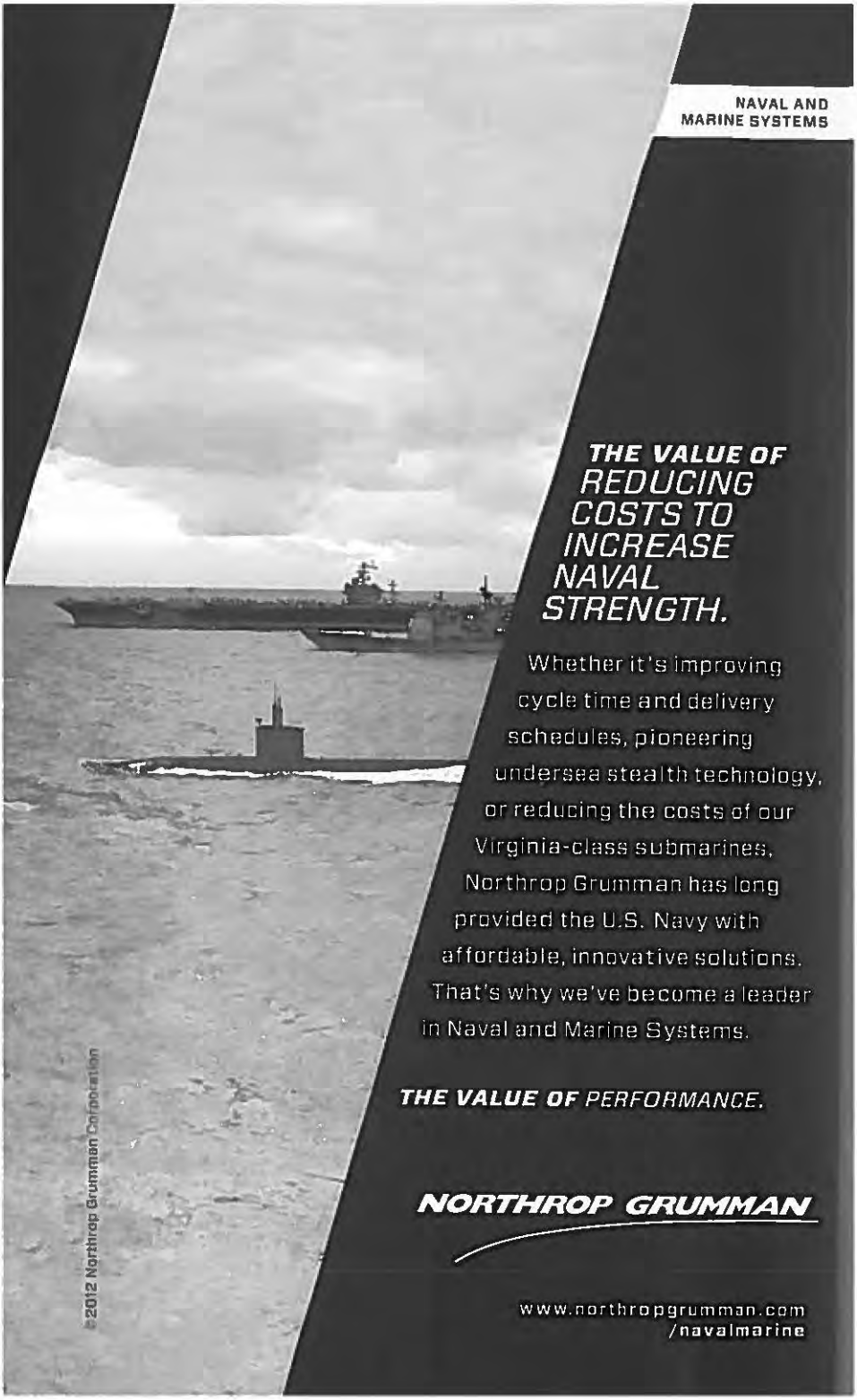
SPRING 2012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EDITOR'S COMMENTS

THE SUBMARINE REVIEW is once again honored to bring our readers an annual highlight; the Luncheon Address at the NSL/JHU-APL Submarine Technology Symposium by Mr. Ron O'Rourke, Naval Analyst for the Congressional Reference Service. As always, Mr. O'Rourke's observations of the journey of submarine issues through the halls of national power are based on thorough research and keen observation. His comments are insightful and meaningful; and very useful to the entire submarine community. In addition, at this year's SubTech Symposium, Mr. O'Rourke offered some observations of the budget *Sequestration* process which is scheduled to go into effect at the beginning of 2013 if real progress in deficit reduction is not enacted prior to that time. Since the law which called for *Sequestration* requires that one-half of the funds to be sequestered come from the national security side of the budget this action is of real concern to the planning for the future of the Submarine Force.

With this issue the magazine owes a double debt of gratitude to the Naval Institute. Both its Naval History and its Proceedings granted us permission to re-publish articles in their June 2012 issues written by Admiral Greenert and Vice Admiral Richardson, respectively. Admiral Greenert's article, Building on a 200 Year Legacy states "Three bedrock lessons from the War of 1812 remain the basis for US Navy operations in the 21st century." Vice Admiral John Richardson, writing in the Proceedings with LT Joel Holwitt, Navigator on the NEW MEXICO and a respected contributor to these pages, chose as his subject Preparing for Today's Undersea Warfare. ComSubLant drew lessons from the past and directions from today's seniors to extrapolate Submarine Warfare to the world's current and easily projected near-term conflicts and specify as much as possible as to what *far forward operations* will look like. This is new and this is important.

Another very interesting senior submariner article is Rear Admiral Jamie Foggo's report to the Submarine Conference in London on March 21st about the dramatic submarine precision

strike operations in Operation ODYSSEY DAWN which established NATO's *no-fly zone* in Libya. The SSGN FLORIDA, accompanied by SCRANTON and PROVIDENCE all were diverted from other missions and assembled off Libya, where on the night of March 19th they fired over 120 cruise missiles to destroy Libya's air defenses. This is exactly the capability so many in the submarine community have worked so long and hard to put in place.

Those three senior submarine officer articles, which can, and should, be read as policy papers are followed by four rather detailed articles, all of which are expositions offering a differing view of the submarine world around us. Dr. Lowell has given us an excellent background upon which to build the case for a submarine-based Ballistic Missile Defense system. It shows that the Sub Based BMD is not only a good idea, but one for which the time seems to have come. Dr. Szaszdi completes his two part description of the seemingly very sophisticated missile system in Russia's 4th generation SSN. Captain Hallett also winds up his well researched narrative of the French World War II submarine mystery of then the world's largest submarine, SURCOUF. Mr. Bruce Rule has drawn some very interesting implications from his research into the acoustic record of the loss of the Soviet GOLF SSG K-129 in 1968.

Lastly, a word about Book Reviews. THE SUBMARINE REVIEW does not usually review works of fiction. We have made exception in some cases, however, such as our review of all of Joe Buff's novels as one unit. Another exception can well be in the case of experienced submariners writing fiction based on a career in the boats—and publishing in the mainstream trade press. We have invited two such authors to give us a brief on their work and the first to appear is George Wallace. Don Ulmer will have the podium for his work in our Summer issue.

Jim Hay
Editor

FROM THE PRESIDENT

The Submarine Force continues taking delivery of submarines ahead of schedule and below budgeted cost. USS MISSISSIPPI (SSN 782) was commissioned in Pascagoula, MS, on 2 June 2012, nearly one year ahead of schedule. She was delivered to the Navy in just over 62 months—the fastest delivery yet for a Virginia class submarine. All Virginia class submarines currently under construction are on track to deliver ahead of schedule and under budget.

The approval of the FY 2013 DoD Budget will fund two submarines for this year in the Five Year Defense Plan and Navy Shipbuilding Program but the out years are in flux in a very uncertain budget environment. I appreciate your continued interest in updating your elected representatives on the importance of continuing the acquisition of two VIRGINIA Class submarines per year. If you need additional information, there is substantial back up material on the NSL website. I plan on addressing the Hampton Roads and South Carolina Chapters on the "Submarine Force Way Ahead" in the near future and this briefing will provide you with current Submarine Force information that you can use.

The Annual History Seminar, ***"OUTLAW SHARK: The Beginning of Over The Horizon Targeting,*** was held on 24 April 2012 at the National War College as part of the Commandant's Lecture Series, hosted by RADM Doug McAneny. We were fortunate to have eight members of the current War College class and eight Midshipmen from the Naval Academy attend the seminar. RADM Jerry Holland's panel provided some excellent historical facts and current use of the OUTLAW SHARK technologies in today's weapon systems and programs. .

The Submarine Technology Symposium, ***"Capitalizing on the Inherent Advantages of Undersea Forces"***, was held at The Johns Hopkins University Applied Physics Laboratory 15 to 17 May 2012. Registration for this outstanding event was restricted due to new DoD conference regulations concerning government costs. We still had good attendance but there were over 50 empty seats

that could have been filled by corporate representatives. There were many comments that this event was one of the best, again having the entire Submarine Force leadership giving presentations and an Active Duty presentation kicking off each technical session. I ask that you consider planning on using this conference to strengthen your submarine support team in the future. This classified forum provides the opportunity to address active duty leadership and potential teaming partners in a forum that identifies technology needs and opportunities for innovation. It is our premiere event and is widely recognized as the best technical symposium of its type.

The final NSL event for 2012 is the Annual Symposium celebrating our 30th Anniversary. It will be held in a new venue at the Fairview Park Marriott in Falls Church, Virginia on 17-18 October 2012. The Submarine Force Fall Cocktail Party will be held on the first evening of the program. We will recognize the performance of eight fleet award winners, the Gold and Silver Dolphins for 2012 and the literary and photo award winners. We will also recognize the Distinguished Submariner and Distinguished Civilian at the Banquet. Please look for the mailing to all members this summer which will include a ballot for the election of members of the NSL Board of Directors.

I will have visited every chapter in the past year when I complete the two briefings I mentioned earlier. We have a dedicated set of volunteer leaders in many of our chapters and I am looking for ways to help you become more engaged with your active duty submariners in your areas. We are the professional organization that supports the Submarine Force. Your Naval Submarine League continues efforts to increase membership and focus on initiatives to recruit members who are active duty, retired, or submarine advocates. I ask each of you to recruit a new member by asking friends and associates to join the Naval Submarine League and to participate in the League activities. We need every submariner involved in maintaining the superior Force needed for our national defense.

THE SUBMARINE REVIEW is widely distributed throughout the Submarine Force, industry, congress, and educational

libraries. Your contributions to the Editor are the sources and information that keep it interesting to read and a trusted resource to those who are submarine advocates. I ask that you provide your comments, articles and even letters to the Editor when you have something of interest to report. The online Membership Directory provides an outstanding resource for contact information for League members. Your continued assistance in updating this resource is appreciated. Finally, our website is updated regularly with submarine news and photos. We also have links to useful websites, and obituaries that we receive are posted on the NSL UPDATE tab. Please let us know how these resources can better serve you.

Bobbie joins me in wishing you a healthy and relaxing summer.

John B. Padgett III
President

REMINDER

The Naval Submarine League Email Address Domain is navalsubleague.com . The cavtel.net domain has been cancelled.

The following email addresses are in effect:
subexec@navalsubleague.com - Executive Director
subleague@navalsubleague.com - Administrative Mail
subtech@navalsubleague.com - SUBTECH Administration
nslmem@navalsubleague.com - Membership
nslops@navalsubleague.com - Operations Director
nslevent@navalsubleague.com - Symposia Coordinator
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THE SUBMARINE REVIEW

THE SUBMARINE REVIEW is a quarterly publication of the Naval Submarine League. It is a forum for discussion of submarine matters, be they of past, present or future aspects of the ships, weapons and men who train and carry out undersea warfare. It is the intention of the **REVIEW** to reflect not only the views of Naval Submarine League members but of all who are interested in submarining.

Articles for this magazine will be accepted on any subject closely related to submarine matters. Article length should be no longer than 2500 to 3000 words. Subjects requiring longer treatment should be prepared in parts for sequential publication. Electronic submission is preferred with MS Word as an acceptable system. If paper copy is submitted, an accompanying CD will be of significant assistance. Content, timing and originality of thought are of first importance in the selection of articles for the **REVIEW.**

A stipend of up to $200.00 will be paid for each major article published. For shorter Reflections, Sea Stories, etc., $100.00 is usual. Book reviewers are awarded $52.00, which is that special figure to honor the U.S. submarines lost during World War II. Annually, three articles are selected for special recognition and an additional honorarium of up to $400.00 will be awarded to the authors. **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. In those instances where the NSL has taken and published an official position or view, specific reference to that fact will accompany the article.

Comments on articles and brief discussion items are welcomed to make **THE SUBMARINE REVIEW** a dynamic reflection of the League's interest in submarines. The success of this magazine is up to those persons who have such a dedicated interest in submarines that they want to keep alive the submarine past, help with present submarine problems and be influential in guiding the future of submarines in the U.S. Navy.

Articles should be submitted to the Editor, SUBMARINE REVIEW, P.O. Box 1146, Annandale, VA 22003.

FEATURES

SUBMARINE TECHNOLOGY SYMPOSIUM AT JHU/APL

ADDRESS BY
MR. RONALD O'ROURKE
MAY 16, 2012

Introduction

Thank you for the kind introduction—and for the invitation to speak once again at this event. I very much appreciate the chance to share my thoughts with you, and your willingness to hear them.

As always, I should state at the outset that these views are my own and not necessarily those of my employer.

Multiyear and block buy contracting

I want to begin by noting briefly, with regard to Navy shipbuilding in general, that the Navy has requested authority this year to negotiate a multiyear procurement contract for the DDG-51 program, and a follow-on multiyear procurement contract for the Virginia class program. If Congress grants these two requests, then in coming years, all three of the Navy's year-to-year shipbuilding programs—the DDG-51 program, the Virginia class program, and the LCS program, which is being executed with block buy contracts—will employ some form of multiyear contracting. This is a significant change from the past, and one that should not go unnoted.

Industry has long asked for stability in shipbuilding to help reduce shipbuilding costs, and the use of MYP and block buy contracting in all three of these programs can be viewed as something that moves Navy shipbuilding a fair ways in that direction. Procuring aircraft carriers under two-ship block buys, without changing the currently planned years of procurement for each carrier, could extend this situation further, though the Navy has testified that it would prefer to wait until next year before considering that option.

The best of times: support for submarine procurement

Let me shift now from shipbuilding in general to submarines in particular. For supporters of submarines, the current situation might be characterized as the best of times and the worst of times, or—to borrow another literary reference—as the year of living dangerously. Either phrase captures a sense of where we are right now.

For the submarine community, these appear to be the best of times in terms of support on Capitol Hill for submarine procurement. Congress historically has been very supportive of the Navy's annual shipbuilding requests, including submarines, but this year, Congress' support for submarine procurement appears particularly strong.

Members on various committees have expressed a strong interest in finding a way, if possible, to restore a second Virginia-class submarine to FY14, and consequently to increase to 10 the number of boats in the next Virginia-class multiyear.

There's a difference of opinion on whether this would be done by using incremental funding in the Virginia-class program, or by simply procuring the additional boat with traditional full funding. But it does appear that a number of Members are interested in finding some way to fund that extra boat.

I think it's fair to say that the possibility of adding this boat is receiving support this year in part because of the Virginia-class program's success in achieving its goals for reducing unit procurement costs and shortening construction times while maintaining or improving ship capability. If the program instead had been experiencing cost growth and schedule delays, it might be harder to make the case for adding that boat.

If the Virginia class program's success in achieving its acquisition goals is a part of the reason why there is support for adding a second boat in FY14, then that is something that other DOD acquisition programs might take notice of, which in turn might be of some benefit to DOD acquisition in general.

It can also be noted that there's been little opposition or questioning of the inclusion in this year's 30-year shipbuilding plan of a couple of years not too far into the future—specifically, FY20

and FY22—showing the procurement of 3 attack boats in a single year. This is the first time in eight years that a 30-year plan has included some years with three attack boats per year.

I don't want to make too much of this, because FY20 and FY22 are beyond the end of the FYDP, where there's less responsibility for showing how you're going to pay for things. But the Navy's willingness to pencil in 3 boats a year for those two years, and the little pushback to date against that, can be noted.

Support for the Virginia-class program this year appears to derive not just from the program's good execution, but from two other things. The first is awareness of China's military modernization effort. Policymaker awareness of, and concern about, this effort has grown steeply over the last year or two, in no small part because of China's assertive behavior regarding its maritime territorial claims in the South and East China Seas. As a result of this growing awareness and concern, China's military modernization effort is now much more at the center of the discussion of U.S. defense plans and programs than it was just two or three years ago. The new U.S. strategic guidance announced in January, with its emphasis on the Asia-Pacific region, can be viewed in part as a reflection of this. As many observers anticipated, increased concern about China and the new strategy's emphasis on the Asia-Pacific region have led to a stronger emphasis on the Navy in discussions of U.S. defense plans and programs.

The other apparent cause for supporting the Virginia-class program this year, beyond the program's good execution, is a growing focus on the projected attack submarine shortfall, particularly when that shortfall is viewed in the context of China's military modernization effort and the new strategic emphasis on the Asia-Pacific.

As some of you might remember, I first highlighted the projected attack boat shortfall in 1995, and have been reporting, testifying, and speaking about it pretty much every year since then.

In this year's 30-year shipbuilding plan, there's been more progress to close up that shortfall than perhaps any other single year. Due to those two years with three boats in them, plus a couple of other years where an additional boat has been added, the

bottom of that shortfall has moved up by four boats, from a minimum of 39 boats in last year's 30-year plan to a minimum of 43 boats in this year's plan.

The new projected low point of 43 boats is the highest in any 30-year plan going back several years, and I would imagine it is the highest projected low point in Navy internal planning going back years before that. If a second boat were added to FY14, that low point would become 44 boats, which reduce shortfall at its lowest point to less than 10% of the force level goal.

In earlier years, when the maximum depth of the shortfall was projected to be larger, it made more pressing the question of whether it would be feasible or cost effective to refuel and extend by 10 years or so the service lives of some number of 688s. If the numbers in this year's 30-year plan continue to hold in future 30-year plans, that question will become less pressing.

The worst of times: the budget and sequestration

So in terms of support for finding a way to fund a second Virginia-class boat in FY14, and the reasons behind that, supporters of submarines might well say that these are the best of times.

But they might also say, at the same time, that these are the worst of times, because of the damage to FY13 programs that might occur with sequestration in January, and because uncertainty about whether sequestration will happen is making it difficult for government and industry officials to make decisions about what kinds of activities and commitments to undertake between now and then.

The question of sequestration, and the potential impact of the Budget Control Act in general, are not easy to sort out. Because I suspect that the possibility of sequestration is a concern for many of you right now, here are 11 things that I can tell you about the situation—and for many of these comments, I'm relying on Steve Daggett, who until very recently was one of our key analysts at CRS for questions on sequestration.

First, although many people are trying to find a way to avoid a sequestration on the defense budget, so far no plan for doing that

has emerged that third-party observers have generally deemed likely to pass both the House and Senate and be signed into law by the President. Nor is it certain that such a plan will emerge between now and January. And the expected lame-duck session following the November elections will have a number of other pressing legislative matters to address. On this basis, a sequestration on the FY13 defense budget would appear to be a real possibility.

Second, although a sequestration may occur on the FY13 defense budget, sequestration appears unlikely to be used in defense for the remaining eight years covered under the Budget Control Act—that is, for FY14 through 21. That's because in those years, the lower caps on discretionary funding are established at the beginning of the budget and appropriations process, and those caps may be enforced through points of order in the appropriations process.

Third, sequestration on the FY13 defense budget would be imposed on each *program, project, and activity*, or PPA, and while PPAs are quite broad in the O&M portion of the defense budget, providing some flexibility for how to best use the remaining funds, they are very narrow in procurement and R&D parts of the budget, providing much less flexibility for mitigating the impact on individual programs.

Fourth, if military personnel accounts are exempted from a sequester, which is permitted, then the across-the-board cuts on other PPAs could be roughly 10%. That figure could move up or down somewhat, depending on certain factors that go into the calculation, but something in the range of about 10% is a fair estimate.

Fifth, because of the low annual procurement quantities of Navy shipbuilding programs, the effects of a sequestration could be particularly disruptive on Navy shipbuilding. Since most Navy shipbuilding programs have a procurement rate of one or two ships per year, losing an FY13 ship to a 10% sequestration—because you can't sign a contract for a ship that isn't fully funded—could mean a 50% or 100% reduction in the program's FY13 procurement quantity.

Sixth—and more specifically for our purpose here today—a 10% reduction on the FY13 Virginia-class program could make the second FY13 boat unexecutable, reducing the FY13 procurement quantity from two boats to one. Whether that second boat would then be deferred into a future fiscal year, or simply lost, is not clear.

Seventh, if the second boat in FY13 cannot be executed as scheduled, the Navy might have to break the current Virginia multiyear contract. Since FY13 is the final year of that contract, the consequences for the government in terms of penalty costs for breaking the contract might not be that great. But the reduction of the FY13 quantity from two to one could have implications for the pricing of the boats to be included in the follow-on multiyear that the Navy is seeking authority from Congress to negotiate for the years FY14 through 18. In short, the cost of the boats in the next multiyear could increase.

Eighth, under a little-discussed 1990 amendment to the law that governs sequestration, the President has authority, prior to the implementation of sequestration, to propose to Congress a Joint Resolution that would reallocate the cuts among PPAs, provided that additions to some PPAs are offset by reductions to other PPAs that are equal both in budget authority and in outlays. Such a Joint Resolution would have to be approved by Congress and signed into law. If the President were to propose such a Joint Resolution, and Congress were to approve it, and the President signed it into law, this reallocated defense budget could become the new baseline for imposing sequestration on FY13 PPAs.

Under this scenario, it is possible to imagine a reallocation that pluses up certain FY13 PPAs, so as to preserve their wholeness following sequestration, while setting up other FY13 PPAs to be, in effect, designated sacrificial lambs. If so, then sequestration might wind up harming some programs, but not others, and sequestration, instead of being a completely thoughtless mathematical operation, as it often has been described, might instead become a partially thoughtful one. This reallocation process might be of particular value to Navy shipbuilding, because

of the outsize effects that a straight 10% sequestration across PPAs would have on low-annual-quantity Navy shipbuilding programs.

The ninth thing I can tell you is that it is not clear whether this reallocation process can be used. The process is set forth under Section 258B of the sequestration law—a section that was approved in a 1990 amendment to the law. But Section 258B refers back to Section 254 of the law, and sequestration of discretionary spending occurs not under Section 254, but under Section 251. So whether the Section 258B reallocation process applies to the spending targets set by the Budget Control Act is uncertain due to ambiguities in the language of the statute, and OMB—which would make the final legal determination on the question—has not yet done so, at least to CRS's knowledge as of late April. The Joint Resolution that would make the reallocation, moreover, might be subject to objections during congressional consideration on parliamentary grounds.

The tenth thing I can tell you is that since the lower defense spending caps in the Budget Control Act for FY14 through 21 would likely be achieved through the annual appropriations process, rather than through sequestration, programs being executed in those years through multiyear contracts could be afforded some degree of protection from funding reductions that would require breaking those contracts, particularly if the penalty costs of breaking those contracts were significant. A Virginia-class multiyear beginning in FY14 would be an example of such a program. The flip side, however, is that if officials believe that defense spending in FY14 and beyond is likely to conform to the lower caps in the Budget Control Act, a decision could be made to limit the new Virginia-class multiyear to fewer than the currently proposed nine boats.

The eleventh and final thing I can tell you about sequestration and the Budget Control Act is a reminder that avoiding a sequestration on the defense budget in FY13 is not the same as avoiding the possibility of reductions in defense spending in FY13 and beyond. The Budget Control Act was passed last summer in the midst of signals from the credit markets to do something to reduce projected growth in the federal debt by a certain minimum

amount. If the credit markets, and also the equity markets, perceive that the reduction in growth of the federal debt that was to be accomplished under the Budget Control Act will now not occur, or not fully occur, they could begin sending signals to do something new to achieve that goal. That new something could include, among other things, further reductions in planned levels of defense spending.

So like I said, for the submarine community, you might say these are the best of times, and the worst of times—or if you prefer, that this is the year of living dangerously.

Range of uncertainty over future Navy budget

Stepping back, and looking at the situation a bit more broadly, it can be noted that there currently is an extraordinarily wide range of possibility for where the Navy's budget might go in coming years. The low end of that range of possibility might be a DOD budget that follows the stage two caps in the Budget Control Act, and an allocation of that DOD budget that doesn't favor the Navy more than marginally.

The high end of that range might be the proposal in the Romney campaign defense white paper from last October to set the defense budget at 4% of GDP, and to increase Navy shipbuilding to 15 ships per year.

That's quite a range of possibility—and it's unclear where, within that range, things will settle out, because the outcome will reflect the result of a much larger debate over federal expenditures, revenues, and deficits that the country has been engaging in since at least last year.

That larger debate could go on for a while before it's resolved. And while it is underway, debate could continue or intensify on questions such as whether there would be strategic grounds for favoring the Navy in allocating a smaller defense budget, or for favoring the Submarine Force in allocating a smaller Navy budget.

Anti-access and area-denial (A2/AD)

In discussions today about the future composition of U.S. defense spending, a major theme is the potential value of various

force elements for countering adversary anti-access and area-denial forces. Just as, a decade ago, everyone was rushing to argue how their favorite defense acquisition programs were transformational, today people are rushing to show how their programs have value in countering A2/AD systems.

Since attack submarines qualify as a classic platform for countering A2/AD systems, supporters of attack submarines should be well prepared to argue the value of attack boats in relation to this strategic focus. Indeed, if they can't make this argument, they ought to just pack up their bags and go home.

But there are two other points I want to make in relation to this issue.

The first is that the A2/AD topic has a political and legal dimension, and that part of this political and legal dimension is China's view, which is subscribed to by some other countries as well, that coastal states have the right to regulate the activities of foreign military forces operating within their exclusive economic zones, or EEZs. This view stands in contrast to the view of the United States and many other countries that coastal states have the right to regulate economic activities, but not military activities, in their EEZs.

Although China's view on this issue is a minority view among world nations, it is one that could gain additional adherents over time. If China's view on this issue were to become the dominant view over time, it could significantly affect U.S. Navy operations around the world, many of which take place in the EEZs of other countries. It could certainly affect operations of U.S. Navy surface ships and aircraft, if not submarines as well.

China's view on this EEZ issue, and the challenge it poses to the current majority view, often gets commingled with, and tends to exist in the shadow of, the related but ultimately separate issue of China's disputes with other countries in its region regarding maritime territorial claims in the South and East China Seas. To some degree, the issue of rights within the EEZ has been a sleeper issue, in spite of its potential for one day significantly affecting the U.S. ability to use naval forces to affect events ashore around the world.

It is China's view on the issue of a coastal state's ability to regulate foreign military activities in its EEZ, and *not* China's maritime territorial claims that appears to be at the crux of the incidents at sea between Chinese and U.S. ships and aircraft in 2001 and 2009. And it is China's view on the EEZ which carries the potential, should it become the dominant view, for affecting U.S. Navy operations not only in the Western Pacific, but around the world. Even if all the issues concerning maritime territorial claims in the South and East China Sea were somehow resolved, this other issue regarding China's views of its rights within its EEZ would remain.

The Navy, including the submarine community, needs to focus on this issue as an integral part of its approach to the anti-access/area-denial issue. To date, I haven't seen too much evidence of this.

