrained to the purely Informational, Economic or Diplomatic response swim

lanes.

The UK policy view is that deterrence has to be a comprehensive approach that integrates national and multilateral alliance endeavours and requires all aspects of the international norm based security framework to work and act together.

Deterrence is also not a smooth continuum. Defence has always been built on a paradox: we prepare for war while what we want to do is prevent it. Deterrence has to be an integral part of a nation's defence strategy and the primary role of its Armed Forces.

This requires not only robust and sustained and scaled capabilities, but also assured credibility and timely strategic messaging in order to be fully effective. If we, as a country, or an Alliance, do not believe that we have the capability and the credibility—the resolve to act in that vital moment—how can we expect our adversaries to buy into the concept of deterrence in their strategic calculations?

The way that we communicate the potential to deploy our deterrent capabilities and the credibility—the willingness to take action – is a vitally important element that enhances the deterrent effect. Above all, our strategic communications must be received and registered in the minds of adversaries and Allies. The messages said, and unsaid, must be clearly understood. This is an area where nationally, bilaterally and across the Alliance we can do better, particularly in the face of emerging threats.

UK Nuclear Deterrent

The UK approach to nuclear deterrence is subtly differently to the other recognized Nuclear Weapon States. Over the years we have reduced our stockpile and delivery systems to a minimum.

- We possess only 1% of the total nuclear stockpile of 17,000 warheads;
- We routinely deploy only one platform, an SSBN submarine;
- We have only one warhead design;
- And we have only one type of delivery vehicle, a Trident

ballistic missile, to deploy our UK warheads.

We also see some enduring principles that underpin the approach to our nuclear deterrent:

- Preventing nuclear attack – through strategic deterrence and not nuclear warfighting;
- Employing a minimum destructive power;
- Maintaining an ambiguity of doctrine and response, but in the context of a strong and enduring commitment to the NATO alliance; and clear operational independence.

For over 46 years and through over 300 patrols, Britain has kept an SSBN submarine at sea providing the ultimate guarantee of security against nuclear attack or nuclear blackmail ….24 hours a day, 365 days a year and I would like to pay tribute to all those involved in sustaining the UK's longest enduring operation, which we call OPERATION RELENTLESS. It is the submarine officers and ratings, dockside engineers, their families and industry who contribute to the UK's most visible commitment to NATO and to a Europe that is free and at peace.

As a signatory and one of the three depository states of the Non-Proliferation Treaty (NPT), the UK Government remains committed to working towards the shared goal of a world without nuclear weapons. But it is not the absence of nuclear weapons that is the goal, rather the strategic conditions where they are no longer necessary that is the real prize. I had the privilege of attending the recent NPT Review Conference in New York to hear for myself the views of those who think now is the time to abandon nuclear weapons and to introduce a ban. The calls from those who talk about the Humanitarian consequences of the use of nuclear weapons are growing louder. However, none of this is new, and the devastating consequences of the use of even a single nuclear weapon are probably known better by the people in this room than anywhere else.

The NPT is the most universal of the United Nations treaties, yet there remain a small number of states outside it, and one has even withdrawn from it. Article 6 is the key part and we need to

read all of it and I make no apologies for reading it verbatim and I ask you to listen for the 3 distinct aims:

"NPT Article VI

Each of the Parties to the Treaty undertakes to pursue negotiations in good faith on effective measures relating to cessation of the nuclear arms race at an early date and to nuclear disarmament, and on a treaty on general and complete disarmament under strict and effective international control."

So how would we mark our homework? Well, aims 1 and 2 are going well, the nuclear arms race has been reversed and we have seen major reductions in nuclear stockpiles by the Nuclear weapon states, but aim 3, general and complete disarmament, is arguably not going so well and it is this aspect that should be the focus of attention.

Collectively the UK and our Allies have made great strides toward reducing the role of nuclear weapons in the Euro-Atlantic region. However, the current conditions for further disarmament by the UK do not yet exist and so for the time being, at least, we have gone as far as we can toward further reducing our nuclear capability.

Nevertheless, the UK remains committed to the NPT process. The fact that the 2015 revcon failed to agree on a consensus document does not mean the treaty is a failure—the commitment to the 2010 action plan remains.

The world is clearly changing at an astonishing pace and we must continue to stand up for the values that we all believe in—the rule of law, democracy, free speech, tolerance and human rights. In order to achieve this, we must do better at spotting emerging security risks and deal with them before they become crises. We need to draw together, and use all the instruments of national and Alliance power, so that the sum of our effort is greater than the component parts.

International nuclear relationships

I wanted to highlight the close and vital relationships that we have with our closest nuclear allies. Firstly, the UK has a long standing and enduring relationship with the US, which is centered

around shared values.

Our relationship with the US is a deep and close one that we exercise through the 1958 Mutual Defence Agreement and the 1963 Polaris Sales Agreement. Over the years, I have seen this relationship grow ever stronger especially in the nuclear area. This relationship continues to deepen and, for example, we are engaged in a joint CMC programme.

Secondly France—I wholeheartedly welcome President Holland's speech on 15 February regarding their nuclear deterrent in which he reaffirmed the close cooperation with the UK. We have signed a 50 year agreement with France to build and operate strategic facilities—project Teutates. I look forward to enhancing both those relationships in the coming years.

Nuclear Threshold

The gap between our understanding of nuclear and non-nuclear deterrence has been increasing for many years. We need to think about this carefully as, perversely, this could lead to the use of nuclear weapons being more likely, especially as our adversaries continue to see a continuum between conventional and nuclear. At the very least, we need to understand what the conditions for crossing the threshold are…so that we understand what messages are being communicated.

We should also guard against thinking that there is a linear relationship between employing conventional and nuclear capabilities. There must continue to be a gap between high-end conventional capabilities and nuclear capabilities in order to ensure that all parties in a conflict are aware of the implications of crossing the threshold into nuclear use. But that gap must not be so large as either to lower the threshold whereby nuclear use may be currently contemplated or question the credibility of nuclear deterrence. This is an important aspect that NATO's strategic communications needs to address with Russia.

We must continually assess our deterrence criteria—and we must always ask ourselves have we got it right? Do our adversaries believe that we have the resolve to act? As I mentioned earlier, the strategic landscape continues to evolve.

Russia is, among other things ……modernising its nuclear forces, is actively commissioning a new class of SSBN submarines, is preparing to deploy a variety of landbased ICBM classes and is planning to reintroduce rail-based intercontinental missiles. We are also seeing consistently worrisome Russian nuclear rhetoric and bluster and increasing Russian out of area operations, and other more significant regional actions all of which are not helpful in achieving good international relations.

Meanwhile, North Korea has carried out three nuclear tests, has threatened a fourth test, and has carried out ballistic missile tests in defiance of the international community.

Regarding Iran, we, of course, welcome the recent deal, but remain realistic about its prospects …it is not a panacea to all of the region's issues…we have zero tolerance towards proliferation…and, of course, we will continue to work closely with our international partners to encourage Iran to play a transparent and constructive role in regional affairs…particularly in the struggle against violent Islamist extremism.

It is, nonetheless, a step in the right direction toward achieving the goal of a Middle East Zone free of weapons of mass destruction.

Cyber & Space Deterrence

Turning to Space & Cyber issues, firstly we do not view these as distinct domains:

- Cyber and Space are integral to modern military capabilities and operations.
- They are also integral to our modern globalised interconnected way of life.
- We face serious threats from both these areas as their effects could be rapid, severe and cascade widely.
- Overall, we cannot afford to regard these as distinct domains.
- What we need to do, is adopt a full-spectrum deterrence approach:
- Deterrence theory is broadly about *imposing costs* and

denying benefits.

- So we need to think about how we can use the various means at our disposal to change the adversary calculation.
- In this context, along with other responsible nations we are considering the application of deterrence principles in the evolving areas of Space and Cyber.

We also need to consider what I would call the current western dependency on its interdependencies:

- For example, our technological dependencies might look to some like an asymmetric vulnerability.
- If an adversary can hope to use cyberspace and space to undermine our capabilities, they may seek to defeat us using non-nuclear and non-kinetic means.
- Denying that aim is potentially a form of deterrence.
- Overall, our ability to influence is becoming harder; and the pace of modern full spectrum operations is likely to be much higher.
- Our nuclear deterrence posture has been developed over decades; it will similarly take time to refine our approach to deterrence and the capabilities we need in newer domains.
- Specific challenges: both cyber and space are more "congested" environments; it can be hard to understand and importantly attribute activity.
- Technology (and therefore the nature of the threat) is changing rapidly and incidents can unfold at great speed (but architectures and systems can still take a long time to develop).
- What is clear is that we will need to work closer with our Allies and partners on these issues.

Concluding Remarks

In closing, I would like to highlight just a few things.

The first is to reaffirm the vital importance of events like this symposium, which gives us the ability to exchange and debate

views around the critical subject of Deterrence and Assurance. This is a pressing issue given that the global order and security context is becoming more complex, with the scope and significance of modern security threats straining our current doctrine and potentially our will as a community to take action.

My second point is that our politicians and policy makers must operate within balanced budgets…this means that we have to base our defence investments and security decisions on robust evidence and clear principles and objectives. This now has to recognise the broader, full spectrum nature of the modern security paradigm that today and long into the foreseeable future will have to address the existential threats that persist and are growing, plus a range of more nuanced non-nuclear and non-kinetic scenarios.

My third point draws on something General Dempsey has highlighted on many occasions…in that the global community is seeing increasingly improved conditions for growing numbers of people, worldwide. The progress made by mankind, over only relatively recent times, relies on the continued peace, security and economic prosperity of every nation and we must therefore continue to take collective responsibility in order to maintain and protect this rule based global order if we are to be able to enjoy the freedoms and benefits that we have become accustomed to and risk taking for granted.

My final, and probably the most important point, is that we need to remember and recognise the men and women in our respective militaries and their civilian counterparts, both in government and industry, that work so diligently and hard to protect all our nations.

There are some who believe that we place our nuclear deterrent in a glass box, only to be broken in case of emergency. I fundamentally disagree and believe that nuclear weapons have prevented war between the major powers for over 70 years and they continue to feature every day in the calculus and decisions reached by our adversaries.

It is due to the dedication and total professionalism of our people who deliver this vital capability that we are able to stay safe each and every day and I commend them all for their service.

IN THE BEGINNING

INTERVIEW NO. 1 WITH VICE ADMIRAL WILLIAM F. RAYBORN, JR., U.S. NAVY, RETIRED

May 21, 1986

RADM Kenneth C. Malley
Director Strategic Systems Programs
Department of the Navy
Washington, D.C. 20376-5002

Dear Admiral Malley:

I am taking the liberty of providing you a copy of an official *verbal history* of the Polaris system in my own words as told to the official Naval verbal historian, Dr. Mason.

This has proved to be a much sought after document. Mr. David Packard asked for a copy and wrote a very complimentary letter saying he wanted to use it as a guide for highest priority programs.

It occurred to me that perhaps you would like to make this a part of the official history of the Polaris Program as it reveals the *fancy footwork* of many people responsible for the Polaris job.

The Polaris history part, per se, commences on page 24. The initial pages were given to Dr. Mason at his insistence that a background of my previous Naval experience and qualifications would be an important part of the management system which evolved.

With warmest wishes,
Red
W.F. Raborn

Place: His residence in Arlington, Virginia
Date: Friday morning, 15 September 1978
Subject: Polaris Project
By: John T. Mason, Jr.

A: Admiral, I'm delighted that you've consented to do this story on Polaris. It comes from the horse's mouth, so to speak: I wonder if we shouldn't begin, however, with a bit of your personal background in the Navy.

You were the man who had all the qualifications that seemed necessary to head up the Special Projects Division in the Navy. Both Admiral Burke and Admiral Sides were in agreement on that. How did you happen to acquire all of the necessary experience? How did you happen to have this in your background? Perhaps you might talk about that for a bit.

Adm. R.: That's a difficult subject to address because the evolution of a person's life is so markedly influenced by his associations and assignments to duty in the case of a military person. Some of the ingredients, I think, that were important to this kind of a job, or, as a matter of fact, any kind of job which requires dedicated effort are a basic enthusiasm for life, a great amount of personal energy, and a thorough appreciation that a person doesn't have to do everything by himself, and that the collective efforts of those that are around him have to be utilized and brought to bear in an optimum way on the problem at hand.

Going back a little bit in my own naval career, it was filled with great enthusiasm for sea duty and for the Navy life in particular. The motivation which I received at the hands of the officers in the Navy at that time was great. Obviously they should receive credit for the enthusiasm with which young officers like myself tackled their job and dedicated themselves to the Navy life. This is part and parcel of the word *leadership* which the Navy and the military in general prize so greatly. For example, in officers as well as enlisted men, the element of leadership is given top rating or effectiveness of a person. *Leadership* is known in civilian circles as the ability to manage and get things done, I believe.

Q: Some of that is part of one's natural endowment, some of it is acquired.

Adm. R.: I suppose that the combination of enthusiasm, energy and dedication just makes a person a better leader. You dedicate yourself to your job, you learn more about it, you become enthused, you enthuse other people, you get people to dedicate their efforts, and the result is you have a buildup of ongoing efforts which commanding officers or officers aboard ship show and result in a ship being a good ship, a ship that's smart, and in which people respond to their duties with pride, and they're alert. All of these things are bound up in the word *leadership*.

My duties at sea were many and varied. They were principally in the ordnance end of the Navy, gunnery officer of ships and so forth. I did have some communications duty, which was collateral. But at an early age, five years after graduating from the Naval Academy, I entered flight training and became a naval aviator, and for the rest of my career I was a naval aviator. I was a rated pilot until the day I retired in September 1963.

Q: Did your experience with aviation, perhaps, contribute to your later ability to make clear-cut and rapid decisions, which was a factor in your success with Polaris?

Adm. R.: I suppose the qualities that made a good naval aviator undoubtedly encompassed many of the qualities of which you speak. Obviously, to fly a fighter plane—and I was a fighter pilot for a large number of years—you had to do things well, if you were going to live, and so that zeal for proficient flying became a guiding way of life for successful fighter pilots. So I emphasize that enthusiasm and the zest for living, is part and parcel of a good leader. The ability to make good decisions and live with it and live because of them was a part of our normal training. I never considered myself an outstanding officer, but I always felt that I could carry my part of the load. My training and duties in aviation squadrons had to do with gunnery. Gunnery fascinated me from the time I was a little child, guns of all kinds.

We found certain gunnery deficiencies in my duties in naval aviation squadrons. For example, it was my dream to teach people to shoot fixed machine guns from fighter planes better, also teach them to dive bomb better from planes. So I was sent to Pensacola as a fighter plane instructor for two years, which I thoroughly enjoyed. Then went to duty in long-range sea planes (patrol planes) about two years before the outbreak of World War II. Patrol planes, or flying boats, as they were called, were considerably short on ordnance equipment, ability to do offensive things. The planes were large and could carry tremendous weights, yet we had no aviation torpedoes, we had no way to carry torpedoes aboard planes. Obviously, these planes could range thousands of miles from the base and could very well come upon an enemy vessel in time or war and, if they had torpedoes on board, they could perhaps sink or cripple the ship.

We had no aviation depth bombs to use against submarines, enemy submarines in time of war. We had no way to carry them. We did have bomb racks, one on each wing. So I took it on myself with the cooperation of people in other parts of the Navy locally in San Diego, to adopt surface-ship torpedoes so that they could be carried on the wings of patrol planes. The Torpedo Station prepared the torpedoes for running and we fixed box fins on the tail to give it some aerodynamic qualities as they dropped from patrol planes, and I myself flew the planes and did all the testing. I had another plane alongside to take pictures of it, and we were able to develop fins and altitudes and attitudes of the plane for dropping destroyer (ship) torpedoes successfully from patrol planes.

We sent in, I remember, an official report to the then Bureau of Ordinance along with pictures in sequence from the time the torpedo was dropped until it entered the water and, theoretically, hit the target which was a destroyer, and we got a blistering letter back saying, you can't do that, these actions exceeded our authority, such things were not a matter for the fleet to experiment with, and this was not to be done. This was my first brush with entrenched bureaucracy!

Q: You were adequately cowed by that, I suspect.

Adm. R.: No, we were not. We just felt, well, no wonder we don't have aerial torpedoes for planes with that kind of attitude at the seat of the government.

Also, we had no depth bombs designed to be dropped from airplanes and we had no way to carry them, as I mentioned before. So, with the aid of metalsmiths, we concocted out of steel rods a device that fit into the bomb racks which would carry a ship type depth bomb on each wing. These were destroyer depth bombs, 300-pound non-streamlined babies. But we also took these out and dropped them very successfully. So we were rather smug about making ourselves in a makeshift way, prepared for battle against surface ships and submarines. As a matter of fact, our wing patrol planes were deployed to Pearl Harbor at Kaneohe just 22 days before World War II broke out. When we got there the aviation admiral in charge of all the aviation units in Oahu looked at our innovations and said "These must receive the highest priority," and he ordered immediate manufacture on a round the clock basis and racks to carry torpedoes and racks to carry depth bombs. I think it was significant that history records a miniature Japanese submarine trying to enter Pearl Harbor was sunk by one of our patrol planes carrying a destroyer depth charge on its wing. He recognized it as a Japanese submarine that was submerged, so he let it fly and the submarine was sunk. That was really the first American use of aerial depth charges in World War II to my knowledge.

Q: That was an interesting development and a new dimension to the reconnaissance concept, wasn't it?

Adm. R.: Yes. Well, this is the kind of thing that it was my privilege to participate in, and my interest in guided missiles—missiles of all kinds—was heightened when I was sent to the Bureau of Ordnance for duty. I was the assistant for R&D for all aviation ordnance and also of all ship based guided missiles then being developed by the Bureau of Ordnance.

Q: Was this the Regulus?

Adm. R.: No, the Regulus was a Bureau of Aeronautics missile. The BuOrd missiles were the three T systems, Terrier, Tartar and Talos anti-aircraft ship based missiles, the 5 inch air-to-air rocket which later became useful for air-to-ground work, the 2.75-inch rocket, and various others—quite a few of these rockets and guided missiles (or other follow on versions) are in use in the fleet today. As a matter of fact, in some considerable numbers.

That tour in the Bureau of Ordnance research and development heightened my interest in guided-missile work. It gave me additional visibility to people who were running the Navy, and I presume that these kind of experiences, which are just among a few, brought me to the attention in a favorable way of folks who were in the process of selecting someone to heat up what later became known as the Navy's Polaris Program.

Q: In this tour of duty at BuOrd, is this where you acquired an ability to deal with scientists, which is a very special ability?

Adm. R.: Perhaps. We certainly had to form close working relationships with the scientists.

Q: This was one of the requisites for the Polaris job, I understand.

Adm. R.: During World War II I was brought back to Washington for a year to establish and set up an aviation gunnery training school because at the outbreak of World War II I was at Kaneohe and I was shocked to note the lack of training for personnel manning machine guns in patrol planes, for instance For example, on the night of 7 December after the devastating attack one of the pilots called me from Pearl Harbor, saying "They're sending me out tonight on a mission with people in waist guns who don't even know how to load the guns! Can't you do something about it!" This was a deplorable state of training, so I determined right then and there—that we had to do something about training all of the patrol plane personnel in the Hawaiian area even though they

belonged to other commands. So the next day I started a gunnery training school at Kaneohe by going down and getting my ordnancemen together and fished the machine guns out of the burned out hulks of the patrol planes and set them up on a point a Kaneohe. Then we put a plane in the air to tow sleeves and set these machine guns up on stands on the ground with the ordnancemen standing besides these flight people, we started training gun crews. The idea caught on and other commands in the area happily sent their flight people over to join in.

Many innovative things were brought in there. We took gun turrets out of torpedo and patrol planes, electrical gun turrets. We set them up on mounts at the gunnery range which was established there on the edge of Kaneohe. We shot at sleeves. We taught people to use the same equipment that they were going to use in the air. I emphasize we took the waist enclosures out of the patrol planes and sat them up there and made them shoot from the same kind of thing they were going to use when they were in the air, except they were on the ground shooting at sleeves, of course. That was the difference.

We did teach people, though, the basic mechanics of taking care of the guns, how to shoot guns, and the result was we had trained, when I left there to come back to Washington to head up the Navy's aviation training program, more than 3,000 gunners.

It was heart warming to hear expressions of appreciations from former student fighter pilots from Pensacola and patrol plane personnel on one of my visits to the combat forces at Guadalcanal. I must say, however, Jimmy Thach did more for fighter gunnery than anyone else. We all admired his pioneering combat techniques.

Q: In what period of time, was this done at Kaneohe?

Adm. R.: I guess it was about thirteen months or something like that. We put them through an accelerated course, but it was all work. And we had lots of enthusiasm for this because we had a war going on and people realized they had to know how to shoot a gun.

Q: That was the new element that was introduced?

Adm. R.: Sure. It was real stimulation. And of course as I have mentioned before my interest toward teaching people how to use machine guns was reflected back to three or four years before when I was at Pensacola and one of the many instructors who taught people how to shoot fixed machine guns from fighter planes by aiming the fighter plane, and how to dive bomb and so forth.

The experiences at Kaneohe was followed by duty in the aviation training department in Washington and we established many aviation gunnery schools over the country to teach aviation gunners how to shoot guns from fighters and patrol planes. After about a year the Navy sent me back to sea and I was executive officer in the aircraft carrier Hancock. My long living with gunnery found another area to express itself when I found the machine guns in the fighter planes were not being cleaned properly when they returned from combat. They were jamming in the air in actual combat! So I got the aviation ordnancemen around and made sure they knew what they were to do and then checked up on them to see that they did it when their planes returned from combat – that those guns were cleaned with soap and hot water, as they were supposed to be, soap and water, properly oiled, and made into apple-pie shape. The bomb racks also were all checked after every flight.

I imported some of my old aviation ordnancemen buddies from the United States schools who knew their business, got them ordered out to the ship by name and the result was our ordnance and gunnery department was the pride of the ship.

Q; Heretofore it had been somewhat secondary, had it?

Adm. R.: In my opinion it was a sloppy operation. The object of the whole game of being out there is to have those guns shoot well. Now, the second part of this, of course, was the defensive guns of the ship. The Essex- type carrier was armed with four gun mounts of 5-inch guns and had sponsons containing 40mms. both twins and quads, and then along the catwalk on the flight deck

were reams of 20-mm guns, which the flight deck crew manned when we were being attacked.

I noted that in the practice gunnery which we had regularly, shooting at sleeves out in the battle zone when we didn't have live targets to shoot at, that they left considerable to be desired. So I took over groups of these, one at a time, for the gunnery officer, set the boys down, and talked to them like a Dutch uncle and reminded them that if they were going to hit a duck they had to shoot in front of them and they had to keep moving the gun as they were shooting. Now, these 20mms were equipped with a lead computing sights which would compute the lead to hit a plane provided that one of the men on the guns would turn a knob to keep the wings of the airplane properly matched within two movable pointers. But in the excitement of combat I'm sure this isn't being done, so I said, "You just go right on and try to keep those wings circumscribed or bounded by these two pointers, but for the man who's actually moving and shooting the gun I want you to lead the target just like he was shooting ducks. If you're going to miss, miss ahead of the plane. You may hit the guy."