Geography and a crown jewel

The second point I want to make on the issue of countering A2/AD systems is that while it's relatively straightforward to make an argument about the value of attack submarines in countering such systems, it can also be easy, in making that argument, to overlook an opportunity to make a broader argument about the value of submarines in supporting U.S. grand strategy.

It is an accident of geography that more than two-thirds of the world's surface is covered by water. But because of this, the United States has the opportunity, through its naval forces, to convert a major part of the world's surface into a medium of operations and maneuver for defending U.S. interests. And underpinning that ability are the Navy's attack submarines, which can deny the use of the oceans, if need be, to all other parties. The United States has built up, over several decades of effort, an advantage in the design and operation of attack submarines, and in undersea warfare generally, that would take other countries many years, and a lot of investment, to match.

By underpinning the U.S. ability to convert what happens to be a major part of the world into a medium of national advantage, and by being something that would take another country a lot of

time and investment to match, the attack Submarine Force can be viewed as a crown jewel in U.S. national strategy—as an investment that the country has developed over time, and which has a high return in terms of the leverage it provides to U.S. policymakers.

The valid point about the value of attack submarines in countering A2/AD forces should not, in my view, obscure this broader point about the value of attack submarines to U.S. grand strategy, particularly if other elements of U.S. strategic dominance become more contested in coming years.

Ohio replacement program

In my final remarks, I want to discuss for a moment the Ohio-replacement program.

With the focus that has occurred this year on the Virginia-class program and the possibility of adding a second boat to FY14, there's been less discussion of other submarine issues, including the Ohio-replacement program.

But the discussion that *has* occurred on the Ohio-replacement program demonstrates an awareness of how the proposed two-year deferral in the program would reduce the SSBN force to 11 or 10 boats for the period FY29 through 41. Supporters of submarines, and those who track strategic nuclear program issues, have expressed misgivings about this, and there has already been some legislative activity on the issue on the House side.

It can also be noted that until this year, the Navy had testified that that there was no slack in the Ohio-replacement program schedule, if a force of 12 SSBNs was to be maintained. This year, the Navy has testified that a two-year deferral in the program could help mitigate risks in the program, and that the resulting reduction of the SSBN force to 11 or 10 boats for the period FY29 through 41, though not optimal, would be manageable, with some risk. The question is whether this shift in testimony has damaged the Navy's credibility with certain audiences.

I remain concerned that potential pressures on the shipbuilding budget in coming years, combined with the funding requirements for the Ohio-replacement program, could crowd out funding for

the Virginia-class program during the years of Ohio-replacement procurement. My thoughts on this issue are largely unchanged from what I have told you before, particularly since the Navy over the last year hasn't announced any further definite progress toward the goal of reducing the average unit cost of the follow boats in the Ohio-replacement program from about $5.6 billion to $4.9 billion in FY10 dollars.

Finally, it can be noted that in spite of the points I have just made, there appears to be strong support for the Ohio-replacement program. There are some proposals for building fewer than 12 boats as part of a plan for reducing the size of U.S. strategic forces, but the idea that SSBNs should form a core part of the future strategic deterrent force appears to enjoy wide support.

Conclusion

In conclusion, in my remarks today, I have ranged from narrow and technical matters such as Section 258B of the sequestration law to broader matters such as world geography and the value of submarines in U.S. grand strategy. The situation currently facing submarines spans matters from one end of this spectrum to the other, and presents an unusually wide range of possibility for where things might go in the future. Hopefully, somewhere along the way, I have shared some comments that you will find of value in trying to address this uncertain and complex situation.

Thank you.

BUILDING ON A 200-YEAR LEGACY

by Admiral Jonathan W. Greenert, U.S. Navy
Chief of Naval Operations

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Three bedrock lessons from the War of 1812 remain the basis for U.S. Navy operations in the 21st century.

Today's U.S. Navy was born (or perhaps reborn) in the War of 1812. Though the Fleet was founded during the first year of the American Revolution, by 1812 it was still a small coastal navy with a limited ability to project power, protect ports, or control the sea. Those shortfalls hurt the United States in the War of 1812 and showed Americans very clearly the importance of a capable navy to protect the nation's security and economic prosperity. At the same time, the characteristics that eventually carried the small U.S. Fleet to victories against the British—tactical proficiency, forward operations, and warfighting readiness—became hallmarks of our Navy that endure to this day.

The U.S. Navy was not ready for the War of 1812 because America's early leaders were not convinced the country even needed an ocean-going force. Presidents George Washington and John Adams initially planned to build up the Fleet to protect the nation's growing economy. But Presidents Thomas Jefferson and James Madison later slowed naval construction because they were wary of either increasing the national debt or raising taxes. In the lead-up to war, many in the Madison administration, recognizing the disparity against the British, argued that the Fleet would best be kept in port to focus on harbor defense.

Small Fleet, Large Impact

As a result, the American Navy that sailed into the War of 1812 consisted of just 20-odd ships—with seven of those undergoing or in need of repair. Despite its size, however, that small Fleet made a big difference. Before Britain completed its blockade of America's coast, most U.S. frigates and other warships were able to get to sea and remain under way throughout the war to challenge the Royal Navy. Those ships and their crews won a series of individual engagements in the Atlantic and on the Great Lakes and Lake Champlain, surprising many observers in both countries and boosting morale in the United States.

Once it was able to mobilize in North America, the larger and more experienced Royal Navy blockaded U.S. merchants and some warships in port and eventually supported an invasion of Washington, D.C. The impact of the British offensive was significant. Insurance rates soared and imports dropped, dramatically raising the price of finished goods from Europe needed in America's homes and factories. Meanwhile, commodity exports fell by more than 80 percent, denying American businesses and the government badly needed revenue.[1] Britain eventually lifted the blockade and negotiated for peace because of the financial drain of the war, the persistent challenge from American warships that evaded the blockade, and a continued threat from France. But the cost of the blockade to the U.S. economy and the Navy's limited effectiveness in ending it forged a consensus after the war that America needed a strong Navy to assure the nation's security and prosperity.[2]

A Young Navy's Enduring Traits

The young American Fleet was able to defeat the preeminent Royal Navy in individual battles because it evidenced traits that continue to be essential today. First, U.S. commanders were bold and innovative, having developed a strong culture of command and independence through the Quasi-War with France and conflict with the Barbary pirates. In the earliest example, Commodore John Rodgers put to sea within hours of learning of the outbreak of war to go in search of British convoys, stretching the limits of his

orders and quickly showing the Royal Navy that America was willing to fight. Master Commandant Thomas Macdonough, after twice being knocked unconscious in the Battle of Lake Champlain, was able to maneuver his flagship, SARATOGA, around to bring a fresh broadside to bear and ultimately win a decisive victory. And, in one of the first examples of trans-oceanic U.S. power projection, Captain David Porter took the frigate ESSEX around Cape Horn in 1813 and successfully disrupted British whaling and trade.

Second, U.S. Navy crews were confident and proficient. American sailors drilled daily at their guns, and were able to shoot more accurately and more rapidly than the British. Through multiple engagements, the Americans demonstrated superior gunnery skills and seamanship, such as when CONSTITUTION evaded a more powerful force because her crew towed and winched the ship away when winds had calmed. Events like those during the War of 1812 reinforced John Paul Jones' earlier conclusion that "men mean more than guns in the rating of a ship."

Third, U.S. ships were well built and resilient, surprising the British with their agility and firepower. American 44-gun frigates were bigger, had thicker hulls, carried larger crews, and were outfitted with more guns than the standard frigates of the day. They made such an impression on the British that the Royal Navy began to question their classification. "Though they may be called Frigates," read a secret order from the Admiralty to all station commanders, they "are of a size, Complem[e]nt and weight of Metal much beyond that Class, and more resembling Line of Battle Ships."[3] The CONSTITUTION, in fact, was given the nickname *Old Ironsides* by her crew after witnessing enemy shot bounce off the oak timbers that made up her hull.

Looking to the Past for the Future

Our Navy's experience in the War of 1812 provides lessons we should apply today. Two hundred years ago our burgeoning industrial base built a Fleet with a focus on warfighting capability, ensuring that our frigates would deliver overwhelming fires while withstanding attacks. Our commanders, in turn, kept their crews'

attention on combat in the lead-up to conflict. Today we must continue applying that tenet of warfighting first—delivering durable, effective capabilities to the Fleet so it can overcome present-day threats.

The War of 1812 showed the vulnerability of our economy to disruptions in overseas trade. Today, globally interconnected supply and production chains make it even more imperative that we operate forward to protect the freedom of navigation at strategic maritime crossroads where shipping lanes and our security interests intersect. Those locations—such as the Gibraltar, Malacca, and Hormuz straits—will only grow in importance as production chains become more global and dependent on reliable trade routes.

America's second war with Great Britain also made clear that confident and well-trained sailors provide a warfighting edge no amount of technology can duplicate. In 1812 American naval victories helped persuade Britain to negotiate peace. Today our forces must be ready to fight every day to promptly counter aggression or dissuade aggressors from their objectives.

Warfighting First. Operate Forward. Be Ready. Those are the key lessons from the U.S. Navy's first sustained trial by fire. Those three tenets are the foundation of my Sailing Directions and keep us linked to our rich heritage.

ENDNOTES

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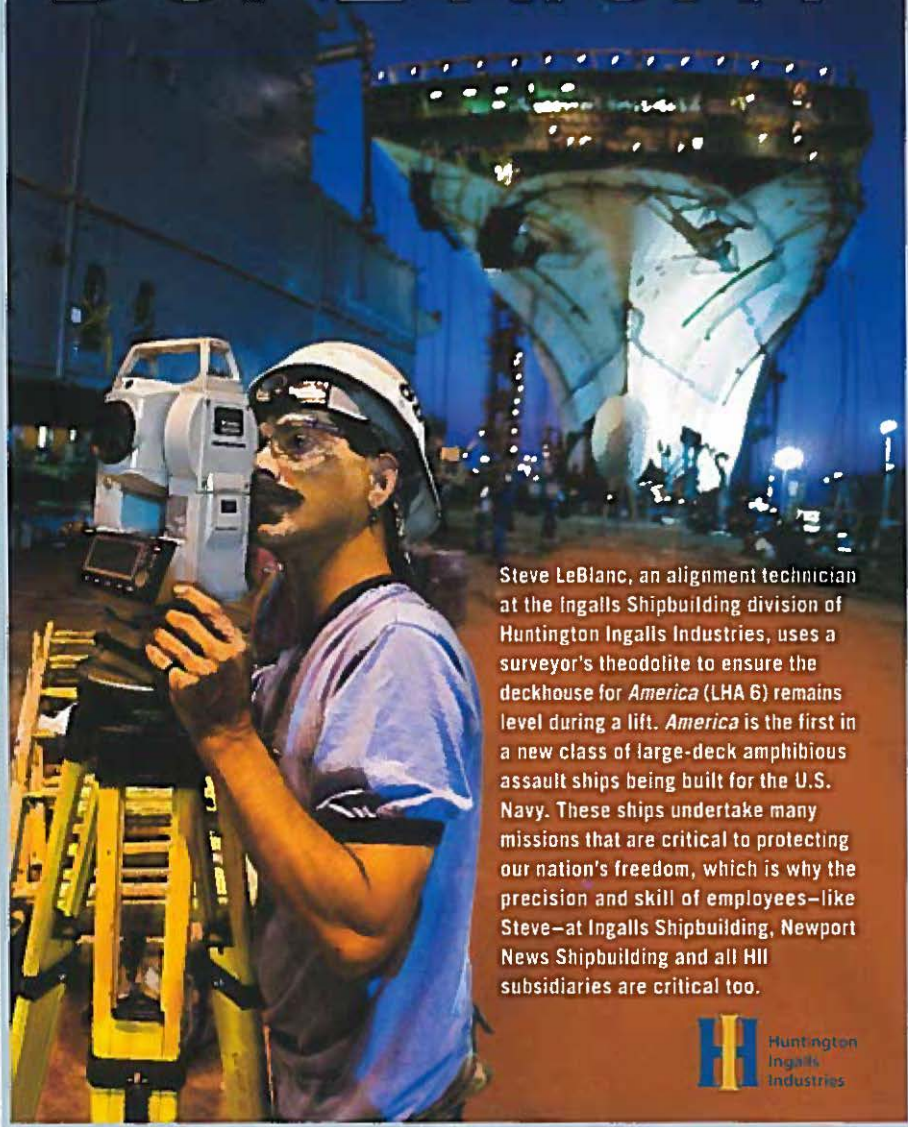
HARD STUFF
DONE RIGHT



Steve LeBlanc, an alignment technician at the Ingalls Shipbuilding division of Huntington Ingalls Industries, uses a surveyor's theodolite to ensure the deckhouse for *America* (LHA 6) remains level during a lift. *America* is the first in a new class of large-deck amphibious assault ships being built for the U.S. Navy. These ships undertake many missions that are critical to protecting our nation's freedom, which is why the precision and skill of employees–like Steve–at Ingalls Shipbuilding, Newport News Shipbuilding and all HII subsidiaries are critical too.

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PREPARING FOR TODAY'S UNDERSEA WARFARE

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Undersea warriors must learn from the past while handling a sophisticated network of manned and unmanned platforms and sensors.

As we draw down our land forces in Iraq and Afghanistan, there is renewed awareness that the United States is a maritime nation. Our fortune has been inextricably linked to our Navy since the nation's birth. The bicentennial commemorations of the War of 1812 in many ways reflect this connection. Perhaps the most conclusive outcome of that war was that the United States was not going to be re-assimilated into the United Kingdom—and its fledgling but bold Navy was a decisive factor.

In the May 2012 issue of *Proceedings*, Under Secretary of the Navy Robert Work provided a compelling interpretation of President Barack Obama and Secretary of Defense Leon Panetta's recently issued *Sustaining U.S. Global Leadership: Priorities for 21st Century Defense*. Work sees it as a blueprint for "a Naval

Century: a new golden age of American sea power." His article provides a sweeping vision of the way ahead into this era as a natural, fully executable continuation of our nation's maritime trajectory.

Now, no navigator worth his salt sails nonchalantly into unknown waters. Even the submarine ace Commander Dudley W. *Mush* Morton, who had a reputation for recklessness, used a blown-up almanac map as a very rough chart when he and the crew of USS WAHOO (SS-238) daringly penetrated Wewak Harbor submerged in broad daylight.[1] As we set sail into this Naval Century, we're in far better shape. To guide our course, Chief of Naval Operations Admiral Jonathan Greenert has provided definitive guidance in his *Sailing Directions and Navigation Plan*. Together, these two documents provide an exposition of his three tenets—Warfighting First, Operate Forward, Be Ready—from the strategic-operational level down to budget-submission priorities.

No naval professional can read the under secretary's article and the CNO's guidance without hearing the general alarm: It's time to move out smartly. These documents constitute a clear call for action that finds the balancing point between our new resources and our new goals. For undersea warriors, the President's *Sustaining U.S. Global Leadership* and the CNO's two documents are sobering, amplifying our historic role of controlling the global commons on the seas while facilitating naval and joint-force access. A few excerpts illustrate the pivotal role that undersea forces must play in the future security environment (italics added):

Sustaining U.S. Global Leadership: The Blueprint

• The U.S. military will invest as required to ensure its ability to operate effectively in anti-access and area-denial (A2/AD) environments. This will include implementing the Joint Operational Access Concept, *sustaining our undersea capabilities*, developing a new stealth bomber, improving missile defenses, and continuing efforts to enhance the resiliency and effectiveness of critical space-based capabilities.

• *Maintain a Safe, Secure, and Effective Nuclear Deterrent.* As long as nuclear weapons remain in existence, the United States will maintain a safe, secure, and effective arsenal.

Guidance from the CNO

From *Sailing Directions*:

• The Navy will continue to dominate the undersea domain using a network of sensors and platforms—with expanded reach and persistence from unmanned autonomous systems.

And from *Navigation Plan*:

• Increase near-term mine warfare capability with . . . unmanned underwater vehicles (UUVs) for shallow and bottom-mine detection.

• Build proven ships and aircraft: Arleigh Burke– class destroyers, San Antonio–class amphibious ships, Virginia-class submarines, MH-60 R/S helicopters, F/A-18 Super Hornets, E/A-18 Growlers, and E-2D Hawkeyes.

• Improve the reach of today's platforms through new payloads of more capable weapons, sensors, and unmanned vehicles to include . . . submarine-launched conventional strike weapon.

• Continue to dominate the undersea environment with a combination of Virginia-class submarines, Virginia-class payload modules, improved torpedoes such as the Mk 54 lightweight torpedo and P-8A high-altitude ASW weapon capability, and large displacement UUV.

• Maintain credible and survivable strategic deterrence; develop SSBN(X) as the Ohio-class replacement while maintaining today's number of available SSBNs.

• Improve ASW sensor reliability and performance, including towed-array maintenance and modernization

• Increase the inventory of decoys, sonobuoys, and torpedoes for Fleet ASW training.

• Sustain Fleet Synthetic Training to provide a wider range of complex and demanding simulations than possible in the field, while conserving operating expenses where appropriate.

The Navy's Submarine Force leaders have been focused on the responsibilities posed by the new security environment. On 20 July 2011, the anniversary of the first launch of a Polaris missile from USS GEORGE WASHINGTON (SSBN-598) in 1960, the *Design for Undersea Warfare* was promulgated to address today's challenges. It was structured along three lines of effort: Operations and Warfighting, Ready Forces, and Future Forces.

This went far to align our capabilities in support of achieving tangible goals, and to guide the undersea force's activities to maintain superiority in that domain. As we begin the process of updating the design in light of the new strategic guidance, we can use lessons of the past to navigate the waters of the future. And as we undertake this responsibility to execute our higher commander's guidance it becomes apparent that we are at the dawn of a fourth generation of undersea warfare.

Generation I: The Basics

The first undersea-warfare generation focused on designing a submarine that could succeed as a viable warship. The rapid change in submarine technology during this era is reflected in the career of Fleet Admiral Chester Nimitz, who commanded USS PLUNGER (SS-2) as an ensign in 1909. PLUNGER was a small seven-man submarine that could go only 8.5 knots on the surface, stay submerged for 4 hours at slow speed, and carry two torpedoes. Thirty-two years later, as a four-star admiral, Nimitz assumed command of the Pacific Fleet on board the 70-man submarine GRAYLIN (SS-209), which could go 21 knots on the surface, stay submerged for 48 hours at two knots, and carry 24 torpedoes.[2]

Throughout much of the first generation, submarine operations, tactics, training, characteristics, design, and construction were dictated by the requirements of War Plan Orange, the U.S. Navy's strategy for its most likely adversary, Japan. It charged the Submarine Force with supporting the U.S. Fleet as it sailed into the western Pacific Ocean to conduct an island-hopping campaign that would ultimately lead to the blockade of Japan.[3] To support the plan, the Submarine Force identified two primary

missions: operating independently in enemy waters in place of aircraft and surface ships, and as a scout ahead of the fleet, or as a naval skirmisher to soften up the enemy fleet before the surface fleet engaged.[4] To accomplish these missions, the ideal *fleet submarine* required long range, high surface speed, and sufficient weaponry.[5]

Unfortunately, based on an unrealistically conservative assessment of adversary antisubmarine capabilities, the Submarine Force prepared for combat with canned training exercises in which potential targets zigzagged while under heavy protection by extremely alert aircraft and surface vessels. To avoid detection (and criticism from their superiors) in these challenging scenarios, submarine commanders developed tactics to operate slowly, remain below 125 feet, and rely on passive sonar for an attack.[6]

Within five hours of the attack on Pearl Harbor, the strategic rationale that underpinned the fleet submarine's design and doctrine was jettisoned when CNO Admiral Harold R. Stark ordered unrestricted submarine warfare against Japan. No longer able to scout ahead of the sunken battle fleet, the Submarine Force instead sailed out to commence warfare and conduct operations independent of the Fleet. Entering the war largely unprepared for the mission that faced them, while remaining innovative and persistent, these submariners defined the second generation of undersea warfare.[7]

Generation II: Warfighting Sea Legs

Nimitz said of the World War II Pacific Fleet: "It was to the Submarine Force that I looked to carry the load until our great industrial activity could produce the weapons we so sorely needed to carry the war to the enemy." The story of the successful U.S. submarine campaign against Japan has been chronicled many times and need not be discussed in detail. Although fleet submarines were not designed for commerce raiding, their characteristics made them perfect commerce raiders in a warfighting domain defined by the broad geography of the western and South Pacific. It's also important to note that although the primary mission of the World War II Submarine Force was

commerce interdiction, subs proved exceptionally versatile, sinking a lion's share of the Japanese Navy, landing commandos in the South Pacific, conducting photo reconnaissance of beaches for amphibious landings, and acting as lifeguards for downed naval aviators.[8]

This warfighting environment required a shift in tactics and training, accompanied by a similar change in commanding officers. Within three years the age of the youngest U.S. submarine commanders dropped by a decade, and younger officers boldly charged into situations that leaders would never have countenanced before the war. As a result, and after overcoming significant difficulties with inappropriate tactics and malfunctioning torpedoes, U.S. submarines sank 55 percent of all Japanese ships.[9]

A great deal of the success in Generation II was due to the technical excellence of the U.S. Submarine Force's industrial base—a quality that continues today. During Generation I, there were many shipbuilders and different *classes* of submarine, as the daring inventors and operators drove to develop a vessel that could be used as a warship. The motivation that guided the development of the fleet boat was to prove obsolete after the attack on Pearl Harbor, as noted previously, but the innate benefits of speed, endurance, stealth, and payload proved supremely useful when the mission switched to commerce raiding.

While doctrine, leadership, and torpedo development all needed major revisions to become effective, the basic fleet boat, first the Tambor and then the Gato and Balao classes, was largely the same basic design; no major revolutionary changes occurred from one class to the next. What *did* happen was a steady evolutionary pace of advancement, both between successive classes but also, importantly, within a given class.

Comparison of any fleet boat at the war's beginning with one in 1945 makes clear the warfighting impact of evolutionary upgrades in weapons (guns and eventually torpedoes), radios, and sensors—particularly the SJ Radar, which enabled the *end around* tactic against enemy shipping, in which a sub could determine the course and speed of a target from ranges over the horizon and out

of visible range, while remaining undetected on the surface. There, faster speed enabled the crew to take a position ahead of the target, submerge on its track, and wait for it to come toward the attack. Innovative advances such as these made new tactics possible and served to keep the enemy off balance throughout the war. The evolutionary approach to advancement continues today: Los Angeles–class submarines for years have benefited from the Advanced Rapid COTS Insertion (ARCI) model that leverages commercial technologies to keep sensors, processors, and software paced with industry's advances. This has resulted in significant warfighting-capability gains and equally important cost avoidance. The approach of evolutionary innovation and improvement within a submarine class has become fully integrated into the design of today's Generation IV Virginia-class submarine.

But the most important development of this period was that *the submariner* became truly defined. This unique sailor was a dedicated team player in a high-stakes part of the war. The Submarine Force was always all-volunteer. These service members were first subjected to intense training in Submarine School, where engineering, tactics, and survival skills were taught. Only the very best passed the test and reported to the fleet, where another challenge—submarine qualification—began.

New sailors had to learn every aspect of the boat, essentially being able to perform any job on the vessel at sea. The combination of the rigorous qualification standard, confined quarters below the sea, highly classified operations, and extreme danger formed the *Silent Service*, a tightly bound band of undersea warriors that comprised only about six percent of the Navy's people. That share is largely intact today.

These submariners were masters of innovation and creativity. Armed with deep expertise and innate intelligence and stamina that allowed for precise teamwork, they were able to outthink, outlast, and outfox the enemy. It was they, more than any other weapon in the arsenal, who were key to the Submarine Force's success. This remains true today.

At the end of World War II, the U.S. Submarine Force briefly found itself in a period of transition and drastic reductions. But the

Force went forward with the development of greater underwater propulsion power submarines, which incorporated streamlined hulls, advanced batteries, and snorkels, making possible extended submerged underways and higher underwater speeds. It was also during the late 1940s and early 1950s that the Submarine Force began the research and development of nuclear-powered and teardrop-shaped submarines, bringing about the third generation of undersea warfare.[10]

Generation III: Nuclear and ASW Strategic Deterrence

In 1992, when the strategic Submarine Force completed its 3,000th strategic-deterrent patrol (by USS TENNESSEE [SSBN-734]), General Colin Powell noted that "America's nuclear-powered ballistic-missile submarine fleet" had been largely responsible for winning the Cold War. The Submarine Force's wisdom in persevering with development was validated as the Soviet Navy's submarines became increasingly advanced and the United States fully committed to the newly established NATO. In the event of a third world war, the fate of the free nations of Europe would depend on the rapid resupply of the outnumbered NATO forces. Just as did the Germans with U-boats in World Wars I and II, the Soviets would undoubtedly attempt to interdict these convoys in the Atlantic. This threat alone justified a significant investment in antisubmarine warfare.[11] The strategic reality of the Soviet presence in Europe dictated a new mission for the U.S. Submarine Force.

Additionally, in the late 1950s, following the development of the intercontinental ballistic missile, both the U.S. and Soviet Navies feverishly worked to develop the submarine-launched ballistic missile (SLBM). With the ability to relocate almost anywhere in world and remain hidden from aerial reconnaissance, SLBMs proved to be the most survivable and reliable leg of the nuclear triad. For the U.S. Submarine Force, the rise of SLBMs reinforced the importance of antisubmarine warfare as well as creating a new mission: strategic deterrence.[12] As intelligence would eventually make clear, the primary mission of the Soviet Submarine Force was to establish secure bastions near the

homeland in which their strategic submarines could remain under way and hidden. By this means they hoped to preserve a decisive and survivable strike capability. Once this Soviet strategy was discerned, it became a primary mission of the U.S. Submarine Force to hold those Soviet SSBNs at risk.

Both antisubmarine warfare and strategic deterrence required submarines with an acoustic advantage and the ability to remain submerged for prolonged periods. After significant experimentation and innovation, the Silent Service achieved the acoustic advantage through better sonars, superior sound silencing, and an understanding of oceanography. Simultaneously, the Submarine Force harnessed the advantage of nuclear power. This meant the vessels could remain submerged indefinitely and travel immense distances at high speed, with no need to refuel or spend significant time at periscope depth for air.[13]

By the end of the Cold War, the Submarine Force had successfully performed as a credible and reliable U.S. nuclear deterrent, holding at risk the Soviet ballistic-missile Submarine Force. This achievement, in the absence of any combat evolutions that would have validated or invalidated the force's strategy, was almost unprecedented. It required "the kind of technical and doctrinal innovation which is normally considered rare in military organizations in peacetime."[14]

Much as occurred during the gradual transition between the second and third generations near the end of World War II, no sharp divide separated the third and fourth generations near the Cold War's end. Although the Soviet menace vanished almost overnight, highly capable adversaries did not disappear. The Submarine Force has had to continue to execute missions similar to those of the Cold War. Precision strike had already emerged, but it evolved and became the submarine force's primary combat mission area of the 1990s.[15]

Despite the lack of a monolithic adversary threat, the Force knew it needed to evolve its capabilities to keep pace with those of potential threats. Much as its leadership at the end of World War II embraced the potential of nuclear power and correctly chose to explore new designs and technologies, the Submarine Force at the

end of the Cold War appropriately embraced the promise of advanced computer processing and digital technology, producing a superior and effective replacement for the Los Angeles class with the Virginia. And just as the undersea challenge of the Cold War did not become fully clear until USS NAUTILUS (SSN-571) was in the water, the situation confronting Generation IV is just now becoming clear. A new security environment is taking shape, and Virginia-class submarines are joining the Fleet in growing numbers.