Well, the result was with this toning up of the ship's gunnery personnel they got so good at shooting down the target sleeves that we were not permitted to shoot at sleeves until all the other ships had finished because every time it came by we shot it down with almost the first burst with 5-inch guns, or 40mms., or 20 mms. They said. "Hancock", no shooting from you until we tell you."

Q: Excellence was a handicap!

Adm. R.: No, it wasn't a handicap but it was a source of great pride to our crew and the tow pilots were happy as they didn't have to stream as many sleeves. It took a lot of time to stream sleeves, so they said you will shoot last. They knew the first pass that the guys would make with the long sleeves being towed, why, down would come the sleeve for we'd shoot if off and they'd have to stream another. Of course, this coupled with special attention and training of lookouts made this aircraft carrier, which of course would be a bull's eye for attacking planes (aircraft carriers were

the target for attacking planes) the pride and joy of the task force commander as far as its ability to defend itself and to shoot and shoot well. We knocked down many a plane. We had a great big old fat battleship over there with guns coming out of it from bow to stern and it didn't seem to be hitting anything but when attacking planes jumped us we knocked them down and got direct hits on them. That didn't keep us from getting damaged sometimes because a plane did suicide us, maybe we hit him solidly but of course he was like a bomb exploding right over the ship. There wasn't much you could do about this.

Q: An early attempt at kamikaze, wasn't it?

Adm. R.: We don't know whether it was a kamikaze or not, but we did hit him and knocked him out of the air but he plunged on into the water. There were several other planes that we hit and knocked out of the air and we got away very fortunately. A bomb would fall on one side and the engine on the other side and all of that, just so we were not touched, sometimes we would have some burning debris on the deck which was quickly put out and pushed over the side.

I guess these kind of associations with naval weaponry at sea and ashore accumulated to a place where I was just one of many officers identified with ordnance and gunnery. So in 1955 when it was decided in Washington that the Navy would join with the Army in an attempt to use at sea the Army ballistic missile to be developed the Navy looked around for a program manager. The Navy had been able to persuade the then Secretary of Defense to join up with the Army in this project. Secretary Wilson – "Engine Charlie" Wilson, I believe he was popularly called to differentiate him from the Charlie Wilson who was head of General Electric, who was fondly called "Washing Machine" Charlie Wilson – (these were all terms of endearment), of course made this decision a very wise one indeed. I learned later that there was quite a group of people who were pulling for one person or another to head up this Navy endeavor with the Army, to see if they could use it aboard surface vessels. Converted merchant ship first and later

perhaps in submarines. I later learned that the Bureau of Aeronautics wanted to be the lead in this effort. The Bureau of Ordnance also wanted to be the lead Bureau. I'm not sure, but I think a classmate of mine who is now deceased, was their candidate. He was an ordnance PG, and eminently qualified. Although I had served in the Bureau of Ordnance for one year I was not an Ordnance PG, yet it was only natural that they would turn towards a competent ordnance PG.

Q: At that time it was thought that it should be an effort within the Navy itself under the direction of some Bureau?

Adm. R.: Yes, that's right. A person would have to have the support of a bureau in order to do this – there were a myriad of things to be done, all the way from getting and maintaining personnel, the support of personnel and office supplies, contractual support, and you name it. The bureau of course was the kind of organization that could provide these services. Admiral Sides, I was told later, was in the middle of this selection. I don't know how he voted, but Admiral Russell told me later that he was sorry not to be designated as the lead bureau, but "they kept him quiet by taking his candidate for the job", which fortunately was me. Then they gave the project to the Bureau of Ordinance.

Now I was summarily jerked out of my job in Norfolk – operations officer for the C in C Atlantic Fleet told me to come to Washington on the run!

Q. You had to leave in 24 hours or something?

Adm. R.: Well, yes. I was told to get up there overnight. So my wife and I loaded our things in two cars and drove up. The job was explained to me and I was told to go to work. Going to work meant going over to an office in the Bureau of Ordnance and I had one officer, Captain Hassler, who is now retired and living in Sunnyvale, California. He was the one person in Bureau of Ordnance who met me. So we started out with one office and one

officer. He had been one of the prime movers in the Bureau of Ordnance to try to get the project for the bureau.

Admiral Burke made it very clear, along with Secretary Thomas, the high importance and absolute top priority within the Navy and on the national scene that the effort was to have, and I was, of course, to work with the Army who had set up a similar organization in Huntsville, Alabama, under Major General Bruce Medaris, to build a large liquid-fuel (main-propulsion engine) ballistic missile which was later named Jupiter. This was supposed to be a 1,500 mile bird and it was in direct competition with the Air Force's similar efforts to build a land-based, as the Jupiter was, missile called Thor.

Q: Atlas?

Adm. R.: No, it wasn't Atlas. Atlas was a 2,500-mile bird. This was a 1,500-mile similar version.

In any event, there was considerable haste on the part of the Army and the Air Force to be the first to develop a 1,500-mile land based ballistic missile, and I'm sure that the imposition of the Secretary of Defense on the Army that the Jupiter had to be used aboard ships was not too well appreciated by the Army because undoubtedly to try to make it useable aboard ships at sea would be a hindrance to them. There'd be many navy requirements laid on them which would not be necessary at all for land-based missiles, and this would impede their progress and cause them to lose the race to the Air Force as to who was going to be the first to provide a 1,500 mile, land based ballistic missile.

Q: Admiral, why did the Secretary of Defense impose this upon the Army and the Navy, too?

Adm. R.: I think it was due to the persuasiveness of Admiral Burke and Secretary Thomas. As I understand it, they were out to Admiral Burke's quarters one night and they were discussing the matter that the Navy should have a ballistic missile at sea. There have been many people who had thought of this and wanted to do

this. As a matter of fact, they did launch a large German built liquid-fueled missile from an aircraft carrier at sea. It was very spectacular but obviously not very practical because of the size of the missile and because the ship moved around too much in the seaway.

So Admiral Burke and Secretary Thomas were persuasive and Secretary Wilson said all right, join up with the Army. The Army, I think, in a way, was pleased to have the Navy support. Obviously, the two services working together were a formidable group.

Q: Was the Navy equally as pleased to have it a joint project, or would they have preferred to have gone their own way?

Adm. R.: Well, in my opinion the Navy actually didn't know and had considerable reservations. When you say "the Navy" that takes in a lot of people, but let's say most of the senior officers in Washington, with the exception of Admiral Burke, were not deliriously happy to embark on such a risky and costly venture like this. They felt – and I think very properly so - that a large liquid-fueled missile aboard ship was a very dangerous thing. There were dangers of leaking fuel from pipes and pumping and all this sort of thing, even on the open launching stations, on the deck where this large thin-shelled bird would be erected and held in place and then just fueled before launch. Conceivably, you'd be in more danger from that than you would if you were under fire from the enemy, and those of us in the Navy project office had reservations too. But national urgency caused us to give it a real try.

As a matter of fact, later on, during our initial tests of mock-ups of the bird and ships' structures we proved very conclusively that in those days the carrying and launching of large liquid-fueled missiles aboard a surface vessel was very, very hazardous because when we'd topple them over to see what would happen and the resulting fire and explosion just made it very difficult thing to countenance, or to really go ahead with. The though of putting these missiles in the confined spaces of a submarine underneath

the water, would make an internal combustion engine out of the whole submarine. Of course storageable liquid fuels have advanced tremendously since then but the inherent safety of solid fuels still gets my vote.

So, as these tests with liquid fuel engines moved on, we were experimenting with large solid rocket boosters that could become, perhaps, motors for ballistic missiles. Of course, the Terrier, Tartar and the 2.75, and the 5-inch HVAR rockets were all solid-propelled boosters, so the Navy was not entirely ignorant of the capabilities of solid propellants. But the specific impulse, or "oomph" of the motors built for solid propellants was not nearly as high as the isp that you could get from liquid fuels. However, solid fuel motors were far more safe and we had some considerable experience in handling them aboard ship and aboard airplanes, so that the Office of Naval Research, in some of their work, with Atlantic Research Corporation, which is in the vicinity of Washington, fortunately about a year after we had been working on liquid fuels motors came up with some rather startling advances in the specific impulse that you could get from solid propellants.

The rule was formerly that the addition of a substance, like powder aluminum in solid propellants, up to a certain point you could get an increase in specific impulse. The people down their said, well, what would happen if you put massive amounts of aluminum powder in it? So they did that –

Q: Ignoring that cut-off point and going ahead beyond it?

Adm. R.: Yes – They ignored what the textbook said, so they went ahead and came up with a marked improvement in the amount of specific impulse, which clearly showed us that now it was possible to build large solid fuel motors that could propel a large missile some 1,200 to 1,500 nautical miles.

Q: This, incidentally, was achieved by two young scientists, was it not, Rumbeau and Henderson?

Adm. R.: I think so, yes, under the sponsorship of the Office of Naval Research.

We delightedly seized upon this and went to work with our principals in the contractual family which we had by this time gathered around us to try to put the Jupiter to sea and to our delight, we came up with a very, very much smaller missile carrying a respectable warhead and one which would be entirely safe to put into submarines. It was very obvious to us that putting ballistic missiles in surface vessels was not nearly as attractive as putting them in submarines, because, one, the submarine was more difficult to find, and secondly, if we could launch it submerged – while the submarine is submerged – the missile would have a very stable platform. It's not rolling around storm-tossed as the surface vessel would be.

So we directed our attention to this matter and evolved a program putting solid-propellant ballistic missiles into submarines. I very proudly carried this over to Admiral Burke and the Secretary of the Navy, and then to the Secretary of Defense Wilson. I contrasted it with the previous program when he had approved for us to go ahead and showed him a series of slides of what it would do for size and costs of the vessels and where we could use it and how in submarines. The last slide showed the contrast with the program he had approved, and that we could put it into submarines and we could save up to $50,000,000.

Q: Was it not 500,000,000?

Adm. R.: No, it was 50,000,000 for the liquid fuel missile place in surface ships.

In any event when I finished the presentation, the Secretary of Defense looked most appreciative and he said, "Well, Admiral, you've shown me a lot of sexy slides this morning, but I tell you that last slide where you showed me the tremendous saving, was the sexiest one of all."

Q: Money speaks!

Adm. R.: We walked out feeling very good indeed about this and, in due time, he indicated that he would give his approval to the dissolution of our working partnership with the Army and to proceed on our own. Acceptance of this program in the Navy, however, was coming along not as good as we had hoped. Admiral Burke called a meeting of all of his senior flag officers in his office and had me there, I guess as the piece de resistance, and he told what we planned to do and sought their advice. Of course, this was typical of Admiral Burke. He didn't try to "bull" his way through. He tried to get people to see things as he saw them and then tried to explain the rationale behind this thinking, hoping that they would come to the same conclusion that he did.

He asked them at the end of his dissertation on what we planned to do and sought their advice that they would advise him to do. Not one of them was enthusiastic about the program.

Q: Why?

Adm. R.: Most of them felt that it would be a waste of money, a tremendous drain on the Navy's budget, and that is would not be successful. The result would be that many things that they needed in their areas of responsibility would not be purchased or would not be done, and the Navy would get a big black eye out of this program, and they so expressed themselves to Admiral Burke.

Q: The overriding issue of national defense didn't -?

Adm. R.: It wasn't that so much. They too were participating in national defense. They had charge of building submarines and destroyers and aircraft carriers, and so on, and to take literally millions and millions of dollars and put it in something they were not convinced would be successful – it was a normal reaction. After all, launching a missile from a submarine while submerged was an entirely new idea. It had never been done, and so on. There were so many things that had yet to be proven.

Q: At the time of this conference, had the Secretary of Defense ordered the funds for the development of this missile to come from the Navy budget?

Adm. R.: Well of course, it was obvious to everybody that the initial funds would have to come from the existing Navy budget to get started until the new fiscal year came around. I'm sure that this played a major part in the attitudes of the admirals because they could see many of their cherished programs going down the drain, which were quite important and no one can say they were not. It was not selfishness. They had a responsibility for a certain part of the Navy and it was obvious that it was important and proper that they speak up for their part of the Navy.

Q: Were you invited to speak your piece at the conference?

Adm. R.: At the end of it, as a sort of finale, Admiral Burke turned to me and said, what do you think. And, in my youthful enthusiasm, I said, "if the Navy didn't go ahead with it, it would be making the biggest mistake it had ever made." With that we were dismissed, and Burke then decreed that we would proceed and proceed with the top priority, and wrote a memorandum to that effect. He sent me a copy and it dictated, in effect, that I was to have absolute top priority on anything I wanted to do and everyone in the Navy would be responsive to my requests. If they found that they could not be, there were to come instantly to him with me and he would take it on himself to say no if he thought it was proper.

Obviously this was a "magic" piece of paper. I carried it in my shirt pocket for days and weeks and months. I only had to show it once or twice and sort of apologetically, you know, the boss told me to do this. And "gosh, this is something I've just got to do and I hope you understand." Of course, we were given carte blanche on everything, including people that we wanted to come in. We asked that people be ordered in from all over the United States. I got one gent off a destroyer off the south coast of Africa. He was flown back and put to work.

Q: How did the admirals who opposed the idea react to this?

Adm. R.: Well, actually, they were a fine group of people, as admirals, as a rule, are. Once the boss made up his mind they fell in behind him on this program quite well. This didn't stop all the bickering, this didn't' make me immediately a "hero". Everybody thought well of it, of course. They had their reservations, but they had their orders, so they carried out their orders, and I think this is to their great credit.

The thing, I think, that shook them up the most of all was that no one had anything to say about the program except me. No one in the Navy could tell me "what" or "how" to do this.

Q: This was completely innovative as far as the Navy went.

Adm. R.: Completely. We had complete, absolute authority, and no one was to look over our shoulders and try to tell us how to do something or what to do.

Q: I take it there was no precedent for this at all?

Adm. R.: No precedent before and, I think, after.

Q: In any one of the services?

Adm. R.: I would think that's right. There were several similar examples along about that time, but they didn't have the complete authority that was given to me, I know for sure. General Schriever had something similar to that, but he had to come and plead and beg whoever was head of their air staff, I know, on many occasions. He had something quite similar and perhaps to him, working within the Air Force command, it was similar and was equivalent. I don't know. But, to me, this was absolute authority. I had the authority of the Secretary of Defense, as authority currently is now known, and this innovation and responsibility, I think was one of the keynotes – key factors – of getting this

program off to a fast start and its performance of the military – industrial team, which has continued to this day.

Q: Obviously, the results proved that point. I wonder, for the sake of this story, Sir, if you wouldn't want to leap back at this time and deal with your first concern, which was the joint effort with the Army and Jupiter- going back to December of 1955 and so forth, because this development that you've just described was the end of 1956.

Adm. R.: Yes. Well, we worked with the Army for the best part of a year. We set up a cadre of officers down at Huntsville and I made many trips down there myself to be sure that we were working together in the best possible way and to ensure that our requirements levied on the missile's characteristics were properly understood and were being met by the Army so that we might have the best chance of using this missile.

Q: What was your attitude on this? Were you optimistic that it could be accomplished, for the Jupiter?

Adm. R.: My attitude was let's give it a fair trial. This was the direction in which we were pointed by both the Navy and the Army, and so it was our responsibility to develop the idea to the maximum extent to be sure that it would go, that it would work or would not work. And this we did. The Army gave us, I thought; very fine cooperation, although we were a hindrance to them obviously. We had to do a lot of extra work and a lot of extra study. Dr. von Braun was then the chief technical officer to General Medaris, and considering the circumstances the relationship between the Army and the Navy was very good. Obviously it was not a happy one for them exactly because we did slow them down and they were in a race with the Air Force. And it was not happy for us because we were trying to make somebody else's missile which was specifically designed primarily for use from land against land targets and we were trying to pump some

salt water into it so that we could take it to sea! That was a tough job and –

Q: Can you cite anything specific in the way of these problems?

Adm. R.: No. They were mainly personal problems – problems of education. We would say we need this characteristic and the Army engineers would say – well, why, why in the world do you need it, you're going to cause us to go back and re-do all of this, that, and the other. So it was an educational process which was, at times, a little painful, particularly when folks were in a hurry and obviously our requirements were slowing them down –and expensive, too.

It was a natural thing but, as I said before, under the circumstances I think our relationships worked out very well indeed. As a matter of fact, most of those people are good personal friends of mine right today. But I'm sure they had a sigh of relief when it was determined we were going to go our own way because they were unfettered and released. They could proceed to optimize the weapon for their own use without any further hindering requirement for naval use.

Q: When you were working with the Army on this joint project, how did you and your fellow officers and scientists develop the overriding wisdom of the Navy's end of it? Tell me about that.

Adm. R.: We established a contractual family, an industry contractual family, to develop the application of the Jupiter missile. It was not a full contractual family such as we had in Polaris because the Army had already selected the missile contractor, which was Chrysler. They had selected a guidance contractor, and they had the engines contractor, which was North American Aviation (at that time). So we had nothing to say about the selection of the industrial partners.

Q: You had to work along with them?

Adm. R: We had to work along with them, and then one of the things we did to make sure of an optimum relationship was to ask Chrysler if they would also be our (the Navy) missile contractor – prime contractor, because inasmuch as they were building the thing for the Army we didn't want to have one group going and explaining what we wanted for another group. We explained it to the same group and the same group of engineers and were then trying to work out both problems.

Q: Did this not result in some confusion in their minds, in industry? I mean there were riding two horses, were they not?

Adm. R.: No, not much confusion. It would have been more confusing had we had another company than Chrysler. They were working for the same boss and they were being motivated by the same boss, I mean their own bosses, civilian bosses, and they were being told by their civilian bosses to please both customers. So they had motivation – I'm talking about the Chrysler people – they had motivation for both customers. The result was you got more cooperation at the working level than you would if you had another contractor, civilian contractor, come in and try to tell them what their client wanted them to do. The principal contractor would resent that.

Q: I see. It would have been kind of chaotic if you had another contractor.

Adm. R.: It would have been terrible if we'd got another prime contractor than Chrysler. That was just sort of a "warm-up" phase – it actually turned out to be a "warm up" phase. We learned a lot, and when it came time to go into the Polaris effort, the bird which we later named Polaris –

Q: Which you named, I understand?

Adm. R.: Yes – we started with using some of the solid propellant motors, having got approval for the program by the Secretary of

Defense and the Secretary of the Navy and the Chief of Naval Operations, we then took about three weeks to select our own industrial family, our associates. We not only had to have a missile contractor, we had to have a missile-guidance contractor, and a missile launching contractor. We were going to do something that has never been done before, and that was to launch large ballistic missiles from a submarine when it was submerged. We had to have a navigational contractor because the submarine was supposed to stay submerged for long periods of time, and we had to know with great precision where it was at all times and have the ability to update the navigational position with minimum exposure of the submarine at regular intervals and this depended on how good the navigational equipment aboard ship was – of course we had to select that contractor.

The selection of various contractors for this widely diversified program involving a missile that had never been built, a navigation system which could precisely locate the position of the submarine, a fire control system to resolve the information to inform the missile what it should do to land on target, and a missile guidance system which could take this information and steer the missile until it told the solid propellant motors to cut themselves off with precise timing in order that the warhead would follow a ballistic course to target – all involved pushing back the frontiers of science to a degree and scope which had never before been done.

To select the contractual family of industry working in partnership with the Navy had to be done with great care but at the same time, because of the urgency of the program, it had to be done on an expedited basis. There was no time for a long drawn out formal competition between various companies for these several elements of the overall weapon systems. And indeed it would have taken literally years to have come up with anything remotely resembling what we actually did develop because of the lack of experience in science and technology at that time. So happily we used the common sense method of selection of contractors which involved an intense scrutiny of the capabilities of various companies, and importantly, the work-load which they already had in-house which would be in competition for their top

technical people with our program. Fortunately our small group of naval officers and civil service engineers were quite well-informed on the various companies who showed an interest in our program and they constituted a review board which gave each of the civilian contractor companies a day to come in and tell us of their ideas and how these unknown developments could best be tackled. Importantly, they were also required to give us a list of names of top technical people who would be dedicated to this job.

So in a period of about one month we were able to sort out with considerable accuracy those who were best fitted to take major prime contractual roles in the various major elements of this entire weapons system, i.e. the missile in its entirety with the sub-primes for the solid propellant motors and the guidance package, the navigational system contractor, the fire control and missile guidance contractor, the launching and handling contractor who would help develop a successful means of shooting a missile from a submerged submarine and, importantly, a program office management concept to manage this entire program through the major sub-system prime contractors.

When a program as innovative as this is initiated it really doesn't make much sense, if time is of importance, to conduct a long drawn-out competition between many contractors and then have a couple of C-130 aircraft fly them to Washington where they will be studied for another year or so before the contractual family is selected. I consider this a very wasteful way of doing business because the technical approaches finally selected will largely be obsolescent by this time and as the program goes on, a major part of this work will have to be discarded with millions of dollars of our taxpayers money wasted and the program in effect set back time-wise because of this unnecessary and over-cautious approach.

So with our contractual family selected in my program office, my first impulse was to go over and tell the Secretary of the Navy who we had chosen, but then it occurred to me that he had given me all of his authority in writing to act for him on all matters pertaining to this project. So I said why in the heck should I abrogate part of this responsibility, so we wrote a telegram and put

our selected contractors under contract, over my signature, and then sent them out.

Then, I went over and told the Secretary of the Navy, and, as usual, he had me ushered in promptly. No matter what he was doing he always excused the people who were there and said, "Show Admiral Rayborn in. He has top priority." It was a little embarrassing at times to have senior admirals shooed out of his office and walk in. I was a "frocked" admiral then. (I'd been selected for admiral. I was wearing an admiral's uniform, but because I had not yet made my number, I was drawing a Captain's pay!). I went in and told the Secretary of the Navy that we'd made the selections for the team and they were put under contract.

He looked at me with a startled and surprised look and said, "I thought I had some responsibility for that." I said, "Yes, Mr. Secretary, you certainly have but, you recall, you delegated your complete authority and responsibility to me and I have exercised it. Here are the people who are now under contract to us." He looked over the list, looked up and beamed and said, "Well, you sure made some good choices, no question about it. I recognize these people. They're all good people."

That was the way this thing was done. What a contrast to todays drawn out, expensive to the taxpayers, "Follow the book" way of doing business!

Q: Did you include on that list any of the contractors who were working on Jupiter, too? Was Chrysler on your list?

Adm. R.: No, Chrysler was not. We chose Lockheed for the missile contractor and chose Westinghouse for the submerged launching contractor. Also I had gone up to talk to Dr. Stark Draper at MIT Instrumentation Laboratory about taking on the technical job of evolving the missile guidance. He had done some very fine work, to my knowledge, on inertial platforms, inertial guidance work, and he agreed to take on the missile guidance job. We brought in the General Electric Company, the Pittsfield GE Division, to be his industrial back-up, to actually manufacture the gyros and accelerometers in production that were to go into the

missiles – and the inertial tables to go into the missile guidance package, but all of this was to be under his technical direction, because he was and still is the world's leading technical genius on inertial platforms for missile guidance. (It is interesting to note that this Polaris guidance team were later hired by N.A.S.A. to guide the astronauts to the moon and back!)

We selected Aerojet General for missile propulsion, to build the solid fuel propellant motors. We had instrumentation people, Interstate Electronics, who were to do the instrumentation of our range and ships and so forth, and they're still doing that job for Poseidon.

This whole contractual family was kept together and we obtained from them promises of a completely dedicated group of people and separate buildings for our work. We constructed the buildings as necessary to put them into business in order that our work could be absolutely segregated from the rest of the contractor's work and be given absolute top priority in their plants. We established an on-site naval-civilian representatives of our own, naval officers in small teams, to follow their work on a day-to-day basis and, of course, we had a small team here in Washington. We had truly a magnificent military-industrial partnership.

Q: Were there any repercussions to your selectees once they became known? Some of the concerns that had worked and were working for the Army, did they not feel they should be in on this particular project?

Adm. R.: No, we had no reverberations whatsoever.
Q: None from the congressional area?

Adm. R.: No, none whatsoever. I think that there's entirely too much about this today. I think the idea of competition for competition's sake is time consuming, expensive, and sometimes, particularly if you put the award of contracts on the lowest price without due regard for capability, you are buying a very bad thing for the defense posture and the taxpayer. As a matter of fact, it's

one of the most uneconomical things and wasteful things you can do – to take somebody who really doesn't know what the problems are all about and, due to ignorance, they in effect "buy" in, and you are required by law to give it to the lowest bidder. This is the most wasteful thing that you can do. No one who's building a house, if he advertised for bids, would take a guy who obviously had no record of success to speak of. Just to take this bid because he is the lowest would be the most foolish thing to do and he'd know it. Well, if you can translate that to a major program dealing in new and unknown technology, you can see how silly it is to slavishly follow "standard" procedures" instead of exercising judgment! It is impossible to cast out a R&D program. We've been building houses for 3,000 years or more, but we still have boo-boos and over-runs in houses. For example, if you want to get a surgical operation on your body, you don't go to the cheapest surgeon, you go the best surgeon that you can interest in your case. National defense deserves equally first class care. Otherwise the corporate body could become corpus delicti!

So the selection of the Polaris team was that kind of thing. We got the best we could for the country, to our judgment, and they in turn have distinctly proven to this country and to anyone who wants to look into it in an unbiased basis that this kind of awarding contracts is the best way to go, because I believe the Polaris contractual team have performance unequalled by any contractual family of a major project before or since. In their performance-time schedules they consistently underran those set for the program. And this performance was obtained by cultivating a real team spirit and effort! Today people want to set up all kinds of managerial techniques which are theoretical in nature by men who frequently have had little or no practical experience in managing programs. These elaborate and theoretical procedures enforced upon program managers hinder rather than help get the job done. Of course they are supposed to prevent a manager from making mistakes, and this is ridiculous. It seems to assume that everyone is inexperienced so you have to go through a set routine in order to get anything done. This kind of slavish devotion to check off lists permits no exercise of brains and literally costs us taxpayers

millions of dollars. It penalizes the armed forces of the United States for they are not as fully armed and fully equipped as they could be if people could use good judgment instead of endless reviews by others. Much money is being wasted by unnecessary competitive efforts and wasteful allocation of contracts to incompetent "low bidder" people. That's what's going right now under the guise of, "well, this is the way the 'book' says to do it." The best way by whose standards? Performance? Certainly not! The various echelons of review seem to feel that only they are competent to pass on the program actions.

The lessons of Polaris have certainly been lost on this country. It was a very successful effort of major proportions – but now people seem to be more content to "stooge" along following the many rules, feeling "protected" while more bureaucrats write more rules to prevent mistakes as if they can ever be a substitute for common sense.

Q: Has it been because it hasn't been published to that extent, or what?

Adm. R.: People don't want to work this way. There are millions of people in the government – and when I say "millions," I guess it's at least a million people in government –whose jobs are built up on the bureaucracy of paper work and endless reviews of the program managers work. Their jobs would be jeopardized if they streamlined action taking and did things in a more common sense, straight forward way. So, obviously we are not going to get this kind of thing turned around. We have unbelievable management "top-hamper" in the Government. They don't want to believe any other way can be successful or profitable, except the way that they are sponsoring. So we have procedural papers and procedural reviews and methodology which is the most wasteful thing I know of in this country, absolutely the most wasteful, under the guise of efficiency! It's the most inefficient thing that I know of, and no one can get anything done, from building a house to developing a new major weapon system under these kind of procedures and do it efficiently and do it effectively, and do it effectively against

time. Talk about inefficiency in defense procurement. How does the civilian metro system in Washington D.C. compare? Or take a look at the new senate office building job over-runs.

In the Polaris program we knocked off some three and a half years off the program schedule, and this was not a stereotyped program such as building subways! This was an innovative, completely new, never been done before weapons system. We didn't know how to navigate submarines with precision while submerged, we didn't know how to launch a large missile submerged in the water, we didn't know how to guide it once it got into the air and deliver it with adequate accuracy, we didn't have a warhead for it – a nuclear warhead. None of these things had been done before and yet naval officers in uniform, and our civil service managed their contractors and it was done superbly well by this consortium of military and industry family. And we had "letter" contracts for about the first two years. As a matter-of fact many of our management techniques are now "standard procedures" in civilian industry. We simply brought out the latent talent in people and gave them performance goals to reach without crippling and excessive supervision. Many people have asked wasn't this expensive? And I said, "Sure, it was expensive, but we were spending at the rate of 1.2 billion dollars a year and we produced the system three and half years ahead of schedule, so we saved six and a half or seven billion dollars, just in time alone." So, how much money did we waste? I don't think we wasted much. The Country had a weapon system it needed, when it needed it! How much is our country's safety worth!

Importantly, we got this system in the hands of the Navy and the country for its defense in a very timely way. It is vital to recognize that it is not important what you've got on the drawing board or in test, when "the balloon goes up" – as we used to say in World War II, when the balloon goes up – you can only fight with what you have in adequate quantity in the hands of the troops. And yet now we have people in high places who are so entranced with all of these procedural matters of management, procedural manners of competition, and mountains and mountains of paper work now required in weapon proposals. As if these are the

important things. The cart is before the horse! The efforts of all those procurement people could be better spent toward doing the thing that has to be done, and you save two to three years on every major program and literally millions of dollars. More importantly the military services would have much needed weapons in hand to defend our Democracy!

Q: What was the overriding consideration which caused you to set aside the established way of doing thing and go about your work directly?

Adm. R.: Well, we were told that this was of the upmost urgency for the defense of our country that we bring this weapon system into existence at the earliest possible time. So we didn't spend time about working on procedures. We spent time on working on the job to be done. We said, "well" – and were all men of some experience – "what's the best way to do it?" "All right, let's do it that way." The staff which we had assembled around ourselves was small but highly talented, they didn't have to go and hold formal one or two competitions to know what was the best thing to do. They had enough experience to say, all right, let's select these contractors and proceed along these lines and learn more about it as technical "savvy" is applied to the job. We went slowly at first but more rapidly as things fit into place. It can be compared to flying an airplane from one place to another. The plane can climb to altitude over the airfield before proceeding, or it can climb enroute to the altitude needed.

Q: Admiral, what did you learn of techniques during this initial year when you were working with the Army? Was there anything of particular importance to you that you could apply when you got working on Polaris?

Adm. R.: Oh, I think any effort engaged over a period of a year, as this was, you're bound to learn some things. It would be, I think, silly to say that a man can live a whole year and not learn anything. We were exposed to the Army's way of controlling their

programs, managing their programmes, and I'm sure this was helpful. We were exposed to industry, firms that were interested and talented in this kind of work and this was helpful. We operated in this environment, the military-industrial environment, of big missiles which gave us a lot of insight into the capabilities of the firms. It added to our store of knowledge and I think it was a very good warm-up, although we didn't use any of those contractors for Polaris because none of them were particularly fitted, we thought, for the specialized application of a submarine launched solid propellant missile that we were going to use.

Q: You speak of "we" constantly, perhaps this would be a time, then, to talk about the team that you began to assemble around you in that initial year.

Adm. R.: Here, again, we were given this job of top priority in the Navy and co-equal to any in the country. We looked around and said, who do we want to assist us? I need a good deputy, and Captain J.B. Colwell came to my attention. (Later vice admiral). I had known of him favorably. He was a man of mature, calm judgment, a wise man. So I asked him to be ordered in. Obviously, the admiral for whom he was working was not too happy about this and I heard about that in no uncertain terms. I had been told that this then Admiral boss would be approached by another admiral and told about this before the orders were issued, but unfortunately that did not occur.

So Captain Colwell came in, and then we started selecting our technical in-house team, a technical director and assistant and we chose then (Captain Grayson Merrill and Levering Smith) by the same kind of familiarity with their past accomplishments. We looked for a good top civilian (civil service), one who knew money management, who knew comptroller duties and planning duties, and the name of Gordon Pehrson came to mind. He was then working for the Army over in the Chief of Staff's office to assist them in their planning. I read some of the work that he was doing for the Army and realized he was a very astute planner.

Q: You didn't know him personally?

Adm. R.: I didn't know him personally. So I asked him to come over and let me talk to him. This he did and we told him what we wanted, that we wanted a "top" civilian. He would run the administrative planning side of the house. He would be the comptroller, he would be the planner, have the management of the funds, of budgets, contracts, the whole thing and he would be counterpart of the technical director and support the technical director in doing his job.

He was persuaded to come over and I promised him a GS-17 classification if he would come and I had a devil of a time getting that billet and other civil service billets approved. I had to go through the White House to get the Civil Service Commission to give me a GS-17 billet. The lower level civil service people, just rebelled, they wouldn't do it. A "super grade civilian" was just out of the question to them. So I had a friend in the White House and he, in turn, got hold of the chairman of the Civil Service Commission and said to him, in effect, your organization is holding up the Polaris program. You ought to go down to see what they are trying to do and you ought to help. So he sent his Number Two man over. I explained to him why we needed the civil service billets and what jobs we wanted them to have, why we wanted men of this quality, and the GS-17 billet, too. He called in the local Civil Service people who passed on these things and "dressed them" down in my presence and said, you go out and prepare the paper work for every one of the Civil Service billets that Admiral Raborn has requested and have them ready pronto. You're not to go home or leave your offices until they are in my hands. This kind of action was unheard of. In other words, the billets, descriptions and the justification for them, which we had previously given the Civil Service people had not been moving with any speed. But now they were required to stay there until they were finished. So we got a GS-17 and we got every one of our civilian billets approved overnight.

It took that kind of action. I didn't know the Chairman of the Civil Services system, the Americans can move when necessary.

The Civil Service Commission proved it to us all. Need I say more?

Q: Do you want to name him, the White House contact? He was a great help.

Adm. R.: Yes he was a great help. He's now deceased. We needed friends, so I went out of my way to introduce people such as him into the program, with what we were then envisioning to accomplish and how important it was to our country.

Q: Did you have to use White House influence any other time?

Adm. R.: No, we did not. It was not necessary, as a matter of fact. Importantly though, the secretary of the National Security Council did interest himself in our work and I took the pains to go over to his office and keep him and the members of his staff up to date on how we were doing. This I continued to do when Dr. Gordon Gray was the secretary of the Security Council for President Eisenhower.

It was apparent to me that it was most necessary that important people in government – science and industry, who could speak a good word for you and help you – had to be acquainted with this program and its status. I took a major role in this. I had a little "road show", which I kept updating, of about thirty minutes and did it all myself bringing along my good buddy, the civilian who ran the viewgraph and slide projector, etc.

Q: And you lectured?

Adm. R.: Yes - Anybody who seemed to be reluctant about the program or had reasons to be kept up-dated. I took it on myself to seek an audience with him and explain what we were doing – how we were doing it and why we were doing it. This just took me even to the Secretary of the Treasury, the National Security Council, members of Congress, particularly all the members of Congress that had a direct responsibility in our program.

Q: Did you appear before committees?

Adm. R.: Well, yes. But what I was describing was informal and in addition to formal committee appearances. I always tried to brief the chairman and their staffs before formal appearances, so that they might have a better idea of what they were going to hear and they would know the status of the program and thus hopefully make the formal hearings go more smoothly, and this indeed it did. They could prepare their questions, etc. I briefed Carl Vinson and his staff, chairman George Mahan and his staff, Senator and Chairman Stennis and his staff, and others. They all became intensely interested in the program, and a major reason why this program went so smoothly was that everyone connected with or had anything to do at all with the program, from the executive branch of the government to the congressional branch and into the military industrial contractual family, were all informed of the true status of the program. Complete honesty within one organization and to those above us was our watch word! We were convinced that if everyone connected with the program were properly informed it would go better.

So we had a very planned, methodical campaign which was carried on by a whole cadre of officers who always made themselves available to go and talk on Polaris. I took it on myself to keep the people in Washington officialdom constantly up to date on our problems and how we were solving them and our successes (or failures), this included the Bureau of the Budget.

In this way, the people who were actually working in the program made it a part of their lives. It was their program. They became involved in it. In our industrial family, as well as our military, we had dedication talks. For instance, we would send out a top man from Washington (and I myself would go sometimes), and we'd have the entire Polaris work in a factory on Saturday morning close down. We'd have all the management and workmen. They were asked to invite their families, wives and children to be present for the presentation. Sometimes there were loud-speaker systems or closed circuit television systems set up – or whatever system was proper and available. Then we would

explain the whole concept of the program. I or someone from my office would explain ‘ the “big” picture and tell them what was being done to bring this weapon system into being and why it was so necessary for our country, for them.

Then the local manager would get up and tell them about their company’s part in this over-all big program, with the emphasis on how necessary it was for their (the people’s) future, the preservation of this country, the continuance of our way of life, etc. This was a major weapon system designed to play a major role in protecting our country and to protect them individually. In this way, we involved the families of the people who were working on Polaris, both military and civilian folks.

Q: Psychologically, that was wonderful!

Adm. R.: Yes – in these meetings we would have soft drinks and cookies for the kids, After the talks, papa would take mama and the kids and showed them where he worked, at what lathe, or where or what he did. This Polaris program then became known. We required dedicated performance on the part of all our people, our officers and civil service everywhere, our home office people and importantly the industrial family. So when a wife would note a neighbor would come home at 4:30 every afternoon and her husband working on the Polaris program would get home at six or seven o’clock – or maybe they wouldn’t get home that night! She naturally needed motivating too! We worked Saturdays, all day, and sometimes we worked on Sundays. This took its toll until we hit upon the idea of motivation, and the result of the motivation was that the families were proud that their husband was working on this program. Many a time, I’m told, when a guy maybe had one too many drink the night before, he’d ask his wife to call in and tell them he was sick, and she’d say “Get out of bed and go to work. You’ve got an important job to do for us.” So he’d be sent to work!

This motivation thing was a very real effort on our part and it paid off in dividends far beyond anything that I can begin to express in these few words. If I’d find an officer some place and it

seemed to me that he was not up to "speed" and not doing the job, I'd call him into my office, sit him down, and I'd go over the whole thing with him. "Evangelistic" fervor, that's the way we approached it. I got him wound up real good and sent him out and let him do his job. They became like tigers. As a matter of fact I called them "my tigers."

Q: This use of motivation like that, how did you arrive at it? Did it spring from your toots on the Bible Belt?

Adm. R. I guess. A lot of my family are evangelistic preachers, Baptist preachers, gospel singers. We all loved fried chicken.

So we became "tigers" and the "tiger" became a symbol. Everybody everywhere had a little toy tiger on their desk, a little tiger symbol. We went after our work like "tigers."

Q: Talking about briefing people and giving them a picture of what you were doing, did you get to the President -- was General Eisenhower interested?

Adm. R.: Yes. General Eisenhower was quite interested in this work because he initiated it and he called us in, General Schriever, General Medaris, and I, in one day for a Security Council meeting and asked us to make a presentation of our programs, which we did in the White House, in the cabinet room. I remember how struck I was at the evident youth of General Schriever. He's young looking for his age, and I'd never met him before. When he came outside and we'd left the presence of the President, I turned to General Schriever in mock seriousness and said, "You daggone Air Force generals give me a pain." He looked at me and kind of wondered, "What in the world is wrong with him?" I said you and your youthful appearances make us old admirals look as old as we actually are!"

That was the fist time we'd ever met, so we became good friends and have remained so ever since.

Q: You spoke before going to the Secretary of the Treasury – and that was George Humphrey –

Adm. R.: Well, at that time, it was the former Deputy Secretary of Defense, the Texan, who was Secretary of the Treasury. Bob Anderson.

Q: Why did you select him?

Adm. R.: It was timely. The program was growing by leaps and bounds and the need for money was getting to be quite sizable, and I just thought, well, it wouldn't be a bad thing because of his former tour as deputy secretary of defense and he was in the high councils, to have him speak a good word for us would be fine. So I called him up and said, "Would you like to see what we're doing, what program we are planning for next year? You've got to print the money." He said, "Send it over." So I sent over the program for the upcoming year. Then I had second thoughts on it because I hadn't yet exposed it to the Secretary of Defense! So I told one of my friends in the Secretary of Defense's office, "Would you mention to him that the Secretary of Treasury indicated he'd like to see it and I thought it would be the courteous and gracious thing to do." He promised he would, but it turned out two or three weeks later when the Secretary of Defense and I were going to inspect the Lockheed installation on the West Coast, that I found that my friend who accompanied him that he had not told the Secretary of my informing the Secretary of Treasury. So riding in the car from San Francisco to Sunnyvale, I mentioned the subject to the Secretary of Defense, the Honorable Neil McElroy. He became rather disturbed about this. I won't say he was angry. He certainly contained himself. And I said, "Well, I recognized that maybe you had better things to do and hadn't had a chance to review it. So I will retrieve the document immediately. Obviously I didn't want him to get it from the Secretary of the Treasury that he had seen the program before SecDef had looked at it. This was a mistake on my part and my enthusiasm for keeping people informed got out of step this time. A good lesson for me!

It behooves anyone trying to do a job of this kind to ensure that people who are going to pass on it are kept well informed on program status and plans! This includes the then Bureau of the Budget – I used to go and talk to Mr. George in the Bureau of Budget who was assigned the job of reviewing Polaris. I used to go over and talk over our budget and explain to him what we were going to do and why, and this was the bill for the work contemplated. Well, we got fine cooperation from the Bureau of the Budget. We got no nit-picking whatsoever, one because Mr. George is a man of great stature, and he made this become one of his programs for personal review.

Q: You have some political instincts, too, I believe!

Adm. R.: Perhaps. Maybe this story will illustrate.

I well remember a trip to Hughes Aircraft Company. At long last they got a job–we decided to have a back-up in the submarine fire control and missile guidance work. I'd like to emphasize that we had lots of competition in industry. We generated our own competition after we got started. For instance, the guidance platform was a very difficult thing to do. As a matter of fact, the gyros and accelerometers that went on the platform were very, very difficult to manufacture, and we had five major companies trying to build them and there were only about two that wound up being able to do it.

We wanted to have an alternate supplier for the guidance package, which includes the inertial table and the electronics. So we chose to team Honeywell and Hughes Aircraft. Honeywell was to build the stable table and Hughes to build the electronics. Well, in due time, as was my custom, I made regular tours of the industry team who were making parts and so I went by Hughes and our old friend L.A. "Pat" Hyland - he's still out there and running a good show –said, "Would you like to see our work?" I said "sure."

So we went down there and there on this very large floor was a block of about 300 girls working, and they were in assembly lines making the electronics that were going on this small inertial

table in the missile guidance. I noticed as I was walking through the line, being escorted by a supervisor, who was a woman, that all the girls at the work benches were dressed in red, white, and blue middy blouses and skirts. I remarked on this and said, "Why is this that they're all in this patriotic uniform?" And she said, "We're so proud to be part of the Polaris family that we decided on our own that we'd go buy these and we wear them every Wednesday."

I said, "Gee, but this is Thursday." She said, "Well, we heard you were coming." "So we wore them to show you how proud we are to be a part of the Polaris program!"

They had a picture taken of them, all of them in a large group, and they all signed their name on the back of it with a little dedication message, dictating their best efforts to this wonderful program. I think that's symbolic of the kind of motivation we had of the people on the factory floor. They would knock themselves out to do a good job, and they did. It's people who do the job. People turn out their best efforts if they're properly motivated and managed. Then you've an unbeatable team.

That was just absolutely symbolic of the whole military-industrial family, no matter where they were.

Of course, we were responsible for putting weapon systems into submarines. We also were responsible for the submarines and everything that went into them. We were responsible for the supply ships, logistic spares and the training of the weapon crews.

We worked directly with the Bureau of Ships but at first we were not working as well because we didn't have good lines of communications with them. So I went over to see the very wise then Chief of the Bureau of Ships, Rear Admiral Al Mumma, who left the Navy at the end of his tour and became President and Chairman of the Worthington Corporation, and I told Al, whom I'd known for many years, that we were not working together as well as we could, and he said, "Well, what would you suggest?"

So I said, "I'd suggest that you get one of your rear admirals, a naval constructor, and order him down here and give him your authority in writing, so that the whole Bureau of Ships establishment, no matter where it is, will know that he is Mr. Polaris and he's exercising Chief of the Bureau of Ships share of responsibil-

ity for the Polaris submarine. You all are going to build it. We're putting the weapon system into it, but you're going to build it." We had to fund everything that went into the submarine. The whole submarine was funded through my budget and, in effect, we were responsible for it.

He said, "That's a good idea." I said, '"he'll set up a management center similar to ours, except yours will be devoted to your work, but it will be in consonance with ours so that we can speak to each other, and we'll know and you'll know how things are going, where the soft spots are and where the effort is." He said, "Have you got any ideas?" And I said, "Rear Admiral Jimmy Farrin comes to mind." So he said, "Well, you can pick 'em too. He's ideal, in my opinion, as your man." So Jimmy Farrin got telephone orders, dispatch orders, that same day to report bag and baggage without delay, which means immediately, to the office of the Chief of the Bureau of Ships, and he was given additional duty in my office, as my deputy for ships, for shipbuilding. So I fixed up an office that was even bigger than mine and put him in right next to my office. I said, "This is your office, Admiral, and you're my deputy now for the shipyards, the building of ships, and the work of installing everything in the submarine. I'm looking to you to see that it gets done. My people will work with you and your people." I had a "ships" section which worked directly with me directly on my staff.

That turned out to be a very fine, excellent relationship and management technique. We didn't go in and try to give orders to the shipyard fellows, but we had one of their own admirals there who handled those duties for us. So what we did was utilize the existing chain of command to do the job. They knew the people to do the job, rather than going in and trying to tell them how to do the job, as is so much the case these days. That was a very happy arrangement.

Q: These were tremendous insights that you were acting upon.