Generation IV: Undersea Networks

The maritime-security environment that distinguishes Generation IV is largely defined by two broad trends. One is the movement toward increasingly pervasive combat networks that combine ubiquitous intelligence, surveillance, and reconnaissance; longer-range, responsive, and precise weapons (including cyber and space weapons with near-instantaneous global reach); and increasingly high-band-width command-and-control networks to connect the ubiquitous sensors with the longer-range weapons. The other trend is the persistence of very simple weapons—groups of mines, salvos of rockets, swarms of small craft—that can impose an asymmetric cost even on an advanced force in a close-quarters fight.

The combination of these rapidly proliferating approaches permits adversaries to attack from close in or at great distance—concentrated in time and space with unprecedented precision. Consequently, our Navy's traditional standoff ranges have become less and less protective. More than ever, it is easy to be *seen*, which can lead to being targeted and, increasingly, hit. These trends combine in ways that are tailored to the user, to produce a uniquely designed system of systems that can deny access to an area altogether, or can severely limit freedom of action within an area—an A2/AD network.

The implications for undersea warfare are far-reaching. Just as in World War II, our missions in the A2/AD environment will pertain to operating in increasingly large areas of the maritime domain where non-stealthy forces are more vulnerable to attack.

While many forces will be working to fight from the *outside in*, undersea forces will fight from the *inside out*, working closely with other low-profile forces (such as stealth aircraft and special-operations forces) within the A2/AD radius, to create chaos and disruption for the enemy and opportunities for our joint force. These operations will be focused on using the stealth, endurance, and payload of undersea forces to exercise freedom of maneuver inside an aggressor's network barriers and enable access for the rest of the Navy and joint force. In other words, networked undersea forces will act as a key to unlock the door for decisive force to enter the fight and seize and maintain the initiative.

Not a Moment to Lose

As the saying goes, "If you want a new idea, read an old book." As we work to expand the concept from Submarine Force to undersea forces—networked manned and unmanned platforms and sensors—to achieve decisive effect in Generation IV, it is instructive to remember successes from past generations. We must do this with some urgency.

As a top priority, we need to replace the sea-based leg of the strategic-deterrent force. This imperative will remain as far into the future as we can see. Both *Sustaining U.S. Global Leadership* and the *Navigation Plan* call out this requirement. We need to get the design right, fully considerate of affordability, and we need to execute within cost and schedule. But we must also be mindful that we cannot afford to build the undersea version of the B-18 bomber. This aircraft—designed, purchased, and built during the Depression in the 1930s—proved almost useless on delivery. It was deficient in range, speed, bomb load, and defensive capability. The submarine class that replaces the current Ohio-class SSBNs potentially will be in service until the 2080s, and we must get it right the first time for the critical and challenging mission it will execute.

Other areas in which the undersea forces should look for lessons from the past include communications security and payloads. The need for the former is hardly a new concept to the Submarine Force. Indeed, the lack of communications security

doomed German efforts to win the Battle of the Atlantic in World War II. Despite a popular narrative to the contrary, Grand Admiral Karl Dönitz's Wolfpack strategy required significant ship-to-shore trans- missions, which allowed Allied escorts to localize U-boat positions with high-frequency direction finding and also to outflank the boats' positions once the Enigma codes had been broken.[16]

But it is an oversimplification to merely turn off radios and operate in EMCON. The need for communications security is in direct tension with a network, which it will take to defeat the A2/AD networks we confront. Prioritized, secure communications techniques are an imperative. So too is developing a cadre of leaders, from the strategic to tactical level, who can craft and employ effective mission-type orders that do not rely on continuous high-bandwidth comms, but succeed by promulgating thoughtful commander's guidance that allows subordinate commanders to take advantage of local opportunities, advance the campaign, and provide feedback.

Strike warfare is an excellent example of this tension. Currently, strike from a submarine requires extensive radio communications, with multiple masts exposed out of the water. Although this was not a significant vulnerability against low-end enemies, it will be fatal against high-end adversaries whose drones are continuously searching to sight periscopes or masts and whose shore-side or space-based antennae are scanning all radio frequencies and locating the transmitters. Consequently, before we consider conducting strike warfare or cyber warfare inside an advanced A2/AD network, we must simplify and minimize communications, provide more independence to commanders, and research and develop new technologies that will permit less-vulnerable communications with our undersea forces, even when they are deep.

Winning inside an A2/AD network will also require us to update our weapons and payload inventory. Right now our submarines carry a mixture of Mk 48 Advanced Capability (ADCAP) torpedoes and Tomahawk land-attack missiles (TLAMs). Although ADCAP was originally designed to destroy

high-speed, deep-diving Soviet Alfa-class titanium-hulled submarines, a program of ongoing evolutionary enhancements has enabled it to remain effective against a broad range of ship and submarine threats.[17] However, it is still a single heavyweight acoustic homing torpedo, and limitations in range and ability to treat diversifying undersea targets must be addressed.

Similarly, although the TLAM has been an evolutionary workhorse in precision strike, it may not have the range or hold the punch necessary to disable targets in a modern, fortressed battle network. As we update our various categories of undersea payloads to address the broader array of targets we need to hold at risk, and as we anticipate the implications of a smaller undersea force, we need to plan for the necessary changes in the undersea payload volume on our newest attack submarines.

Meet the New Realities

Finally, we need to renew our studies about how to optimally employ limited undersea assets. Admittedly, it would be great if we had the luxury to pick and choose missions that we will no longer execute. But the enemy gets a vote. Today's strategic environment is like a game of three- or four-player chess—in a battlespace consisting of geographic, oceanographic/acoustic, and, increasingly, cyber/information layers. In our current fiscally tight environment, we must look to increase the flexibility and capacity of the submerged payload, then prioritize limited available undersea assets and deploy them where they are most needed. This requires full teaming of submarines with land, surface, and air forces to launch, employ, and recover undersea payloads when it is optimum for them to do so. Undersea forces must expand and enhance the impact of the current Submarine Force.

Once again, this experience is not new. Our predecessors—even in the first generation, during the fiscally lean decades of the 1920s and 1930s—held numerous conferences and studiously analyzed the results of war games at the Naval War College and Fleet Problems at sea to assess the best characteristics, tactics, and new technologies required to create the fleet submarine.[18] The

periods after World War II and the Cold War were marked by extremely creative approaches to employing new technologies.

Working with the Naval Warfare Development Command and Naval Undersea Warfare Command, today's undersea forces are conducting war games and seminars to identify concepts and technologies that should be researched and possibly developed. Among some of the exciting capabilities with which we are forging ahead are UUVs (including armed), cyber-warfare, and soft-kill technologies. We are working to ensure that we do not repeat the painful experience of Generation II, when we were a force unprepared for the conflict that arrived on our door-step. In future warfare, it is unlikely we will have the time to *regroup* that we had at the beginning of World War II.

The President, Secretary of Defense, and CNO have given us clear direction and a call to action. As the character of Generation IV of undersea warfare becomes clear, the concepts, technologies, and, most important, dedicated and adaptive people must deliver against the challenges of the new security environment. Just as our past generations of undersea warriors were courageous in adversity and relentless in their pursuit of new opportunities, we fourth- generation undersea warriors must be bold and visionary. It's time to get under way, rig for dive, and submerge ourselves in meeting the new realities of this era.

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SUBMARINE OPERATIONS IN THE MEDITERRANEAN THEATER

Presented by
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London, England

Last month, in Naples, Italy, where I'm located for my job as Submarine Group EIGHT and Commander Submarines, Allied Naval Forces South, we held a change of command ceremony for Admiral Sam Locklear, the outgoing Commander of Joint Forces Command Naples, and the Commander of U.S. Naval Forces Europe and Africa. Several speakers lauded Admiral Locklear for his leadership and vision throughout his tour, but some of the highest praise came from Admiral Jim Stavridis, the Supreme Allied Commander Europe and the Commander of U.S. European Command, who called to mind Admiral Locklear's leadership in a time of crisis:

"*Libya*... was the ultimate *unexpected* event – we pivoted from a coalition of the willing...to an Alliance operation...and led 13 NATO and Arab nations, and European partners. And the effect that I would draw to mind is that this operation saved tens of thousands of lives."

Back in October of 2011, as Major Combat Operations in Libya were ending, Secretary of Defense Leon Panetta was joined by Admiral Stavridis, when he visited Naples. Even at the eleventh hour of the campaign, some of the worst fighting continued in Misrata.

Admiral Stavridis remarked and I paraphrase: *Someday, someone will write the story of Misrata in the context of a modern-day Stalingrad.*

He was referring, of course, to the largest battle on the Eastern Front during World War Two, which is remembered for brutality and high numbers of civilian casualties. So history will tell this story and others related to the Libya campaign.

Now this campaign in Libya kicked off one year ago this month. On Monday, I received an unclassified message from General Carter Ham, U.S. Army, Commander USAFRICOM. He wrote to each of his warfare commanders and asked that we reflect back on the date of 19 March 2011 with great pride. He said:

> *"Thankfully, we'll never really know what would have happened if you didn't plan, coordinate, and conduct an amazingly swift and effective campaign to stop the Ghaddafi regime's forces from attacking the people of Benghazi. But there's no doubt whatsoever in my mind that there are countless Libyan men, women, and children who are alive today because of you.*
>
> *There are lots of things that I am proud of that have occurred over the 37 years of my service. None make me prouder than to have been associated with you and the great women and men of ODYSSEY DAWN."*

Countless Libyan lives saved and a nation given its natural right to self determination…

Ladies and gentlemen, I am here today to tell you the critical role that submarines and submariners played in this successful operation.

Our-well earned moniker of being the *Silent Service* has less to do with our stealth, and more to about our reticence to brag about our people and our magnificent submarines.

So…inviting a Submariner to tell sea stories in a public forum is normally pretty boring…but as I mentioned, today is an exception…given the nature and transparency of the Libya operation, there is enough unclassified information available to highlight the outstanding work of the Submarines and Submariners in the Mediterranean theater.

In the United States Navy, we have enjoyed 112 years of successful submarining.

Our legacy can be traced back to 1899 when USS HOLLAND, the first commissioned submarine in the U.S. Navy, set sail from New Suffolk, New York. Six other Holland Torpedo Boat Company submarines were based in New Suffolk between 1899 and 1905 prompting the hamlet to claim to be the *First Submarine Base* in the United States.

USS HOLLAND was just a beginning and a far cry from the incredible nuclear powered submarines that we sail today.

It was their *stealth, precision firepower, incredible payload, exquisite sensor packages, and long dwell time* that enabled a successful jump-start in the Libya campaign.

So let the story begin…

It was just over a year ago – March 17 to be precise – that the International Community's patience with Moammar Ghaddafi had run out.

The United Nations had given the Libyan regime two weeks to comply with Security Council Resolution #1970, which essentially called for compliance with existing international humanitarian law.

As we know, Ghaddafi was less than compliant and the United Nations Security Council imposed a ban on all flights in Libya's airspace—a No-Fly Zone—and tightened sanctions on the Ghaddafi regime and its supporters… Innocent civilians were being murdered.

By passing Resolution 1973, the Council authorized member nations to take all necessary measures to protect those civilians under threat of attack in the country.

And so, the UN's policy had grown teeth in just two weeks...but how did we get there?

This story is bigger than Libya... It is the story of the *Arab Spring*. The tipping point was three months earlier in Tunisia, and involved a 26-year-old destitute fruit and vegetable merchant named Mohamed Bouazizi.

In hindsight, the Al Jazeera English news organization reports that Bouazizi had been regularly abused by the police in his hometown his whole life. They had confiscated his produce and fined him for not having a permit—leaving him no way to support himself.

On December 17, the abuse had finally become too much. Left with what he thought was nothing to lose, he doused himself in gasoline and set himself on fire to bring attention to the corruption.

He did something much greater, by putting in motion a series of events that history will remember as *The Arab Spring*.

This singular event mobilized the masses in Tunisia and then energized popular movements throughout Northern Africa and the Middle East. One by one, regimes changed...Tunisia ... Egypt...and then...surprisingly to a revolution in an autocratic Libya.

As Libya rapidly descended into chaos, Ghaddafi's forces turned to extreme violence, killing large numbers of civilians in an attempt to quash a revolution. Arab and European leaders were horrified by the prospect of massive bloodshed and the failure of diplomatic overtures to constrain the Ghaddafi regime.

In response, the United Nations Security Council adopted Resolution #1973 and President Barack Obama offered "U.S. unique capabilities" to support the United Nations Security Council mandated efforts to both protect the Libyan people and to impose an arms blockade on Libyan forces.

General Carter Ham, the Commander of U.S. Africa Command, was assigned the *civilian protect mission*, and he, in turn,

designated Admiral Sam Locklear to be the Joint Task Force Commander for Operation ODYSSEY DAWN.

It is safe to say that the rapidity with which The Arab Spring manifested itself in North Africa caught many in the West by surprise.

Many pundits have capitalized on our sense of surprise at the onset of the Arab Spring, but my story today does not articulate shortfalls in intelligence, but rather recognizes our strengths and credits the *agility* of our forces afloat.

We know that the World is filled with uncertainty—and we strive to be ready for every contingency. Even after the breakup of the Soviet Union and the end of the Cold War, the European theater of operations has maintained a steady operational drumbeat.

With competing requirements in the Arabian Gulf and Pacific Theaters of operation, many naval assets in the European theater are on a *transit* or *rotational-based presence.*

When Admiral Locklear reviewed the assets available to him for the Libya mission, besides his command ship, USS MOUNT WHITNEY, additional naval forces in theater were dispersed with other tasking. Out went a *call for fire…*

That's where the Submarine Force comes in… As these events were unfolding, Captain Tom Calabrese and his GOLD crew had just taken charge of the guided-missile submarine USS FLORIDA. At this point, FLORIDA, homported in Kings Bay, Georgia, had already been deployed for over a year.

The SSGNs came to fruition when four extremely capable ballistic missile platforms were retired from strategic service as a result of arms control treaties with the former Soviet Union.

Rather than scrap them, we were able to adapt the OHIO-class submarines and 22 of 24 missile tubes into vertical launching systems with multiple all-up-round canisters. FLORIDA, like three other SSGNs, has the capability to launch up to 154 Tomahawk Land Attack Missiles and still has two tubes modified to support special operation forces. Talk about a force multiplier!

For context, an SSGN with a full load-out has about the same strike capacity as an entire carrier battle group—and that is pretty awesome!

But, it doesn't stop there. To complement her firepower, FLORIDA has a robust onboard command and control suite, which allows for unique multi-mission options. All of these features would come into play as the situation rapidly deteriorated.

Now, I want to be clear that every submarine is really a multi-mission platform. Any fast-attack or guided-missile submarine brings the unique capabilities of covert surveillance and intelligence collection, covert special operations, covert precision strike, covert mining and countermining, and covert anti-submarine operations to the fight.

Often times we prepare for all of these missions but may not know which one or ones we'll be called to execute on a given deployment.

FLORIDA's strike capability is impressive, but it is certainly not a new concept. In fact, as I was preparing for this presentation, I came across an article Rear Admiral Dietrich Kuhlmann wrote when he was on the staff of Commander, Submarine Forces back in 2000 titled *Submarine Strike Comes of Age.*

It was really quite visionary considering it was written in the relative peace prior to the attacks on 9/11. Covering submarine strike warfare spanning from Operation DESERT STORM in 1991 to Operations DESERT FOX and NOBLE ANVIL in 1999, he thought we had reached the height of strike capability.

For example, Operation DESERT STORM was the first employment of the Tomahawk Land Attack Missile. The Tomahawk is a subsonic, all-weather, land attack cruise missile with a range of about 600 nautical miles—a real workhorse.

In DESERT STORM, two fast-attack submarines, USS LOUISVILLE and USS PITTSBURGH, launched a total of 12 missiles, this came out to ***four percent*** of the total strike missions. ***Remember that number please!***

Command and control, communications, and water space management made employment of submarines in this new role

very challenging. However, thanks to guys like Jim Patton, we made great strides through the '90's.

By 1998, we reached a new level of performance. USS MIAMI demonstrated that submarines were capable of not just striking from anywhere, but also seemingly from everywhere.

She became the first ship *of any class* to launch missiles in *two* theaters in *one* deployment. MIAMI launched most of her inventory in the Arabian Gulf during DESERT FOX, a four-day bombing campaign against Iraq.

After a brief in-theater reload, MIAMI headed for the Adriatic to support the 1999 NATO bombing campaign of the Kosovo War known as Operation NOBLE ANVIL. Now during NOBLE ANVIL, 25 percent of all the Tomahawks were launched from both U.S. and Allied submarines.

From 4 percent to 25 percent in less than a decade is an impressive trend—but you'll see, we continued to improve—making submarines one of the nation's most responsive and reliable land-attack assets. And, I do have something to add to Admiral Kuhlmann's timeline.

He began his trend analysis in 1991, but if you look a bit further back in the U.S. Navy's history, you'll find that submarine Sailors actually began launching guided missiles during World War Two.

In fact, the first submariner to launch missiles from a submarine in combat was the noted tactical pioneer and American hero Rear Admiral Eugene Fluckey.

Then-Commander Fluckey was frustrated with the limitations and design flaws of torpedoes that plagued the Submarine Force in those early days of the Second World War. So... necessity being the mother of tactical invention... Fluckey mounted a rocket launcher on his submarine, USS BARB.

After sneaking in to the harbor of Shari, Japan, on June 22, 1945, Fluckey launched 12 of what he called *ballistic missiles* into a Japanese mining and lumber town, setting it ablaze, earning a place in submarine history, and creating a new role for the submarine.

Strike warfare has long held a place in the multi-mission capabilities of the submarine, but it wasn't the first thing on the minds of the FLORIDA crew.

Again, while the Arab Spring was unfolding, FLORIDA was busy preparing for her voyage home and a welcomed maintenance period after 13 months at sea.

The crew was scheduled to conduct several high-visibility Theater Security Cooperation events in the Mediterranean, to include a V.I.P. cruise out of Naples, Italy, and a final port visit in Gibraltar, Spain, before returning to the United States.

But, fate had something else in store for FLORIDA.

While in The SIXTH Fleet area of responsibility, FLORIDA's presence was a windfall to our strike planners, and this is exactly what she was made for! To the planners, furiously responding to the developments on the ground in Libya, the SSGN provided the most capable platform with which to establish the conditions necessary to enforce the No-Fly Zone.

With a strike mission as prime tasking, her Theater Security Cooperation missions were deferred and FLORIDA was directed to the newly-established Joint Operating Area or "JOA" for the foreseeable future. And she would not be alone...

Far to the north, USS SCRANTON, a Los-Angeles class fast-attack submarine was conducting a port visit here in the UK in Portsmouth.

With five months left in a six-month deployment, the submarine and her crew were at peak efficiency. I personally called Commander Paul Whitescarver and told him there'd been a change of plans. I directed SCRANTON to make a left turn when leaving Portsmouth and to make best speed for the Straits of Gibraltar and join the FLORIDA in the Joint Operating Area.

USS PROVIDENCE was transiting home following a deployment to U.S. FIFTH Fleet, and she too had a change of plans.

We rerouted her to the Joint Operating Area as well, giving us a third strike platform.

We continued to prepare for the worst case scenario, while hoping for the best. The conditions in Libya continued to worsen, but there was always hope for a political solution.

Meanwhile, submarines, with their inherent stealth, were the platform of choice to operate off-shore. From their vantage point, they were able to collect the information necessary to assess the rapidly changing conditions on the ground, evaluate the maritime environment and assist the planners as they developed courses of action for the Joint Task Force Commander.

Invisible to those on shore, our submarines operated freely… they were on scene, but unseen. They required no force protection; the regime's anti-ship missile systems posed no threat to our stealth platforms.

Additionally, with the enhanced communications capabilities, our submarines had nearly unlimited access to all of the fleet's resources and the Commanding Officers had consistent access to the Commander's Decision Cycle—a rather new and unique capability for a vessel typically considered encumbered in the silent service.

As violence against civilians continued and regime armored elements converged upon the besieged city of Benghazi, the international community decided to act to prevent an impending genocide.

Admiral Locklear directed operations to enforce the Security Council resolutions, the first of which was to establish a No-Fly Zone.

Then-Secretary of Defense Robert Gates laid out the ramifications of doing so, in no uncertain terms during his testimony to Congress in early March: "Let's just call a spade a spade," he said. "A No-Fly Zone begins with an attack on Libya to destroy the air defenses."

Innocent civilians were dying… time was of the essence.

Major combat operations commenced on the evening of March 19, with USS PROVIDENCE, USS SCRANTON, HMS TRIUMPH, and the surface ships USS BARRY and USS STOUT,

joining USS FLORIDA in the combined strike against Ghaddafi's air defense network. Over 120 Tomahawk Land Attack Missiles were launched that first night.

By daybreak, the coalition succeeded in defeating Ghaddafi's Integrated Air Defense Systems, setting the conditions for uncontested dominance of the skies over Libya – the No-Fly Zone was established.

By the termination of combat operations, FLORIDA had launched over 90 Tomahawks in the impressive first-ever employment of the SSGN in its strike role. Overall, submarines launched over ***50 percent*** of the Tomahawks fired in support of the precision strike mission. So in only two decades, we move from 4 to 25 to 50 percent of strike ops ashore.

And remember, strike was not the primary mission assigned to any of these submarines when they deployed, but their agility—their expert preparation and their flawless execution—were crucial to achieving the Joint Task Force Commander's mission.

Tasking complete, FLORIDA and her crew returned home to Kings Bay, Georgia, safely concluding the submarine's 14.5-month overseas deployment.

It was truly a testament to the work of the whole FLORIDA team—both crews, as well as the maintenance and oversight teams, that the she was able to flawlessly execute the mission after more than a year away from home port. It is also a testament to the unique capability the SSGN brings to the combatant commander, a capability clearly required in a world where you can't always predict the location and nature of the next conflict.

Operation ODYSSEY DAWN showcased the intelligence, surveillance, reconnaissance, and strike capabilities of our submarines, particularly the SSGN. But the submarine contribution didn't end there.

As we transitioned to NATO's Operation UNIFIED PROTECTOR, we were joined in the Joint Operating Area by submarines of many of the nations who make up the NATO command, Allied Submarines South—all supporting both the No-Fly Zone and embargo missions.

Their teamwork enabled an average of 3.4 of these submarines on station throughout UNIFIED PROTECTOR, and over 25 submarine-months of surveillance provided.

This is impressive not just from the perspective of the submarines, but also the coordination and efforts by the watchstanders at the U.S. SIXTH Fleet and Maritime Command Naples' Maritime Operation Centers who handled the challenging task of water space management.

Strike was certainly the most visible contribution by our submarines, but there were some other remarkable capabilities demonstrated by submarines in the Joint Operating Area—while I can't go into the operational details of the missions, I can tell you that it was a submarine, in an intelligence, surveillance, and reconnaissance role, that provided the initial reports that Gaddafi's military was attempting to lay mines in the maritime approaches to Misrata.

Without that submarine's cueing, the first indication of the mining effort might have been the loss of one of the international relief vessels attempting to access the beleaguered city.

Submarines also provided the cueing that enabled our aviation partners to conduct the first-ever engagement of a hostile surface vessel with a P-3 launched Maverick missile.

Operation ODYSSEY DAWN left us with lessons learned at many levels and the inevitable question is: "Where do we go from here?"

Instability and uncertainty are likely the new normal, leaving us with not-so-clear mission to be ready for everything. We do know that we must be on station and ready when the crisis breaks.

We must continue to provide the full range of options from covert operations in peacetime to decisive firepower in wartime, all from under the sea.

Recently, Vice Admiral John Richardson, Commander of the U.S. Submarine Force unveiled the Design for Undersea Warfare—the strategy of how we intend to maintain our posture in the undersea domain—a charted course to follow into the future. Admiral Richardson draws three lines-of-effort: maintain ready

forces... *effectively employ* our forces...and most relevant to this part of the presentation, develop future force capabilities.

In the coming years, I expect to see unmanned systems play a growing role in the undersea environment. The U.S. Navy has already incorporated the Fire Scout and Scan Eagle unmanned aerial systems. Unmanned Aerial Vehicles or UAVs can provide the submarine with an external reconnaissance system that greatly improves its strike, Special Forces, and surveillance and intelligence missions.

Unmanned Undersea Vehicles or UUVs will harness new and emerging technology to build upon our existing undersea strengths of stealth, agility, endurance and global reach.

This technology already exists—our task is to incorporate Command and Control for the Unmanned Aerial Vehicles and organic Unmanned Undersea Vehicles into our submarines.

In February, NATO hosted Exercise Proud Manta, their largest Anti-Submarine Warfare live exercise, in the Mediterranean, and I saw first-hand the NATO Undersea Research Center's (NURC) gliders and Autonomous Unmanned Undersea Vehicles —and the advancements being made to incorporate this new and impressive technology into today's maritime operations. You'll have to hear more about this from NURC Director, Dr. John Potter.

As far as baseline platforms are concerned, ten years ago, the Submarine Force had the foresight to develop and employ the highly capable SSGN. And now we can clearly see its value.

Unfortunately, the lifespan of the SSGN platform is limited and we're left to decide how to fill the void as the four guided-missile submarines retire in the next fifteen years. One potential solution being considered right now is a modification of VIRGINIA-class submarines.

By installing the proposed VIRGINIA Payload Module, these later submarines could have *flexible* compartments configurable for strike systems—and while no single submarine would have the weapons density afforded by the SSGN, the number of platforms proposed could make up for that capability and gap.

I've spoken at length about our Sailors and their submarines, but I have not spent as much time as I would have liked on the importance of the European Region.

And as for what the future holds, this theater is as important as ever.

Admiral Jonathan Greenert, our new Chief of Naval Operations...and a fellow submariner... recently visited our headquarters in Naples and reaffirmed the Navy's commitment in the European region. He highlighted that soon Arleigh Burke-class guided-missile destroyers that will be forward deployed to Rota, Spain, beginning in 2014, and said the growing numbers of ships operating forward in the Mediterranean is an indication of Europe's continued significance.

Admiral Greenert assured our Sailors that the U.S. is committed to NATO and its operations and the European region is as important as it always has been to our future maritime strategy.

CONCLUSION: I am tremendously proud of the Submarine Force, with its enduring attributes of technical and military expertise... skill at employing stealth... self-sufficiency... initiative... a penchant for tactical innovation... and aggressive Warfighting tenacity.

Since Fluckey launched rockets from the deck of USS BARB and to the present day, the Submarine Force has shown the ability to preserve our collective national security interests, but more importantly, provide our leadership with options.

During Operation ODYSSEY DAWN, and continuing through Operation UNIFIED PROTECTOR, submarines demonstrated their multi-mission capability, they launched precision strikes, and that is impressive, but it doesn't show the big picture... our submarines were part of an Alliance that saved lives...thousands of lives.

Much about the future is uncertain...However, I would wager that it will hold exciting new advancements, and just as certain it will hold new threats to peace.

Whether it is the deep and cold waters of the North Atlantic, the warm waters of the Mediterranean or the shallow, congested

Arabian Gulf; whether it is peacetime or wartime; rest assured that an Allied submarine is there… ready to respond.

Thank you for your time, and I look forward to taking some questions.

BALLISTIC MISSILE DEFENSE FROM UNDER THE SEA

By Dr. Robert L. Lowell

Dr. Lowell (CAPT (Ret.)) is a 30-year submariner with operational and acquisition assignments in five SSBNs (including command of USS BENJAMIN FRANKLIN BLUE and GOLD) and program manager positions in NAVSEA and DARPA. Since retiring from the Navy in 1997, he has worked advanced technology development projects at Electric Boat Corporation including participation on the Missile Defense National Team.