Adm. R.: I don't call it an insight. It just seems to me to be common sense. Who goes in the kitchen and tells the wife how to

cook? Only a good cook, and I'm not a good cook. Not being burdened with a great deal of knowledge about anything, I just depend on a lot of people to do the work for me, and I really used this principle. It was well quoted and well known. I would never do anything if I could get someone else to do it because, one, the other fellow probably knew how to do the job far better than I, and two, it gave me time to do the things that only I could do. It gave me time to think. It gave me time to look at the soft spots, the soft spots in performance or in part of our military-industrial team or soft spots in protecting the political lines in Washington. It gave me time to go and do something about it. That's why I had a good deputy. My deputy ran my show – the deputy and the chief civilian and the technical director were known as the "Board of Directors." Do you think I attended the Board of Directors? Hell, no! I didn't want to get into the minutiae.

Q: The technical director was Levering Smith?

Adm. R.: It turned out to be Levering Smith.

Q: Tell me about his selection.

Adm. R.: He came on the scene at a change-over from the Jupiter to the solid propellant missile. Our first technical director was a Bureau of Aeronautics man, who was a very fine gentleman, and he was quite talented – his name was Captain Grayson Merrill and he was a very fine technical man but not particularly knowledgeable in large solid propellant technology.

In my tour in the Bureau of Ordnance, which was during the Korean War some years previous, I became acquainted with Levering Smith who was a lieutenant commander at the Naval Ordnance Test Station, Inyokern. He was in charge of solid rocket work out there. He came into my office one day with plans for a shaped-charge head which would fit on the 4-inch HVR rocket, which was an air to air rocket. (Aircraft against aircraft).

This shaped charge was a technique of pinpointing the explosive and directing it direct in a straight line and sort of funneling it

against the target rather than having it going in all directions, as a normal explosion does. It's a very fine technique that optimizes the effect on a relatively small area.

Q: It focuses!

Adm. R.: Yes, focuses, exactly. We didn't have any rockets that would knock out those Korean tanks. These 5-inch HVR rockets had a fragmentation head which was designed to knock down aircraft. The result was there was a big hue and cry, why don't we have a shaped-charge head. Well, the shape- charge head for that application was, by gentlemen's agreement, in the hands of the Army Ordnance Department at that time, because they couldn't didn't fly combat airplanes at that time, Army ordnance were not much interested in this. They had priorities elsewhere.

But Levering Smith and his cohorts in Inyokern said, well, why don't we put a shaped-charge head on 5-inch rockets which would be carried by airplanes and aimed at tanks. He presented himself with this idea and in those days a mere naval captain could start such a program by just merely giving the word. So I told him to go back with the utmost priority and develop this shape-charged head for the 5-inch rocket. Then I sat down and wrote out a TWX and sent it to him, confirming it.

Within ten days' time they had fabricated this and fired it at a slab of ship armor, which was 17 ½ inches of homogeneous armor –it had penetrated 17 ½ inches which was at an angle of 75 degrees from the horizontal, using a door-bell button for the initiator so that they'd have the necessary stand-off position. The door-bell triggered off the mechanism, the shaped charge was focused, and boomed right through and penetrated it. Well they came dashing back to Washington with the news. That, of course, was a tremendous breakthrough, so the Chief of Naval Ordnance was delighted with this, heartily applauded it, and told them to go ahead and hand-build as many as they could, and when they had a plane load there was an Air Force plane, which was an R-4D, waiting to fly the load directly to Korea.

That was my introduction to Levering Smith. He was quite an authority on solid propellants. So when it became evident we were going to go into solid propellants for motors, I brought him in, even though Captain Merrill was there. Shortly after that Captain Merrill decided he would retire from the Navy on his own volition.

Q: No trips to Europe or anything?

Adm. R.: Captain Merrill had a boat lying in the Chesapeake and he went down there and played around on that boat for two weeks, and he decided that he was going to get out and go into civilian life. I of course, was appalled by this and told him, "You've just queered two weeks leave for everybody else. I'll never give anybody two weeks to think about their troubles." One week, max!

So, when Levering Smith came on board, I said, you're the technical director, go to work. So, he went to work. He's very dedicated and intelligent and I think he's the best scientist in uniform today. There's no question about it in my mind. He's dedicated, thorough, entirely wise. He and I would usually close up the shop around seven or seven-thirty. I'd start home and go by his office and he'd be there working, and my invariable greeting was "What's the matter? Did somebody forget to wake you up? It's time to go home." He'd grin and go on working.

But he, I think, has proved himself to be the finest scientist in uniform and he is, I guess, probably the most respected by the military and industry – technical officer, in my time. I don't know anyone that approaches him. Now there have been some very good ones, there's no question about that, but I believe that over the years he has gained this enviable niche. It was a very happy thing for me to have a man like him – a very happy thing for the program and for our country.

Q: How did you happen to involve somebody like Jack Dunlap?

Adm. R.: Dunlap and I had collaborated when I was – I told you earlier that they got me back from World War II for one year in Washington to establish the aviation gunnery training program for

the whole Navy, and Dunlap, an industrial psychologist, was then in uniform as a lieutenant commander in the Chief of Bureau of Medicine and Surgery's office. I needed people who knew how to intelligently conduct tests to analyze the worthiness of this training equipment via a vis that training equipment. What it would do, so that you could teach a person aerial gunnery using machines on the ground. We had to use a lot of simulation machines to teach people because we couldn't afford to use the regular equipment and we wanted to have something that could be evolved in short order and get it in place in the numerous schools that we had established or were establishing.

So I called over there and got hold of a doctor friend of mine who was a psychologist who I thought might be helpful, and he said, "Yes, we have some very good people over here. They are Reserves brought back on active duty." So he sent Dr. Dunlap over, who had a Ph.D. in math and a Ph.D. in psychology, which is quite a combination – an ideal man because he knew a lot about controlled testing and he had great initiative. He used my authority and my name with considerable effect, going in and seeing the Commander in Chief Atlantic, and saying, "Captain Rayborn in the office of the CNO for Operations has asked this test to be run and I'd like a squadron of planes." "We're going down to Florida and we're going to do this, that, and the other - we're going to test this gun sight or that piece of equipment, and so on and so forth." He was amazingly efficient and brazen.

In the Polaris program it occurred to us that one of the real things that we had to explore and break ground in, was the adaptation of man to the machine. We were going to bring into existence machines and equipment which the Navy had not seen before, had no experience with. The necessity for the maintainability of the equipment aboard the submarine and the operability of the equipment by the personnel was very high on our list. We wanted to optimize the knowledge of the people to maintain it and to make the equipment easy to maintain, make it self-diagnostic for trouble shooting as much as we could. To make it easily repairable and easily maintainable, because space aboard a submarine is quite limited, as you know, and we wanted to put

aboard spare parts and replacement parts for the equipment only to the extent absolutely necessary, because we just wouldn't have room for it. Something else had to "give", for everything we put aboard.

I asked Dr. Dunlap, who headed up his own firm, Dunlap and Associates, if he would like to take on a job of human engineering the whole program. He was delighted and said, "This is the kind of thing I just love to do." So I said, "All right," and I gave him a letter that delegated my authority to him. He had the authority to go into all of our principal contractors that were building these odd, weird and wonderful pieces of equipment and set up human engineering divisions that had absolute authority over how things were made as to their maintainability and operability by our naval personnel. So he had human engineering staffs in these various major companies, because he said there are lots of guys running around with a human engineering title that he wouldn't let in the front door, much less do the work. So he had to staff them with competent people.

As it turned out, years later when the Defense Department just couldn't believe the high "up time" that the weapon system was consistently turning in on station, they sent out a very smart intelligent group of technical analysts to ride herd and see if these reports that the weapon system was completely operable and "ready" the very high portion of time on station were actually true. They came back with their hats in their hands. It was actually true.

The Navy evolved this system of pulling a sub off the line on signal as they would get in wartime, fire the missiles into a designated area, a realistic test. DOD would have people there to observe the efficiency of the tests. They were excellent! So I have to give Dr. Dunlap and his people a real plus in making the weapon system ready to go all the time, and, of course, that's the name of the game. He had at that time (during development of the system) my priority and he worked at this. I'm sure that he and his people got in the hair of the engineers, "any old dumb cluck ought to be able to do this, that and the other thing", but he said never mind about that we will not be using highly scientific engineers

with PHDs on the submarines. We must make the equipment simple and easy to maintain and operate. Rugged!

Q: This, too, I suppose, was entirely new to the industries?

Adm. R.: Yes. I believe it was, particularly this amount of attention on human engineering, this emphasis, and we made a lot of todo about this, so that in the Polaris schools and so forth training was simplified. And well it was, for the Polaris system is not childs play. At first we didn't have actual weapon systems equipment for our schools, but I fought like a tiger and got the money and set up a school at Dam Neck, Virginia with actual weapons system equipment. We build it out of whole cloth, new buildings, new everything, and I'm embarrassed to say that they named the building after me. I said you have to be dead to get that kind of award and they said, not in this case.

Anyway, this school has a complete Polaris/Poseidon weapon system. The actual equipment is there and it's grouped by subsystems in classroom sizes – here is the navigation system, here is the missile guidance, here is the fire-control system, and here is this, that, and the other – and here's the launcher and they can fire dummy loads in the air.

So the people coming back off patrols and those people coming new into the program go through this extensive training at Dam Neck, Virginia, and they operate the same equipment in the same way as they will aboard the submarine, and it is a rule that any new piece of equipment going to be introduced into submarines at sea – I'm talking about the weapon systems now – first has to go to Dam Neck before it goes out into use in submarines. Because we want the people to be trained in it. The only real fight I ever had with that great gentleman Mr. Franke, Secretary of the Navy Franke, was when he wanted to cut me 50 million dollars -I asked for 100 million for the school and he cut it in half. I argued with him and argued with him. He said "You're the hardest man to say no to I've ever seen. I've thrown you out of my office three times and here you come right back."

I said, “Well, I can’t let you make this mistake. This is a huge mistake.” “Well,” he said, “I’m going to make it. I’ve got to make one in this program” or something like that! So he whacked me 50 million dollars. I laughed. I said, “Well, okay, if you want to make one mistake, you can for you have been such a tremendous help and supporter of the program.”

But he turned right around on the next year budget and made it up, so we were about six months late doing all the things we wanted to do, but we got them done. There isn’t anybody who knows anything about the program at all who would say that that approach of putting the actual equipment in the school isn’t absolutely essential. I must say Sec. Franke was funny, great man and a great supporter. I couldn't have worked for a finer man.

Q: Tell me how Clement Hayes Watson got involved in your program?

Adm. R.: At the very outset, of course, it was extremely important that we always in our contacts with other people present our ideas in a rational, effective way – “what” we were going to do, “why” do you want to do it, in our presentations or whatever they were. Somebody put a little pamphlet on my desk which was issued by the Chief of Naval Personnel on how to make a presentation. I read it and was quite interested. I immediately saw that this was really the work of great skill and wisdom and whoever wrote that for the Chief of Naval Personnel really knew his business. It just went home like that. So I said who was the man who authored this? Well, his name was Watson. Where does he live? In Connecticut, what is his phone number? They didn’t know but they knew where he lived, so I called him on the phone and I said, “Mr. Watson, I’m calling in regard to one of the highest priority programs in the United States. We need your skills in teaching us to be effective in our presentations. Could you come down and talk to us about helping us?” And he said, “I will, certainly,” and he came down the very next day.

He was a Reserve naval officer in World War II.

Q: He was no longer with J. Walter Thompson?

Adm. R.: No, he was running his own firm. He came down and I told him what we were doing and he said, "Gee, I'd be happy to," so we put him under contract. We required all of our officers and men – officers and civilians – at the home office to take this course on how do you prepare your materials and how do you talk and make an effective presentation.

Q: Sort of a Dale Carnegie set-up?

Adm. R.: Exactly, and he was very efficient. In fact, I sent him out to the principal contractors. We offered his services and he was received quite well by them. We've got to give him a lot of credit for the effectiveness of our presentations.

Q: This "road show" that you put on, he was –

Adm. R.: That was being put on by a lot of our people at all times, everyone, and we brought in what we called technical information officers who, in effect, were PRs, public information. They were very, very good. As a matter of fact, one of them turned up to be Deputy Chief on Navy Information. I think his name was – Ken Wade. He currently runs the State of California's office here in Washington. He got me down and gave me some practice about mannerisms and so forth. "I noticed when you were talking you had a match box you were bouncing around," he said, "you know, that was very distracting for the people. You ought to stop things like that." And I said thank you very much.

Effective presentations were, I think, a very helpful element in the total result, getting the total job done.

Q: It's interesting, Sir, that you had this appreciation of the value of public relations and pursued it. This aspect of Navy life has not always been paramount. How do you account for that?

Adm. R.: I don't know. Of course I'd had two tours of duty in Washington before - or three tours, or something like that – so I was not unacquainted with the way you have to get things done in Washington, the people that you had to contact, the people you have to convince that what you want is proper, correct and needed, and get people to have confidence in you.

Q: But the Navy was rather reticent about this, wasn't it?

Adm. R.: I think that most naval officers spend a lot of their time at sea, and I was one of those, but being first in battleships and destroyers then in aviation, I had more time at sea duty than actually anybody else in my Admiral class. I think that statement is correct. But the importance of being able to present these things well and to get to the general public with our story – because there was a great deal of gee-hawing between the services. Each thought their own missile programs were the best for the country, and that's proper, there's nothing wrong with that opinion. That's a reality. Each of them had their supporters, their own associations and Navy Leagues or whatever you call them, and people as a whole across the United States were interested in this program. It was new and imaginative, something like the moon program when it first started. The result was than none of our officers once turned down an invitation to make a speech. I encouraged our officers to make speeches. They carried the Gospel, so to speak, about how important Polaris was, because a submarine goes out there and loses itself in the so-called trackless wastes of the ocean, yet always be ready to go, zeroed in and pinpointed on the target.

Without pointing the finger at land-based installations, we did, I think, in due fashion bring out before congressmen and others the advantage of the submarine approach to the ballistic missile defense.

Q: That was your party line!

Adm. R.: Yes sir. We never spoke badly about anybody or any other program. We made a policy of this, and it paid us big

dividends. We had something to sell and why knock the other, any maybe competitive products. We held the view, rightly or wrongly, publicly that we were not in competition with land based missiles. We were providing sea-based missile, and you shouldn't think of them in the same terms. They were a natural adjunct – strong adjunct – of the over-all national missile program. The contractual family in their normal PR work showed how proud they were of being on the team.

This was very, very helpful. As a matter of fact, I have several plaques. When I left the program they had a luncheon for me, all the PR types were there. Of course, they were all extroverts and great guys and they gave me a silver plaque containing a couple of silver spurs mounted on the plaque! Somebody said they wanted to put a little blood on it – a little red paint or something! This is the kind of total dedication you've got to have, and this was symbolic.

Q: The fact that you put great emphasis, and so rightly, on public relations leads me to ask you about the matter of security. Was there any great concern in that area in the development of these sensitive matters?

Adm. R.: Security, yes. We were concerned about security in two ways. One, safeguarding valuable blueprints of innovative things which we were developing and bringing into existence. We had a fire once in a blueprint vault, a secure classified vault, at Lockheed. It was caused by a lamp that was too close to some blueprints. Fortunately they were able to put the fire out, otherwise we would have lost lots of valuable time because of these valuable, one copy of a kind, blueprints that were in that vault. It was a huge vault. Instantly I was on the phone to Gene Root and I said, "I want you to establish two other repositories of blueprints. Whenever you make a blueprint, you make it at least in triplicate for stowage, make three copies, and I want you to stow it at two other places, secure, classified, top secret. When it comes off the machine, one goes to your vault and the other two go to two separate vaults and none of them in the same city."

Q: Not in the same city?

Adm. R.: Not in the same city. There was such a thing as sabotage. Obviously this was a very important program and we didn't want someone throwing an incendiary bomb in there and, gee, it would throw us back two or three developing the missile. So these were the kind of precautions we took.

As far as handling classified materials, we just applied the normal precautions, and dedication of the people out on the factory floor and elsewhere to this program precluded a serious leak. If there was anyone against this program he would have been mobbed instantly by his fellow workers, you see.

Q: For the most part it was not secret except for the atomic aspect of it?

Adm. R.: Oh, no. All of the weapon systems, navigational equipment, etc. was quite secret, quite classified. No one had ever done this before and obviously it behooved us to protect it. No one had ever built a stable guidance table that could be fired from under water, the motors igniting after coming through the water, and the missile on its way to hit a target. No one had done that. No one knew about the launchers. The launch equipment was secret. The formulation of propellants, how do you blend it, how do you put it in the motors, how do you keep it from cracking, and all that was quite secret. These were military assets of the first order.

Q: Were there any leakages?

Adm. R.: I don't know of any, but obviously as time went on, why I'm sure that the exchanges of technical information and things that could be declassified, a great majority of things that could be declassified. That's all right. I mean that's a normal thing.

Q: That's evolution.

Adm. R.: Yes, that's right. It's just the normal thing that goes on in the technical world all the time. There's nothing wrong with it at all.

Polaris – a story of dedicated government-military-industry cooperation in a working free society, and free from excessive bureaucracy, developed out of whole cloth a revolutionary weapon system in an unprecedented short time, fully operational and on station in a little over for years!

There's a lesson in this program for someone today. But can we turn back the tide of ever enlarging bureaucracy in military procurement?

FEATURES

RUSSIA STAKES NEW CLAIM TO EXPANSE IN THE ARCTIC

by Mr. Andrew Kramer
The New York Times
August 4, 2015

Moscow—Russia formally staked a claim on Tuesday to a vast area of the Arctic Ocean, including the North Pole.

If the United Nations committee that arbitrates sea boundaries accepts Russia's claim, the waters will be subject to Moscow's oversight on economic matters, including fishing and oil and gas drilling, though Russia will not have full sovereignty.

Under a 1982 United Nations convention, the Law of the Sea, a nation may claim an exclusive economic zone over the continental shelf abutting its shores. If the shelf extends far out to sea, so can the boundaries of the zone. The claim Russia lodged on Tuesday contends that the shelf extends far north of the Eurasian land mass, out under the planet's northern ice cap.

Russia submitted a similar claim in 2002, but the United Nations rejected it for lack of scientific support. So this time, the Kremlin has offered new evidence collected by its research vessels. It even dispatched a well-known Arctic explorer, Artur N. Chilingarov, to take a miniature submarine to the sea floor directly below the North Pole, scoop up a soil sample and plant a Russian flag made of titanium there.

In a statement posted on its website, the Russian Foreign Ministry said the claim would expand Russia's total territory on land and sea by about 1.2 million square kilometers, or about 463,000 square miles.

"To base its claim, Russia in this region used a broad range of scientific data collected over many years of Arctic exploration," the statement said. "Submitting the claim to the commission is an important step in formulating Russia's right to the Arctic Shelf in accordance with the United Nations convention on the Law of the Sea."

Russia has set its sights northward for a long time. Under Stalin, the Kremlin claimed a huge pie-shaped section of the Arctic Ocean extending from its eastern and western borders to the North Pole.

For years nobody else paid much attention to boundaries in the high latitudes of the Arctic Ocean, populated only by polar bears, walruses, seals and the occasional explorer.

But global warming is changing that fast, as wider and wider areas of the Arctic become free of ice for all or part of the year. Russia has oil drilling projects in the Kara Sea, a part of the ocean already under its undisputed control, and Royal Dutch Shell plans to drill north of Alaska in the Chukchi Sea this summer. Drilling even farther north now seems plausible.

Denmark submitted an expanded claim of its own to the United Nations last year, seeking control of economic activity around the North Pole and asserting that the area is part of the continental shelf jutting north from Greenland, not Russia.

The claims are aimed at a section of the Arctic Ocean known as the doughnut hole, a Texas-size area of international waters encircled by the existing economic-zone boundaries of shoreline countries. Conservation groups have opposed any claims to the waters of the doughnut hole, saying they would bring harmful oil drilling and fishing. They point to a recent international accord to ban commercial trawling in the area as the better way forward in the far north.

Greenpeace issued a statement on Tuesday by its Russian Arctic campaigner, Vladimir Chuprov, saying "the melting of the Arctic ice is uncovering a new and vulnerable sea, but countries like Russia and Norway want to turn it into the next Saudi Arabia."

Russia is the largest country in the world by area, and it grew larger last year by annexing the Crimean Peninsula from Ukraine. The Russian Foreign Ministry statement said the United Nations commission should expedite the review of its claim, placing it before those of other countries, because it was first filed in 2002. The ministry said it expected a decision by autumn.

SEAWOLF COMPLETES SIX-MONTH ARCTIC DEPLOYMENT

NAVY NEWS SERVICE 25 AUG 15
Mass Communication Specialist 2nd Class Amanda R. Gray, Commander, Submarine Group 9 Public Affairs

BREMERTON, Wash.—The fast-attack submarine USS SEAWOLF (SSN 21) returned to its homeport of Naval Base Kitsap-Bremerton Aug. 21, following a six-month deployment.

During the deployment, SEAWOLF conducted routine submarine operations, which included scheduled under-ice transits and under-ice operations.

"The crew performed superbly on multiple operations in the 6th Fleet area of responsibility," said Cmdr. Jeff Bierley, SEAWOLF's Commanding Officer, from Birmingham, Alabama. "We conducted two polar transits, including a routine surfacing at the North Pole. Operations under the Arctic are part of the Navy's continued commitment to maintain access to all international seas, and SEAWOLF was just part of that commitment."

The Navy has been operating in the Arctic for decades and it is expected that presence requirements will likely increase as maritime traffic in the region increases. Ships like SEAWOLF support the Arctic national strategy by developing capabilities, increasing maritime awareness and preserving freedom.

"SEAWOLF did an exceptional job; they had an accelerated fleet readiness training period so they were really pushed to get all of their preparations, training and certifications done before deployment, including preparations for the very challenging Arctic transit," said Capt. Douglas Perry, Commander, Submarine Development Squadron 5, from Alexandria, Virginia. "Arctic transits are important, not just for us to be able to keep our fleet assets around the globe, but it also give us an opportunity to maintain undersea dominance of the Arctic spaces, an area that is very challenging and is changing dramatically."

This was the first deployment for many of the Sailors aboard SEAWOLF, awarding them the unique experience of visiting the North Pole.

"It was a very interesting deployment full of mixed emotions and the unexpected," said Yeoman 3rd Class Felipe Aparicio, from Los Angeles. "Surfacing at the North Pole was awesome. As you push through the surface it takes your breath away. You feel the ice hit the hull of the boat and you hear thumping back and forth all around you; then it just stops. It was a memorable experience. We got out of the boat, and the best way to describe the North Pole is that it's a cold, snowy desert."

These polar transits and the surfacing of submarines demonstrate the U.S. Navy's commitment to assure access to all international waters. USS NAUTILUS (SSN 571) was the first submarine to complete a submerged polar transit.

"We are very happy to be home to the Pacific Northwest, and we are eager to spend time with our family and friends," said Bierley.

SEAWOLF, commissioned July 19, 1997, is the first of the Navy's three Seawolf-class submarines. The SEAWOLF is significantly quieter than any Los Angeles-class submarine. It is also faster, has more torpedoes tubes and can carry up to 50 torpedoes or missiles, or 100 mines.