The U.S. should develop and deploy a submarine-based ballistic missile defense capability that could operate close to potential threats without political provocation or risk of attack. Such a capability would impose costs on potential adversaries, increase their risk of operational failure, and bolster U.S. regional security alliances.

The Threat—Ballistic missile (BM) threats against the U.S. homeland and regionally against allies, partners and their deployed forces are becoming more flexible, mobile, survivable, reliable, and accurate, with increasing range.[1] Continued evolution by Iran and North Korea of BMs towards intercontinental BM (ICBM) ranges and repeated demonstrations of salvo launches enabling large attack raid sizes must both be considered in U.S.'s fielding a BM defense system.[2]

Currently, against limited potential ICBM threats to the homeland, the U.S. has fielded a midcourse defense capability - consisting of ground-based interceptors at Ft. Greely, Alaska and Vandenberg Air Force Base, California; land-, sea- and space-based sensors; and a global command and control, ballistic missile and communications (C2BMC) network. Alternatively, in the future with very high speed regional interceptors, a Defense Science Board study concluded that forward-based advanced regional interceptors against hostile ICBMs on trajectories towards

the U.S. could significantly improve homeland ballistic missile defense (BMD) using a "shoot-assess-shoot" concept.[3] Meanwhile, against the rapidly proliferating regional threats from short- and medium-range BMs (SRBMs and MRBMs), the U.S. is maturing a flexible BMD capability called the phase adaptive approach (PAA). PAA addresses land-based point defense using Patriot Missile batteries and area defense using Terminal High Altitude Area Defense (THAAD) and Aegis Ashore, in addition to deployable sensors for detecting and tracking ballistic missiles (e.g., AN/TPY-2 X Band Radars). However, the sea-based Aegis BMD system using Standard Missile (SM) variant interceptors are the centerpieces of this system.[4]

The Sea-Based Advantage — Sea-based platforms are sovereign U.S. assets that can exploit the in-theater maneuver space without host country permission. That flexibility and proximity to potential adversaries they can achieve, makes sea-based BMD ideal for boost-/early-ascent phase intercepts (before missile countermeasure deployment) or mid-course geometries. They can position mobile sensor platforms for tracking and classifying adversary missiles, augmenting land-based and space-based systems. In addition, they complement ongoing initiatives for regional collaborations with evolving NATO sea- and land-based BMD capability.

For these reasons, plus the availability and maturity of Aegis BMD, the U.S. selected an evolutionary four-phase PAA, using a combination of re-locatable land and sea-based systems. PAA is a more cost effective system relative to a large, fixed land-based footprint and minimizes political entanglements. A 2009 review concluded PAA was the best method for addressing the regional Iranian BMD threat in Europe. In 2011, the U.S. Missile Defense Agency (MDA) implemented Phase 1, *Initial Integrated Defense*, and achieved initial operational capability against SRBMs, MRBMs and intermediate-range BMs (IRBMs). This phase uses sea-based Aegis BMD and SM-3 Block IA interceptors. Evolution to Phase 4, *Early Intercept and Regional ICBM Defense* should complete by 2020 with airborne sensors (ABIR) or sensors in orbit

(PTSS) to detect and track hostile missiles[5], advanced discrimination technologies, advanced Aegis BMD capability (afloat and ashore), higher velocity SM-3 IIA/B interceptor missiles, and enhanced C2BMC to intercept large raids of MRBMs/ IRBMs and non-advanced ICBMs early in flight. [6,7]

The Submarine Advantage — Submarines could provide a complementary capability in the European Phased Adaptive Approach (EPAA) or in other theaters. By exploiting the large payload volume available in SSGNs or future VIRGINIA-class attack submarines (SSNs) equipped with payload modules, these submarines could conduct near simultaneous intercepts against recently launched hostile missiles (defensive capability) and strike missions (e.g., tomahawk) against launch complexes/platforms (strike capability).

Submarines could covertly, independently, persistently patrol in optimal operating areas – *sweet spots* to maximize defended area, early battle space intercepts and *shoot-assess-shoot* engagement opportunities – fulfilling two BMDS axioms: (1) Geography counts, and (2) The farther forward you attack, the more advantageous it is.[8] Surface combatants similarly located could be subject to harassment or attack. Submarine-based BMD can offer non-provocative, survivable presence in a readiness posture analogous to that of an alert SSBN. Although interceptor launches could temporarily disclose a submarine's location, submarine crews are adept at quickly recovering their stealth.

Submarines deploying with the SM-3 Block IIA could provide an *engage on remote* capability[9] to complement other PAA components. This concept was validated in April 2011 when USS O'KANE (DDG 77) used an in-service SM-3 Block IA for a *launch on remote* intercept of a modified Trident I/C-4 ballistic missile target based on non-organic detection and tracking data inputs.[10]

Significant payload capacity exists today in four SSGNs. However, these ships will retire without replacement in about 18 years. In order to maintain undersea payload capacity, the Navy is considering the insertion of payload modules into future

VIRGINIA-class SSNs. VIRGINIA Payload Modules (VPMs) would provide additional missile stows that could carry BMD interceptors, strike weapons, or unmanned vehicles[11]. This added payload capacity could accommodate more energetic interceptors to engage longer-range threats and provide greater defended area protection to the U.S. and its allies. Overall, the Navy's BMD capability would increase with more sea-based launchers and a greater depth of magazine.

Study Recommends A Submarine BMD Solution — In 2007 a joint Navy-Missile Defense Agency team conducted an alternatives assessment to differentiate between sea-mobile platforms capable of hosting the kinetic energy interceptor (KEI) system. KEI was a large, highly energetic missile planned for boost phase intercept missions. Although the KEI program was eventually cancelled, conclusions from the assessment remain relevant to new, more capable ballistic missile interceptors such as the SM-3 Block IIB.

The KEI study assessed boost, ascent, and mid-course intercept concepts. **For boost- and ascent-phase missions, converted SSBN (SSXN – retired from Trident mission and transferred to KEI mission only) was the launch platform of choice...although it could be augmented by the SSGN for increased flexibility and firepower. For mid-course intercept, SSXN was again the preferred platform,** but an optimally designed commercial containership could provide almost equal benefit at potentially less cost. Platforms considered included backfit installation on SSGN, retired SSBN, DDG-51 Flight IIA, LPD-17, a T-AKE support ship, and a new-build commercial containership. Other platforms considered but not examined included CG(X), CG-47, DDG-1000, tug-barges, oil platforms, SSNs and other older Navy combatants and amphibious ships. Multi-mission SSBNs carrying both KEI and Trident II D5 missiles were dismissed due to policy considerations. SSGN was retained for consideration due to its relative ease of missile integration and covert operational capabilities. VIRGINIA-class

attack submarines with large diameter payload tubes were not conceptualized, and therefore were not considered as alternatives.

These conclusions were based on a weighted-attribute, cost-benefit assessment and comparison of platform options. Costs included up-front development, testing, procurement, operating and support considerations. Benefits included a combination of differences in performance (BMD capability, survivability, and availability), platform suitability (development and fielding schedule, raid handling capacity, KEI component growth margin, human system factors, integration, and endurance), risk (technical, operational, programmatic, and schedule) and Navy force structure impacts (opportunity cost of performing KEI mission and other logistical support requirements, defensive escort requirements).

Technical and Operational Feasibility — To alleviate concerns about a submarine's ability to perform the BMD mission, the study focused on high-risk areas of submarine timelines for boost-phase intercept and general communications concerns with integration and operation. For the submarine conducting boost- and ascent-phase intercepts, the study answered two main questions: (1) could the boost-phase timeline be met, and (2) was the predicted availability of submarine systems sufficient to execute the KEI mission. The timeline issue was simply whether communications concepts existed (or could be developed) to ensure receipt of a conditional alert and launch command on board, and whether pre-launch operations could be conducted on the submarine within the required timeline. Submarine communications options that were investigated concluded that communications could meet the KEI requirement—to include boost-phase timelines. For the stringent boost-phase timelines, changes to the very low frequency (VLF) system were investigated and proposed by Space and Naval Warfare Command (SPAWAR). SPAWAR concluded that VLF would permit sufficient information to be transmitted to and received by the submarine to allow for KEI launch. Satellite communications (SATCOM) options were deemed viable backup paths for boost phase for cases when the

submarine was at periscope depth (PD) and were also deemed viable to support much larger data rates for the midcourse mission.

Onboard pre-launch operations were also investigated to ensure the submarine could meet a reasonable boost-phase launch timeline. For the availability question, several issues were considered: (1) whether there exist wash-over or platform motion issues with the mast/buoy/wire antenna that would substantially limit communications availability, and (2) whether platform control in high seas would substantially limit system availability. The study assumed that for boost- and ascent-phase intercepts, KEI in-flight communication (KICS) and fire control functionality (KFC) would be performed off-board the submarine ashore or aboard a surface ship.[12] That concept now embraced as *engage on remote* is scheduled to be fielded as phase 3 EPAA capability.

Midcourse considerations assessed the same timeline and system availability constraints. The study identified no critical showstoppers.[13]

But that was then, and this is now.[14] Since the study, several Submarine Force initiatives have improved the flexibility with which a submarine BMDS capability can be deployed.

- SSGNs, initially deploying in October 2007 with USS OHIO, launched multiple tomahawk cruise missiles from a single *7-pack* Multiple All up Round Canister (MAC) in a missile tube. (KEI study assumed a single interceptor per tube.) Given that SM-3 missile variants are of comparable size to a tomahawk, a significant interceptor battery could be covertly stationed in theater to engage large raids.
- Two large diameter OHIO-like missile tubes are being built into the VIRGINIA Class submarine (Block 3) bow, with designs to insert a 4-tube VIRGINIA Payload Modules (VPM) in follow on VIRGINIA Block 5. This capability will increase the payload capabilities when SSGNs are retired.

- As an alternative to encapsulated missiles, such as stealthy affordable capsule system (SACS) examined in the study, the Water Piercing Missile Launcher (WPML) could enable launch of a non-marinized missile without encapsulation costs and post-launch debris fall out concerns for the submarine.[15] The study envisioned (for a mid-course KEI intercept) the ability to erect a large diameter antenna on a retractable mast from a missile tube if required. Deployed at PD following a *bell-ringer* early warning issued by the BMDS C2BMC, this antenna would provide tracking and communications with the hostile missile/interceptor. The ability to erect/retract such large payloads from a missile tube has been demonstrated on the Universal Launch and Recovery Module.[16]

Submarine BMD Operational Concepts — Submarines conducting BMD missions would operate similarly to an SSBN on patrol. Commanders would adopt operating profiles (speed, depth, launch/fire control equipment readiness, proximity to potentially hostile surface contacts, etc.) within acceptable limits determined by the necessary response time. Without special communications antennas, the submarine would *engage on remote* with cues and external (post-launch) control by other platforms and systems tracking the threat missile(s) and tracking and communicating with the interceptor.

The submarine assigned to a BMD mission would operate in an *alert* readiness condition. It would be in continuous (receive only) communications listening for an alerting message indicating the possibility of a hostile ballistic missile launch. Upon receipt of that message, the submarine would acknowledge receipt using a towed or expendable communications buoy with transmit capability; state the submarine's readiness to launch; and specify its geographic position. It would then transition to maximum readiness posture and stand-by for a launch order.

If the alert is evaluated to be legitimate (i.e., a hostile launch), and the submarine is selected as the platform optimally positioned to engage the threat missile(s), the submarine would receive a

launch order with fire control parameters (e.g., state vector) calculated for the interceptor to engage the threat missile. This message would pass through submarine communication systems directly to the fire control and launch systems. With the submarine operating within acceptable launch parameters, launch would proceed automatically (aborted by ship's operators only by exception). The submarine would continue launching until its salvo is complete (i.e., all released interceptors deployed, hostile missiles out of range, etc.). Corrected intercept calculations and interceptor redirection would be performed by other off-board sensors/communications systems consistent with the PAA *engage on remote* concept.

With interceptor launches complete or if the submarine is not directed to launch, it maneuvers to clear datum to regain operational stealth at best speed/depth and reconfigures ship's systems consistent with maintaining required readiness levels, including maintaining continuous communications as required. The submarine could also be directed to preemptively strike other hostile missile assets or command and control facilities.

Submarine Ballistic Missile Defense Is A Cost Imposing Strategy — Adding new payloads like SM-3 variants to submarines increases their capability and imposes cost on potential adversaries. They would have to presume interceptor-equipped submarines were operating in theater and capable of intercepting missiles launched against the U.S., its deployed forces, or against regional security partners. Submarines equipped with strike weapons (e.g., tomahawk cruise missiles) could conduct counter-battery strikes or preemptively strike other hostile weapons or support systems. If potential adversaries wanted to neutralize submarine-based BMD, they would have to increase missile capabilities (velocity at burnout, deployment of countermeasures, etc.) and/or inventories significantly, or develop a credible anti-submarine warfare (ASW) force. Both options are expensive, with the latter being operationally challenging—requiring high-technology platforms and highly skilled operators.

Because of its unique operational attributes, submarines could complement the established Aegis BMD-centric PAA with access to areas hazardous to non-stealthy sea-based platforms. Submarines have established themselves as credible, combat-tested missile shooters. If armed with appropriate interceptors, they could deter aggressors, or if necessary, defeat even large hostile raids. Submarine operational responsiveness demonstrated for other missions and increased emphasis on fielding *middle ware* to quickly accommodate non-marinized payloads, continue to validate the KEI alternatives assessment conclusion that "Overall, because the submarine already launches missiles larger than KEI, the submarine integration is minor compared with some of the structural changes associated with a surface ship."[17] Submarines could make an outstanding contribution to U.S. BMD efforts as an element of the current PAA.

ENDNOTES

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RUSSIA'S FOURTH-GENERATION NUCLEAR-POWERED ATTACK SUBMARINE: A MISSILE DEFENSE NIGHTMARE – PART II

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Another missile that could potentially be carried in SEVERODVINSK's eight missile tubes would be a submarine-launched version of the Tochka-U (NATO

designation: SS-21 SCARAB) SRBM, if it is developed. The idea of deploying SS-21 short-range ballistic missiles in a submarine would also replicate plans to deploy in U.S. submarines a naval version of ATACMS. The SS-21 has a diameter of 650 mm (26 inches) and a length of 6.4 meters which would allow the missile to be fitted inside a *pressurized canister* with the dimensions of the SS-N-26 SLCM missile canister, which has a diameter of 710 mm (28 inches) and a length of 9 meters (SS-N-26 has a length of 8.9 meters).[68] Hence, each of the submarine's eight missile tubes could hold as many SS-21 as SS-N-26 could be carried, to a maximum of four missiles per launcher or just three. The Tochka-U missile has a range of 120 km, with reports that *a smaller missile* was designed with a 185 km range. It has also been suggested that with a smaller warhead the Tochka-U missile could have its range increased to 150 km.[69] Tochka-U can carry a 482 kg conventional warhead or tactical nuclear warheads with yields of 10 kilotons and 100 kilotons. The missile could be armed with *an anti-radar blast warhead* to attack radars on the ground or in ships.[70] There is reportedly a version of the SS-21 armed with an electromagnetic pulse (EMP) warhead, the Tochka-R missile, designed to attack enemy radars. This missile would fulfill one of SS-21's Cold War functions, which was to take part in the suppression of NATO enemy air defenses by targeting, for instance, the radars of Patriot SAM batteries.[71] According to Jane's, the Tochka-U SRBM has "the capability to fly depressed trajectories, and to make pre-programmed manoeuvres of up to 10 *g* during the terminal phase of flight to make interception more difficult for the defence."[72] A *Yasen/Yasen-M* class submarine could fire salvoes of SS-21 used as an anti-ship ballistic missile (ASBM) to overwhelm the defenses of a carrier battle group, probably by launching a mix of ASBM and supersonic anti-ship cruise missiles.

Currently the Pentagon has plans to deploy in the future the Prompt Global Strike vehicle in U.S. Navy submarines. The Prompt Global Strike, which could be a *hypersonic glider*, would be launched from the 87-inch launch tubes of the Virginia Payload Module, to be fitted to future *Virginia* class SSNs.[73] The

Conventional Prompt Global Strike (CPGS), *likely to be a hypersonic glider*, would be used to hit time-sensitive targets by being able to reach *anywhere on Earth in 30 to 40 minutes*.[74] It is feasible that Russia could develop a similar weapon to Prompt Global Strike, to match this future U.S. missile strike capability. The Soviet Union already developed the concept of a hypersonic strike vehicle back in 1959 in the form of the Tupolev Tu-130 *gliding strike UAV*, identified as *izdeliye 'DP.'* The *DP* vehicle, mounted on top of an intermediate-range ballistic missile, would have been lifted to a height of 80,000 meters to 100,000 meters above the earth where it would have detached itself from the missile to glide towards the target 4,000 km away at speeds of Mach 10. The Tu-130 would have been armed with a *thermo-nuclear warhead*.[75] The maximum range for the Tu-130 has been quoted also as 12,000 km.[76] The length of the final Tu-130 design was 8.8 meters and the vehicle's height was 2.2 meters.[77] If Russia develops a weapon equivalent to the Conventional Prompt Global Strike, it could also arm it with a tactical nuclear warhead, and use it in case of war against the command and control centers, radar installations, and missile batteries of the European missile defense system or of the U.S. National Missile Defense system. Such a weapon would be designed to be launched, one per missile tube, from the *Yasen* class of nuclear-powered attack and cruise missile submarines.

Yasen and *Yasen-M* class submarines are expected to be very quiet, to approach by stealth to a target and strike it with salvoes of missiles. Back in 1996 the Project 885 submarines were expected by the Office of Naval Intelligence to have been as quiet as the SEAWOLF and NSSN (*Virginia*) classes of SSN in terms of narrowband noise, produced by *specific frequencies*. It was also expected that in terms of broadband noise, that which is caused by *the submarine's overall noise levels*, the *Seawolf* and *Virginia* classes would be quieter than the *Yasen* class.[78] It may be that the SEVERODVINSK is in both narrowband and broadband as silent as the U.S. fourth-generation nuclear-powered attack submarines, and if not, that the Russian submarine KAZAN under construction and the following vessels of the *Yasen-M* class would be at least as

quiet as the U.S. Navy's fourth-generation submarines. By being very quiet SEVERODVINSK and its sister ships could approach a target undetected to deliver a devastating blow with missiles against ground-based missile defense elements, land-based air defenses, sea-based missile defense platforms, military bases, carrier battle groups, coastal industrial, energy and economic infrastructures, and cities.

In wartime the *Yasen* and *Yasen-M* class submarines would intercept NATO submarines, including nuclear-powered attack submarines (SSN), nuclear-powered ballistic missile submarines (SSBN), and nuclear-powered guided-missile submarines (SSGN) that would threaten Russia with ballistic missile or cruise missile strikes. As part of their sonar suite, the new Russian fourth-generation SSN/SSGN submarines will be equipped in the bow with a large-sized spherical sonar array, a low-frequency active and passive sonar system for *search and attack*.[79]

SEVERODVINSK and the *Yasen-M* class submarines will be armed with anti-submarine warfare (ASW) missiles designed to quickly engage and destroy enemy submarines at a stand-off distance.[80] One of these ASW missiles, according to a report from 1999, is an upgraded version probably derived from the 90RU Tsakra (NATO designation: SS-N-15 *Starfish*) missile.[81] There is no data on the 90RU Tsakra, and the original version of the SS-N-15, the RPK-2 or 81R Vyuga missile, was armed with a depth charge that was either nuclear with a 200 kiloton yield or conventional with a 300 kg high explosive warhead.[82] The 81R Vyuga missile was launched from a 21-inch torpedo tube from as deep as 50 meters and after surfacing and leaving the water it could fly to a maximum range of 35 km or a minimum distance of 10 km to a location above where the enemy submarine would be located. The missile would then release the depth charge, which would denote close to the target down to a depth as far as 350 meters.[83]

A new ASW weapon that SEVERODVINSK could be carrying is the 91R1 missile, a member of the Klub, SS-N-27 family of missiles. The weapon is armed with a lightweight ASW torpedo and it is similar in design to the SS-N-15 and SS-N-16 ASW

missiles, with the SS-N-16 also armed with an ASW torpedo.[84] In this regard, it may be that the new improved version of the SS-N-15 reported over twelve years ago is in fact the 91R1 missile. The 91R1 can be launched from a 21-inch torpedo tube, and after leaving the water it flies above the sea surface towards the location of the target up to 50 km away, over which it releases the torpedo. The missile is armed with the MPT-1UM torpedo, and may probably carry the bigger APSET-95 ASW torpedo, with both lightweight torpedoes reportedly having a 60 kg warhead. APSET-95 can operate at depths of 15 meters to 500 meters, it can acquire a submerged target 1.2 km distant, and it has a range of about 15 km at a speed of 40 knots.[85]

The 91R1 could also be armed with the APR-3 torpedo, which arms its ship-launched version, the 91R2 ASW missile. Propelled by a *water-jet*, the APR-3 can reach a target 800 meters deep, it has a range of 10 km, a search speed of 65 knots and an attack speed of 100 knots, a search range of up to 2 km, and a warhead that has been mentioned as either 76kg or 100 kg.[86] The earlier version of the APR-3, the rocket-propelled APR-2, was designed to hit a submarine's bow, its control room or propeller.[87] The *Yasen/Yasen-M* class submarines would be armed with at least four ASW missiles.[88]

The U.S. Navy lacks an ASW stand-off weapon because the planned submarine-launched Sea Lance ASW missile system program was ended in Fiscal Year 1991 for *budgetary reasons*. Launched from a 21-inch torpedo tube, Sea Lance would have carried a Mk 50 lightweight ASW torpedo to a distance of over 185 km.[89]

In addition to conventional torpedoes, a shorter range weapon that will arm SEVERODVINSK and its follow-on submarines is the rocket-propelled torpedo.[90] The weapon in question is an improved version of the VA-111 Shkval (squall) ASW rocket-propelled torpedo. The improved weapon has an attack speed of 300 knots, a search speed of 60 knots, *a probable laser fuze*, and it is also launched from a standard 21-inch torpedo tube. The new version of the Shkval would also have the capability of being used against sea surface targets. The original Shkval rocket torpedo has

a speed of 200 knots, a 210 kg warhead, and a range of 10 km at 200 knots, although a maximum range of 15-20 km has also been reported, probably traveling at 50 knots.[91]

Other missions that the *Yasen/Yasen-M* class of submarines would perform are protection of Russian nuclear-powered ballistic missile submarines, particularly in the Arctic Ocean, the search for foreign nuclear-powered attack submarines operating in Arctic waters and hunting for Russian SSBN, and the defense of Russia's interests in the Arctic, including the protection of the Northern Sea Route.[92]

In case of war between Russia and NATO, SEVERODVINSK could also attack the sea lines of communication (SLOC) linking Europe with North America. The submarine's torpedo and anti-ship cruise missile load potentially could allow it to destroy one single convoy of 30-35 merchant ships similar to the Allied Atlantic convoys of the Second World War.[93] Additionally, the *Yasen/Yasen-M* class submarines could carry at least 80 sea mines and probably 100 if not more, with two sea mines in place of each torpedo.[94] In case of war with NATO, SEVERODVINSK could attempt to mine Norway's coastal waters to hinder efforts to send NATO naval forces and troop reinforcements by sea to the Norwegian fjords.[95]

Recommendations:

To meet the potential challenges posed by Russia's fourth-generation nuclear-powered multirole attack and cruise missile submarines, and their planned and potential missile armament, the U.S. and its NATO allies should:

- Build two new nuclear-powered attack submarines a year.[96]

At least maintain the building rate of *Virginia* class submarines to two per year from Fiscal Year 2011 onwards. It is essential to reach the objective of 30 *Virginia* class SSN and that cuts to this production goal should be avoided. The U.S. Navy plans to have by 2030 a force of 39 SSNs down from 53 in FY11, constituting a drop of 25 percent in the nuclear-powered attack submarine force.[97] The Pentagon should take into account the

modernization of both the Chinese Submarine Force[98] and of the Russian Submarine Force. Russia will build seven *Yasen/Yasen-M* class submarines, and it may build seven more of a follow-on class of multirole nuclear-powered attack and cruise missile submarines. By 2030 Russia could have at least about 14 fourth-generation nuclear-powered attack/cruise missile submarines. The Russian Navy may also maintain until then the current operational force of eight *Oscar-II* SSGN and 10 SSN of the Improved *Akula-I* (6), *Akula-II* (2), and the titanium-hulled *Sierra-II* (2) classes.[99] Although the U.S. Navy may have by 2030 more than double the number of fourth-generation SSNs when compared to Russia, our country's leaders should be aware that in addition to the current missions of our Submarine Force, they may have to face the additional challenge of growing and more capable Submarine Forces in both Russia and China. Russia's fourth-generation SSN/SSGN submarines may not be numerous in the future, but since it is expected that they would be very quiet and thus hard to find,[100] more of our submarines may be required to look for them in the underwater expanses of the Arctic, Atlantic and Pacific Oceans.

- Keep Improved *Los Angeles* class attack submarines in reserve when retired from service.

There are 23 Improved *Los Angeles* class (688I) SSNs that were built.[101] By 2030 of the planned force of 39 submarines, 30 would be of the *Virginia* class, three of the *Seawolf* class, and six would be of the Improved *Los Angeles* class. As the U.S. Navy plans to retire prematurely *Los Angeles* class SSNs due to the current and expected budgetary cuts, it should be funded to maintain in reserve all or part of the 17 Improved *Los Angeles* class submarines that would be retired by 2030, in case that an emerging naval threat in the two decades ahead would require the submarines to be brought back into service. The first 688I submarine planned to be retired is SSN 752 PASADENA in Fiscal Year 2019. Incidentally, the Improved *Los Angeles* class began with SSN 751 SAN JUAN, due to be retired in Fiscal Year 2021

together with SSN 755 MIAMI.[102] Another option that should be considered would be to add more *Virginia* class submarines beyond the planned 30 if a serious naval threat surfaces in the coming decades.

- Deploy and continue to develop strong missile defense and air defense systems on the ground and at sea.

No matter from where it comes, the ballistic missile threat is real, particularly in the form of Iranian and North Korean ballistic missiles. New missile threats are looming over the horizon, as those posed by modern cruise missiles with supersonic and stealth characteristics and with evasive maneuvering capabilities. The same can be said of the latest short-range and theater ballistic missiles, possessing more accuracy, depressed trajectories and maneuvering reentry vehicles to defeat missile defenses. Deploy and continue to develop more capable versions of the Standard SM-3 missile defense missile in both sea and land based versions. Promote the export of SM-3 to our allies in NATO and the Asia-Pacific region. Deploy at the earliest possible time in AEGIS cruisers and destroyers the Standard SM-6 surface-to-air missile. According to Jane's, the SM-6's "initial design will be optimized for use against supersonic cruise missiles, in particular the Russian P-900 Alfa, but will also have an improved capability against aircraft, helicopters and UAV [Unmanned Aerial Vehicle]....A later version might be developed against SRBM threats."[103] Continue to deploy the Terminal High Altitude Area Defence (THAAD) system, designed against *tactical and theater ballistic missiles* and which is *the upper tier of a basic two-tiered defence against ballistic threats.*[104] Continue development and consider deployment of naval THAAD at sea and promote the export of International THAAD (ITHAAD) to our allies in NATO and the Asia-Pacific region[105] The *extremely fast* speed of the THAAD missile of 2,800 meters per second,[106] equivalent to about Mach 8.2, may enable the system to intercept a modern Russian missile system equivalent to the Prompt Global Strike and with the capabilities of the 1959 Tu-130. In this regard, restore funding for

the Medium Extended Air Defense System (MEADS). Despite Germany's decision to pull out of the MEADS program[107] this would not erase the very real potential danger that NATO faces from Russian land-attack cruise missiles and short-range ballistic missiles. MEADS was *designed to kill enemy aircraft, cruise missiles and UAVs within its reach, while providing next-generation point defense capabilities against ballistic missiles.*[108] Russia has threatened to deploy weapon systems against NATO's European missile defense system, and as Russian Foreign Minister Sergei Lavrov said recently: "the General Staff will be required to take measures of military-technical nature, if modern hardware – radars, interceptors – emerge around our borders."[109] The *Yasen* class submarines may provide a platform for those *military-technical measures* Russia threatens to take. MEADS would provide a second tier line of defense to shoot down cruise missiles and SRBM aimed at destroying European missile defense emplacements. Furthermore, development of laser air and missile defense weapon systems should continue, to deploy them at the earliest possible time.

- Despite budgetary pressures, NATO allies should avoid cuts to their projected Submarine Forces.

In particular, the U.K. should fund construction of the last of the seven fourth-generation nuclear-powered attack submarines of the *Astute* class. France should maintain its commitment to build and complete its planned six fourth-generation SSN of the *Barracuda* class, the first of which, SUFFREN, is expected to be commissioned in 2017.[110]

- Enhance anti-submarine warfare capabilities.

Atrophied U.S. ASW capabilities are particularly worrisome because developing skilled ASW personnel requires years of intensive training. Congress should allocate sufficient and stable funding to increase ASW capabilities both qualitatively and quantitatively. Specifically, Congress should increase the number

of ASW platforms by expanding and accelerating the P-8 program and by building more ships with ASW capabilities, including ... DDG-1000 destroyers or upgraded DDG-51s with towed sonar arrays.[111] It should also be noted that the best ASW platform is another submarine, and in particular a nuclear-powered attack submarine.

Conclusion:

Back in the mid 1990s, the Office of Naval Intelligence regarded Russian submarine-launched SLCM with a 4,500 km range as the future SLCM threat.[112] Based on these estimates, submarine-launched LRCM with a range of 5,500 km fired from the Norwegian Sea could potentially hit the northeastern seaboard of the U.S. Even though the likelihood of war with Russia is slim, this type of long-range cruise missiles could be Moscow's answer to NATO's European missile defense system and the U.S. National Missile Defense. In this regard, these LRCM could be used as second strike weapons, although formally they may be regarded as tactical nuclear weapons. As such they could be used to target military air and naval bases as well as cities in coastal areas. The U.S. and NATO must have robust missile defenses to meet the threat posed by a new generation of cruise missiles, and must maintain strong submarine and anti-submarine forces.

ENDNOTES

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[75] Yefim Gordon and Vladimir Rigmant, *OKB Tupolev: A History of the Design Bureau and its Aircraft* (Hinckley, U.K.: Midland Publishing, 2005), pp. 314-15; Sergey Babain, "'130' (Tu-130, 'DP') Tupoleva," *Nastoyashchye sverkhzvukovye!* (True supersonics!), at http://sergib.agava.ru/russia/tupolev/130/130.htm (November 1, 2011).
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[79] Funnell and Hollosi, *Jane's Underwater Warfare Systems 2010-2011*, p. 234; Wertheim, *The Naval Institute Guide to Combat Fleets of the World: Their Ships, Aircraft, and Systems*, p. 604.
[80] RIA Novosti, "New Russian nuclear submarine will not enter serial production – paper."
[81] Funnell and Hollosi, *Jane's Underwater Warfare Systems 2010-2011*, pp. 25, 355; Funnell, *Jane's Underwater Warfare Systems 2008-2009*, p. 323; Lennox, *Jane's Strategic Weapon Systems*, pp. 159-60.
[82] Lennox, *Jane's Strategic Weapon Systems*, p. 160; Funnell and Hollosi, *Jane's Underwater Warfare Systems 2010-2011*, p. 355.
[83] Funnell and Hollosi, *Jane's Underwater Warfare Systems 2010-2011*, p. 355; Lennox, *Jane's Strategic Weapon Systems*, p. 160.
[84] Lennox, *Jane's Strategic Weapon Systems*, pp. 119, 120.
[85] Lennox, *Jane's Strategic Weapon Systems*, p. 121; Funnell and Hollosi, *Jane's Underwater Warfare Systems 2010-2011*, pp. 340, 380.
[86] Lennox, *Jane's Strategic Weapon Systems*, p. 121; Funnell and Hollosi, *Jane's Underwater Warfare Systems 2010-2011*, p. 378; Wertheim, *The Naval Institute Guide to Combat Fleets of the World: Their Ships, Aircraft, and Systems*, p. 594.
[87] Funnell and Hollosi, *Jane's Underwater Warfare Systems 2010-2011*, p. 378.
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[89] Norman Polmar, *The Naval Institute Guide to the Ships and Aircraft of the U.S. Fleet*, 15th ed. (Annapolis, Md.: Naval Institute Press, 1993), p. 491.

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[93] Thames Television Ltd., "Wolf Pack: U-Boats in the Atlantic 1939–1944," in The World at War, Vol. 3, 1973, A&E Television Networks AAE-71377, 2004, DVD.
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[97] Rear-Admiral Michael Jabaley, USN, presentation on the Virginia Class Program, 29th Annual Symposium of the Naval Submarine League, October 20, 2011.
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[99] Funnell and Hollosi, *Jane's Underwater Warfare Systems 2010-2011*, pp. 24-25; Funnell, *Jane's Underwater Warfare Systems 2008-2009*, pp. 23-24.
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[101] Wertheim, *The Naval Institute Guide to Combat Fleets of the World: Their Ships, Aircraft, and Systems*, p. 901.
[102] Wertheim, *The Naval Institute Guide to Combat Fleets of the World: Their Ships, Aircraft, and Systems*, pp. 902, 901.
[103] Lennox, *Jane's Strategic Weapon Systems*, p. 356.
[104] James C. O'Halloran and Christopher F. Foss, *Jane's Land-Based Air Defence 2010-2011*, 23rd ed. (Coulsdon, U.K.: Jane's Information Group, 2010), p. 445.
[105] O'Halloran and Foss, *Jane's Land-Based Air Defence 2010-2011*, p. 447.
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[107] Baker Spring and Michaela Bendikova, "Missile Defense: Germany Will Not Procure MEADS," *The Foundry*, October 25, 2011, at

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[110] Funnell, *Jane's Underwater Warfare Systems 2008-2009*, p. 61.

[111] Quoted from Eaglen and Rodeback, "Submarine Arms Race in the Pacific: The Chinese Challenge to U.S. Undersea Supremacy."

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THE LOSS OF SURCOUF: SOLVING AN OLD MYSTERY
Part II of II

by CAPT Frederick H. Hallett, USNR (Ret)

THE FIRST INSTALLMENT of this article described the strange set of circumstances which brought the giant French submarine SURCOUF in 1940 to England and then to America before taking part in the *liberation* of the North American French colony at St. Pierre and Miquelon. Almost the entire experienced crew had left her immediately after arriving in Britain, and from late 1940 onward she had been operated by a crew recruited from available French Navy men who had escaped from France just before the surrender to the Germans. This experiment in *on-the-job* training had not gone well.

SURCOUF left St. Pierre for Halifax on 11 January 1942. The North Atlantic again lived up to its winter reputation. She took one very large wave aboard, dislodging part of her superstructure and jamming the gun turret. The Halifax dockyard attempted to repair the superstructure damage and to make permanent repairs to the ballast tanks damaged in New London.

While she was under repair, U.S. naval intelligence reported that there were now U-boats in the Caribbean:

"On January 26, 1942, a naval intelligence report reached Caribbean Defense Command headquarters at Quarry Heights in the Panama Canal Zone, that a large number of German submarines had entered the Caribbean Sea, destination unknown. The radioed report did warn that "attacks on tankers from Venezuela, Curaçao and [the] vicinity [of] Trinidad [are] possible.

-Source: U.S. Army, Caribbean Defense Command, Historical Section, Special Study, "Occupation and Use of Bases in the Netherlands Colonies-Aruba and Curacao" p.23

On 3 February, the dockyard reported "*Defects SURCOUF completed*" and she departed for Bermuda immediately. While she was at sea, Admiral Kennedy-Purvis reported to Admiral Horton that he believed "*The two main problems* (aboard SURCOUF) *are lack of interest and incompetency. Discipline is bad and the officers have little control. I have no suggestions to offer which are likely to assist in eliminating these defects which I am afraid are inherent. SURCOUF is a large, complicated and indifferently designed submarine which could only be of operational value if manned by an exceptionally well-qualified crew. At present she is of no operational value and is little short of a menace. For political reasons it may be desirable to keep her in commission but my view is that she should proceed to UK and pay off.*" He also recommended that the BNLO and his two Royal Navy assistants should be taken off, since SURCOUF would no longer be under his control when she entered the Pacific.

On 7 February, SURCOUF arrived in Bermuda with a serious defect in one main motor. Each shaft had two separate 850 h.p. direct current propulsion motors on it, and this short-circuited stator had required shutting down one of her two propulsion shafts, forcing her to complete the voyage using only one propeller. Captain Blaison recommended that repairs to the damaged motor be undertaken as soon as possible. The Ireland Point dockyard estimated that repairs would take three months.

Meanwhile, Admiral Kennedy-Purvis had his intelligence officer, Commander Ridgeway, personally interview and interrogate crew members to determine their reliability and trustworthiness to support the Allied cause. The Commander reported that more than half the crew were pro-Vichy and could not be trusted.

While in Bermuda, BNLO Burney filed what would be his last report to Admiral Horton. He said that SURCOUF had only dived once since leaving PNSY, and that the entire trip from Halifax had

been on the surface. He also noted that only seven of her sixteen underwater listening hydrophones were working.

Admiral Horton responded that his orders were to be carried out as issued. There would be no three month delay for motor repairs. To Admiral Kennedy-Purvis, reading between the lines, his boss's preference was clear without further explanation. He was to get rid of SURCOUF. She was a distraction and a liability, but she could not be simply put out of commission for political reasons.

There was apparently some discussion of simply putting limpet charges aboard—a limpet charge is a delayed action explosive device magnetically attached to a steel hull—but I think he decided against that. I believe he decided to proceed in a way which would accomplish the desired objective with perhaps less loss of life and without intentionally causing the death of the British liaison party. If he routed her through the Caicos channel with only celestial navigation and possibly radio direction finding (but no radar) aboard, there was a real chance, considering the tricky currents in the area, of her stranding on a shoal. This might result in no loss of life. If she did get through to the Windward Passage, being on the surface day and night and passing close to the U.S. base at Guantanamo, she was almost certain to be detected by American patrol aircraft on the prowl for U-boats. Being of an unfamiliar configuration, it was very likely that she would be incorrectly identified and attacked. Under those circumstances rescue of survivors might be possible. She might also be attacked by U-boats seeking targets in the area. Along with the Mona Passage and the Yucatan Passage, the Windward Passage was heavily trafficked with oil tankers bringing crude to U.S. Gulf and east coast refineries. There were no pipelines from Texas in those days and tankers were the sole source of crude for the eastern half of the country. The Windward Passage was also an important link in bringing bauxite to the U.S. from mines in the Guianas to the aluminum smelters supplying American aircraft manufacturers. Germany's Admiral Doenitz had directed his U-boat commanders to give top priority to interdicting shipping through the Windward and Mona Passages.

The U.S. maintained both surface and submarine patrols in the Windward Passage. The chances of SURCOUF successfully running this gauntlet were low, but if she did survive, U.S. Army Air Corps planes based in Panama might attack her as she approached the Canal. This scheme must have seemed to Admiral Kennedy-Purvis likely to accomplish the elimination of SURCOUF without compromising the honor of Britain's Senior Service. All he had to do was send SURCOUF down a path to destruction. The odds were very high that she would not even make it to the Panama Canal. The chances that she would safely complete her voyage to Tahiti were infinitesimal. But even if she did eventually arrive in Tahiti, she would no longer be the Royal Navy's problem. For that his boss, Flag Officer (Submarines), would be very grateful.

This is probably the best place to explain why the conventional wisdom about the loss of SURCOUF is wrong. Many sources, official and otherwise, erroneously attribute her disappearance to a collision with the American freighter THOMPSON LYKES at 2230 on 18 February at position 10-40 N, 79-31W. This fiction was obviously welcomed by the British authorities, since it removed any shadow of blame from the Royal Navy. The French government, anxious to downplay its collaboration with the Germans, also welcomed this handy cover-up. And the American government, which censored all mention of U-boats in the Caribbean at the time, was convinced that it had sunk the U-boat which torpedoed a U.S. destroyer and had no way of knowing the truth until the incident was long past. There is no doubt that LYKES collided with something that night, but the site of that collision, by the shortest possible route, is 1538 nautical miles from Bermuda. SURCOUF left Bermuda at 1500 on Feb. 12th, with only one propeller shaft in operation. She had arrived from Halifax in that same condition by direct route without diving and had averaged only 7.9 knots. (756 n.m. in 96 hrs.) That is the only indication we have of her speed in the open sea using only one propeller. With just one propeller operating, the idle one exerts a significant drag whether it is stationary or windmilling. With only

half her normal shaft horsepower and added drag, she could not have reached the collision site by 2230 on the 18th.

To have done so, she would have to have averaged 10.15 knots continuously for 151.5 hours. I have not found any evidence that she ever made an ocean passage anywhere averaging 10 knots for *any* length of time, even with both shafts in operation. The fastest passage she ever made as far as I could discover was from Bermuda to Portsmouth, New Hampshire, when her overhaul at the Naval Shipyard was approved. In ideal summertime weather, July 25-28, 1941, in peacetime conditions without diving, she averaged 9.76 knots, using both shafts. The next fastest passage, also in peacetime conditions with both shafts operating, was going from New London on 27 November, 1941, to Bermuda (667 n.m. in 72 hours), averaging 9.3 knots. Earlier, under wartime conditions after being dismissed from escorting convoy HX-118/ SC 27 on 10 April 1941 and ordered to return to Plymouth, (1136 nm in 7 days) she averaged only 6.7 knots.

Even Hitler's newest U-boats with elite crews did not make open ocean transits at 10 knots. U-502 en route to attack Aruba on 16 February 1942 from Lorient averaged 6.3 knots for 3911 miles. U-123 travelled 2769 miles from Lorient to Cape Cod in 20 days, averaging 5.8 knots. And America's newest submarine, USS MARLIN, hurrying from New London to St. Thomas to augment Admiral Hoover's surveillance of the French Islands in January 1942, (1409 miles in seven days), averaged only 8.4 knots. This was the same speed as USS S-14 transiting from St. Thomas to Coco Solo in March, 1942. USS MACKEREL, leaving New London headed for St. Thomas on 31 January 1941, did manage to maintain 10.5 knots but only for 24 hours. After examining dozens of 1942 submarine deck logs these were the fastest ocean passages I found. And some of those were done by brand new boats in top condition, fresh from the shipyard. There are many reasons for a submarine's slow speed of advance. Certainly in the North Atlantic in February one reason is sea state, i.e. wave height and direction. For SURCOUF with her extreme rolling tendency, sea state would be a great concern, particularly since she could not safely dive to give her crew time to eat and rest. Also most

submarines of the day slowed for a trim dive daily to ensure their ability to submerge quickly to evade patrolling aircraft when necessary. Slowing might also be necessary to allow the navigator to take star sights at dawn and dusk and sun lines during the day. And in a war zone in 1942, every surface ship and submarine on the surface would zig-zag, hoping to foil a submarine attack. Having been warned about the dangerous submarine situation near Bermuda, SURCOUF should have zig-zagged continuously and especially upon approaching Windward Passage. Believing that SURCOUF, with only one propeller turning, could average 10.1 knots for six days is like believing that a three-legged horse could win the Kentucky Derby. And almost as unlikely is the idea that this uniquely fierce-looking warship could have proceeded on the surface without zig-zagging at over 10 knots for almost a week, day and night, in an active war zone where even U.S. warships routinely demanded air cover, through a narrow passage patrolled not only by U-boats but by U.S. submarines, destroyers and aircraft hunting U-boats *and* a steady stream of freighters and tankers, without being seen or attacked by anyone. Yet if she were to have reached the scene of the LYKES collision, that is exactly what would have had to happen. But there were no sightings after SURCOUF left Bermuda, even in the confined waters of the Windward Passage. If the reader is not yet convinced, consider this. We know SURCOUF's speed on the surface en route to Bermuda from Halifax was 7.9 knots. Assume that she never slowed for any reason, (no zig-zag, no trim dive, no delays of any kind). In 151.5 hours she would have travelled 1197 nautical miles. She would have been 341 n. m. away from the LYKES collision site when it occurred at 2230 on 18 February.

The LYKES may have collided with a small tanker smuggling gasoline to some Western Caribbean destination from Venezuela. Smuggling was rampant in the Caribbean during the war years, and shallow draft tankers operated on regular runs from Lake Maracaibo to refineries on Aruba, Curacao and Trinidad. Such a vessel diverting from legitimate routes for private gain might have been running without lights and be unreported even if it failed to arrive. And some of the colorful reports of the LYKES crew

contained references to *white sheets of flame* and *great explosions* which are much more likely to have been gasoline than plain old submarine diesel oil. Needless to say, if SURCOUF could not have been at the site of the collision on the 18th, neither could she have been even further south at the site of the purported aircraft attack on the following day. I could find no documentation that such an attack actually occurred, nor any official claims of a submarine sunk by aircraft on the 19th.

In analyzing the plight of SURCOUF as it might have appeared through the eyes of her skipper the day before she left Bermuda on her final voyage, I have imagined him standing alone on the bridge looking across the aquamarine water toward Hinson Island and the narrow entrance to Hamilton harbor:

Capitaine De Fregate Georges Louis Nicolas Blaison had finally reached the limit of his ability to tolerate the intolerable. Most of his shipmates from the gloriously carefree pre-war days aboard SURCOUF were dead. Yves Daniel had been killed in that ridiculous exhibition of grown men playing pirate back in Devonport when his boat forcibly came under British control. Captain Martin and the rest of the crew had probably died on the trip back to France. The few who had stayed aboard SURCOUF had witnessed the decline of this fighting submarine from being the pride of the French Navy to being a cripple, unable to dive safely, manned by a dangerously incompetent totally disillusioned crew, many of them quite open about their pro-Vichy feelings, and homesick. Of course there were a few good officers and men like his exec, Georges Rossignol and Jean-yves Leoquet, both able and loyal, but he was ashamed to be associated with the rest, many of whom really weren't warfighters but Breton fishermen posing as submariners, uneasy with Navy discipline, quite ignorant about undersea warfare and annoyingly independent of spirit, sometimes simply ignoring orders from their officers. All three British Navy Liaison Officers who had been aboard told their Royal Navy superiors that because of poor maintenance and a poorly trained crew, the

ship was worthless to the Allied cause....and the bitter truth was they were right. This motley crew had used up all its luck in submerging with the conning tower hatch open, flooding the batteries with sea water and diving so far out of trim they exceeded design depth and all of them had only survived because the hull was stronger than it was designed to be. Their much-touted airplane was gone, their unique twin gun turret leaked, their torpedoes, so long aboard without shop maintenance, were unlikely to operate even if he could manage to maneuver into firing position. They had not even fired a gun in months nor had they been even able to do a trim dive on the trip down from Halifax. God knows what would happen if they submerged, but it certainly shouldn't be done in deep water. And that's all they had in Bermuda once you got outside the channel.

He was deeply troubled by several things that had happened. First, before leaving Halifax they had received a warning that several U-boats were headed for the Caribbean. That was new. In the last month, there had been many U-boat attacks along the U.S. east coast, but none that he knew of south of Florida. Secondly, he had strongly recommended that the repairs to the main motor stator be completed before they went anywhere. With the technical manuals and drawings having been destroyed during the takeover by the British, and no propulsion motor spare parts available from Compagnie Générale d'Electricité, the Bermuda dockyard officials estimated the repairs would take three months. London had turned his proposal down flat. He was supposed to carry out his orders without delay. That was crazy. He could only make seven or eight knots with just 1700 h.p. on one shaft and the useless prop dragging through the water. That is how they had made most of the trip down from Halifax, unable to dive because with only one shaft they might not have enough power to recover if SURCOUF went into another of her out-of-control depth excursions. Lord knows he had had too many of those already. So now he was supposed to travel halfway around the world to Tahiti with one propeller on the surface through a war zone where he could expect U-boats plus U.S. submarines and destroyers and aircraft hunting those

U-boats. He'd already heard of eager American pilots attacking their own submarines. What chance did he have? Especially since HMS MALABAR, the Royal Navy command in Bermuda, had routed him through the Windward Passage, not to mention the navigator's nightmare before they got there, the Caicos Passage. And they had told him to maintain ten knots en route. That would have been tough with both motors in commission, but at ten knots they couldn't hear anything, especially with only seven of their 16 hydrophones working. And anyone with half a brain could see that the Windward and Mona passages were chokepoints, prime hunting grounds for U-boats. And the third thing - he had heard a disturbing rumor that somebody in Bermuda, probably some mental patient, was planning to put some sort of bomb aboard SURCOUF. Great! That's all he needed. The Royal Navy was apparently willing to try anything to get rid of them. They didn't need any help. And there was something even more disturbing. Sub-Lieutenant Burney, Warner and Gough, the British liaison team, were to be taken off either in Bermuda or in Panama. Admiral Horton was washing his hands of SURCOUF, there was no doubt about that. And Vice Admiral Kennedy-Purvis, Bermuda's senior Navy official, had his own intelligence chief interview the crew to judge their reliability. The results were not good. Commander Ridgway judged them unreliable, pro-Vichy. The admiral recommended SURCOUF be sent back to England and "paid off." She would end up rusting in some British backwater. No more help from London...or America either. He had worn out his welcome in New Hampshire and in New London, and never had been welcome in Washington, D. C.

That's when he made a decision which would have been unthinkable just a few months ago when the Americans were trying hard to help at Portsmouth Navy Yard. They had done their best, although there were many work items left undone for lack of repair parts for French-made pumps, motors and valves. The Navy Yard people had treated him well, and his crew had been happy with all the French-speakers in southern Maine who treated them like honored warriors back from the front. That

was a little bit of a hoax. They had never fired a shot, and if truth be known, they were not even certain whether to shoot the British or the Germans. Nobody was sure who was going to win the war, and it was pretty obvious most of the French Navy's admirals were betting on the Germans. The British were increasingly unfriendly. HMS MALABAR had requested that they not come back to Bermuda but go straight to Panama, supposedly because of "the U-boat situation". Well, now the Brits had apparently decided the best way to get rid of them was to send them right into the U-boat situation... unaccompanied....like one lone covered wagon going through Indian country with tribes on the warpath. Well, he wasn't buying it.

He made up his mind. The British admirals could all go to hell. He was not taking his crew and his boat to die for no reason. If they could have made some great coup, struck some vital blow for the glory of France, they would have done it. But this Tahiti business was just insanity. They would go where they really belonged and where they would be welcomed - to join their French brothers-in-arms in Martinique. BEARN was there. EMILE BERTIN was there, and BARFLEUR, ESTEREL and QUERCY. Not far away in Guadeloupe was his old alma mater, the school cruiser JEANNE D'ARC. His old commander, Admiral Rouyer was there with dozens of old classmates and shipmates. There were plenty of spare parts for their inoperable equipment there, weapons experts to help put them back in fighting trim, and even electricians to restore their main propulsion motor. Yes, almost everyone aboard would be delighted to go to Martinique. There they would share whatever fate awaited their comrades. Maybe they would all become Free French eventually. Of course, if the three British Navy people were not removed before SURCOUF sailed they would have to be dealt with at sea. That was regrettable, but c'est la guerre. None of them would be missed by anyone else aboard."

And so I believe that is just what happened. In February, 1942, the American Navy, operating under arrangements negotiated between U.S. Admiral John W. Greenslade and the French High

Commissioner for French Territories in the Western Hemisphere, Admiral Georges A.M.J. Robert, was carefully monitoring the French Navy ships in the islands, and had orders to capture or destroy any of them if they attempted to escape.

COMCARIBSEAFRON message 052103 OPERATION ORDER 3-42
"CAPTURE OR DESTROY FRENCH VESSELS IN MARTINIQUE OR GUADELOUPE WHICH ATTEMPT TO LEAVE PORT"

But the U.S. made no effort to interdict any other ship traffic to the islands, and there was lively commerce in food and other necessities, some legal and some not, and while darkened ships entering after sundown might be noted in a U.S. log book, they were not stopped or searched. SURCOUF may have arrived as early as February 19th (but probably later) and probably would have travelled in the open Atlantic on the windward (eastern) side of the island chain to avoid both the U-boats attacking ships daily on the Caribbean side as well as the U.S. submarine patrols which were focused on Fort de France and Guadeloupe's Pointe a Pitre harbors. U.S. authorities were urging American and Allied shipping to take this longer but safer route. Upon reaching latitude 14-20N, with Martinique in sight and staying well clear of the shoals on the east side of the island, she could easily travel the last 35 miles at night using shore lights to enter the harbor at Fort de France, tying up alongside one of the other French Navy ships. (If the Cross of Lorraine had not been painted in white on the conning tower earlier, it would have been very handy that night to instantly establish her identity as *friendly*.) Even if her arrival had not been prearranged, her distinctive profile could have been quickly hidden with canvas tarps and barges alongside. In those pre-air conditioning days, every ship while in port in the tropics rigged large canvas sunshades from bow to stern.

Even if surprised, Admiral Robert would have been delighted at her arrival, and the welcome from the rest of the French Navy would have been enthusiastic about putting something over on the arrogant Americans. *Quelle bonne plaisanterie!* (What a good joke!) U.S. Navy intelligence officers had received many reports of submarines alongside French ships in Martinique, but, of course everyone assumed they were U-boats. And there was at least one confirmed and acknowledged U-boat visit to Martinique on February 20, 1942, when U-156 dropped off its wounded gunnery officer for medical treatment after he was injured during the attack on Aruba on February 16th. The U.S. protested, but to no avail, and the U.S. Vice Admiral John H. Hoover's negotiations with the pro-Vichy High Commissioner for the French Colonies became very contentious as time went on. The U.S. was ready to invade if necessary. By early May, with no substantial progress and, after repeated violations of neutrality and when pro-Vichy suppression of dissent in the islands reached unacceptable levels, the U.S. told the High Commissioner he had forty-eight hours to accept the conditions set forth in the U.S. proposal (which required him to disable all the French naval vessels in the French Antilles by removing fuel and spare parts and putting them in U.S. custody) and declaring that if these conditions were not met, the French ships would be destroyed. To back up this threat, a great fleet of ships including the cruisers CINCINNATI and JUNEAU was brought up within sight of the islands. Destroyers were brought in very close to the channel entrances to Fort de France and Point a Pitre at night to prevent any chance of a French ship escaping. The Commissioner was notified that in view of the visits by U-boats and their obvious proximity to the islands, U.S. ships and aircraft would no longer respect the three-mile limit and that we would be overflying their cities, harbors and coastline. This very tight and very visible blockade (with all ships and aircraft on high alert for the order to attack) finally broke the nerve of Admiral Robert and he agreed to accede to the U.S. demands if Hoover would drop the blockade. That was easily done. Admiral Hoover told our forces to stand down. And just in that moment, on the 25th of May, when it was obvious that JEANNE D'ARC, EMILE BERTIN, BEARN

and all the other French ships were eventually going to come under the control of the Americans, the destroyer USS BLAKELEY (DD-150) was torpedoed by U-156 operating within French territorial waters.