All of the SEAWOLF-class submarines are homeported in the Pacific Northwest – USS CONNECTICUT (SSN 22) and SEAWOLF at Bremerton, Washington, and USS JIMMY CARTER (SSN 23) at Naval Base Kitsap-Bangor.

ARTICLES

SUBMARINES
KEY TO THE OFFSET STRATEGY

by RADM W. J. Holland, Jr., USN, Ret.

Editor's Note: This article is reprinted with permission from the June 2015 issue of the U.S. Naval Institute Proceedings. It is felt there are significant differences in this Proceedings version from the Admiral's precursor article which appeared in the December 2014 issue of this magazine.

Rear Admiral Holland devoted most of his service to submarines or submarine-related activities. He is a frequent contributor to The Submarine Review.

As has been the case for decades, the strategic spotlight shines once again on the U.S. Navy's subsurface force.

On 3 September 2014 Secretary of Defense Chuck Hagel, warning that China and Russia are *pursuing and funding long-term, comprehensive military modernization programs*, to include fielding an array of capabilities designed to counter traditional U.S. military advantages, promoted an *offset* strategy. Rather than wading into a symmetrical duel with the military modernization of potential opponents, he advocated employing technologies and associated operational skills that impose disproportionate costs on any competitor; specifically:

> ...key investments in *submarines*, cyber, next-generation fighter and bomber aircraft, missile defense, and special operations forces—putting a *premium on rapidly deployable, self-sustaining platforms* that can defeat more technologically advanced adversaries. *Undersea capabilities that can deploy and strike with relative freedom of movement and decision will continue to be a vital part of the mix*. (Italics added).[1]

As an analyst with the Center for Strategic and Budgetary Assessment some 20 years ago, now-Deputy Secretary of Defense Robert Work promoted submarines as the basis for a strategy that sought to exploit U.S. advantages in technologies for which there was no peer. Work viewed submarines as the prime example of investing in a weapon system in which the United States possessed a clear advantage with a lead that could grow faster than a potential adversary could match. Rather than trying to respond to an opponent's strengths, an *offset* strategy seeks to impose on such a competitor burdens that will require more time and resources than it can muster. This cost-imposing strategy's goal is not just victory in war but deterrence by making evident the costs to compete and the prospect of a likely defeat in the event of war.

Any future conflict in the open ocean will start with submarines. For the immediate future no country will have the capacity and capability to deploy an armada to contest the sea in the face of the overwhelming superiority of the U.S. Navy. Even should such a navy appear, there will be no *fleet actions*. Any war at sea will be fought between submarines and such antisubmarine adversaries as can be assembled. In the words of historian and commentator John Keegan:

> ...command of the sea in the future unquestionably lies beneath rather than on the surface.... Consider the record of the only naval campaign fought since 1945, that of the Falklands in 1982. From it two salient facts stand out: that the surface ship can barely defend itself against high-performance, jet propelled aircraft and that it cannot defend itself at all against a nuclear powered submarine.[2]

Recognition of the preeminence of American sea power is evident in the proliferation of Submarine Forces around the world. Even small countries investing in a navy elect submarines as their naval weapon system of choice. Many, if indeed not most, of those countries building navies and investing in Submarine Forces are friends or allies. Their submarines are not aimed at American

carriers. Others, however, with nascent or resurrecting Submarine Forces, are devoted to efforts that threaten U.S. dominance at sea.

Only the First Step

But a simple selection of hulls is only the first step in creating an effective Submarine Force. Developing such a capability requires serious investment of money, intellect, people, and time. Development takes years or even decades to create the kind of capability that Germany, Japan, the United States, and Great Britain wielded in World War II. Attempts by smaller countries to produce an effective Submarine Force have foundered on lack of resources, failure to enlist and retain skilled people, and an inability to construct and sustain the logistics infrastructure necessary to create and then maintain these complex machines. Some Western countries have been successful in building and maintaining an effective Submarine Force, but only in small numbers and not without difficulty. Canada, Germany and Australia, for example, all have admitted their inability to man all the submarines that they have in commission.

The United States, on the other hand, has a major force of submarines manned by experienced crews, practiced in the operations at sea and in the far corners of the world. These are supported by a construction and maintenance infrastructure that is the envy not just of other navies but of other parts of the U.S. Navy as well. The submarines this force operates are the world's quietest and most technologically advanced. More important, behind this force is a training establishment that not only instructs a steady stream of new personnel but provides advanced training in maintenance and operations including realistic simulators in which submarine operational tactics are practiced daily. Finally, still smarting from the ineffective torpedoes of World War II, the Americans shoot real torpedoes regularly, including proof-testing war shots.

To properly employ Submarine Forces of whatever size requires leaders that grasp the unusual nature of their operations—the limitations as well as the capabilities of these ships and crews. Ships that *intentionally sink* do not follow the norms for other

seagoing vessels. In World War II the Japanese failed to employ to their full capability talented crews and well-built submarines because the leadership of these forces rested with admirals experienced in battleship operations and conditioned to expect decisive battle between surface fleets. The lack of experience and understanding in the senior Imperial Japanese Navy leadership often resulted in deploying submarines as if they were surface ships, as scouts and supply vessels. Despite their misemployment, Japanese submarines scored a number of significant blows. On 15 September 1942 the torpedo spread from the I-19 that sank the aircraft carrier USS WASP (CV-7), fatally damaged her escort destroyer USS O'BRIEN (DD-415), and put the battleship USS NORTH CAROLINA (BB-55) out of action for months has to be at least close to the most significant score from a single submarine salvo in history. German and U.S. submarine operations in World War II benefitted not just from leaders who knew and understood such actions but from command climates that for the most part encouraged honest reports and critical self-examination. Such climates are not erected overnight or come as a result of classroom instruction. They take time, energy, and personal investment to create. Regular and sustained operations at sea are a vital ingredient not only to hone the ability of the individual ships' crews to conduct their affairs but also to set the expectations of the command and staff personnel as they learn and exercise their functions. The limits for radio communication with submarines requires advanced planning, a climate of mutual understanding, and trust that comes about only with personal investment and routine practice. As difficult and time-consuming as they are to create, these climates can be fatally damaged by senior leadership that disabuses reporters of bad news, ignores symptoms of trouble or distress, or hogs credit for successes rightly achieved by subordinates. Societies that are based on rigid caste systems, have formal class hierarchies, or must conform to rigid political straitjackets have difficulty creating and maintaining such command-and-control characteristics. But any navy that expects to effectively employ its submarines requires these distinctive attributes.

The operational military effort involved in a strategy to dominate the sea is a return to Alfred Thayer Mahan's classic dictum that the first aim of the Navy is to destroy the enemy's fleet.[3] Before 1945 this meant major fleet actions but today any such action is exceedingly unlikely. As demonstrated in the Falklands Islands campaign, the ability of nuclear-powered submarines to dominate the ocean surface means that in future conflict, warships will be widely dispersed and the most important parts of a fleet will be stealthy. Engagement will be defined by the ability to locate individual units and bring them to battle. The historical parallel is the cruiser warfare of the War of 1812 and World War I rather than the major fleet actions of Trafalgar or Jutland. But the goal remains the same: the first aim of a Navy in war is destruction of the enemy fleet.

Whatever the name, this effort is offensive submarine warfare. The operational aim at the heart of the strategy is to position submarines in the coastal and near-ocean areas of a potential enemy as a crisis builds and, should war break out, to quickly sink all opposing surface warships and submarines. War games have demonstrated the great advantage of "flooding the littorals with SSNs." Properly operated, submarines become a national maritime resource not simply a component of a battle group or the launcher of land-attack missiles.

The Pitfalls

Here lie pitfalls within the Navy itself. Submarines have themselves become primary antisubmarine weapon systems. Their presence and performance as part of a task group have built an aura of security and a confidence that, when so assigned, threatening submarines will not appear undetected. This record is admirable but creates a situation that can dilute the primary task in the event of war. Commanders' demands for submarines to be assigned to protect their task groups subvert the primary attribute of conducting unrestricted warfare against the enemy's force in waters that otherwise are not open or accessible to others. The proper employment of submarines is as a major force to be wielded as a unit—dispersed and widely distributed under an

operational command whose task is to *sweep the seas*. Destruction of the enemy fleet is the goal; protecting our own fleet by eliminating the threat is a beneficial byproduct.

The second difficulty in properly using American submarines in times of war rises from their new role as arsenal ships. Recent wars and related actions against shore targets have seen employment of submarine-launched missiles in significant numbers—not because the submarine is the best-fitted launch platform or situated within an enemy surveillance and strike zone too dangerous for surface ships. Submarine-launched weapons are used because they are there. Surface-ship launchers outnumber the submarines' in most situations, but such launchers are also homes for antimissile and antiair weapons. Where such threats may exist, the number of land-attack weapons in the surface fleet is substantially reduced—often leaving submarines as a significant source of land-attack missiles. Combatant commanders with eyes focused on objectives and targets on the land are likely to want to add the land-attack weapons on board submarines to those available for attacking targets ashore at the expense of assigning their host submarines to efforts at sea.

For at least the duration of the period in which maritime dominance is being contested, submarines should be employed in pursuing elimination of the enemy navy—a task for which they are singularly fitted. In this early phase, submarines should be used as missile shooters only when they are the only launchers within range of high-priority targets or when the attack needs to be launched from an otherwise-impossible azimuth. Once maritime dominance is established, submarine missile shooters can then be positioned where most advantageous in regard to time of flight and direction of attack considerations.

Nuclear propulsion not only allows the submarine to operate under the cloak of invisibility, but it powers the ability to reposition quickly without a logistics train and for a long duration. These are all incalculable advantages in any time-constrained situation. This logistic-free tail allows dispatch of submarines singly or in numbers on short notice and with little buildup or fanfare. Among the advantages arising from this is an opportunity

to learn the environment first and to find the most advantageous positions in relation to expected threats and geography.

Great Flexibility

Flexible submarine deployments can be accomplished without adding to the tensions surrounding a crisis, and with no notice or with subtle direct evidence if such is to our advantage. Early major deployments before the commencement of hostilities give the combatant commanders the assets to execute attacks and interdiction from the first moment of a war. This *freedom of movement and decision* that Secretary Hagel found so important is inherent in nuclear-powered submarines. This ability to enter the area of conflict without notice provides an additional benefit in that any opponent of the United States must assume that American submarines are always present on his littoral and across his maritime pathways.

Because nuclear power adds this dimension of logistic flexibility and rapid reaction, the capability to redeploy American's total force of submarines on short notice places great stress on any potential opponent. Such an adversary must count on facing *all* active U.S. submarines within days. In any crisis the first forces to arrive at the scene are of great tactical importance and strategic significance. When those forces are not only powerful, but stealthy, the effect is multiplied by uncertainty concerning their location and strength. Regular operations by submarines in these waters are a necessary ingredient in this aspect of submarine warfare—not only to train crews but to establish the expectations that, should conflict occur, the American submarines will be on-scene early.

The potential peer maritime competitor appears to be developing an anti-access/area-denial strategy based on a suspected land-based ballistic missile and an undefined ocean surveillance and targeting system aimed at large ships at sea. While the difficulties in creating and then operating such a system are enormous, its deployment might threaten major capital ships (read aircraft carriers). But a strategy based on such a system does not address the threat to the adversary's navy and maritime assets from

submarines. In the words of defense analyst and former assistant Secretary of the Navy Seth Cropsey:

> As a hedge against China's anti-access strategy, submarines are matchless…. So long as submarines remain stealthy, they bypass the age-old technological cat-and-mouse game of countering an adversary's technology and in turn being countered.[4]

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

One necessary ingredient in the success of an offset strategy is the potential competitor's recognition of these aspects of the contest. Establishing this perception is not accomplished by ships in harbor, much less ships on the building ways. Sustained operations at sea and regular visits to the neighborhoods populated by potential opponents create the impressions on which to lay the ground work to effect the strategic objective. By the end of the Cold War most public utterances of officers of the Soviet Navy acknowledged the omnipresence of the Western powers' submarines. That impression was one of the keys to their adaptation of defensive tactical operations-and to the success of the 1981 *Maritime Strategy*.

ENDNOTES

1. Secretary of Defense Chuck Hagel, Southeastern New England Defense
2. Industry Alliance, Newport, RI, 3 September 2014.
3. John Keegan, The Price of Admiralty (London: Hutchinson, 1988), 324.
4. Alfred T. Mahan, Naval Strategy (Boston: Little, Brown, 1918), 5.
5. Seth Cropsey "A Naval Disaster in the Making," The Weekly Standard, 6 October 2014, www.weeklystandard.com/articles/naval-disaster-making_806166.html.

RESPECT FOR AUTHORITY—OVERRATED?

by RADM Dave Oliver, USN, Ret.

Editor's Note: Admiral Oliver is the author of the recently published Against the Tide, subtitled Rickover's Leadership Principles and the Rise of the Nuclear Navy.

Often senior military personnel speak about respect for authority as if it were one of the essential building blocks of an organization. But is that necessarily true? Certainly Admiral H. G. Rickover didn't think so. In fact, *authority* was one of his *red headed step-children*. The Admiral's words were as unambiguous last century when he was initially building our nuclear Submarine Force as they are today:

> "*Free discussion requires an atmosphere unembarrassed by any suggestion of authority*…."[1]

How in the world could that ever work? Why did Rickover feel so strongly? How is it possible to even have such a conversation in a military organization?

I will give you some examples of past *discussions with authority*. One involves *technical authority*, one *operational authority* and the last has to do with *cultural authority*. As always, as there is in life, there were consequences for participants.

As you undoubtedly realize, Admiral Rickover's office had control over only a very small portion of each nuclear submarine. Ninety percent of the responsibility of the ship actually was the responsibility of and reported to the traditional Navy system. That meant that the technical decisions and support for nearly all of each submarine was the responsibility of organizations that in the early days proved slow to adapt to the extraordinary new challenges and dangers the new high speeds and deep depths presented.

Sometimes mistakes were made.

A very public and tragic one occurred in April 1963 when USS THRESHER (SSN 593) was lost with all hands off the coast of Maine. For those who have forgotten, most believe the cause was the failure of a sil-brazed *weld* that separated, permitting sea water from two parting sections of pipe to inundate an electrical panel, causing a reactor scram and loss of power. THRESHER began gaining weight from the ingress of seawater. When the crew experienced a subsequent failure of the high-pressure ballast blow system (freezing of the in-line filters preventing air from expelling the water), the boat sank and perished.

While the official investigation refused to affix specific blame on any individual(s), it nevertheless identified multiple serious problems in nuclear submarine construction at the Portsmouth Naval Shipyard, which was "using the specifications as goals rather than requirements in certain cases."[2]

Even more telling to those of us who were having our own problems making good sil-braze welds, Portsmouth had received direction from BuShips *(Ed. Note: Now Naval Sea Systems Command, NAVSEA)* the previous year that as soon as THRESHER returned to the shipyard after her shakedown cruise, the shipyard was "to employ a minimum of one ultrasonic test team throughout the entire assigned post shakedown availability to examine, insofar as possible the maximum number of sil-braze joints."[3]

Portsmouth disregarded this direction from Washington. In fact, when inspecting the sil-braze joints aboard THRESHER became difficult partway through the process; the shipyard simply stopped testing.[4] So no inspections happened during the final four long months before the fatal dive!

According to the investigation after the tragedy, the THRESHER Commanding Officer received a copy of the Shipyard's ill-fated decision not to follow instructions.[5]

Until Rickover got the nuclear culture firmly established, submarine Commanding Officers frequently needed to rise up and refuse to accept decisions being forced upon them by the *technical authorities* working on their ships. Each time he did so the Commanding Officer was made to feel threatened or vulnerable.

He was personally aligned against a group of more senior officers who had more technical training and experience; it was pointed out that he was delaying the ship's schedule; it was he who was holding up the Shipyard, Tender or Maintenance Activity; he who was costing the Navy hundreds of thousands or even millions of dollars in delays.

But no matter how difficult or uncomfortable the process, not accepting incorrect technical authority was never wrong. It was not poor manners, unmilitary or a waste of scarce resources. On the contrary, it was a matter of life and death for the hundred men that would later go deep under the water for their country. Many stalwart submariners saved thousands of lives. Being right about a technical issue is still never wrong today.

Of course *authority* can be deadly about more than just technical issues. Once a submarine is built, its entire purpose revolves around operations at sea. In the Submarine Force, this means that the same egos and personalities are involved, but frequently without the Naval Reactors' office serving as a brake or safety valve.

For a vignette let me shift from the coast of Maine to the other major ocean which laps on our shores. It is nearly twenty years after the tragic loss of THRESHER (that is, like today, everyone in the Submarine Force thought they have learned everything about safe submarine operations) and ASW aircraft have faint contact on a Soviet ballistic missile submarine steaming somewhere between the West Coast and Hawaii. The President himself wants that ship tracked all the way back to Russia. The seas are building and the ASW aircraft are uncertain how long they could maintain contact.

It is late Friday afternoon. While there are sixty submarines in the Pacific, only one ship can be loaded for a three-month mission and get to the mission area in time. That crew does not need to be trained as the submarine has recently returned from a similar year-long mission—a readymade answer to a real-world need. The powers that be need USS PLUNGER away from its San Diego pier lickity-split and into the *hunt*.

But PLUNGER has several material deficiencies which cannot be repaired at sea. The Commanding Officer had previously

informed his boss (the Squadron Commander) his submarine needed one specific deficiency corrected (that would take about forty hours of work) before they could get underway.

The White House pressure, perceived or real, has a significant effect on the chain of command. In San Diego, the Squadron Commander informs the Commanding Officer that the former does not consider the PLUNGER material deficiency to be key and orders the latter to immediately take the ship to sea.

After considering the options for a couple of hours, the PLUNGER Commanding Officer informed the Squadron Commander that the latter would have to find a different commander if his boss wanted PLUNGER underway before the material deficiency was corrected.

Two days later, PLUNGER nosed out of the fog near buoy SD-1 and turns her black bow west. The same Commanding Officer will stand in the White House Situation Room seven months hence and brief the results of the successful mission. He and his former Squadron Commander never do become close friends, but both serve as Flag Officers.

This brings us to a final example on challenging authority, again a sad one in which people die.

While Rickover was working to introduce a culture change in technical standards, it was up to the operational side of the Submarine Force to fret over whether or not any of the *safety practices* we had imported from diesel submarines were dangerous for nuclear submarines.

I am sure there were several. I recognized one when it nearly killed me.

As you may know, diesel boats like TRUMPETFISH (SS 425), my first ship, had multiple internal compartments (any one of which might be completely flooded and still permit the submarine to survive); operated in relatively shallow water (where it might be possible to salvage a damaged submarine); transited in busy shipping lanes and went up and down in the acoustically-difficult near-surface zone many times each day. Consequently, the diesel force had adopted several standard practices to improve their survivability in this difficult environment. One was to "*Set*

Condition Baker" before coming to periscope depth. When this word was passed on the 1MC, every qualified submariner was trained to immediately shut each watertight door and ventilation flapper fore and aft in his compartment, quickly establishing the maximum watertight control. This practice followed the diesel submariners into the new nuclear fleet. Everyone observed this safety procedure. As we will discuss, USS NAUTILUS (SSN 571) was commissioned in 1955; fourteen years later she was still setting *Condition Baker* when I reported aboard for duty as Engineer Officer.

Unfortunately, we did not realize that for a nuclear submarine, Condition Baker increased the risk of dying.

In diesel submarines, the battery was the lifeblood of the ship. Everyone aboard recognized that fact and was trained on battery care. A battery charge might turn deadly now and then (in port at night when the caretaker watch was inattentive or careless). Certainly there was more than sufficient power in a battery to destroy a submarine, for seven submarines (E-2, O-5, K-4, S-49, USS COCHINO (SS-365), USS BASS (SS-464) and USS POMONDON (SS-486) had demonstrated that by blowing themselves to Kingdom Come.[6] At about eight percent hydrogen, the mix with oxygen was explosively unstable!

Given the inherent danger of the battery (the enormous out-gassing of pure hydrogen produced during the latter part of the charge), I have always attributed the relatively small number of battery incidents to the direct relationship of the diesel engines and the battery. To do a charge aboard a diesel boat required the diesel engines to be operating. Those engines sucked so much cleansing air through the battery well that any hydrogen ions generated were swept harmlessly away to be burned in the engine cylinders. The air flow through the battery wells was not the minor breeze pumped by air fans like it is aboard nuclear ships. The draft from the engines was so strong aboard TRUMPETFISH that personnel in the engine rooms during battery charges searched for foul weather jackets.

If the engines stopped, the cleansing air flow stopped, so did the charge to the battery, and given the differences in electricity

and thermodynamics, the electrons stopped going in the battery before the air ceased moving by the tops of the cells. A pretty good symbiotic relationship. Because the battery was used so often, a charge was required sometimes twice a day, at a minimum three times a week. You could truly say it was second nature to the crew.

On a nuclear submarine at the time the battery was only used in an emergency and for drills. Often a battery charge was performed only once a month. In a nuclear submarine at sea there was only an artificial relationship between what drove the electrical ions into the battery (one of the motor generators powered from the reactor), what provided the air flow through the battery wells (fans that circulate the air through the ship powered from the same motor generators) and what disposed of the hydrogen (a separate machine designed to *burn* the hydrogen and convert it harmlessly to water). So, an infrequently performed process, no symbiotic relationship, and not nearly the margin for error.

One night years ago at sea aboard the USS GEORGE WASHINGTON CARVER (SSBN 656) (Gold), we were in the last quarter-hour of a battery charge. I was on watch in the engineering spaces, monitoring the team responsible for the reactor plant and other engineering evolutions. The hydrogen percentage in the two battery wells was hovering as expected at about a percent and a half, both black needles still well inside the solid green (safe) area painted on the face of the vertical gauge located on the left side of the electrical panel.

Suddenly a command from Officer of the Deck rang out over the 1MC, "*Set Condition Baker throughout the Ship*," and the ship pitched up, apparently preparatory to proceeding to periscope depth. I could hear heavy steel watertight doors slamming shut throughout the ship.

"Stop the charge!" I ordered the electrician sitting in the chair in front of me. With the watertight doors shut, no longer was cleansing air scavenging the bubbling hydrogen rapidly being manufactured in every cell in our huge battery. I snatched up the

1MC and informed the Officer of the Deck. "We have a battery charge in progress."

By the time I had placed the microphone back in its cradle, the hydrogen needles had leaped to the red area of the gauge. They were now indicating 3 1/2 and 4%. One gauge, two needles, one indicative of the conditions in the forward part of the battery well, the second reading hydrogen concentration in the after sector. No one in Maneuvering said anything for the next minute except "The charge is off, sir."

Every eye was focused on the climbing hydrogen needles. Everyone was silently willing them to stop. Both quivering indicators had passed six percent and their thin points were creeping ever upward toward the next number. If they reached eight, we would all be dead.

When we built CARVER, I had helped install the sensors that fed those needles. An electrician and I had tried to optimally position them in the well but it really had been just a guess. What if I had been wrong by just a few inches – a few tenths of a percent? The announcement of "*Baker*" had set in process an evolution which completely isolated the battery well from any cleansing air flow. We were not going to restore the diluting flow until we reached the surface … were the gauges stabilizing around seven and a half percent or was I engaging in wishful thinking?