U-156 was no stranger to these waters. She was one of the four U-boats of Operation NEULAND which had launched a coordinated bombardment of oil refineries at Trinidad, Curacao and Aruba on February 16, 1942, just four days after SURCOUF left Bermuda. Before she left Fort de France on a previous visit, her skipper mentioned that she was returning to her Lorient base for more torpedoes but would return, adding "***You will know when we get back.***"

Sixty feet of the destroyer's bow was blown off.

She limped into Fort de France, having had six men killed and 21 wounded. Needless to say, the search for the submarine responsible went into high gear, while U.S. seaplanes and USS TARBELL, a destroyer which had been patrolling nearby entered Fort de France harbor to assist her. The discovery of SURCOUF, if she remained in Martinique, was inevitable. But with the

relaxation of the blockade, perhaps she could get away. Someone came up with an idea of how she could escape. They had been waiting for the right moment. Now they could wait no longer. It was time to save her for Vichy. If the Americans caught her in Fort de France they would not be kind. Not only had Blaison betrayed the trust of both the British and the Americans, he had dishonorably disobeyed Admiral Horton's orders and *defected* from the Royal Navy. And he would be held responsible for the deaths of three British Navy men in the liaison party. Even worse, he had betrayed the Free French Navy, and Admiral Muselier and even de Gaulle himself. With increasing pressure from the U. S. authorities, Admiral Robert knew he was slowly losing control of the French Navy ships which were known to be in the French Antilles. But SURCOUF was *not* known to be there, at least by the Americans and the British. If she could slip away unnoticed, she could go back to France (U-boats like U-156 were making trips to and from Lorient without difficulty) and take her place as the pride of the real French Navy, the Vichy Navy. Her crew was certainly willing and eager to get home to their families, and it just might be possible.

U-69 was just 60 miles to the west of Martinique, and had made her presence known by sinking TORONDOC, a small Canadian freighter loaded with bauxite aluminum ore at 0753 on 21 May. She had been on her 9th patrol since 12 April with a new skipper, Oberleutnant Ulrich Graf, who had sunk three other ships since leaving St. Nazaire.

About this time Graf must have received some very strange orders from Admiral Doenitz. He was to go to a small port on the east side of Martinique called Le Vauclin, come ashore and meet with some local officials concerning a special mission. U-69 arrived there on 22 May and remained for three days, during which the plan took shape. He was to escort SURCOUF to St. Nazaire. She would get underway as soon as possible now that the blockade had been relaxed. U-69 was to take a position about 40 nautical miles west of Fort de France when the plan was executed and SURCOUF would rendezvous with him, recognizing that she would have to evade U.S. surface and air patrols en route. She

would leave at night but would submerge during daylight hours until well clear of the island. Before venturing offshore she would have to conduct a trim dive in shallow water, which might take some extra time. He was to remain at the rendezvous point until she arrived, then travel in company with her to render any assistance necessary to ensure her safe arrival in France. Of course U-69 would also make sure that SURCOUF did not have a change of heart in mid-ocean and attempt to go somewhere other than St. Nazaire. Unaware of the plan, U-156 almost ruined it by torpedoing the BLAKELEY on the morning of May 25th. But it turned out to be a favorable diversion, and with all attention focused on the seriously damaged BLAKELEY in Fort de France harbor, no one noticed a large dark shape moving slowly toward the sea after dark.

As soon as the sun went down on the evening of the 25th, SURCOUF must have made preparations for getting underway. With all that needed to be done it might have been hours later that she slipped out. Knowing of frequent daylight air patrols by PBYs and her inability to travel very far before sunrise, she moved just outside the harbor entrance where there was a narrow shelf of shallow water for her first trim dive in many months. Knowing she would be detected if she surfaced, she probably decided to remain there for the day.

About 0915 on the morning of May 26, LTJG E.N. Chase, with his co-pilot AP Myles of Patrol Squadron 31 based at St. Lucia , flew over a submerged submarine about 3 miles from Point Negro (14-36N, 61-09W) and was astounded at what he saw. He estimated the gray-green shape was submerged between 30 and 50 feet and he later told the St. Lucia intelligence officer it was the biggest submarine he had ever seen— "It had to be over 300 feet long" (SURCOUF was 361 ft. long). He dropped 4 depth charges but all fell short. He said in the debriefing that he had never expected to be able to see a submerged submarine but the sea and sun combination was just right. At 1800 that evening, another VP-31 PBY-5 piloted by Ensign E. G. Binning took off from St. Lucia to begin his patrol off the entrance to Ft. de France, this time within the 3-mile limit. Finding nothing, he expanded his search

area to Cape Solomon-St. Pierre. His radar operator had a contact about 10 miles off St. Pierre at 2145 and he briefly spotted a conning tower and the foredeck of a submarine but then lost it. Neither the float lights nor the flares he dropped ignited. It was a bright moonlight night with 3 to 4 mile visibility and at 2357 about 17 miles off St. Pierre, (14-40N, 61-30W), another radar contact was confirmed and both Binning and his co-pilot Thomas Oelberg saw the submarine on the surface. Binning said it was barely moving. Oelberg estimated its speed at *only 5 knots*. Binning thought it looked like a U-boat of the 750-ton class but made particular mention of the *large oval front of the conning tower*. (SURCOUF had a large oval gun turret forward of her conning tower.) He also noted a *plain white cross* on the conning tower. (Crew member William Howell also said "there was something white on the conning tower. I thought it was a big cross but it might have been just an emblem.")

U.S.S. TARBELL, an American destroyer, was on the scene ten minutes after the attack but found nothing. ENS Binning flew over the site at daybreak and spotted a heavy oil slick about 50 yards wide and 150 yards long. Both the aircrew and Admiral Hoover thought they had sunk the U-boat which had attacked U.S.S. BLAKELEY the previous day. But (thanks to the extensive records available at www.uboat.net) we now know that BLAKELEY was attacked by U-156, and that U-156 was not sunk that night and not until 8 March 1943 off Barbados.

PBY-5 Catalina Patrol Bomber

There is no record of SURCOUF having replaced with a cross the large block *17P* which appears on her conning tower in earlier pictures, although she had often flown a *Cross of Lorraine* flag. However, if she planned to cross the Atlantic in company with U-69 and enter St. Nazaire, such a distinctively French marking might have proven very useful.

The PBY dropped its first depth charge from an altitude of about 100', about 10 feet from the stern. (These were Mark 17 Depth Bombs with Mark 24 Fuzes containing 325 lbs. of explosive with a lethal range of about 50'.) He turned sharply (crew member Walter Smith said "It was the fastest I've ever seen a PBY come around in a turn") and dropped two more straddling the conning tower (a *dream shot*, Binning called it). He said the sub seemed to have been totally surprised and "sat there like she was on parade." Crew members reported the boat seemed to heave up a few feet with each explosion. On the third pass, they approached from the starboard quarter and the bomb was released from about 50-75 feet and landed within ten feet of the bow, *raising it up in the air a few feet.* Also on the third pass they fired forty rounds of 50-caliber armor-piercing machine gun ammuni-

tion at the conning tower. The sub lost way and sank vertically.* Sea depth at that point is about 4650 feet.

U-69 remained in position 14-33 N 61-45W for a week, waiting for SURCOUF. There was a steady 1-knot current carrying them to the west, but the water was shallow enough to anchor (about 120') so she managed to stay on station, perhaps submerging during daylight hours and occasionally at night if an American PBY got too close. On June 1st Oberleutnant Graf apparently decided something had gone wrong with the plan and that he had best head for home. He arrived alone at St. Nazaire on June 25, 1942 after the longest patrol in his boat's history.

* "**Chronology of Significant Events** - 26 May 1942: Lieutenant Edward G. Binning, operating from NAS St. Lucia, B.W.I., located a submarine on the surface at 2357 hours and dropped three depth charges on it in two diving attacks. The submarine appeared to settle slowly in the water in a sinking condition. Tarbell (DD 142) was called to the scene and was also of the opinion that the submarine had been sunk. This attack deserved special notice because it was the first night attack carried out successfully in that area. Lieutenant Binning was subsequently awarded the Navy Cross for this action. Postwar examination of German Navy records, however, did not record any loss of a U-boat on that date." - *DICTIONARY OF AMERICAN NAVAL AVIATION SQUADRONS—Volume 2 VPB-105 (Redesignated Patrol Squadron THIRTY ONE (VP-31) on 1 July 1939) page 516*

At the time of Ensign Binning's attack, there were only three U-boats within 300 miles of Martinique: U-156 (Hartenstein) which had moved after the attack on BLAKELEY to a position about 70 miles east of Martinique, U-155 (Piening) who was southeast of Barbados, and U-69 (Ulrich Graf) which was about 16 miles WSW of the Binning attack site and remained in that vicinity for several days afterward. At 2357 on May 26th SURCOUF was about 19 n.m off St. Pierre and U-69 was about 35 miles offshore.

No other submarines, German, British or American, were sunk on that date. LTJG Binning received the Navy Cross for his action that moonlight night. Later in the war he commanded a Patrol Squadron of his own and after the war remained active in the Naval Reserve. Rear Admiral Edward Garrison Binning U.S.N.R. (Ret.) was killed in a plane crash in China in 1961 and is buried in Arlington National Cemetery.

Apparently to deny the enemy any intelligence value, Admiral Hoover had directed that all reports of German submarine activity in his command be strictly censored. In a letter dated June 1, 1942, the Officer in Charge of the Intelligence Field Office in St. Lucia wrote "*Information has reached this office that there are officers in the Tenth Naval District who are puzzled as to how the stories and accounts of the BLAKELEY torpedoing and the subsequent sinking of a submarine off Martinique were released.*" He goes on to say that he knew that this lapse might jeopardize on-going negotiations with Admiral Robert, but that his censors had followed the rules they were given. Admiral Hoover exonerated him in his reply, commenting that in any event "our Ensign Binning" sank the sub in that same location on May 27th.

There is a memorial to the SURCOUF crew on a pier in Cherbourg. The date on it is surely wrong although that is not really important. It is doubtful that Sub-lieutenant Burney and his men, Warner and Gough, were aboard when she sank. And although it is pure speculation, it would have made great sense to have taken aboard a German or two, perhaps whoever had served in Martinique as U-boat liaison since it was obvious his work was drawing to a close. It would have been very handy to have a German (and his encoding and decoding skills) to handle communications with the escorting U-69 during the trip to France. Also, it would not be surprising if some of the Bank of France gold which had arrived aboard EMILE BERTIN and been stored at Fort Desaix was put aboard SURCOUF for delivery to the Vichy government.

It should be obvious why the THOMPSON LYKES story was quickly adopted as the *official* explanation of what happened to SURCOUF. The U.S. did not want to admit to the world the deceit

perpetrated at the highest level when President Roosevelt publicly denied the presence of German U-boats in the Caribbean when he knew otherwise. The fact of having sunk a French submarine by mistake would have been embarrassing to the U.S. Navy as well, when France was, or would later become, an ally. The British government, however correct it had been in deciding that SURCOUF was useless to the Allied cause, could have been seen as the indirect killers of its own liaison party. (The approval from London to remove the three British Navy men from SURCOUF had arrived in Bermuda two days after she had departed.) And the French government, eager to bury its sordid history of mass collaboration with the Nazis as deeply and quickly as possible, was happy to accept as true a story which accounted for the loss of this unique ship with all its crew while embarrassing no one. Only a few Germans would ever have known of the aborted scheme to take SURCOUF back to Vichy France, and most of them probably died when U-69 was sunk on her 11th patrol on 17 February 1943.

It is my hope that with the publication of this new set of conclusions, (based largely on now-declassified records unavailable to earlier researchers), new facts will emerge either from survivors, archives or perhaps even location of wreckage at the site of Ensign Binning's attack to provide concrete proof of SURCOU F's final resting place.

*COMPARISON OF TECHNICAL SPECIFICATIONS FOR CONTEMPORARY SUBMARINES

	Length	Surf. Displacement	Propulsion Motors	Max. Surf. Speed
USS BARRACUDA S-163	341'	2119 Tons	2 x 1200 HP	21 knots
USS NARWHAL S-167	371'	2770	2 x 1270 HP	17.4
British T-class	276.5'	1290	2 x 1450 HP	15.5
British G-class	188.8'	703	2 x 840 HP	14.5
British M-class	296'	1594	4 x 800 HP	15
SURCOUF (NN3)	361'	3257*	2 X 1700 HP	18.5

* Source: NAVAL INSTITUTE PROCEEDINGS, Jan. 1930, p. 58.

SOURCES: Hundreds, or perhaps thousands of documents were examined during many days at the National Archives in College Park, Maryland. While I was able to copy some of the critical pages for later reference and retain them in my files, attributing sources, as in many historical narratives, can easily overwhelm an author. I have tried to identify readily available online sources below for the convenience of readers. ***FHH***

Torpedoing of French repatriation ship MEKNES with loss of 383 lives

RUSSIAN SSBNs – A "DEAD MAN" LAUNCH CAPABILITY?

by Mr. Bruce Rule

Bruce Rule, for 42 years, was the lead acoustic analyst at the Office of Naval Intelligence. In 2003, he wrote the Navy position-paper on the acoustic, dynamic and temporal characteristics of submarine pressure-hull and bulkhead collapse events. In 2009 he provided the Navy with the first reanalysis of acoustic detections of the loss of USS SCORPION in 40-years, which confirmed that disaster was the result of a battery explosion.

Introduction

When the GOLF II Class Soviet SSB K-129 was lost in the northwest Pacific on 11 March 1968, the event produced a series of acoustic signals detected by US Air Force Technical Applications Center (AFTAC) sea-floor sensors (hydrophones) located at geographically dispersed positions in the central and western Pacific.

As discussed by CNO ltr ser 0051P32 of 21 May 1968 (now open source), AFTAC had, by May 1968, compared the detection times of the K-129 acoustic signals by those sensors to determine the event occurred near 40-06N, 179-57E. That position provided the basis for the successful search for the K-129 wreck by USS HALIBUT (SSN 587) and the eventual recovery of the 38-foot bow section of the submarine on 6 August 1974 by the CIA salvage ship, the Hughes Glomar Explorer (HGE).

That recovery operation was observed—but not recognized as such—by two Soviet surface ships whose position for the HGE during the recovery was reported by the newspaper Petropavlovsk-Kamchatskiy KRASNAYA ZVEZDA (Red Star), issue 5-7 Aug

1991, to have been 40-04-05N 179-57-03E. That position is 2.00 nautical miles (nm), bearing 180 degrees from the AFTAC position, and 1593 nm from Pearl Harbor. As discussed by S.G. Kolesnikov in "Strategicheskoye raketno-yadernoye oruzhiye" published by Arsenal Press, 1996, the maximum range of the R-21/D4 missile carried by the K-129 was reported to have been 756 nm.

Analysis of the AFTAC acoustic data obtained from public domain sources in 2008 established—for the first time—that the K-129 was lost because three explosions occurred within the pressure hull immediately prior to an apparent dual R-21/D4 missile launch training event scheduled for 12:00:00Z on 11 March 1968, hereafter referred to as T-0. Those explosions allowed that training event to become the firing to fuel exhaustion of two R-21/D4 missile within their closed—but subsequently breached—launch tubes. The AFTAC data confirms these R-21/D4 firing events and launch support system activity occurred over an eight minutes and 36 second period following ignition of the first missile. That launch support activity, apparently directed by a programmed launch sequence control system, remained at least partially operational despite the almost certain death of the crew from the first internal explosive that occurred 62 seconds before ignition of the first missile (T-62 seconds).

This article examines the possibility the K-129 had a *dead man* launch capability to insure the launch of at least one missile even had the platform been successfully attacked immediately prior to launch. The continued partial functioning of a programmed launch control system for such an extended period after the probable death of the crew and extreme internal damage, including a breaching of the pressure hull, suggests that if modern Russian SSBNs have a similar capability, they may be able to launch all 16 missiles in 105 seconds (open source data) or, in the case of TYPHOON, all 20 missiles in about 135 seconds even after attack (impact) by multiple conventional weapons.

ANALYSIS OF THE AFTAC ACOUSTIC DATA: TIMELINE OF EVENTS ON THE K-129

Background

As discussed in Chapter SIX of Why the USS SCORPION (SSN-589) Was Lost (hereafter: WHY), reviewed in the Winter 2012 issue of this publication, the SCORPION crew was killed or functionally disabled (rendered unconscious) by two explosions associated with the main storage battery. Those explosions occurred 21 minutes and 50 seconds before the SCORPION pressure-hull collapsed at 18:42:34Z on 22 May 1968 at a depth of 1530 feet.

To support that assessment, Chapter SIX of WHY provides discussions of the 2008 analysis of the AFTAC acoustic detections of the loss of the K-129. As discussed above, the initiating events responsible for the K-129 disaster were three internal explosions that—like SCORPION events—were contained within the K-129 pressure hull. These events are discussed below.

- FIRST INTERNAL EXPLOSIVE EVENT AT 11:58:58Z (T-62 seconds)

The first explosive event contained within the K-129 pressure hull occurred at T-62 seconds (11:58:58Z on 11 March 1968) or 62 seconds before ignition of the first R-21/D4 missile at T-0 (12:00:00Z). The T-62 event had a duration (signal level above ambient sea noise at the sensor) of 1.5 seconds and an estimated energy yield—based on signal amplitude - of about 10 pounds of TNT. A nearly constant signal level was sustained for the duration of the acoustic event.

As stated in Chapter SIX of WHY, the assessment that the K-129 crew was killed by the first internal explosion is based, in part, on a crew member who apparently had been reading a torpedo manual and who was found still in the remains of his bunk in the bow section of the K-129 recovered by the HGE. Had the crew member been conscious, he almost certainly would not have remained in his bunk between the first explosive event at T-62 seconds and the second explosive event 45 seconds later at 11:58:43Z), 17 seconds before the first R-21 ignited.

Further, examination (not autopsies) of the remains of the crew members found in the bow section indicated they died from burning explosive force before their bodies were subjected to the crushing hydrostatic (sea) pressure.

Finally, the crew took no effective action to prevent what appeared to have been a simulated dual launch training event scheduled for exactly midnight local (12:00:00Z) from becoming the actual firing of both missiles within their closed launch tubes.

- SECOND INTERNAL EXPLOSIVE EVENT AT 11:59:43Z (T-17 seconds)

The second explosive event contained within the K-129 pressure hull, which occurred 45 seconds later, at T-17 seconds (11:59:43Z), had a duration of 2.4 seconds with a relatively constant signal level for the initial 1.5 seconds followed by a high amplitude pulse with a duration of less than 0.2 seconds and an estimated energy yield of about 20 pounds of TNT. The suggestion is a relatively low-level thermal event that triggered a high Q exothermic event (explosion) with an energy level equal to the internal events that immediately followed ignition of the first R-21/D4 missile (see below).

- THIRD INTERNAL EXPLOSIVE EVENT AT 11:59:47Z (T-13 seconds)

The third explosive event contained within the pressure hull occurred four seconds after the second event, or at T-13 seconds (11:59:47Z), had a duration of 0.7 seconds and an estimated energy yield of about five pounds of TNT.

- FIRST R-21/D4 MISSILE FIRING EVENT AT 12:00:00Z (T-0)

Thirteen seconds after the third internal explosive event, the first R-21/D4 missile ignited at exactly 12:00:00Z (T-0), developed full thrust in 1.3 seconds and fired at full thrust for 95.2 seconds still within its closed launch tube. At T+5 seconds (12:00:05Z), an acoustic event occurred onboard the K-129 which is assessed to have been burn-through of that launch tube. (Open

source Soviet data indicates a thickness of 0.88 inches for the QT28 nickel-steel alloy pressure hull and a thickness of 0.38 inches for the launch tubes where they were internal to the pressure hull which included at least the lower half of the tube).

Five additional high amplitude acoustic signals (internal explosions) with peak energy levels for less than 0.2 seconds occurred in the 22 second period following the assessed launch tube burn-through (12:00:05Z-12:00:27Z). Based on the extreme damage within the recovered first compartment of the K-129, it appears the 5000 degree (F) missile exhaust plume expanded almost instantly throughout the K-129 after the launch tube was breached. This conclusion is consistent with the destruction of documents and equipment Project AZORIAN was intended to recover from the 100 foot mid-ships section of the K-129 had that section not been lost as it was being raised by the HGE, i.e., such material and equipment were exposed to the 5000 degree missile exhaust plumes for a total (both missiles) of 190 seconds.

At T+77.5 seconds ((12:01:17.5Z), 77.5 seconds after ignition of the first R-21/D4)), a major acoustic event with a peak energy level for 4.9 seconds occurred when, under normal circumstances, the R-21/D4 would already have been ejected from its launch tube about 75 seconds earlier. Exactly 77.5 seconds later (at T+155.0 seconds), another major acoustic event with a peak energy level for 5.2 seconds occurred. The timing of these events, 77.5 after ignition and 155.0 seconds (2 X 77.5) after ignition strongly suggest programmed launch support activity that occurred even though there already had been extreme internal damage and the pressure-hull appears to have been breached in the area below the launch tube as shown by images of the wreck.

- SECOND R-21/D4 MISSILE FIRING EVENT AT 12:06:01Z (T+361 SECONDS)

At 12:06:01Z, six minutes and one second after ignition of the first R-21/D4 missile, a second missile in an adjacent launch tube ignited and burned at full thrust for 95.4 seconds. Major acoustic events also occurred at exactly 77.5 (peak energy for 3.4 seconds) and 155.0 seconds (peak energy level for 4.3 seconds) after

ignition of the second R-21/D4 missile. The precise repeatability of the timing of those events from the first missile launch sequence to the second missile launch sequence provides additional support for the conclusion that an automated launch support system was at least still partially functioning in the K-129 despite the damaged and flooded condition. Although some components of this system remained operational, the launch tubes had not been opened because it was a simulated launch: a training event. The ignition of both missiles occurred as it would have during an actual launch, possibly because of the three earlier internal explosive events or because that operation required intervention by the now-dead crew as part of the training event that had to be taken to prevent what actually occurred, ignition within closed launch tubes. Analysis of the acoustic data does not resolve this issue.

Based on the duration of the signals that occurred at ignition plus 77.5 and 155.0 seconds for both R-21/D4 missiles compared to the duration of the internal explosive events that occurred immediately after launch tube burn-through, and the fact that the signals at 77.5 and 155.0 seconds obviously were scheduled events, the source of these four signals is assessed to have been bubble-pulse energy associated with programmed (scheduled) deballasting (purging) of what, subsequent to a normal R-21/D4 launch, would have been flooded launch tubes. Bubble-pulse acoustic energy is produced by the pressure induced oscillations (alternate expansion/contraction cycles) of an air cavity (bubble) created, in this case, by the escape of high-pressure air from the deballasting events through the ruptured launch tubes and pressure hull. The at least partial functioning of the launch control system for more than eight minutes after ignition of the first R-21/D4 missile suggests the location of this control system and its air supply could have been external to the pressure hull.

Subsequent to the end of the second missile launch support sequence at 12:08:36Z (155 seconds after ignition), only one relatively low level acoustic event was detected by the AFTAC sensors. That event occurred on the K-129 at 12:09:01Z. No acoustic signals produced by structural collapse events were

detected at any time indicating the K-129 pressure hull and all internal compartments were fully flooded before the submarine reached collapse depth.

Comment

Page 164 of "AZORIAN. The CIA and the Raising of the K-129" by Norman Polmar and Michael White, which is based on the documentary film "*Azorian: The Raising of the K-129*" by Michael White, shows the time versus amplitude AFTAC acoustic data display from which the above timeline of events onboard the K-129 was derived. Both the book and the film provide extensive discussions of the development and execution of the AZORIAN recovery effort with video images of the K-129 wreck and computer-generated images (cgi) based on the video data. The cgi provided with this article is based on an outline of the K-129 wreck derived from HALIBUT photography and video images from the Hughes Glomar Explorer K-129 capture vehicle.

Conclusions

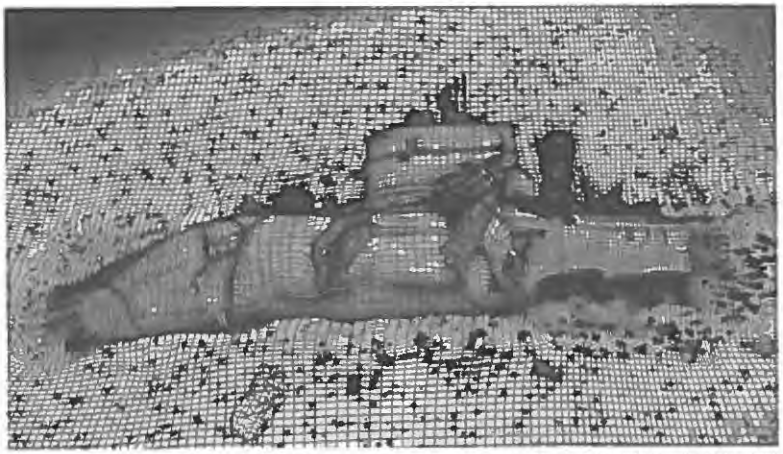
The above K-129 event timeline, first derived from the AFTAC acoustic data in 2008, confirms that some components of an automated (programmed) missile launch support system continued to operate despite the probable death of the crew one minute before the first missile fired at 12:00:00Z. The system was still partially functioning in a flooding pressure hull one minute after the second R-21/D4 had fired to fuel exhaustion at 12:07:36Z.

As noted in the book AZORIAN, a Russian source confirmed that the R-21/D4 missile burn time to maximum range (fuel exhaustion) was (quote) about 94 seconds and six minutes between ignition events had been demonstrated during one of the first test launches from a GOLF-II SSB. (end quote) As discussed above, the values derived from analysis of the AFTAC acoustic data were 95.2 and 95.4 seconds for the R-21/D4 firing times at full thrust and six minutes and one second for the firing interval. The agreement of these values with known R-21/D4 missile system parameters confirms the conclusions discussed above.

This assessment of the K-129 missile launch support system suggests that if current Russian SSBNs have a similarly *robust* launch system survival capability, they may, as discussed above in BACKGROUND, be capable of ripple-firing all missiles even if the crew has been killed or incapacitated and the platform has sustained significant battle damage.

Further, the stand-off distance provided by Russian double-hull construction, adds significantly to the problem of making a successful mission-ending attack on currently operational Russian SSBNs with conventional weapons.

In the case of TYPHOON Class Russian SSBN, the twin main pressure hull configuration—with the missile launch tubes located between the 7.2m (23.6 foot) diameter pressure hulls (open source)—provides a stand-off distance of at least 27 feet for the missile tubes against a midline beam weapon impact. This configuration, in combination with a reserve buoyancy in excess of 40 percent, further complicates an already difficult situation by making the outcome (success) of an attack on a TYPHOON very problematic, even with multiple conventional weapons. The reported design parameters of the new DOLGORUKY Class Russian SSBN (24,000 tons submerged displacement) are relevant to this issue.



The CGI framework image of the wreck of the K129 was made during a stage process of construction of the final CGI rendering for the film The Raising of the K129.

It was mapped from a tracing of the famous Halibut montage image that was made for the recovery engineers at Lockheed Ocean Systems and from a Video Montage made up from still frames of the cameras of Lockheeds Capture Vehicle during the actual mission in 1974.

THE UNITED STATES NAVY, JORDAN, AND A LONG TERM ISRAELI-PALESTINIAN SECURITY AGREEMENT MAY, 2012

by Dr. Anthony Wells

Dr. Anthony Wells is the Chief Executive Officer of TKC International LLC, a national security company.