Some hours later, having lived, I wrote a succinct letter via the chain-of-command to the head of the Submarine Force summarizing why the concept of "*Condition Baker*" was dangerous for nuclear ships and needed to be promptly eliminated.[7]

Sadly, on June 5, 1968, two years after our scare aboard USS CARVER, everyone aboard USS SCORPION (SSN 598) died when that nuclear submarine sank in deep water off the Azores. After a long investigation, the official investigation failed to identify a cause. The inquiry did determine that SCORPION appeared to be in the process of coming to periscope depth when an undetermined fatal explosion occurred.

But, the facts were always lying on the bottom mud and recorded on seismographs, and, after years of speculation, Bruce Rule's book on the physics of the recorded explosions from

Scorpion[8] as well as a 2008 review by the CNO's Advisory Group report on the condition of the battery cell components[9] are finally clear. SCORPION blew herself up while conducting a battery charge on the way home from patrol. The Engineering Officer of the Watch aboard Scorpion had simply been a quarter of a percent more unlucky than I.

When we submitted our letter on *Condition Baker* I had assumed the first submariner in the chain of command with any force-wide authority would immediately cancel the procedure. We had deep-sixed the use of "*Baker*" aboard CARVER before I even sat down to my after-watch sandwich. Three years later, when I initially stepped aboard NAUTILUS, I was taken aback to find her still using this dangerous process. I immediately fixed the problem there but became immersed in NAUTILUS problems and didn't think of the larger *Baker* issue.

Authority—I can think only of technical, operational and cultural reasons to challenge this bastion. At the same time, one needs to be realistic about the career dangers. Nearly everyone perceives challenges to his perceived authority as personal challenges to him (Rickover did not, but he was a one-of-a-kind and he is dead). One has to choose their battles carefully. Nevertheless, if the game is worth the candle, carefully consider Admiral Rickover's words.

"*Free discussion requires an atmosphere unembarrassed by any suggestion of authority*…."

ENDNOTES

1. Rickover's speech at the Naval Post Graduate School in 1954 after the successful launch of *USS Nautilus (SSN 571),* the world's first nuclear submarine. Dave Oliver, *Against the Tide, Rickover's Leadership Principles and the Rise of the Nuclear Navy.* Naval Institute Press. 2014. 159.
2. 9 April 1963 Advocate General Investigation of the Loss of USS Thresher, Fact 150. www.jag.navy.mil/library/jagman_investigations.html. 3 August 2015.
3. Ibid. Fact 98.
4. Ibid. Fact 105.
5. Ibid. Fact 106.

6 Romig, Mary F. *Fatal Submarine Accidents; A Bibliography*, 1900-1965. RAND, Santa Monica, California, November 1966.
7 Much of the preceding paragraphs about events aboard Carver are contained in Chapter 7 of *Against the Tide*.
8 Bruce Rule. Why the USS Scorpion (SSN-590) was Lost, Death of a Submarine in the North Atlantic. Nimble Books, LLC. 1 October 2011.
9. Bruce Rule letter of 6 August 2010 to Director of Naval Intelligence Subj: Why the USS Scorpion (SSN 590) Was Lost on 22 May 1968. "The USS SCORPION was lost because hydrogen produced by the …main storage battery exploded in two-stages one-half second apart ….This assessment is not the generic attribution of the loss of a submarine to a battery-explosion advanced as a default explanation in the absence of any more likely construct….July 2008 reanalysis of the SCORPION "precursor" acoustic signals….the general battery damage is violent. The high velocity intrusion of pieces of the flash arrestor into both inside and outside surfaces of the retrieved plastisol cover attest to violence in the battery well…The battery probably exploded at some time before flooding of the battery well occurred…."

TRACKING AN ULTRA-QUIET SUBMARINE AFTER DISCOVERY

by Mr. Steve Cordell

Mr. Cordell has a BS Engineering Cal. State Univ. and MA Sociology American Univ. Wash DC. He was a Petty Officer (Aviation Machinist Mate), in the Korean War. He has nine US & German Patents, three patents are pending. His interest is in using his experience to help keep the Navy strong.

The purpose of this essay is to describe a method for tracking the precise location of an already detected, ultra-quiet submarine. Helicopters dipping sonobuoys can detect an ultra-quiet submarine, but like all sonobuoy searching, it cannot track or reliably sense an ultra-quiet submarine that was detected and its location cannot be accurately remembered in the single position determined and known for some fraction of a second. This was proven by the US Navy in 2014 when it invited a Swedish ultra-quiet submarine to try to escape an aircraft that it was tracking after it was detected. It disappeared and was not redetected by the Navy during the exercise.

The tracking of the submarine without losing the submarine's position is the helicopter's task. The proposed method provides the opportunity to instantaneously begin tracking the submarine both vertically and horizontally. After detection of a perceived ultra-quiet submarine, the helicopter automatically and instantly launches a wide swarm of sensors in the known submarine's area. These sensors, called Monitor Marbles, continually monitor and self track the submarine's movement (Fig. 1). The submarine's position data is continually transferred to the control center on the aircraft from some or all of the monitor marbles. As the location becomes more precise, smaller swarms of a different type of sensor named Sentinel Marbles, described in Fig. 2, are launched into the even better known area. If the submarine dives for safer

layers or executes a hiding maneuver, the swarm detaches some of the sonar marbles and they will individually sink; sonar pinging will be used for sending the current submarine's location to the control center (Fig. 3).

Background: Two patents have been granted for both torpedo and submarine detection and tracking (Whitesell et al (1999)[1] & Novick et al (2009)[2] claim both tethered and randomly placed, freely drifting sonobuoys). They claim not only to track but also to detect ultra-quiet submarines. Novick was granted a patent 10 years after Whitesell. This is significant because Novick describes serious problems distinguishing between the targets, and the weaknesses of random, free-drifting sonobuoys for detection; for example there can be false detection between a ship and a submarine." The detection and tracking weaknesses of sonobuoys, either free drifting or tethered, and not motorized or given specific motion freedoms, do not allow for changing position or attitude. The tracking suffers from the Novick-described weaknesses of layer, depth, and surface weather conditions, among other short or longer interruptions or error-prone sensing of the data being collected and transferred to controllers. Depending on how the sonobuoys were launched, and whether they are driven or drifting, the initial launch will not have a good a chance to begin tracking compared to the first swarm of the monitor marbles since the marbles are launched directly in the area of the submarine.

Objects of the Proposal: The object is for the aircraft with dipping sonobuoy to reliably track the ultra-quiet submarine that it has detected. It is not the purpose of this essay to describe or determine weaponry.

Summary: After the ultra-quiet submarine has been detected, the continuous tracking of the known horizontal position is begun by the aircraft launching the very large swarm of Monitor Marbles to quickly begin tracking over a somewhat large area (Fig. 1). There is only one such swarm, and the next and subsequent swarms are Sentinel Marbles that each swarm has a smaller area to track (Fig. 2). If the submarine maneuvers downward, then the Sentinel Marbles are launched and one or more of the marbles can be released to sink (Fig. 3). When the first and subsequent swarms

of marbles are released at the closest known point of the last position, some or all of the swarm marbles immediately send the calculated locations to the control center. This is repeated as often as necessary until the submarine stops to hide under a layer that it considers a safe haven, or executes some other intelligent maneuver. When the swarm of marbles detects a new horizontal motion in any direction, the feedback to the control center decides how dense and when to release the next marble swarm. Each swarm will normally have fewer marbles than the previous swarm, since the data indicate that the area of the target is tighter than the last swarm. The system can send a swarm with more marbles if the area expands. The system of sending swarms of marbles has the function of detecting the horizontal and vertical changes of the submarine's position. The vertical changes of the submarine's position between swarms are performed by some marbles being released to sink and for a limited time to sense the submarine within a closer position. This marble release is independent of the swarm's position. There is no reliable maneuver of moving up with an upward movement of the submarine, but a new swarm can be sent to the best known area position.

There are numerous sports, toys and military launchers available, and with changes they can be customized as necessary.

Brief description of the drawings: The marbles shown in the three figures are about 3 cms. (1 ¼ in.)

Figure 1: This Monitor Marble is slightly lighter than the sentinel marble. These marbles are released in the initial swarm in greater multitude since that swarm reaches the least exact known submarine position

Figure 2: This Sentinel Marble is very similar to the monitor marble, but is shown with its computing power, the same logic as the monitor marble. For simplicity, neither the identical logic circuit boards (8) nor the identical antennas (3) are shown on the two marble types. The circuit board is shown stylized but with its size as fitting within the marble. The large battery on the sentinel marble (11) is required for executing all tasks and as an extra weight when it is released to sink.

Figure 3: The special sentinel marble for tracking silent submarines shows the float (14) containing the antenna, a heavy battery (11) to keep the antenna upright, and the tether (15) with integrated wiring to the antenna; wiring and its simple tether release is not shown. The lower part of the circuit logic board, heavy electronic elements shown in Fig. 2 to keep the marble upright and submerged are not shown here since the sentinel marbles (Fig. 2) and (Fig. 3) are identical. Only the algorithms and the capability to release itself for sinking distinguishes sentinel marble (Fig. 3) from the identical sentinel marble (Fig. 2).

Drawings-Reference Numerals

1 waterline
2 round plastic marble
3 antennae
4 small battery
5 sonar
6 self-destruction device (monitor marbles only)
7 stereo-sonar
8 logic circuit board
9 perforated seal
10 antennae water seal
11 large battery
14 float containing antennae & battery (11)
15 tether with wiring to antennae
16 show Fig. 3 & Fig. 2 having identical sentinel marbles

Detailed description of the drawings

The monitor and sentinel marbles are used to track a conventional, ultra-quiet submarine before it can slip away. For this purpose, the sentinel marble (Fig. 2) with its superior sonar processing capability and transmission strength, will be launched by a helicopter within the area where the detected submarine position is calculated to be. As the submarine sneaks away in any direction, the marbles transmit data to the control center, and the

helicopter can continue launching fewer marbles but in the continually calculated smaller area. This continues until the submarine descends below some layer that will hide it or it executes some other hiding maneuver.

However, the marbles can be silent to the submarine so it will never know when it is safe to ascend again or even when it can safely leave the area. To compensate for noise in rough seas, a special version of the sentinel marble can be tethered to a small weighted ball that keeps the antenna upright and out of the water (Figure 3) For sentinel marbles that follow a submarine down and maintain continuous tracking for some interval, one or more are released from the tether and the marbles sink. One-way communication to the surface marbles (Fig. 3) is via sonar pinging.

Additional Functions: An example of a future function is a small balloon and a mini compressed air tank to slow down the sinking of some of the sentinel marbles (Fig. 3)

It is suggested that the reader compare this proposal with the patents Novick[1] and Whitesell[2] "Backgrounds of the Invention" (especially sonobuoy arrays deployed from long-range aircraft; not described in the patents!) and the "Summaries of the Invention": Although both patents state that they track submarines, it is not decipherable just how the tracking functions with the "special computers" and the equipment.

References:

1. Novick et al patent US 8,107,320 Publication Column 1-6 (or Application No. 61035870 page 5-7 of 56)
2. Whitesell et al patent US 5,995,445 Patent or Application No. 61035870 P. 9-10 of 29

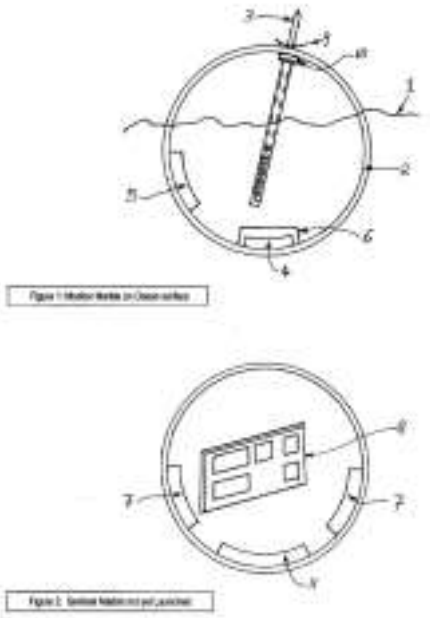


Figure 1 and 2

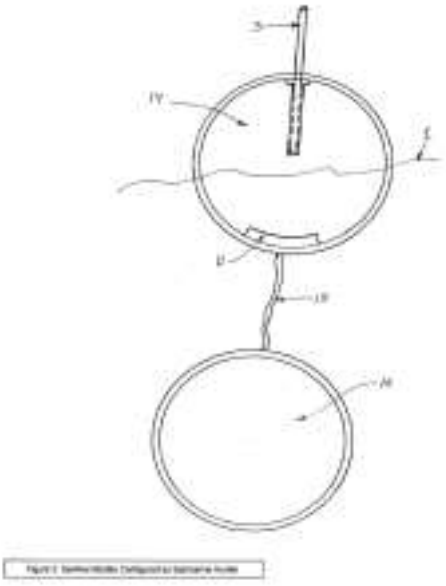


Figure 3

SUBMARINE NEWS FROM AROUND THE WORLD

Reprinted with permission from AMI HOT NEWS, an internet publication AMI International, PO Box 30, Bremerton, Washington, 98337.

From the June 2015 Issue

ASIA SOUTH KOREA SON WON II CLSS SUBMARINE (KSS-2): On 15 May 2015, the Republic of Korea Navy's (ROKN) sixth Son Won II class submarine, ROKS YU GWAN-SUN (SS 077), was launched from Daewoo Shipbuilding and Marine Engineering (DSME) in South Korea.

The Yu Gwan-Sun will be commissioned in 2016 and followed by three additional units of the class. The Son Won II class will end at nine units.

NAVAL SHIP DESIGN DEVELOPMENTS

AMI is currently tracking naval ship design developments. The following is a highlight for the months of May and June 2015:

Croatian Drakon 220 Midget Submarine: On 26 April 2015, the Croatian shipbuilding industry released information regarding a newly designed mini-submarine dubbed the DRAKON 220. Designed strictly for the export market, it has been rumored that the DRAKON 220 has been offered to Indonesia as well as several other countries around the world.

The new submarine design is a diesel-electric powered boat, 30.27m (99.3ft) in length, displacing 220 tons surfaced and 255 tons submerged. They are to have a range of 3000nm and a maximum diving depth of 150m (492ft) with a top submerged speed of 10.2 knots.

Armaments will include two torpedo tubes for heavyweight or lightweight torpedoes, two seabed mines (with 4 additional mines in optional side saddles), plus an option for submarine-launched anti-air missiles. They will be capable of deploying two, single-seat DRUW-2 underwater commando vehicles.

They are designed to be operated by a crew of nine, with berths and equipment stowage for four combat divers. The small

size and minimum manning requirement makes them ideal for navies wanting to get into the submarine game yet needing to keep cost and manning to a minimum. The DRAKON 220 is report to cost approximately €50M (US$54.5M).

DID YOU KNOW?

UNITED STATES: On 16 May 2015, the keel was laid for the United States Navy's (USN) 16th Virginia class submarine, USS INDIANA (SSN789) at Huntington Ingalls Industries Newport News Shipbuilding in Virginia.

MODERNIZATION PROGRAMS

CANADA: Victoria Class Submarines: On 02 May 2015, the Royal Canadian Navy (RCN) announced that it was planning for a major Submarine Life Extension Program (SLEP) for the four Victoria class submarines. The SLEP would extend the lies of the class to 2033 (and perhaps beyond).

Various options are now being considered and a report on those options are expected to be finalized by the end of June 2015. Depending on the capabilities selected, the project could cost an estimated US$1.2B to US$2.5B. Some improvements have already been identified and some are already underway or now completing under the Victoria Class Submarine Capability Life Extension (SCLE)/Victoria Class Submarine In-Service Support Contract (VISSC) or various other upgrades that have occurred since 2010.The modernization package now being planned (assuming approval) is to begin in 2020. The overhauls will be conducted in Canada with Babcock Canada, Northrop Grumman Canada Ltd and Ultra Electronics Canada figuring to be major players as all three have been involved in the modernization and maintenance programs of the Victoria class up until this point.

From the July 2015 Issue

THAILAND

Submarine Program Moving Toward Chinese Solution

In late June 2014, AMI received information that the 17-member Submarine Procurement Committee appointed by the

Royal Thai Navy (RTN) voted in favor of the Chinese solution for the sea service's submarine program. Although the Chinese solution (probably Type 041 or the S20 export version) got the most votes (breakdown not released), sources indicate that the remaining votes were split between Germany and South Korea.

Although the 17-member panel approved the Chinese solution, the program must still be approved by the Thai Cabinet. As is, the plan calls for the procurement of three submarines at a cost of 36B BHT (US$1.06B) or around US$355M per hull, which will be based on the Type 041 or the S20 export variant. The Thai Cabinet is expected to announce the preferred supplier decision over the next several weeks.

Sources indicate that the decision was based on the best value for the money, which included the three submarines, submarine technology transfer agreements in addition to a training package.

The process started on 24 April 2015 when the TRN formally submitted its proposal for the acquisition of submarines to the Thai Government. The proposal came one week prior to a meeting between Thai and Chinese officials. Thai Deputy Prime Minister/Defense Minister Prawit Wongsuwan met with Chinese Defense Minister General Chang Wanquan during the last week of April in 2015.

Although the Chinese solution is admittedly less superior than those offered by the Europeans and the Russians, the price tag at US$355M per hull (with technology transfer and training package) has to be seriously considered as cost has been a primary factor since the RTN began planning for new submarines in 2011. In addition, the supplier base of the RTN is beginning to shift more solidly toward the Chinese and the South Koreans as the price tag for procuring military equipment from those sources tends to be less costly than from Thailand's traditional suppliers of the past (European and US).

USN Issues RfP for T-AO(X) and LHA-8

On 25 June 2015, the US Navy (USN) issued a Request for Proposals (RfP) directly to General Dynamics NASSCO and Huntington Ingalls Industries (HII) for the third America class

LHA (LHA-8) and the first six Future Fleet Replenishment Ships (T-AO(X)). The RfPs were sent directly to the builders without public notification on the US Federal Business Opportunities (FedBizOpps) solicitation website.

The USN expects responses to the RfP in the third quarter of 2015. The responses will not be publicly releasable. One of the two yards will receive the contract for the first six T-AO(X) and the other yard LHA-8. The issuance of a single solicitation (for both projects) to the two builders was in order to preserve the industrial base, leverage competition, and bring affordability to the programs. HII and NASSCO are the only two remaining yards in the US that can build large amphibious ships (Ingalls) and large auxiliary ships (NASSCO).

The RfP release follows the early March 2015 announcement that HII Ingalls Shipbuilding and General Dynamics NASSCO would compete for the single contract that will bundle work on the Notional Amphibious Ship (LXR) Program, the first six Future Fleet Replenishment Ships (T-AO(X)) and the third unit of the America class Amphibious Assault Ship (LHA-8).

Both yards will also compete for the LXR program which will begin FY 2020.

The first T-AO(X) will begin in Fiscal Year (FY) 2016 and LHA-8 (third America class) is scheduled to start in FY 2018. In total, the USN will procure nine America class LHAs through 2048, 17 T-AO(X)s through 2036 and 11 LXRs through 2038.

SWEDEN

Two A26 Submarines Under Contract With Saab

On 30 June 2015, the Swedish Defence Materiel Administration (FMV) signed a contract with Saab worth US$1.04B for the construction of two new construction A26 submarines and a mid-life upgrade of two Gotland class submarines HALLAND and GOTLAND. This follows information received on 17 March that Swedish Defense Minister Peter Hultqvist announced the intention to procure two A26 Submarines from Saab Kockums at a cost of US$948.5M. The proposal had already been formally proposed to the Cabinet for review and approval.

With the contract now complete, construction will probably begin in 2016 with the first unit entering service in 2022 and the second in 2024. Although only two units are under contract, AMI estimates that a total of five units will be procured by the Royal Swedish Navy (RSwN) to replace the two Sodermanland (A17) class and the three Gotland (A19) class. The first two will replace the Sodermanland class with three additional units being ordered by the mid-2020s to replace the three units of the Gotland class.

The two Gotland class submarines, HALLAND and GOTLAND, will undergo a major overhaul as part of this contract. Those submarines will return to the fleet in 2018 and 2019. AMI anticipates that some of the latest sensor and weapons upgrades found on the modernized Gotlands will also be utilized on the first A26 submarines.

DID YOU KNOW?

UNITED STATES: On 25 June 2015, the United States Navy (USN) took delivery of the 12th Virginia class submarine, USS JOHN WARNER (SSN 785) at Huntington Ingalls Industries Newport News Shipbuilding in Virginia. It will be commissioned on 01 August 2015. On 24 May, the USN announced that the 23rd hull will be named USS NEW JERSEY (SSN 796).

RUSSIA: On 03 July 2015, the Russian Navy (VMFR) commissioned its third Improved Kilo (Project 636.6) class submarine, RFS STARY OSKOL at Admiralty Shipyard in St. Petersburg.

MODERNIZATION & SHIP TRANSFER

SWEDEN – Gotland (A19) Class Submarines HSwMS HALLAND and HSwMS GOTLAND: On 30 June 2015, the Swedish Defence Materiel Administration (FMV) signed a contract with Saab worth US$1.04B for the construction of two new construction A26 submarines and a mid-life upgrade of the two Gotland class submarines HALLAND and GOTLAND. This follows information received on 29 September 2014 that Saab received an order from the FMV to overhaul the Gotland class submarines, HSwMS HALLAND. The work on HALLAND will

be accomplished through the end of 2015 at a cost of US$18M. The order is part of the Letter of Intent (LoI) regarding the Swedish Armed Forced Forces underwater capability announced on 09 June 2014.

The overhaul of the HALLAND includes all necessary measures to ensure the submarine's operational availability, the standard maintenance period that takes place every six years. A major part of the contract was the definition of future needs for maintenance work that will need to be accomplished on both the HALLAND and GOTLAND under the 30 June 2015 US$1.04B contract with Saab. The latest overhauls will be accomplished at Saab's Kockums yard in Karlskrona. The two upgraded submarines will return to service in 2018 and 2019.

Modernization plans for both submarines that will be accomplished under separate contracts and include the following:

- OSI Maritime will deliver the Tactical Dived Navigation System (TDNS) as per a late 2013 contract.
- On 28 January 2015, Kongsberg was selected to provide the SA9510 mine avoidance and navigation sonar as well as the EM2040 Dual RX multi-beam echo sounder.
- On 16 January 015, Exelis was awarded a US$17M contract to provide the ES-3701 electronic warfare system (EW).
- The addition of a diving lock built into the sail
- Installation of non-hull penetrating optronic masts.
- Diesel engine and generator overhaul.
- Upgrade of the Air Independent Propulsion (AIP) system
- Replacement of sonar suite.
- Upgrade of the combat management system (CMS).
- Upgrade of the Type 62 heavyweight torpedoes.
- The addition of an AUV/ROV capability (SUBROV).

The new unmanned capability for the Gotland class is the Saab SUBROV submarine deployed remotely operated vehicle. SUBROV is designed to be launched via torpedo tube and is guided by fiber-optic cable. It has a maximum range of 20km

(12.4 miles). Missions include remote communications, electronic support measures (ESM) collection, hull inspection, mine detection, and freeing submarine from obstacles.