The President of the United States has stated that he wishes to see Israel return to the pre 1967 June War boundaries in accordance with United Nations Security Council Resolution 242 passed at the end of the June War. President Obama sees this action as a critical prerequisite to begin a truly long term solution to the Israel-Palestinian situation. His administration's position rests on the fundamental UN concept embodied in Resolution 242 that Israel took land that was not Israel's by force and that in order to meet Palestinian rights to nationhood and wider Arab demands that the Golan Heights and the West Bank be restored to their lawful owners.

President Netanyahu of Israel reacted vehemently to the White House statements, stressing to multiple international audiences that in any two state solution to the Israeli-Palestinian situation Israel must have what he defines as *defensible boundaries*. He sees a return to the 1967 status quo as giving up territory that is vital for Israel's survival in the event of various scenarios. His opposite number, President Abbas, and Secretary of State Hilary Clinton fully understand the reasons for his declarations. However, if the peace process is ever to enter a new substantively different era from the prior decades, and if the Palestinians are indeed ever to accede, as Israel did, to become a nation state within the community of nations, clearly more has to happen than declarations, whether rhetorical or otherwise.

A brief overview of the prior history will help in order to understand what may constitute a very viable solution to the

apparent intractable dilemma described above, polarized as it is by the precise wording of UN Resolution 242. There has been considerable analysis over the years since 1967 of the intent of the wording of Resolution 242, drafted by the then British Ambassador to the United Nations, Lord Caradon. The Resolution is to most lawyers and international specialists quite explicit, precise and well worded with no ambiguity. However, the wording that has caused most analysis is the Section of the Resolution that says, in affirmation of Article 2 of the UN Charter, the United Nations Security Council Affirms: "Termination of all claims or states of belligerency and respect for and acknowledgment of the sovereignty, territorial integrity and political independence of every state in the area and their right to live in peace within secure and recognized boundaries free form threats or acts of force". Within this Section the words that cause most disagreement are, "rights to live in peace within secure and recognized boundaries". The Israelis and President Netanyahu have been explicit in stating that any redrawing of the pre 1967 June War boundaries (now essentially the West Bank of the Jordan River and the Golan Heights, since Israel has withdrawn for the Sinai must be so that Israel can be secure. The latter has been defined by President Netanyahu as being *defensible boundaries*. To most military personnel this phrase has significant and very definable connotations.

In looking back briefly to the 1960s the Middle East was a critical part of the Cold War stand off and a hot bed for playing out the international rivalries between the United States and the Soviet Union. Israel felt naturally threatened and surrounded by potential belligerents that were encouraged and supported by Moscow. By June of 1967 the situation reached boiling point. The sudden preemptive strikes made by Israel to seize territory from Egypt, Syria and Jordan to extent its boundaries and create defensive barriers was extremely successful. However, Israel's action precipitated a crisis that all but plunged the United States into a conflict with the Soviet Union, but for US pressure to stop Israel advancing beyond the Golan Heights. Very well documented research has shown how the Soviet Union would have

launched forces against Israel if they had continued in their march towards Damascus from the Golan Heights. The world has changed with the demise of the Soviet Union, and in its aftermath have emerged equally compelling threats to Middle East stability, not least the rise of Iran and the emergence of several parties and groups that espouse terrorism as a vehicle for achieving political goals. Other state and non state players have become either directly or indirectly involved through the supply of arms, training, and other equipment.

It is very easy to forget that over the past sixty-six years since the conclusion of World War Two terrorism has been the vehicle for implementing political change. President Menachim Begin of Israel was a member of Irgun, an organization dubbed by the international community as a violent and extremist terrorist organization and one which David Ben-Gurion described as the *enemy of the Jewish people.* Begin saw himself as a freedom fighter, not a terrorist. It is easy to forget that in the Middle East the past is often prologue. Hamas and Hezbollah pursue political goals often by unacceptable violent means, most often dubbed terrorist acts by the international community. Such factions cite the same principles in working for the creation of an independent Palestinian state that the post war Israeli *terrorists* cited to justify their violent actions in seeking the creation of the independent state of Israel. It is very easy to lose this perspective, while at the same time condemning as the international community should indeed do, any acts of terrorism, whatever the goal. Many years later Menachem Begin, the man born a Russian Jew and persecuted by both the Nazis and the Soviets, became prime Minister of Israel in 1977, was responsible for the peace treaty with Anwar Sadat of Egypt that returned the Sinai to Egypt, and which led to both men winning the Nobel Peace Prize. What this shows is that all things are possible, even when in 1946 Begin had led the bombing of the King David Hotel in Jerusalem, and in March 1952 the attempt on the life of Chancellor Konrad Adenauer of West Germany.

Today the Sunni Islamist group Hamas that has run the Gaza portion of the Palestinian Territories, and Hezbollah, the Shi's

Muslim militant group and political party in Lebanon appear very much like how Irgun looked in 1942 when it split from the Haganah, launching from 1944-1948 a campaign against the British in Palestine. On May 14, 1948 the state of Israel was created. The relevance and poignancy is clear—Israel was fundamentally born out of terrorism. The key for today's situation is to prevent the spread of terrorism while clearly finding a solution. The answer lies with Jordan and Israel, supported by the United States and with key capabilities provided by the United States Navy.

President Netanyahu's strategic concerns for the *defensive boundaries* of Israel are clearly demarcated by geography—the distance between key locations in Israel and the West Bank are on the order of six to nine miles, with a huge concentration of the Israeli population on the coastal strip where most of Israel's commercial and industrial life resides. His perfectly reasonable concern is that the West Bank provides a buffer area and site for defensive missile systems that will ward off an attack. The key to helping President Netanyahu and the Israeli people find both peace and security lies with Jordan.

Jordan is the most stable political regime in the Arab world—King Abdullah leads a nation that is making strident progress in both democratization and improvement in the lives of the ordinary Jordanian, while providing bedrock security against outside extremist influences. Israel has to both respect and trust Jordan, and Jordan's security against outside threats has to be underpinned by equal aid from the United States, just as the United States provides aid to Israel. The likelihood of a destabilizing and anti Israel regime emerging in Jordan is very remote. The threats to Israel lie much further to the east in Iran, and that country's extremist associations with other state and non state players. By the same token Jordan is equally threatened by extremist groups from outside that would try to destabilize an otherwise progressive regime, with the vast majority of Jordanians loyal both to their political processes and their Head of State.

Modern cruise and ballistic missile technology is such that the West Bank buffer zone is not relevant for Israel in terms of a

ground attack invasion from the east, and particularly given relationships with both Jordan and the underpinnings provided by the United States. The major threats to both countries, other than extremist attacks from terrorist groups, are most likely to come from missile attacks. The very worst scenario for Israel would be a preemptive ballistic missile attack from Iran. In this and other missile scenarios the West Bank does not play as a key geographic entity because of speed, times, and distance issues associated with the location of key targets in both Jordan and Israel if attacked by cruise and Ballistic missiles. However, where the West Bank can play a role is in a layered defense network of defensive missile silos.

A settlement with Jordan over the West Bank can include the following. Jordan regains control of the West Bank and with United States oversight begins the management of both Palestinian and Israeli settlements in the area. In return Jordan should grant to Israel several key sovereign air base sites in the West Bank where Israel may have full rights, permanent access for its military to man 24/7 defensive missile batteries and provide early warning radar systems. Such sites and systems will be of equal value to Jordan. In addition the United States can provide two other key layers of defensive systems for both Jordan and Israel, in addition to the military systems that it provides under the various aid agreements.

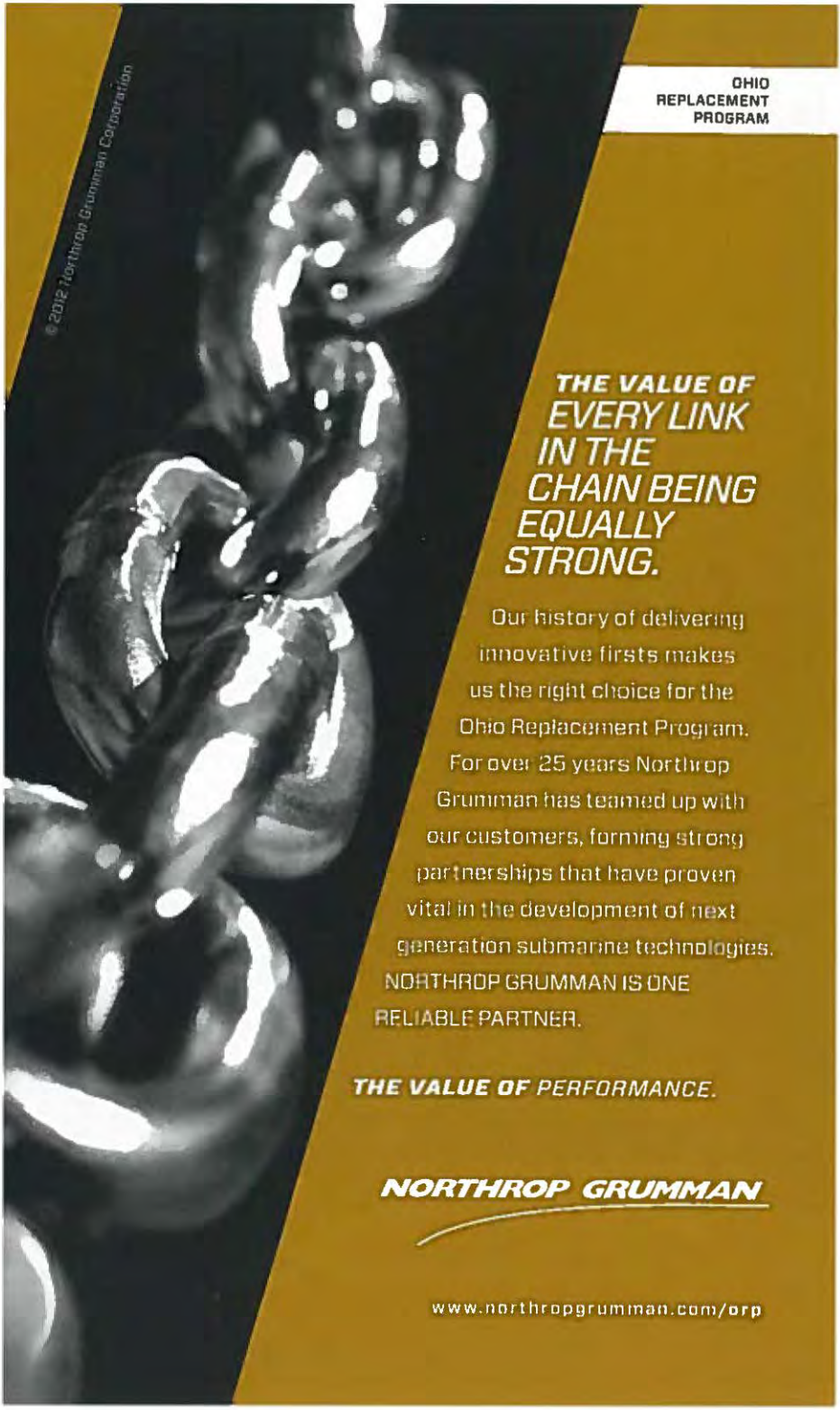
The one critical system that the United States possesses that provides a mobile, flexible, and persistent presence in deterring and worst case defending against ballistic missile attacks is the US Navy's Aegis missile system. The Navy has proven that the Aegis system not only works it can be deployed to those sea areas where the time needed for responses in the event of ballistic missile attacks is dramatically shortened by the flexible on station positioning and employment of the Navy's Aegis cruisers and destroyers. The US can provide forward deployed layered missile defense for both Jordan and Israel, and its NATO Allies in Europe, by deployment in the Fifth Fleet and Sixth Fleet AORs. In addition, the covert and stealthy persistent presence of the United States Navy's attack submarines (SSNs) and cruise missile

submarines (SSGNs) firing Tactical Tomahawks against land based missile targets is a formidable deterrent against aggressors whose missile locations, whether fixed, underground, or mobile, can be targeted in time scales that make preemption by an aggressor a very foolish strategic act. The United States provides therefore in the Persian Gulf and the eastern Mediterranean two critical layers of defense, the first layer and the last, and in between are the defensive systems provided by both Jordan and Israel. If an accord can be reached between Israel and Jordan on the above terms, underwritten by the United States government, then Jordan and Israel can move towards the next stage of creating an integrated joint common missile defense system. From President Netanyahu's perspective the issue of the strategic role of the West Bank has now taken on a whole new complexion, and one that guarantees Israeli access and presence for the above defensive systems.

Intelligence sharing is critical in the above agreements. Warning time is vital, and both Jordan and Israel will need to build confidence with themselves and mutually with the United States in order to share time sensitive intelligence, and also from the United States perspective the need to minimize deployment costs, except at times of rising tension in the region.

The above offers a long term solution, and not just for the key issue of the West Bank. The arguments are defused of both the extremists and the much more moderate members of the international community who see the on going crisis of the Palestinian situation as a running sore that foments not only discord within the civilized community of nations but also provides ammunition to those groups who wish to destabilize the Middle East by violent means.

The United States Navy plays a crucial role in making long term peace in the Middle East a reality.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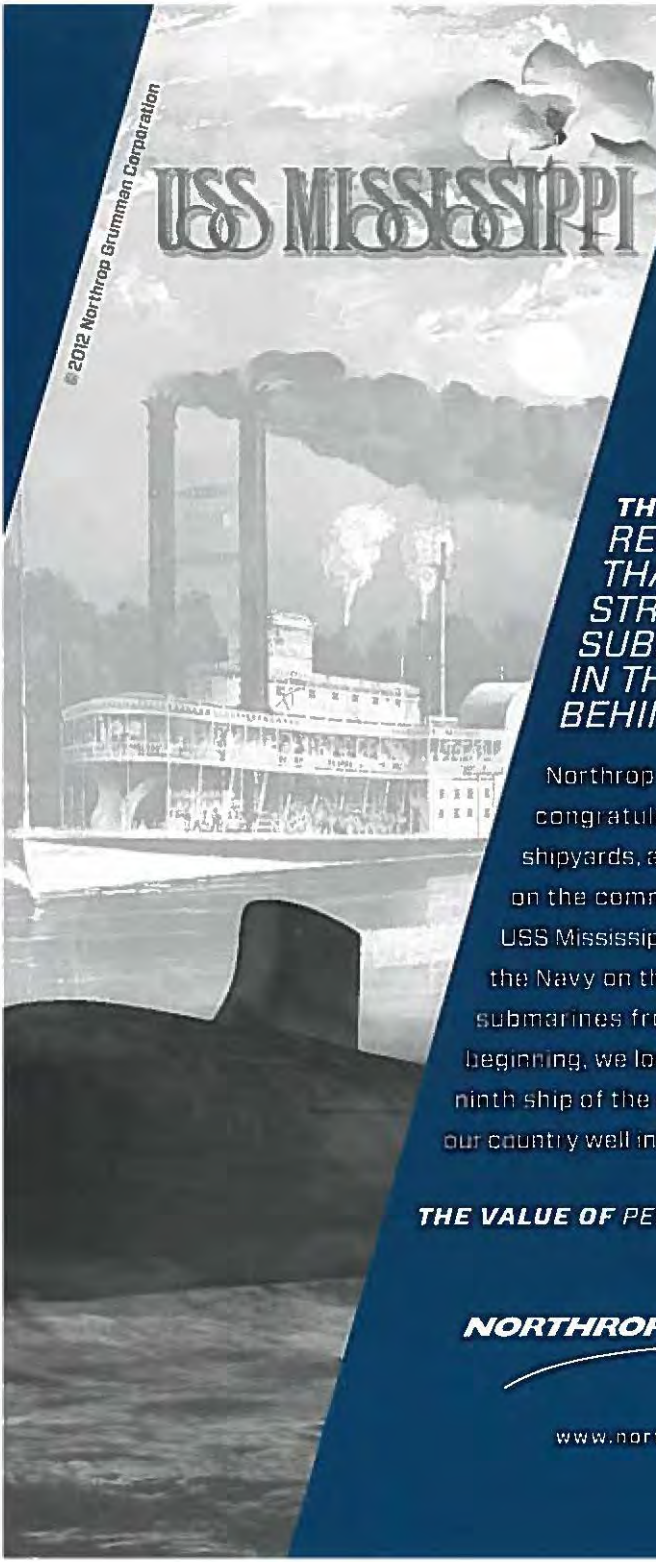

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SHORT SUMMARY OF WORLD WAR II SUBMARINE OPS

by John T. Kuehn, Commander USN(Ret)

John T. Kuehn is an Associate Professor of Military History and has served on the faculty of the U.S. Army Command and General Staff College since July 2000. Retiring after naval service in 2004, he earned a Ph.D. in History from Kansas State University in 2007. He is the author of Agents of Innovation (2008) and co-authored Eyewitness Pacific Theater (2008) with D.M. Giangreco, as well as numerous articles and editorials. In October 2009 he lectured Chief of Naval Operations Strategic Studies Group in Newport, Rhode Island, chaired by retired Admiral James Hogg. He recently was awarded a Moncado Prize from the Society for Military History in 2011 for "The U.S. Navy General Board and Naval Arms Limitation: 1922-1937." He is also an adjunct professor for the Naval War College Fleet Seminar Program and with the MA in Military History Program at Norwich University. A former naval aviator (flying in both EP-3 and ES-3 aircraft), he has completed numerous cruises aboard four different aircraft carriers. He flew reconnaissance and combat missions during the last decade of the Cold War, the First Gulf War (Desert Storm), Iraq and the Persian Gulf (Southern Watch), and the Balkans (Deliberate Force over Bosnia).

Editor's Note: To augment his lesson on naval innovation in World War II, Commander Kuehn sent a request for a short summary (4 to 5 pages) of the WW II submarine campaign to Captain Peter Swartz of the Center for Naval Analyses. The request was forwarded to several possible sources, one of which was THE SUBMARINE REVIEW. That answer is next in this interesting interchange.

Commander Kuehn,

As with several others who have responded to your request for a 4 or 5 page summary of US Submarine Operations in World War II, I have to say I am not aware of any worthwhile summary of anywhere near that length. I do note, however, that you mentioned naval innovation as an interest so perhaps a few facts might help:

Roscoe's book Submarine Operations in World War II published in 1949 by the Naval Institute in a tabular description of results gives these figures which describe the intensity of the effort—31,571 days of submarine patrols in the op areas with a total of 1,150 merchant ships sunk out of a total of 2,250 by all forces. This with 6% of the Navy's personnel. Although the primary job for WW II US Subs was Commerce Raiding against Japanese Logistics, some other missions were squeezed in, often enroute to patrol areas:

A. Fleet Scouting—Some done but considered by Nimitz to be secondary to Unrestricted Submarine Warfare vs. Logistics
B. Fleet Interdiction—Phil Sea, Leyte Gulf
C. Special Force Operations—Agent & Marine Recon Landing and Support
D. Mining—Done as a second priority to torpedo attacks
E. Photo Reconnaissance—After September '43, Every Landing was preceded by a Submarine Photo Recon.
F. Support of Amphibious Operations
G. Lifeguard Duty--Later in War when targets were few and far between, to rescue downed aviators in forward areas (as with George H. W. Bush)

Captain John F. O'Connell USN (Ret.) has published two books on "Submarine Operational Effectiveness" (iUniverse Bloomington Indiana) Part I goes up to 1939 and Part II is for World War II period.

In his 260 pages of text in Part II he uses about 45 pages to describe US Submarine Operations in the Pacific. That's the

shortest summary I can think of.

I hope this helps.

Jim Hay
Capt. USN (Ret.)
Editor, THE SUBMARINE REVIEW

Dear Captain Hay,

Thank you so much for these references, actually I am familiar with Roscoe. As for your list of missions, we had a bright young submarine officer going to SAMS and he did a wonderful monograph on submarine support to land operations. Finally, as I read all the emails I realized that I might have a short-term solution three feet away from my keyboard—Fleet Admiral King's Official Reports to the SECNAV published in 1946—the submarine section is a tight, concise 3 and half pages. I added a quick addendum as you can see to help explain the numbers. I added my former submarine officer brother to the cc line (pre-com USS LOUISVILLE), I hope you do not mind. Sorry for the size of the attachments.

Very Respectfully, John

John T. Kuehn, Ph.D.
Associate Professor of Military History
U.S. Army Command and General Staff College
Fort Leavenworth, KS
913-684-3972

U.S. NAVY AT WAR
1941-1945
OFFICIAL REPORTS TO THE SECRETARY OF THE NAVY
BY FLEET ADMIRAL ERNEST J. KING, U.S. NAVY
COMMANDER IN CHIEF, UNITED STATES FLEET AND CHIEF OF NAVAL OPERATIONS

Washington
United States Navy Department
1946
(Ed. Note: Addendum to Professor Kuehn's letter to the Editor)

IV
Submarine Operations

Submarine warfare was an important factor in the defeat of the Japanese. With the end of hostilities, it is now possible to reveal in greater detail the splendid accomplishments of the submarines of the Pacific Fleet and the Seventh Fleet. Our submarines are credited with almost two thirds of the total tonnage of Japanese merchant marine losses, or a greater part than all other forces, surface and air, Army and Navy combined. (See Plate 18.) Of the total number of Japanese naval vessels sunk, our submarines are credited with almost one third.

Attacks on Merchant Shipping

Our submarines, operating thousands of miles from their bases and deep within enemy-controlled waters, began their campaign of attrition on Japanese shipping immediately following the attack on Pearl Harbor, and continued to fight with telling effectiveness until the Japanese capitulated. During the early part of 1942, while our surface forces were still weakened by the Japanese initial attack of 7 December 1941, submarines were virtually the only United States naval forces which could be risked in offensive operations. Although the number of submarines available at the start was so

small that the 1500-ton fleet-type class was augmented by older types, submarine attacks produced immediate and damaging results, which were greatly needed at the time. They made it more difficult for the enemy to consolidate his forward positions, to reinforce his threatened areas, and to pile up in Japan an adequate reserve of fuel oil, rubber, and other loot from his newly conquered territory. Their operations thus hastened our ultimate victory and resulted in the saving of American lives.

Sinking of enemy merchant ships rose from 134 ships totaling 580,390 tons in 1942 to 284 ships totaling 1,341,968 tons in 1943. Then in 1944, when submarine coordinated attack groups reached the peak of their effectiveness, the merchant fleet of Japan suffered its worst and most crippling blow—492 ships of 2,387,780 tons were sunk or destroyed in submarine torpedo and gun attacks. The figures given above, which are based on evaluated estimates, include only ships of 1000 tons and larger. It should be borne in mind that our submarines sank or destroyed, chiefly by gunfire, large numbers of small vessels, particularly during the latter part of the war, when few large enemy ships still remained afloat.

In 1945, because of the tremendous attrition on Japanese shipping by our earlier submarine operations and the destructive sweeps by our fleets and carrier air forces, enemy merchantmen sunk by submarines dropped to 132 ships totaling 469,872 tons. The advance of our forces had further driven Japanese ships back to the coast lines and shallow waters of Japan and the Asiatic mainland. Our submarines followed the enemy shipping into these dangerous waters and made many skillful and daring attacks, such as the one in April when TIRANTE entered a patrolled anchorage in Quelpart Island to blow up a 10,000 ton tanker and two 1,500 ton escort vessels, which were peacefully lying at anchor. Further south, persistent submarine patrolling plus air sweeps had, by the end of March, stopped almost all enemy traffic along the sea lanes of the East Indies and the coast of Indo-China.

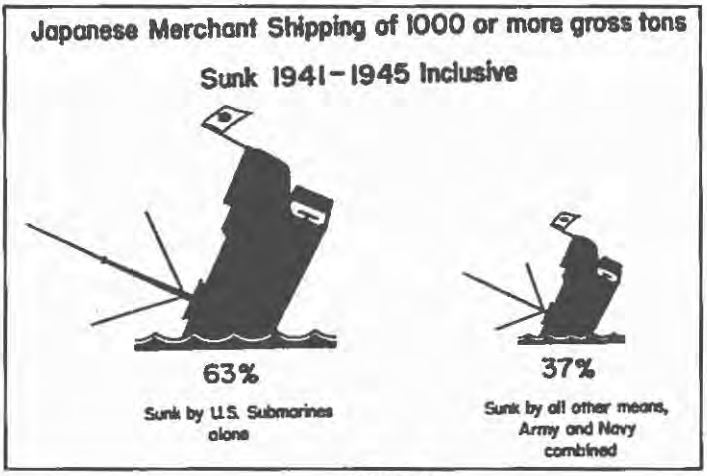

Plate 18

For a time, Japanese shipping continued to ply in the East China and Yellow Seas, but the invasion of Okinawa in April soon made the East China Sea untenable to the Japanese. Causing heavy damage, our submarines were very active during April and May in the Yellow Sea and along the east and south coasts of the main Japanese islands. In June the landlocked Sea of Japan was penetrated in force. The submarines had excellent hunting, and in a series of coordinated attacks did tremendous damage to the remnants of the Japanese merchant fleet. One of the intruders, BARB, even landed a party on the coast of Honshu, and successfully blew up a bridge and the speeding train that was crossing it. By the end of the war, the Japanese merchant fleet was virtually nonexistent.

Attacks on Naval Vessels

While United States submarines were effectively eliminating the Japanese merchant fleet, they were also carrying out damaging attacks on Japanese naval units. During the course of the war, the following principal Japanese combatant types were sent to the bottom as a result of these attacks:

SUBMARINE OPERATIONS

Battleship	1
Carriers	4
Escort carriers	4
Heavy cruisers	3
Light cruisers	9
Destroyers	43
Submarines	23
Minor combatant vessels and naval auxiliaries (including 60 escort vessels)	189

Details of these sinkings will be found in Appendix A. While the loss of the heavier naval units was critical to the Japanese, especially as the strength of our surface fleet increased, the surprisingly high losses of enemy destroyers and escort vessels to submarine attack are particularly noteworthy. Our submarines, refusing to accept the role of the hunted, even after their presence was known, frequently attacked their arch-enemies under circumstances of such great risk that the failure of their attack on the enemy antisubmarine vessel placed the submarine in extreme danger of loss. So successful, however, were these attacks that the Japanese developed a dangerous deficiency of destroyer screening units in their naval task forces, and their merchant shipping was often inadequately escorted.

Special Missions

Among the special missions performed by submarines were reconnaissance, rescue, supply and lifeguard duties. An outstanding result of effective submarine reconnaissance was the vital advance information furnished our surface and air forces prior to the Battle for Leyte Gulf, information which contributed materially to that victory. Our submarines in a number of instances rescued stranded personnel and performed personnel evacuation duties notably from Corregidor. The supplies and equipment delivered by submarines to friendly guerilla forces in the Philippines did much to keep alive the spirit of resistance in those islands.

When our air forces came into positions from which they could intensify their attacks on Japanese-held territory, United States submarines were called upon to carry out lifeguard operations to rescue aviators forced down at sea in enemy waters. Sometimes assisted by friendly aircraft, which provided fighter cover and assisted in locating survivors, and sometimes operating alone, our submarines rescued more than 500 aviators during the course of the war.

Fifty-two United States submarines were lost from all causes during the war, forty-six due to enemy action, six due to accidents and stranding. These losses were due to continued penetration deep within the enemy zone of defense, far from our bases, and, until the last phase of the war, far beyond the areas where our surface ships and aircraft could operate. Because of the nature of submarine operations and the general necessity of submarines operating alone, the personnel loss in most instances was the entire ship's company. As heavy as were the losses in submarine personnel and equipment, submarine training and building programs supplied replacements so effectively that our Submarine Force at the end of the war far exceeded its pre-Pearl Harbor strength—and was the most powerful and effective in the world. The Japanese capitulation found our submarines on station searching for the remnants of the Japanese Navy and merchant marine, and on the alert to rescue downed aviators off the coast of Japan.