INDIA – Sindhughosh (Kilo – Project 877) Class Submarine INS SINDHUKIRTI (S61): On 21 May 2015, the Sindhughosh class submarine INS SINDHUKIRTI (S61) departed Hindustan Shipyard Ltd (HSL) for sea trials following a nine year overhaul period. The mid-life upgrade (MLU) began in 2006. The submarine will be returned to active service by the end of 2015.
The work package for the MLU included:

- Hull, mechanical and electrical maintenance and repair.
- Installation of the Novator club-S (3M-54E1, SS-N-27/Sizzler) missile system.
- Replacement of weapon control system.
- Upgrades to electronic warfare suite.
- Installation of the indigenous Ushus sonar system.
- Installation of the indigenous CCS-MK radio communication system.
- Installation of L3 KEO non-hull penetrating mast.
- Installation of the Sagem SIGMA 40 ring laser gyro system.

The four remaining units of the class (Sindhudhvaj – S56, SINDHURAJ – S57, SINDHUVIR – S58, and SINDHUSHASTRA – S65) were originally schedule to have this refit completed by 2016 at HSL under the direction of advisors from Rubin Design Bureau and Zvezdochka Shipyard. However, it now appears that the IN will probably overhaul the two of the remaining four at Zvezdochka starting in 2016 and the final two at HSL.

TURKEY – Atilay (Ay) Class Submarine: a modernization for TCG DOGANAY (S351) and TCG DOLUNAY 9S352) was started in late 2011. STM was the prime contractor for the program and Havelsan was designated as the systems integration lead which includes upgrades to the communications, navigation

and sensors, weapons control system, electronic support measures (ESM), and inertial navigation system (INS). Additionally:

- Four of the bow tubes were to undergo modification, enabling them to handle the Mk 48 adcap MOD 6 at heavyweight torpedo.
- The Airbus DS Optronics SERO 250-A and the 250-S attack and search periscope with an infrared camera, a TV camera and an ESM-EW/GPS antenna was to be installed.

The TCG DOGANAY 9S351) was completed and returned to service on 09 April 2014 and the TCG DOLUNAY (S352) was completed on 22 April 2015. The remaining four units of the class (Atilay, Saldiray, Batiray and Yildiray) will not receive the modernization efforts as they will be the first units to be replaced by the new construction type 214s (Reis Class).

NETHERLANDS – Submarine Support Ship/Torpedo Tender MERCUUR (A 900): In May 2015, Damen Schelde Naval Shipbuilding (DSNS) was awarded a contract for the refit of the Submarine Support Ship Torpedo Tender MERCUUR. The vessel will enter DSNS on 07 September 2015 and will be completed by 2016. The work package includes:

- Hull, Mechanical and Electrical (H,M&E) work including the reinforcement of the bow section and the repainting of the hull.
- Bridge layout will be reconfigured with new communications equipment.
- Crew spaces and dining facilities will be refurbished.

The vessel will remain operational until 2025.

UNITED KINGDOM/FRANCE/NORWAY – NATO Submarine Rescue system (NSRS): In early June 2015, AMI received information that JFD (merger of James Fisher Defence and Divex) had won a contract worth US$19M to provide through life support for the NATO Submarine Rescue System (NSRS). The five year contract through 2020 includes options through 2023

The service will be managed by JFD's Submarine Escape and Rescue Team with engineering and technical support will be provided by JFD's Engineering Support Cell.

USED SHIP TRANSFERS/RECEIPTS/ DECOMMISSIONINGS

UNITED STATES – Los Angeles Class Nuclear Powered Attack Submarine (SSN) USS MIAMI (SSN 755): On 28 March 2014, USS MIAMI (SSN 755) was decommissioned at Portsmouth Naval Shipyard in Maine. In early August 2013, the USN announced that it would decommission the Los Angeles class submarine USS MIAMI (SSN 755) due to a fire on 23 May of that year. MIAMI was expected to be refurbished, however, by early August 2013, the USN decided to forego the US$450M repair and scrap the submarine.

On 12 June 2015, the submarine departed Portsmouth Naval Shipyard in Maine en-route Bremerton, Washington where it will be cut up for scrap. All of the equipment and propulsion systems have been removed.

From the August 2015 Issue

INDIA – Naval Programs Update

In early August 2015, AMI received information from multiple sources concerning updates to Indian Navy (IN) programs including the following.

Vertical Launch Missile Submarine (SS/SSG) (Project 75I): On 12 July 2015, the IN announced that it had shortlisted five domestic yards that wish to participate in the construction of six submarines that will be built under Project 75I. The yards shortlisted are Mazagon Dock Ltd (MDL), Hindustan Shipyard Ltd (HSL), Cochin Shipyard Ltd (CSL), Pipavav Shipyard Ltd (PSL) and Larsen & Toubro (L&T).

These five yards will be invited to submit bids to build the six submarines with a foreign yard of their choice. The Request for Proposals (RfPs) should be released in 2016 at the latest now that the five domestic yards have been identified. Some of the known domestic yard/foreign yard affiliations are as follows:

- DCNS of France with PSL and MDL (Project 75 Scorpene Program). Super Scorpene design for Project 75I.
- HSL signed a collaborative agreement with South Koreas Hyundai Heavy Industries (HHI) to jointly build submarines. Probably a variant of the Type 209.

CSL and L&T are not yet affiliated with a foreign yard (at least not to AMI's knowledge) and could still join with ThyssenKrupp Marine Systems (TKMS) which is offering the Type 214 design, Saab Kockums with it's a 26 design, Rubin Design Bureau with its Amur 1650 and Navantia with its S80 design.

All six units will be built in India with the foreign partner providing the design, construction and integration assistance. The weapon and sensor systems will probably be a combination of foreign and Indian developed systems.

Assuming that the RfP is released in 2016, a construction contract could be in place by 2017 with the first unit entering service in 2022.

PAKISTAN

Submarine Negotiations with China Complete

On 24 July 2015, AMI received information that Pakistan and China agreed to terms on a US$4-$US$5B deal for the procurement of up to eight Chinese designed submarines for the Pakistani Navy (PN). Financial agreements were concluded during a meeting between Pakistan's Finance Minister, Ishaq Dar and Chinese state owned China Shipbuilding and Offshore International Company Ltd's (CSOC), Xu Ziquin.

The agreement is still subject to final review from higher authorities in Beijing and then followed by the formal agreement. The financial agreements were the final phase of negotiations which started in 2011. The financial terms include Pakistan making payments in four installments to China. The technology transfer agreements were concluded in 2014.

This financial agreement follows information received by AMI on 01 April 2015 that Pakistan's Prime Minister Nawaz

Sharif approved the government-to-government deal for the eight submarines from China. The deal is still expected to be signed by both parties when China's president Xi Jinping visits Pakistan before the end of 2015.

Pakistan's Prime Minister did announce in April that the PN was considering the Yuan (Type 041) and the export S20 design.

AMI estimates that the first four units will be made in China at either the Wuhu or Jiangnan Shipyards and the four Pakistani units at Karachi Shipbuilding and Engineering Works (KSEW) with Chinese assistance. It is possible that China could build additional units (of the remaining four) if Pakistan falls behind on its building schedule. This will be the most aggressive naval building program for KSEW to date.

Assuming the contract signature by the end of 2015, the first four units that will be built in china could start the construction phase in early 2016 with delivery by 2022. The first Pakistani unit could start by the end of 2016 and commission in 2021. The remaining three units of the class (assuming all Pakistani construction) could commission from 2022 through 2025.

AMI estimates that the majority of all combat and sensor systems will be of Chinese origin with some of the components being built in Pakistan. It appears that Pakistan has finally decided to move forward with the Chinese alternative rather than further pursue its western options (Type 214 and Scorpene), which have been on the table since the early 2000s.

The new submarines will displace around 2,300 tons and armed with YJ-82 anti-ship missiles and a combination of Yu-3 and Yu-4 torpedoes. The biggest question will be if the PN wants to have an Air Independent Propulsion (AIP) capability, which was stipulated in the early days of the program. Since 2007, rumors have persisted that some of the Chinese Yuan (Type 041) class are using an IP system developed by the No. 711 Research Institute. If this technology is available, then the PN will most likely integrate it into the program, and hence the final design selected. Pakistan could also utilize Tognum MTU diesel engines in lieu of Chinese diesels. China used MTU diesels in its Song class and builds MTU engines under license.

THAILAND

Submarine Program Delayed Again

On 15 July 2015, Thailand's Defense Minister, Prawit Wongsuwan, announced that the recent submarine procurement program would be put on hold. According to the Defense Minister, the purchase plan for the Chinese submarines would not be submitted to the Cabinet for the time being pending a thorough study. Cabinet approval is the final crucial step to moving forward with the program.

This announcement comes on the heels of the late June 2015 announcement that the 17-member Submarine Procurement Committee appointed by the Royal Thai Navy (RTN) voted in favor of the Chinese solution for the sea service's submarine program. Although the Chinese solution (probably type 041 or the S20 export version) got the most votes (breakdown not released), sources indicate that the remaining votes were split between Germany and South Korea.

The program before being put on hold called for the procurement of three submarines at a cost of 36B BHT (US$1.06B) or around US$355M per hull, which will be based on the Type 041 or the S20 export variant. The Thai Cabinet was expected to announce the preferred supplier decision be the third quarter of 2015. Sources indicated that Submarine Procurement Committee decision was based on the best value for the money, which included the three submarines, submarine technology transfer agreements in addition to a training package.

Although there was no timeline given by the Defense Minister as when thorough study would be started or completed; it appears that this decision was political in nature. It is no secret there is opposition with the TRN and the Defense Ministry in addition to politicians and activists. Many in the civil population believe that the funds would be better spent on the local economy and others believe that Thailand is becoming too close to China.

Although it seems the RTN was on the cusp of getting new submarines, the procurement once again has stalled due to political reasons. This scenario has become very familiar as the RTN

continues its quest for submarines, a quest that started in the 1990s. The theme for the Thai submarines seems to be, better luck next year.

NETHERLANDS

Interest in Swimmer Delivery Vehicles

On 17 July 2015, AMI received information that the Royal Netherlands Navy (RNIN) has expressed interest in acquiring swimmer delivery vehicles (SDV0 for their naval special operations forces.

This announcement follows the June 2015 statement at the Undersea Defense Technology (UDT) 2015 exposition in Rotterdam that the Dutch Ministry of Defense (MoD) was partly financing the development of SDVs by the Dutch company Ortega Submersibles. With the MoD providing part of the financing, it would seem that the SDVs may have commercial as well as military applications.

While there has been no indication that others may join in this program, it must be noted that the Royal Norwegian Navy (RNoN) is in the market for a class of SDVs as well, with a construction contract expected by the end of 2015. The RNoN could very well join the program with the RNIN in order to reduce overall costs.

Whether or not Norway joins the Netherlands in this program, AMI anticipates that the development of the SDV by Ortega Submersibles is well on its way and could see a construction contract with the RNIN by mid-2016. AMI estimates that up to six SDVs could be procured under this program.

ASIA

Hanoi Class (Kilo 636) Diesel Electric Submarine (SS): On 30 June 2015, the fourth Hanoi class (kilo 636) submarine, DA NANG (HQ-185) arrives in Vietnam.

The fifth and sixth units, KHAN HOA (HQ-186) will be delivered by the end of 2016 ending the program. There are no indications at this time that the VPN will order additional units following the delivery of the final units in 2016.

DID YOU KNOW?

UNITED KINGDOM: On 17 July 2015, the Royal Navy (RN) announced that its third Astute class nuclear powered attack submarine (SSN), HMS ARTFUL (S 121), was set to start sea trials.

UNITED STATES: On 01 August 2015, the United States Navy (USN) commissioned the Virginia class nuclear-powered attack submarine (SSN) USS JOHN WARNER (SSN 785) into service.

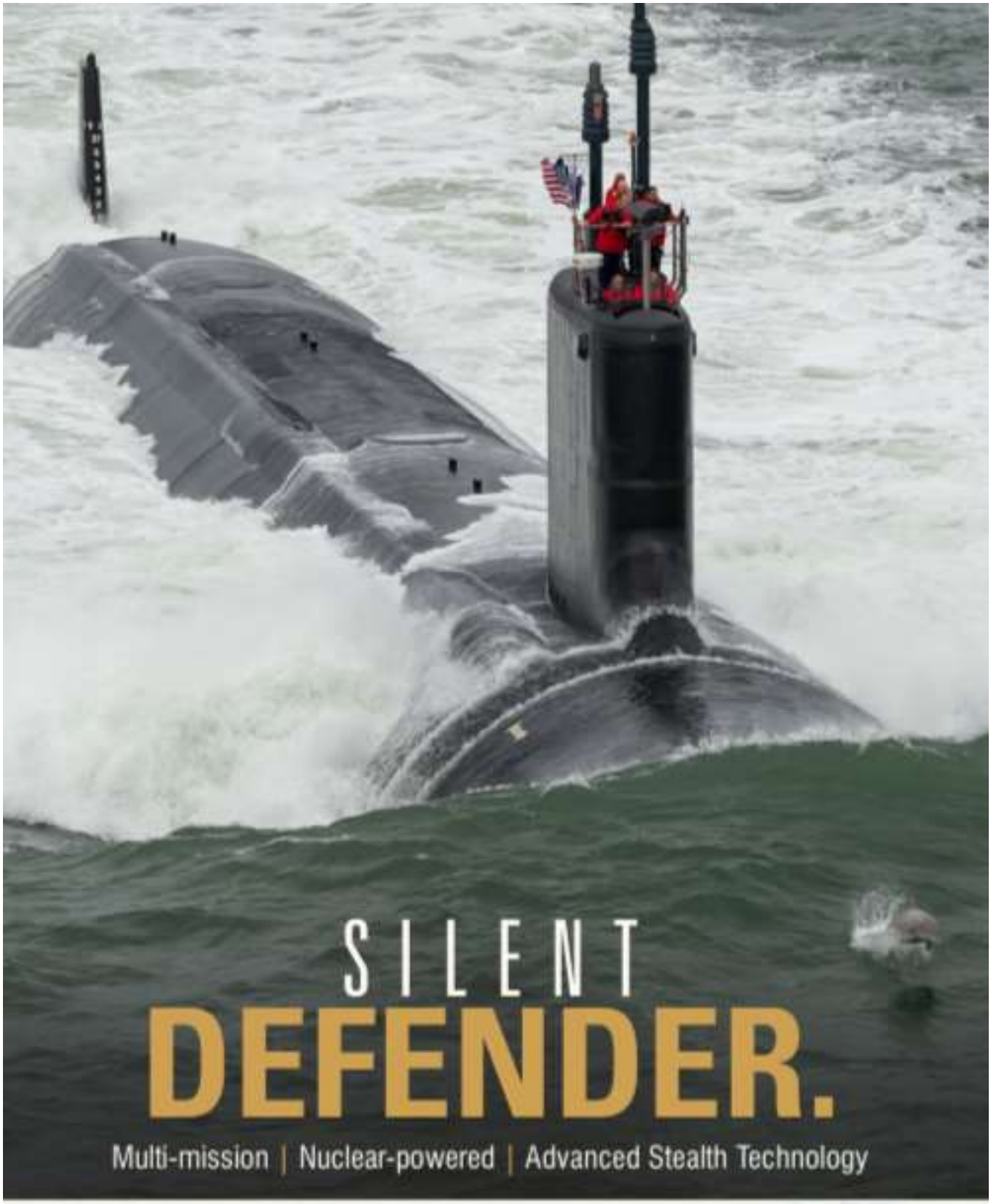
USED SHIP TRANSFERS/RECEIPTS/ DECOMMISSIONINGS

INDIA – Nuclear-Powered Attack Submarines (SSN) Lease: On 12 December 2014, Russia's Trade Minister announced that it was ready to lease an additional used nuclear submarine to the Indian Navy (IN). The statement was believed to have referred to the Akula class, of which one is already under a US$970M ten-year lease to the Indian sea service through 2021. In late March 2015, AMI received information that the Indian Government had made the formal request for a second Akula.

Sources now report that the IN may also be considering one of the Yasen class SSNs as an alternative. The Yasen class is much newer than the 1980s/90s vintage Akula class SSNs. The only two units of the Yasen class built to date are the RFS SEVERODVINSK (K 329) and the RFS KAZAN, both commissioned since 2013. The IN began considering the lease of a second unit in early 2013.

In the event that the IN remains with the Akula, it may be either the Akula II hull IRIBIS, which is 60% complete and remains at Russia's Amur Shipyard or the completed Akula I KASHALOT (K-322).

The procurement of the second SSN has become a much higher priority in recent months as the first Indian-built Nuclear Powered Ballistic Missile Submarine (SSBN) INS ARIHANT began sea trials in mid-December 2014. Negotiations will probably be completed by 2016.



John Warner (SSN 785)

HuntingtonIngalls.com

Huntington Ingalls Industries

Hard Stuff Done Right™

Save the Dates

33rd ANNUAL SYMPOSIUM

21-22 October 2015

Fairview Park Marriott, Falls Church, VA

CORPORATE MEMBER RECOGNITION DAYS

9-10 March 2016

Fairview Park Marriott, Falls Church, VA

SUBMARINE TECHNOLOGY SYMPOSIUM

3-5 May 2016

Johns Hopkins University - APL

Laurel, MD

THE NEPTUNE AWARD – A TRADITION WITHIN THE SUBMARINE FORCE

by CAPT Sherman (Bud) Alexander, USN, Ret.

Can anybody claim to have made 38 SSBN patrols? That record—equating to over 6 years on patrol and submerged—was established by Master Chief Andy Sierra, the holder of the *Neptune Award* while serving on the Blue Crew aboard USS MARYLAND (SSBN 738). Reflecting on his service, Chief Sierra commented, "I have received many awards during my career, but none as significant to me as the Neptune Award. The award celebrates the dedication of the officers and men who make the fleet ballistic missile submarine program so successful."[1] Before and after Chief Sierra's record-setting number of patrols, the Neptune Award continues as one of the traditions of the Submarine Force.

During the 60 years of the fleet ballistic missile program and with over 4000 *Polaris*, *Poseidon*, *Trident I* and *Trident II* strategic deterrent patrols, the officers and enlisted personnel on board our strategic submarines have established a largely unsung record of dedicated service to the nation. This article is intended to record the origin, anecdotal background and current status of the Neptune Award; a continuing part of the history—the lore—of the Submarine Force.

Back in the late 1970s, in the days of *41 for Freedom*, it became apparent that many of our submariners were accumulating significant numbers of patrols since the completion of USS GEORGE WASHINGTON's (SSBN 598) first patrol in January 1961. While serving as Deputy Chief of Staff for Strategic Warfare Systems Readiness (then N6) on the Submarine Force Atlantic Staff in 1978, I proposed the creation of a continuing award to focus attention on this ongoing history of dedicated service being established by SSBN crew members. Subsequently, in August 1978, the proposal for the Neptune Award, named after the God of the Sea in Roman mythology, was submitted to the CNO by ComSubLant, then Vice Admiral Ken Carr, to recognize that submariner, officer or enlisted, who had completed the most SSBN deterrent patrols. The Neptune Award was approved and

promulgated by OPNAV Instruction in February 1979 as a means of honoring "all those individuals who have sacrificed so much in years of continued performance of duty in the strategic Submarine Force".

When QMC(SS) Hubert Coleman made his first patrol in USS PATRICK HENRY (SSBN 599) in 1962, he "had no idea . . ." that he would be the first recipient of the Neptune Award 17 years later after completing 23 patrols on five submarines. When receiving the award in the Pentagon in January 1979 from VADM Charles Griffith, the DCNO for Submarine Warfare, Chief Coleman commented, "Every boat is an individual. The closeness of the crew is what makes life aboard a submarine special . . . I'd recommend it to anybody."[2]

As prescribed in the original OPNAV Instruction, the Neptune Award was to consist of a permanent trophy and a miniature replica to be presented to each recipient. The holder of the award was also authorized to wear a gold SSBN Deterrent Patrol Pin for as long as he retained the award.[3] The recipient would retain the award as long as he held the record and remained on active duty. Subsequently, the governing Instruction was updated to include a detailed description of the trophy to consist of a bust of Neptune rising from the sea holding a Trident spear mounted on a tiered foundation with a model of an SSBN, the SSBN deterrent patrol pin, and the names and number of patrols of the award recipients; and, prescribing that the trophy is to be retained at the recipient's off-crew site.[4] In addition, in a change from the original instruction, the current instruction authorizes any submariner who has completed twenty or more deterrent patrols to wear the gold Deterrent Patrol Pin.

In May 1980, Lieutenant George Beaton, topped Chief Coleman's record when he completed his 24th patrol while serving in the Blue Crew aboard USS ETHAN ALLEN (SSBN 608). He had accumulated his patrols while serving aboard six SSBNs, making 18 patrols as enlisted—six as a Limited Duty Officer. He received his Neptune Award from CINCPAC, then Admiral Bob Long. Lieutenant Beaton's patrol count was surpassed in December 1981 by MMCM(SS) Jim Brooks, serving on the Gold Crew aboard

USS MARIANO G. VALLEJO (SSBN 658). Master Chief Brooks went on to record 29 patrols from his service on 5 SSBN crews prior to his retirement.

The number of patrols of the award recipients continued to increase as the years went by. In November 1985, STSCS(SS) Joseph Gemma, serving in the Gold Crew of USS CASIMIR PULASKI (SSBN 633), succeeded Chief Brooks, registering his 29th patrol after service aboard five other SSBNs. Senior Chief Gemma received the Neptune Award in Charleston, tagged at the ceremony by ComSubGru SIX, Rear Admiral Stan Bump as the "most waterlogged submariner". Chief Gemma was quoted In a Navy press release stating he had no idea there was an award for completing the most patrols. "I never considered winning recognition for what I've done, or saw making a large number of patrols as an accomplishment. All this time I have just been doing a job I like . . . That's the main reason I stayed with it so long." He stated his respect for the mission of the FBM submarine, and commented about his personal preference for submarine duty, "I turned down shore duty whenever I came up for rotation . . . preferring to stay on submarines." He went on to record a total of 33 patrols.

Chief Gemma's record stood for over four years until March 1990 when FTCM(SS) Stephen Wellinghurst recorded his 34th—and last—patrol, while also serving in the Pulaski's Gold Crew. He remained the record holder until October 1993 when MSCM(SS) Andrew Sierra recorded his 34th patrol on the Blue Crew of USS HENRY STIMSON (SSBN 655).

On the occasion of succeeding Chief Wellinghurst, Master Chief Sierra received the Neptune Award in Kings Bay from ComSubGru TEN, RADM Jerry Ellis. He continued to hold the award while serving ashore for two years. He returned to SSBN duty aboard the Blue Crew of USS MARYLAND (SSBN 738), adding four more patrols to reach a total overall number of 38 patrols (aboard nine SSBNs) prior to his retirement. His record still stands as the most SSBN patrols by a submariner. Chief Sierra recently e-mailed the following comment: "I spent most of my career in Charleston . . . everyone knew or were familiar with each

other . . . a very tight and dedicated group of submarine officers and sailors. I was able to move from boat to boat because I knew who was getting transferred and when they would be leaving. I took the initiative to call my detailer and ask to be assigned to a particular command."

Upon Chief Sierra's retirement in May 1996, ETC(SS) Benjamin Smith became the holder of the Neptune Award while serving aboard the Blue Crew of USS NEBRASKA (SSBN 739). Chief Smith retained the award for nearly five years with a total of 29 patrols until he retired in April 2001.

For the next 48 months until April 2005, ETCM(SS) Larry Keene held the Neptune Award. He accumulated 27 deterrent patrols completing his final patrol while serving in the Gold Crew of USS MARYLAND (SSBN 738). During his service aboard MARYLAND, Master Chief Keene also received the Naval Submarine League *Silver Dolphin Award* recognizing his standing in 2002 with the earliest date of qualification in submarines.

A new longevity period for the Neptune Award was set by MMCM(SS) Korey Ketola who held the award for the most patrols from April 2005 until his retirement in July 2013. Master Chief Ketola also received the Submarine League *Silver Dolphin Award* in 2012. All 35 of his patrols were made aboard *Trident* submarines – recording his 35th while serving in the Gold Crew of USS MAINE (SSBN 741) prior to his transfer to duty ashore at the Trident Training Facility, Kings Bay. His last sea duty assignment occurred aboard USS GEORGIA (SSGN 729) prior to his retirement.

In July 2013, COMSUBFOR announced that Lieutenant Commander Floyd Rinehold, then serving at the Trident Training Facility, Bangor, was the next Neptune Award recipient having recorded his 32nd patrol during his previous assignment aboard USS ALABAMA (SSBN 731) Blue Crew. After enlisting in 1986, LCDR Rinehold served on six SSBN crews, initially aboard the Blue Crew of USS ALEXANDER HAMILTON (SSBN 617). Following his commissioning as a Limited Duty Officer, he served aboard three additional SSBNs, completing his sea duty assignments as Weapons Officer on the Blue Crew of USS ALABAMA

(SSBN 731). In April 2015, his Neptune Award status was recognized by Admiral Cecil Haney, Commander, U.S. Strategic Command, at an awards ceremony in Omaha during which he received his replica of the Neptune Award. LCDR Rinehold, currently ashore at the Strategic Weapons Facility, Bangor, remains the holder of the Neptune Award pending his potential retirement in 2016.

Since the establishment of the Neptune Award, the permanent trophy had been displayed at the off-crew site of the current recipient. Over the years, the base of the original trophy became damaged while on display at the off-crew site in Kings Bay. Recently, the Neptune Award Trophy has been remade with the names of all recipients and will remain on permanent display on the Quarterdeck at ComSubLant headquarters in Norfolk. Recipients will continue to receive a miniature replica of the award and, as occurred for LCDR Rinehold, the award ceremony for the recipient will be held when possible at ComStratCom in Omaha.

As might be expected and as history records, the Neptune Award is infrequently turned over. Since the initial award in January 1979, there have been only ten Neptune Award recipients. On average, the recipient has retained the award for not quite 4 years, varying from the first award holder, Chief Coleman, who held it for just 4 months, to Master Chief Ketola who retained the recognition for over 8 years. With current and fewer projected SSBNs in the future, the next generation of Neptune Award recipients may likely make fewer qualifying patrols than in the past. In any case, as established in 1979, the Neptune Award will continue to be a traditional means for the Submarine Force to recognize "all those individuals who have sacrificed so much in years of continued performance of duty".

ENDNOTES

[1] *Periscope*, Naval Submarine Base, Kings Bay, GA, 4 February 1994

[2] *All Hands, Magazine of the U.S. Navy*, June 1979

[3] The creation of the original SSBN Deterrent Patrol Pin was initiated in late 1967 by the N6 Division (then the Strategic Operations Division) of SubLant Staff, headed by DCOS Captain (later VADM) Oliver H. ("Hap") Perry. It was eventually authorized in Navy Uniform Regulations about January 1969. (In 2009, the UK submarine force similarly established the Royal Navy Deterrent Patrol Pin awarded for patrols exceeding 30-days; a silver patrol pin for less than 20 patrols; a gold patrol pin for more than 20 patrols.)

[4] ComSubLant/ComSubPacInst 1650.5, 29 June 2012

AN OPEN CALL TO THE NAVAL SUBMARINE LEAGUE: PROFESSIONAL DEVELOPMENT RESPONSE:

BECOMING A 'BROTHER OF THE PFIN'

by Mr. Jack Townsend

My first submarine was a World War II Diesel Boat home ported in San Diego. It was late January 1961 when the event described here came to be.

After reporting aboard I had to very quickly get qualified on a few basic underway watch stations so that I could become a contributing and useful member of the crew. One of my first qualifications was as a *Lookout*. Now even that seemingly simple qualification was difficult. Most of the senior enlisted crew members, the ones that had to sign your qualification card, wore World War II Submarine War Patrol Pins, and they were very demanding to say the least. As a new guy, a non-qual, one had to prove yourself to them every day with everything you did. They were tough and there was no free ride on anything. There was never a situation where your performance could be signed off as *good enough*. For these old World War II submarine warriors, there was only one *right way* and everything else was the *wrong way*. Everyone in the crew all the way up to ship's Captain seemed to hold these old war-hardened sailors in special regard and I'm ashamed to say that I never fully understood it at the time. The Chief of the Boat, the senior enlisted man on board, was an old World War II Torpedoman who everyone called *Blackie*, and he was the absolute god ON THAT SUBMARINE. In the eyes of a young enlisted man, he absolutely ran the ship.

When I give my mind free reign to drift through the pages of my old memories, I can easily slide backward to one particularly significant instance on that old boat when I was still a green kid. As one of my special duties, I was assigned as Bow Lookout on the Special Fog Detail. Now this assignment would not normally amount to much as the Special Fog Detail was rarely called out other than for a training evolution.

Alas, as luck would have it, one night soon after my qual card was signed off for that evolution, we did a night surface in the open ocean, off the coast of San Diego into a heavy fog bank. The Special Fog Detail was immediately called away and I had to very quickly get my gear assembled and get on station which was topside, on deck, way out on the bow. My gear consisted of a set of sound powered phones, a heavy leather belt with a four foot piece of nylon line attached and a *C* shaped metal fitting on its end that would mate with an imbedded *T* shaped rail (we called it a railroad track) built into the submarine's deck, and of course a pair of high quality marine binoculars were around my neck suspended by a sturdy lanyard.

Thus equipped, I reported to the control room prepared to ascend the ladder into the Conning Tower. After receiving permission from the OD, I climbed up the ladder through the access hatch to the Bridge, then down an external ladder from the bridge onto the deck. This was a tricky position to be in for until I located the deck rail with my right hand and latched my *C* fitting onto it, I only had my left hand with which to hold onto the waist high safety rail that ran around the base of the exterior conning tower. Any slip of my hand or a wave or swell that I was not prepared for could send me into the sea in an instant, never to be seen again. This was dangerous stuff. Needless to say I quickly connected my harness fitting to the deck safety rail as I had practiced in training, many times previously in daylight and good weather. I knew right where it was.

Now I could relax just a bit as I was firmly tethered to the deck but I still needed to find the sound powered phone jack on the front of the conning tower and plug my phone headset to it. I had to assume that the IC Electrician down in the control room had flipped the right switch connecting this particular jack into the phone system. Connecting my phone was in itself a difficult task in the dark and mostly done by feel and knowledge of where the jack box should be located. This too had been practiced in the daylight (while blindfolded I might add). While these activities were going on of course the boat continues rocking back and forth while it's rising up and down with the ocean swells. Sure is

difficult to maintain your balance out there in the dark as there is really no point of reference for your eyes to lock onto.

With my phone hooked up, and communications established with the bridge phone talker I had to now move forward in the darkness as quickly as possible to the bow. This was accomplished by holding my harness line in my right hand and sliding the C fitting along on the safety rail as I slid my now soaked boondockers along on the deck and slowly felt my way forward toward the bow. Once on station I had to report in to the bridge. Now situated in my final position I could sort of make a triangle with my feet and my tether which gave me a degree of stability. Even so, I continued using one hand gripping my tether while the other held my binoculars to my eyes. Fortunately the sea was relatively calm with little or no wind, but the slow moving swells were huge relative to little old me.

Now this particular boat was a special purpose AGSS and she had a very large Bow Buoyancy Tank. This is the forward most ballast tank and is flooded full of sea water when the boat dives along with several other tanks along the length of the hull on both sides. The tanks of course are then blown free of water when the crew desires to surface. The boat had surfaced tonight using the minimum amount of high pressure air (as was commonly done to conserve the high pressure air) and the low pressure blower was running to blow out the seawater that remained in the tanks (I could vaguely hear it running).

Suddenly a large slow moving swell passed over the bow and I gasped as the unexpected coolness of seawater rose up my pants, up to about my waist. So there I was up to my waist in sea water, in the foggy darkness. I could see nothing and my only point of reference was my feet that were firmly planted on the deck of the submarine below me. My tethered harness tightened around my waist as I leaned against the swell. I was scared, really scared, but I had a job to do that was important to the ship and the safety of my shipmates so I continued to do what I needed to do, what I was trained to do. I prayed there in the dark that the sensation I felt was in fact a sea swell and not the submarine slipping below the

surface from a loss of depth control, for if that was the case, I was done for.

If the boat did not continue to slowly rise out of the sea, or if the swells changed direction, or if the crew in operations lost a bit of depth control, the boat could yet partially or even fully submerge and I would be pulled below the surface and surely drown. I could not easily disconnect myself from the safety rail at my feet nor remove the large leather belt around my waist. You see, in my location there on the bow, there was no provision on the rail that would permit me to unhook. With the darkness and the fog this created a *very* frightening situation. From my position, looking in the direction of what I though was aft, I couldn't see the bridge, the conning tower, the shears, or even the mast light. The boats horn (or whistle as it is commonly called) would be sounded periodically to warn any others out there of our presence. The chatter in my earphones was at least reassuring but still, it was like I was out there in the middle of the ocean, in the dark and heavy fog, all by myself, and in my state of mind, that is exactly where I was.

My only contact with another human was through my ear phones and my only *real* security came from my own confidence that my shipmates were indeed there with me, carefully guiding and directing that piece of steel to which I was fastened. In all my days as a submariner, I was never truly frightened to that extent again. At that time in my career, I was a long way from being *Qualified in Submarines* but as I look back on that situation, I think I became a *Brother of the Pfin* that night. I learned under fire just what it meant to have shipmates that I could depend on. I also realized the mindset I had to develop if I was ever to be a *qualified* submariner and wear those coveted *dolphins* on my chest. I absolutely had to keep my head straight for if I panicked, well, I wouldn't be here today, would I? If I had lost my head and became separated from the boat for any reason, my body would never have been found in the darkness and fog (and of course I knew this all too well).

Now in this scared to death situation for a young inexperienced submariner that I have described, one might ask why I did

not refuse, for safety reasons, to go out on deck under the conditions that were present. Well, I guess I could have refused but, if I had, it would have been the end of my submarine duty. I would never be certified as Qualified in Submarines and receive those coveted Dolphins for no one in the crew would trust me to do my duty when the situation got a little rough and therefore there would be no more signatures on my qual card. In short, I would have been an outcast to say the least and soon transferred out of the submarine community to some old clunker surface craft to serve out my enlistment. Those old WWII guys that were my mentors and teachers would never have stood for any crewmember refusing to do his duty. And going out there on deck that night as a bow lookout was my duty for I was on the watch quarter, and station bill for that assignment.

All of this happened over 50 years ago, yet even today, I am never more comfortable, relaxed, and at peace with my surroundings as when I am in the company of my *Brothers of the Pfin*. We are a very small specialized fraternity, very open and friendly with others of our kind. Submariners by nature often appear secretive to those outside our community (a hard lesson learned during wartime) but there are seldom any secrets between us. Anywhere I go while wearing my SubVets ball cap, if there is another submariner in the vicinity, he will always approach and strike up a conversation and I do the same thing, for we are all forever *Brothers of the Pfin*.

ETERNAL PATROL

RADM Stanley E. Bump, USN, Ret.
CAPT Andrew G. Cotterman, USN, Ret.
Dr. Donald Ross
LCDR John C. Holdorf, USN, Ret.
CAPT Robert A. Maxwell, USN, Ret.
Mr. Daniel L. McMillin
CAPT John D. Porter, USN, Ret.
FTC (SS) Myron R. Prevatte, USN, Ret.

AN OPEN CALL TO THE NAVAL SUBMARINE LEAGUE: PROFESSIONAL DEVELOPMENT RESPONSE:

BEST ADVICE I EVER RECEIVED

March, 1949, first day aboard USS CLAMAGORE (SS 343) best advice I ever had came from Chief of the Boat who told me two things; First, number one priority, keep the ocean outboard of the pressure hull. Second, always remember the purpose of everything and everybody between the torpedo rooms is to get the launchers into attack position. Advice sustained me well for twenty years, final two as CO USS CLAMAGORE.

COB QMC Hamel to ET3 Don Ulmer
(only Navy-man to serve aboard enlisted and
Commanding Officer of the same US warship)

Came from Capt. Bill Riffer when he was CO of USS SIMON LAKE (AS-33). It concerned the art of delegation. He said "Anytime I get tasking, I look around and see who I can give it to".

LCDR Steve Kurak, USN, Ret.
CISSP, ISSEP, ISSMP

NAVAL SUBMARINE LEAGUE
LIFE MEMBERS

EMCM (SS) Shaun Abbott, USN, Ret.
LCDR Kevin M. Adams, USN, Ret.
CDR John W. Brown III, USN, Ret.
RADM John D. Butler, USN, Ret.
Mr. Christopher R. Donahue
CDR Michael E. Douglass, USN, Ret.
LCDR Richard Elster, USN, Ret.
TMC (SS) Richard S. Geddes, USN, Ret.
CAPT G. Michael Hewitt, USN, Ret.
CWO4 Gilbert F. Houston, USN, Ret.
CDR Kurk R. Johnson, USN, Ret.
Mr. Felix Keeley
Mr. Michael Lyster
Mr. Donald Madura

PATRON
ADM Frank L. "Skip" Bowman, USN, Ret.
ADM Kirkland A. Donald, USN, Ret.
Mr. James R. Hupton
VADM George P. Steele, USN, Ret.

SPONSOR
RADM Peter C. Conrad, USN, Ret.
ADM Thomas Fargo, USN, Ret.
ADM Thomas B. Hayward, USN, Ret.
RADM Larry R. Marsh, USN, Ret.
VADM George Sterner, USN, Ret.
RADM Robert H. Wertheim, USN, Ret.

COMMODORE
CAPT James N. Adkins Jr., USN, Ret.
VADM Dan Cooper, USN, Ret.
CAPT Howard S. Crosby, USN, Ret.
Mr. Joel W. Duling
CDR John M. Gluck, USN, Ret.
CAPT Ronald Gumbert, Jr., USN, Ret.
CAPT Wynn Harding, USN, Ret.
CAPR Allen B. Higginbotham, USN, Ret.
Mr. James Marion
RADM John F. Shipway, USN, Ret.
Ms. Melaine Sloane
VADM Nils R. Thunman, USN, Ret.
RMCM James Wright, USN, Ret.

SKIPPER
CAPT Patrick H. Allman, USN, Ret.
CDR William Arata, USN, Ret.
LCDR Daniel J. Archer, USN, Ret.
VADM Roger F. Bacon, USN, Ret.
CAPT William P. Bancroft, USN, Ret.
CAPT James S. Baumstark, USN, Ret.
CDR William J. Black, USN, Ret.
LCDR Stephen Bloch, USN, Ret.
CAPT David H. Boyd, USN, Ret.
LCDR Kenneth Brown, USN, Ret.
VADM Carl (Van) Mauney, USN, Ret.
RADM Douglas J. McAneny, USN, Ret.
CAPT George McWilliams, USN, Ret.
HMCS (SS) James M. Mosley, USN, Ret.
CAPT Charlie Nesbitt, USN, Ret.
CAPT James Piburn, USN, Ret.
Mr. Charles E. Rasmussen
CAPT George J. Roletter, USN, Ret.
Mrs. Shelly Saxton
Mr. William Sharp
RADM Paul F. Sullivan, USN, Ret.
CAPT Richard L. Snead, USN, Ret.
RDML Matthew A. Zirkle, USN

SKIPPER continued
Mr. Joseph Buff
RADM Stanley Bump, USN, Ret.
CDR and Mrs. Ed Conant, USN, Ret.
Ms. Judith Curtis
Rev. Melvin Dornak
CAPT Max C. Duncan, USN, Ret.
CDR Wallace Durkin, USN, Ret.
RADM John J. Ekelund, USN, Ret.
IC1 (SS) Frank Elliott, USN, Ret.
RADM Sean Filipowski, USN
RADM Millard S. Firebaugh, USN, Ret.
CAPT Wayne Fritz, USN, Ret.
CAPT Gene F. Gauthier, USN, Ret.
ADM Jonathan W. Greenert, USN
CAPT Robert Greenman, USN, Ret.
LT T. Morris Hackney, USN, Ret.
CAPT Nathan A. Heuberger, USN, Ret.
YNCM (SS) James Hunnicutt, USN, Ret.
CAPT Jonathan Hurt, USN, Ret.
CAPT John G. Juergens, USN, Ret.
Mrs. Louise Kenny
CAPT William Larson, USN, Ret.
CAPT Horace Leavitt Jr., USN, Ret.
Mr. Peter Lobner
Mr. Peter Lobner
CAPT Robert McWethy, USN, Ret.
CDR Robert Meloy, USN, Ret.
CDR Curtis Olsen, USN, Ret.
CAPT Larry Olsen, USN, Ret.
Mr. Jim Paulk Jr.
LCDR William Revesz, Jr.
Mr. Stanley Robertson III
CAPT Peter A. Scala, USN, Ret.
Mr. Roger Sexauer
Mr. John Sirmalis
ADM William D. Smith, USN, Ret.
CAPT John H. Stein, USN, Ret.
MT3 (SS) Mervin Stringer II, USN, Ret.
CAPT Kenneth A. Swan, USN, Ret.

THE SUBMARINE REVIEW

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

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

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

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

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

2015 NSL CORPORATE MEMBERS

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

4 STAR LEVEL
Booz Allen Hamilton
Dell Services Federal Government
General Dynamics Mission Systems

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

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

1 STAR LEVEL
AMADIS, Inc.
Applied Mathematics, Inc.
Business Resources, Inc.
C.S. Draper Laboratory, Inc.
Capitol Integration
CEPEDA Associates, Inc.
Imes
Murray Guard, Inc.
Nord-Lock/Superbolt, Inc.
OceanWorks International
Orbis, Inc.
Pacific Fleet Submarine Memorial Association, Inc.
Precision Defense Services
PRL, Inc. (new in 2015)
RIX Industries
SAIC
Sargent Aerospace & Defense
Security Technologies International
SSS Clutch Company, Inc.
Teledyne SeaBotix, Inc.
Treadwell Corporation
Undersea Solutions Group, A Subsidiary of HII (new in 2015)
VACCO Industries (new in 2015)
Westland Technologies

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

MEMBERSHIP APPLICATION FORM

Name: _____ Birth Year: _____

Rank/Rate, Service (if applicable): _____

Duty Station (if applicable): _____

Preferred Mailing Address: _____

_____

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

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

THIS SECTION MUST BE COMPLETED BEFORE YOUR APPLICTION WILL BE PROCESSED

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

Signature:_____

NAVAL SUBMARINE LEAGUE MEMBERSHIP APPLICATION

ELECTRONIC *REVIEW* MEMBERSHIP

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

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

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

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

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

PRINTED *REVIEW* MEMBERSHIP

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

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

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

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

PAYMENT

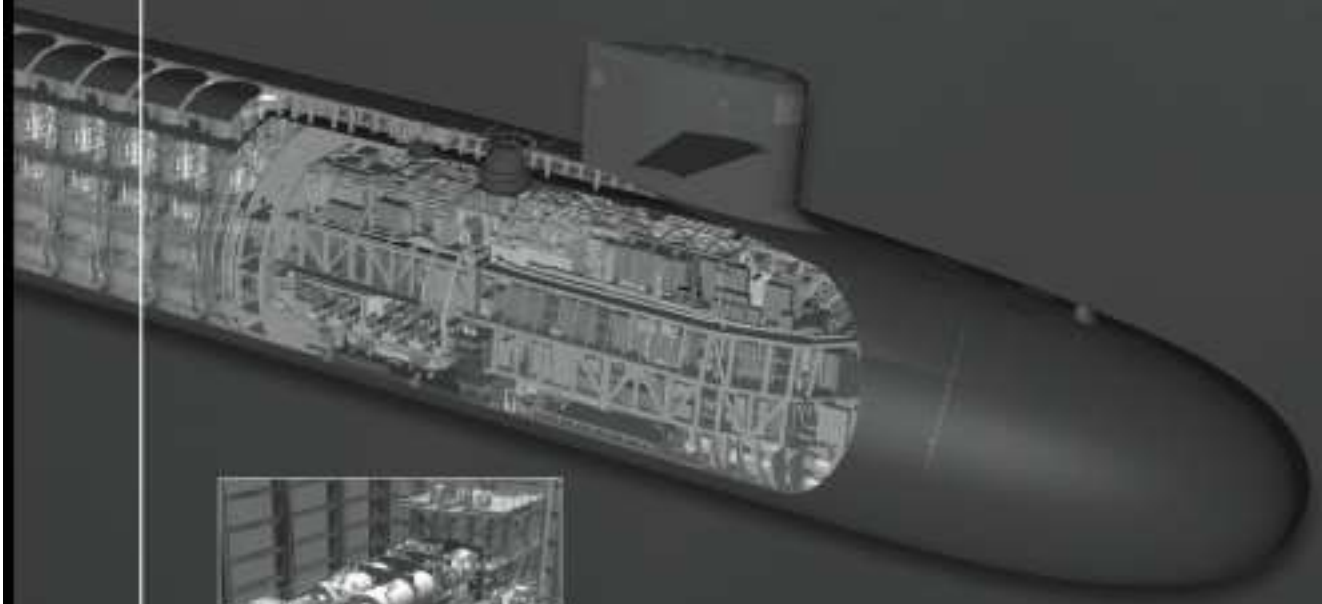
☐ CHECK ☐ VISA/MASTERCARD ☐ I would like to request automatic membership renewal

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

Exp. Date: _____/_____ Security Code: _____

Signature: _____

OHIO REPLACEMENT SSBN
BUILDING THE FUTURE – TODAY



The World Demands Deterrence…The Times Demand Affordability

General Dynamics Electric Boat has demonstrated a new method of constructing the next-generation SSBN that will save millions of dollars per ship, a decade before work begins. One Navy admiral called it 'The most successful prototype program I have ever been involved with.' It's part of the Navy-EB commitment to controlling costs of a program vital to national security.

GENERAL DYNAMICS
Electric Boat
www.gdeb.com