Submarines of the Pacific Fleet have been commanded by Vice Admiral C. A. Lockwood, Jr., since February 1943. Rear Admiral James Fife, Jr., has commanded the Seventh Fleet submarines, including a number of British and Dutch submarines, since December 1944.

No account of submarine warfare in the Pacific would be complete without mention of the splendid contribution of the submarines of our Allies. These craft, operating in the southwest Pacific, contributed materially to the destruction of Japanese naval and merchant shipping, and inflicted losses over and above those previously listed.

Addendum to *U.S. Navy At War: 1941-1945*, by Fleet Admiral Ernest J. King

by John T. Kuehn (01/18/2011)

Admiral King's reports to the Secretary of the Navy James Forrestal offer little explanation as to why the U.S. Submarine Force did so much damage to the Imperial Japanese Navy and the Japanese Merchant Marine during the war beyond the excellence and ferocity of the elite crews and captains of the Pacific Submarine Force. As with most things in history, there is more to the story than American courage and *know how*. Contingency, serendipity, and accidents played their roles. The numbers cited in the King report, especially the vast increase in tonnages sunk in both 1943 and 1944, require additional discussion.

In the first place, the Americans designed the best long range submarine of any of the naval combatants used in the war, including the Germans, typified by the Tambor/Gato class. These submarine designs were the result of a painful process during the interwar period, but the payoff was extremely high. TAMBOR and later classes had first-of their kind/state-of-the art air conditioning systems, extremely long range, reliable engines and batteries, and were the most habitable submarines of any combatant in the war due to the restrictions of the Washington Naval Treaty and the requirements of War Plan Orange.[1] The Tambor and Gato classes additionally had ten torpedo tubes mounted both fore and aft (six bow and four stern) as well as the ability to mount a five inch deck gun to replace the small three inch gun if required, more on this in a moment.[2]

However, the American Navy went to war with one of the worst torpedo designs of any of the major naval powers—for its submarines, destroyers and airplanes. Because of this deficiency, the initial submarine offensive was a flop. Because of the obstinacy of the senior naval leadership, both in Pearl Harbor and especially at the Bureau of Ordinance, which had overseen the Mark XIV torpedo program's testing, development, and

operational employment, the torpedo problem was not fixed until mid-1943.[3] The increase in numbers of sunk merchant tonnage in 1943 reflect this fix and then the additional tonnages in 1944 reflect an entire year of these excellent submarines with a now serviceable torpedo at work.

However, there is more to the story. The normally catastrophic torpedo situation eventually worked in the U.S. Submarine Force's favor. When the torpedoes failed and the first submarine patrols returned with disappointing results, this, plus the cautious pre-war tactical training of the U.S. submarine skippers (commanding officers) often resulted in that officer's relief. It has been said that fully a third of the Submarine Force's skippers were relieved in the first year for poor performance that was the result of a combination of bad torpedoes and timid interwar operational doctrine designed for major fleet engagements and not for *illegal* unrestricted submarine warfare. These officers were often replaced with a new breed of *up-and-coming*, aggressive naval officers as reflected in reality by Dudley *Mush* Morton of USS WAHO fame and even infamy.[4] Additionally, U.S. submarines were refitted with the five inch gun mentioned previously in order to allow them to attack targets on the surface when the torpedoes didn't work or simply after the supply had been expended.

At the strategic level the U.S. had abandoned nearly 160 years of defending the rights of neutral shipping at sea when the Chief of Naval Operations, on the day of Pearl Harbor, issued a terse:

EXECUTE AGAINST JAPAN UNRESTRICTED AIR AND SUBMARINE WARFARE.

Recently Joel Holwitt has shown that this decision to execute unrestricted submarine warfare did not arise from spur of the moment anger at Pearl Harbor so much as it was the result of deliberate strategic planning in the late 1930's by the Navy's senior leadership. The problem was, of course, that this strategy could not be operationalized or even reflected in tactical doctrine and so resulted in the over cautious sub skippers mentioned above.[5] This interacted with Japanese plans with favorable results.

Japan's merchant marine fleet constituted the great Achilles heel for her maritime empire. The ineffectiveness of the U.S. submarine campaign during the first 18 months of the war reinforced a false sense of security in the Japanese Navy as well as contributed to an ongoing Japanese failure to adequately address anti-submarine warfare (ASW) in its training and doctrine. In fact, there was only one Japanese officer on the Naval General Staff primarily tasked with oversight of ASW. Japanese officers and sailors disesteemed protection of merchant ships as a lesser and even dishonorable naval mission.[6]

The final nail in the coffin that constituted Japan's vulnerable sea lines of communication had to do with leadership. Admiral Charles Lockwood, one of the pre-war advocates of the Tambor class boats, received orders to take over submarine operations out of Freemantle, Australia in 1942 and his aggressive leadership resulted in Admiral Nimitz bringing him back to Pearl Harbor to command the entire Pacific submarine force (SUBPAC) in early 1943 after the untimely death of Admiral Thomas English. Lockwood was a veritable American version of Karl Doenitz in his leadership of his command. He employed an operational analytical approach in utilizing America's huge intelligence windfalls from code-breaking and was instrumental in fixing the torpedo problem. The combination of all these factors: Japanese complacency and ignorance of the danger, effective torpedoes, aggressive skippers, intelligence superiority (in tracking ships and convoys), and a superb leader with a highly effective tracking and command and control center in Pearl Harbor hit the Japanese merchant fleet like an underwater tidal wave.[7] The Japanese lost the rest of their merchant fleet in about nine months, especially the precious oil tankers and escorting destroyers (the two top targets in the first part of the campaign). By the time they realized the danger it was too late. This discussion helps clarify the startling numbers in King's report with one final comment—a third of the Japanese Navy's warships were sunk by submarines, too.

ENDNOTES

1. See Jeffrey K. Juergens, "The Impact of the General Board of the Navy on Interwar Submarine Design," Master of Military Art and Science Thesis (Fort Leavenworth, KS: U.S. Army Command and General Staff College, 2009), 113-121; see also John T. Kuehn, *Agents of Innovation* (Naval Institute Press, 2008), chapter 4 passim.
2. Juergens, 123.
3. See Holger H. Herwig, "Innovation Ignored: The Submarine Problem, Germany, Britain, and the United States, 1919-1939," in Military Innovation in the Interwar Period, eds. Williamson Murray and Alan Millett (Cambridge, MA: Cambridge University Press, 1996), 258-260.
4. Don Keith, Undersea Warrior, *The World War II Story of "Mush" Morton and the USS* Wahoo (New York: Caliber Books, 2011), 5. Morton machine-gunned helpless Japanese sailors and soldiers in the waters around their sinking ships.
5. Joel I. Holwitt, "Execute Against Japan: The U.S. Decision to Conduct Unrestricted Submarine Warfare (College Station, TX: Texas A&M University Press, 2009), 1-2 and 183. Juergens' study, too, finds evidence of serious consideration of unrestricted warfare as a valid strategy in the secret General Board hearings before the war.
6. See Dave Evans and Mark Peattie, *Kaigun* (Annapolis, MD: Naval Institute Press, 1997); the author confirmed the single Japanese staff officer information in a personal conversation with Sadao Asada.
7. Herwig, 258-260; http://www.fleetsubmarine.com/lockwood.html (accessed 01/18/2012). For the complacency of the Japanese Navy and the destruction of her merchant fleet see Mark Parillo, *The Japanese Merchant Marine in World War II* (Annapolis, MD: Naval Institute Press, 1993).

SUBMARINE NEWS FROM AROUND THE WORLD

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From the March 2012 Issue

TAIWAN—Submarine Search on Again

In late February 2012, AMI received information that the Republic of China Navy (ROCN) is still considering the purchase of up to eight submarines under the Kwang Hua 8 Program with the latest twist being the consideration of additional foreign suppliers. Making no progress since the 2001 President Bush offer of eight diesel electric submarines, the ROCN has requested their Parliament again fund up to eight units of a new submarine to replace their two Hai Lung II class submarines built in the 1980s and two World War II vintage Guppy class.

Since 2001, the Taiwanese Government has had on again/off again support from the US Government, various Taiwanese Administrations and Parliament (Legislative Yuan) as well as Taiwan's shipbuilding industry. However, through the eleven years, the ROCN has never been able to get to the construction phase as either design, construction location and financing issues have never been resolved.

In regards to US initiatives since 2001, the US Navy has not designed a conventional submarine since the Barbel class of the 1950s although the US Government was willing (and may still be) to finance some of the program under Foreign Military Financing (FMF) terms.

Information received in late 2010 indicated that the ROCN was in talks with Russia for the Kilo class although AMI believes that Taiwan may have used Russia as a supplier consideration in order to get more support from the US Government. From late 2010 until early 2012, the submarine program went dormant yet again.

Information in March reveals that the ROCN is again asking the Legislative Yuan for monetary support and may be considering up to four new suppliers, other than the US and Russia. Although not announced publicly, AMI believes that the four prospective candidates could be India, Indonesia, Turkey and South Korea. However, AMI believes that only Turkey and South Korea could be considered serious candidates in terms of building experience, pricing and delivery timelines.

South Korea and Turkey have both built large numbers of Type 209s under license and are now moving forward with indigenously built Type 214s, with South Korea winning its first export order of its Type 209 to Indonesia in late 2011. Another positive is that both countries are US allies and that could be beneficial if Taiwan decides to request US funding support with FMF and management support with the US Naval Sea Systems Command (USNAVSEA). Both prospective suppliers are very familiar with US agencies and international financing programs.

There are still major questions that must be answered for this program to begin moving forward:

- Is South Korea, Turkey or any other supplier willing to do business with the ROCN as economic retaliation from the mainland is a typical response for such an offer?
- Will the US be involved in project oversight (USNAVSEA) or in the supply of subsystems as FMF dictates some US content?
- Will the Legislative Yuan actually fund the program with or without US FMF?
- What will be the build location? All at a foreign yard or a split build with China Shipbuilding Corporation (CSBC); which is becoming more insistent with indigenous construction. The downside of any construction at CSBC will be a slower build rate due to a lack of construction experience combined with the willingness of its foreign partner to risk alienating the mainland for only a limited number of hulls. In other words, the reward of eight hulls may outweigh the risk of economic sanctions from the mainland.

In regards to the Kwang Hua 8, given the difficulties Taiwan has encountered over the years with their unsuccessful efforts to acquire new submarines, one would trust they understand the difficulties and complexities involved and would therefore see the need for a different plan and process for bringing this about. AMI believes that this program will continue to take many more turns, but if another entity such as South Korea or Turkey would be willing to build or split build the Type 209 in their respective countries (or jointly with CSBC) and under a formal US FMF program, the odds of success may be much better than all of their previous proposals since 2001. A South Korean or Turkish built Type 209 with some US subsystems (to get FMF backing) with management from the US Navy may be the best scenario that the ROCN can hope for.

GREECE—Naval, Coast Guard and Shipyard Update

In February 2012, AMI sources in various European locations have provided the following information to update the ongoing naval and coast guard shipbuilding situation in Greece as well as the prospective financial viability of Greek naval shipyards. The sale of Hellenic Shipyard (HSY) to Abu Dhabi MAR (ADM) has been completed. However, with no major shipbuilding contracts in place, HSY's viability in the long term is questionable. HSY continues to press the Greek Government to build two additional Type 214s for an estimated €155M (US$204.6M) in order to keep the shipyard afloat. The Greek Government continues to refuse any new funding for additional submarines.

The only prospective work at this time would be modernization of the Hydra and Elli class frigates and a new construction offshore patrol vessel (OPV) program for the Hellenic Coast guard (HCG) that is in its early stages of discussion. However, sources indicate that no funding is available for any of the initiatives at this time.

Elefsis shipyard is near closure according to AMI's sources. Elefsis apparently failed to receive funding from the Greek Government to complete the final three Super VITA class FAC.

Similar to HSY, Elefsis would need to receive funding to complete the FAC or support for the modernization effort of the Hydra and Elli class frigates and win some or all of the HCG OPV Program. Again, those programs remain unfunded.

It appears that every HN and HCG Program is in jeopardy at this time due to the financial crisis. Listed below is the current status of the programs:

Type 214 Submarines: The first four units have completed construction and are in various stages of repair in order to pass acceptance testing. The proposal by HSY to the Greek Government to procure two additional Type 214s has been refused by the Government.

POLAND—Submarines Become Higher Priority

In late February 2012, AMI received information that the Polish Ministry of Defense (MoD) allocated US$316.5M for the procurement of the first of three new construction submarines announced under the 2009-2018 Polish Modernization Program. Part of the funding was reallocated from the Gawron corvette project which has been stopped.

An AMI employee visited Gdynia Naval Shipyard (GNS) in September 2011 and confirmed that construction on the Gawron has stopped and the hull is currently in a construction hall at GNS. The hull has been completed but no weapons have been installed.

The stoppage of the Gawron corroborates other sources indicating a new construction submarine has taken a higher priority. Two Gawron corvettes and three submarines were both listed in the 2009-2018 defense plan, although constrained funding appears to have forced the Polish Navy into reprioritizing its efforts.

Additional sources indicate that the modernization of the four used Kobben class and the first new construction submarine are now the top priorities of the Polish Navy with the modernization of the Perry class frigates following.

In regards to a new construction submarine, sources confirm that it is a two horse race between the Germans and the French, more than likely a TKMS Type 214 or a DCNS Scorpene. AMI

began received information in 2010 that the Polish Government was interested in a joint construction program with a foreign entity, now identified as TKMS and DCNS. Poland's shipbuilding industry has faltered over the past two decades and was interested in a partner to improve the shipyard infrastructure as well as jointly building a new submarine design for the Polish sea service as well as other export programs in conjunction with the selected partner. It appears that GNS is the shipyard in question as it needs the facelift and future order book in order to survive. GNS is currently in bankruptcy/receivership with senior management and business decisions of the yard significantly influenced by government ministries (Finance, Defense and Infrastructure). Currently GNS is only being considered for modernization of two of the Kobben class submarines and two Perry class frigates, although both programs are still waiting final approval and funding.

A decision on the joint partner for GNS, and by de facto, the new submarine design could be determined at any time. The key for Poland is the funding remaining intact; and it appears that the chances may be good as the submarine construction and modernization programs have become the top priority in the Polish Navy.

INDIA—Project 75I Submarine Procurement Plan Modified

In early March 2012, AMI received information that Indian Navy (IN) is beginning to modify its Project 75I submarine procurement plan. This latest move highlights how the P75I program is shaping up as very similar to the earlier procurement of the Shishumar (type 209/1500) class submarines.

In both programs, initial hulls built in the supplier country would be followed by remaining production in Indian shipyards. In regards to Project 75I, the Ministry of Defense (MoD) has apparently made the decision on a procurement strategy to have the first two units being built at a foreign location and the remaining four hulls being built at one of two government yards: Mazagon Dock Ltd (MDL) or Hindustan Shipyard Ltd (HSL).

However, AMI believes that this decision will continue to be negotiated until a supplier/foreign partner is finally selected, which is currently scheduled to happen by he end of 2012 or in early 2013.

Up until now, the Indian shipbuilding industry has been adamant about the firm requirement to open a second submarine line for Project 75I at private Indian yards such as Larsen & Toubro (L&T) (building the Arihant SSBN), ABG Shipyard and Pipavav Shipyard. Industry has advocated this move as the government yards at MDL and HSL are already back logged with naval vessel programs—many of which remain years behind schedule and are suffering cost overruns as high as 50%.

In March 2012, the MoD decided to exclude India's private yards from the submarine competition, returning to the old strategy of building some units in foreign yards and the remainder in India's government-owned yards. No doubt the cost overruns and delayed schedules of almost all naval and coast guard programs at indigenous yards (government and private) were major factors influencing this decision.

The MoD ruled that the private yards in country did not have the infrastructure or capability required to build high technology submarines at their respective facilities. In L&T's case, obviously, the higher priority Arihant class SSBN program was a determining factor. In the case of the government's MDL and HSL, both are running behind and over budget. More specifically, MDL is now running years behind schedule on the Scorpene program, which is not good news for the IN.

AMI believes that the IN probably supports this decision to keep submarine programs in government-owned yards as a risk mitigator to ensure experienced builders deliver submarines ready for service—accepting that a foreign builder role in the new sub procurement is part of the price paid for an operational Submarine Force.

This is a win (if the decision remains intact) for the IN as it will no doubt get two (possibly more) quality submarines from the foreign supplier (DCNS, TKMS, or Russia) much sooner than if built in India. And the P75I now represents one of the largest and

most promising prospective submarine export orders for competing foreign builders.

The downside for India and naval builders is the clear setback in their efforts to become the sole suppliers of all 100% of India's new naval ship and submarines.

DID YOU KNOW?

ISRAEL: On 25 February 2012, the first Israeli Navy (Heyl Hayam (HH) Dolphin II class submarine was named INS TANIN.

UNITED KINGDOM-Vanguard Class Nuclear Powered Ballistic Missile Submarine (SSBN) VIGILANT. In late February 2012, AMI received information that the Royal Navy's (RN) Vanguard Class SSBN VIGILANT would reenter service in late March or early April 2012 following a three and a half year modernization effort. In December 2008, VIGILANT entered the Devenport Royal Dockyard for a Long Overhaul Period and Refuel (LPOR) under a £350M (US$538.1M) contract.

Highlights of the three plus year overhaul include:

- Overhaul of the new nuclear reactor core (Core H).
- Upgrades to the Trident missile system.
- Inboard technology refresh for the TUS Type 2054 sonar.
- Upgrade of the UAP 3 RESM system.

Refueling was completed in November 2010 and the SSBN re-entered the water in June 2011. VIGILANT will begin sea trials in March prior to reentering the fleet. VIGILANT will be replaced by the HMS VENGEANCE which will be the last of the Vanguard class to undergo the LOPR. The LOPR is a joint effort by the United Kingdom's Ministry of Defence (MoD), Babcock and Rolls Royce.

TAIWAN – Hai Lung I (Sea Dragon) Class Submarines: On 21 February 2012, AMI received information that the Republic of China Navy (ROCN) was preparing to integrate the Boeing Harpoon anti-ship missile (ASM into both Hai Lung II class submarines, HAI LUNG (SS-793) and HAI HU (SS-794). Both units are expected to complete the process by 2013.

In 2009, the ROCN purchased 32 UGM-84L Sub-Launched Harpoon Block II missiles and 2 UTM-84L HARPOON Block II Exercise missiles, as well as associated equipment and services. The total value of the contract was worth US$200M.

From the April 2012 Issue

CANADA: Early Submarine Planning

In late-February 2012, the Royal Canadian Navy (RCN) Chief-of-Staff testified before Parliament and remarked the sea service would begin the progress of conceptualizing a new submarine procurement program within the next four-years. Vice-Admiral Paul Maddison told a Parliamentary Committee that losing the capability of underwater surveillance and attack would be, "A dire day for Canada."

"In terms of surveillance of our ocean approaches and protection of our sovereignty, I would consider a submarine capability critical and so to lose that for a G8 nation, a NATO country like Canada, a country that continues to lead internationally and aspires to lead more, I would consider that a critical loss," Maddison concluded.

Since purchasing the four ex-UK Royal Navy (RN) Upholder class diesel submarines (SSK), the four Victoria class units have faced a series of extremely costly mishaps and setbacks—to the point where even the Defense Minister Peter MacKay recently acknowledged they have had a *spotty* history. The submarines entered RN service in the early to mid-1990's. Initially they were incapable of firing torpedoes and underwent a £9M (US$14.4M) modification to correct the error. When they were determined to be uneconomical for further service in the RN they were deactivated with the intention of being sold internationally on the used market.

In 1998, Canada accepted the four SSKs as replacements for their older Oberon class of submarines at the cost of C$750M (US$750.8M) with an additional C$1B (US$1.001B) in repairs, converting them for Canadian use. By 2004, all four units of the Victoria class had been transferred to the RCN—that's when the

trouble began. In October 2004, HMCS CHICOUTIMI experienced a severe electrical fire on its maiden voyage. This has resulted in CHICOUTIMI being laid-up inoperable. Additionally, a track record of accidents has followed for almost 15-years, culminating with the grounding of the HMCS CORNERBROOK earlier this year. As a result, the RCN is without an operational submarine. Adding insult to injury—in 2011, AMI reported Canada was incapable of using NATO standard Mk 48 ADCAP heavy torpedoes—forcing them to purchase conversion kits for the four submarines from Raytheon.

HMCS VICTORIA is expected to complete the first round of torpedo launch capability test in April 2012 and these will be followed by HMCS Windsor in the fall—meaning by the end of the year the RCN can be expected to have one operational submarine on each coast. It has also been speculated that HMCS CHICOUTIMI could finally enter service by the end of 2013.

AMI believes it has become obvious the RCN is very dissatisfied with the performance of the four SSKs and is now saddled with the expense of an estimated additional US$865M, to perform modernization to keep them in some semblance of operational capability until 2023. AMI sources indicate the Canadian government has been briefed that it would take six to eight years to build four new submarines following the signing of any contract. Additionally, design studies could take it least another two to three-years.

As reported in November 2011 Hot News, Canada has made protecting its sovereignty in the Arctic region a central part of its *Canada First Defence Strategy* (CFDS) and the *National Shipbuilding Procurement Strategy* (NSPS).

Canada has never undertaken a domestic submarine program. AMI believes the RCN is likely to pursue a new construction acquisition program in-lieu of purchasing units from the used international market. Although the idea of a nuclear submarine program has been floated, AMI thinks this is politically and economically unaffordable even under the CFDS national defense policy and the NSPS. Additionally, this level of technology would likely never be released by the US to its northern neighbor.

Also, AMI estimates Canada is likely to not seek providers outside of trusted western and northern European circles, which would preclude Turkey and any Asia-Pacific region manufacturer from the selection process. For these reasons, AMI believes the likely candidates for partnering with Canada in a submarine program are:

- Sweden's Kockums with their A26 design.
- France's DCNS with the Scorpene.
- Spain's Navantia with their S80.
- Germany's Thyssenkrupp marine with their Type 214.

AMI believes the design effort for a new submarine class will likely emphasize a balance of advanced technology and cost savings. The new submarine is likely to be air independent propulsion-capable (AIP) and will incorporate other stealth features and capabilities to allow for operations under the Arctic ice in its northern economic exclusive zone.

Although Canada has never previously constructed a submarine, AMI believes Canada's larger shipyards are capable of accomplishing some of the construction work and Canadian systems houses could provide many of the internal systems with final assembly and full integration taking place at the foreign partner's yard. This would provide jobs under NSPS to further stimulate the Canadian economy. This scenario obviously requires Parliamentary approval for Canada to maintain a submarine capability as well as a steady funding stream to carry out the acquisition process.

DID YOU KNOW?

JAPAN: On 16 March 2012, the Japan Maritime Self Defense Force's (JMSDF) fourth Soryu class submarine, JS KENRUY (SS-504), was commissioned at Kawasaki Heavy Industry's Kobe Shipyard.

From the May 2012 Issue

Poland—Modernization Plan 2030 Announced

In late April 2012, AMI received information on the latest Polish Navy (MarynarkaWojenna – MW) Modernization Plan

2030. The plan calls for spending up to US$278M per year through 2030 (total of US$5B for the period) for the modernization of the existing force and for the purchase of submarines, surface ships, helicopters and unmanned maritime systems (UMS). The plan is broken down into three phases:

- Phase 1 through 2022 is for the modernization of the current fleet (primarily Perry frigates and Kobben submarines).
- Phase 2 through 2026 calls for the procurement of two submarines and two surface combatants.
- Phase 3 through 2030 calls for the procurement of a third submarine and third surface combatant.

From the outset, the number of submarines that will be procured remains at three, the same identified under the 2009-2018 modernization plan; although it appears that the program will now be stretched to 2030. Sources indicate that the submarines do remain the highest priority in regards to capital ships and submarines. The 2030 plan also calls for three new surface combatants, two by 2026 and a third by 2030. This is a new requirement as the 2009-2018 plan had funding for the single Gawron class corvette program being terminated in favor of new submarines.

In late-February 2012, AMI received information that the Polish Ministry of Defense (MoD) had allocated US$316.5M for the procurement of the first of three new construction submarines announced under the 2009-2018 Polish Modernization Program. However, with the new plan calling for the submarines at a much later date, these funds may have been reallocated to other modernization programs as this is the priority through 2022. The MW could also begin funding its lower cost aviation and UMS programs.

If the MW intends to commission its first two surface combatants and submarines by 2026 and the third of each by 2030, a funding stream would need to begin by 2020. In regards to the submarine program, Poland intends to build the submarines in country with design and construction assistance from a foreign

supplier, with DCNS and ThyssenKrupp Marine as the two primary candidates.

PERU—MoU Signed With Korea for Future Naval Programs

In mid-April 2012, AMI received information that Daewoo Shipbuilding and Marine Engineering (DSME) had signed a Memorandum of Understanding (MoU) with the Peruvian Government to build ships and submarines for the Peruvian Navy (Marina de Guerra del Peru MGP) in the event that a South Korean solution is selected for specific naval projects. The MoU will also cover the modernization of the six Type 209/1200 submarines currently in service with MGP, AMI estimates that DSME is currently offering the Chang Bogo (Type 209) submarine design and the LST-II class Tank Landing Ship (LST) as the MGP has an immediate requirement to upgrade its submarine and amphibious force.

Peru, operating one of the oldest naval forces in South America, is undoubtedly interested in replacing its six 1970s-vintage Type 209/1200 submarines and its four 1950s-vintage Walworth County class LSTs. Since the late 1970s, the MGP has procured the majority of its equipment through the used ship market due to the naval forces low priority.

Due to its low funding levels, no wonder the MGP is now exploring its options other than the traditional European suppliers of the past. The MGP is probably beginning to believe that if it intends to procure any new construction vessels, it no doubt has to consider lower cost providers such as DSME in addition to other creative financing arrangements.

As added benefit to Peru would be if it does select the South Korean Type 209 or LST-II, it will be joining two programs already in progress and could enjoy additional pricing benefits through the economies of scale. DSME is scheduled to build the Type 209 for the Indonesian Navy and is already building the LST-II class LSTs for the Republic of Korea Navy (ROKN).

If DSME is selected to provide these vessels for Peru, it would be DSME's first major customer in South America and the first export of the LST-II amphibious design. In regards to Peru, it

would be able to realize its first major new construction program since the late 1970s.

A final decision on the MoU and corresponding new construction and modernization projects could come as early as 2013. The MGP would require at least four submarines to replace the six Type 209s in service and four LSTs to replace the four Walworth county LSTs remaining in service as well as a comprehensive overhaul of some of the Type 209/1200 submarines in service.

AUSTRALIA—SEA 1000 Submarine Studies to Begin

On 03 May 2012, Australia's Prime Minister Julia Gillard, Minister for Defence Stephen Smith and Minister for Defence Materiel Jason Clare announced that the government would provide US$221M (AUD214M) for the next stage of the Future Submarine Program (SEA 1000). SEA 1000 currently calls for up to 12 diesel submarines to replace the six units of the Collins class for an estimated US$14-20B.

The detailed studies and analysis will inform the Australian Government on the design of the country's next submarine that will follow the Collins class. First pass approval for the program is expected by late 2013 or early 2014 and second pass and the corresponding construction phase in 2017.

The detailed studies will include:

- A Military-off-the-Shelf (MOTS) design study with DCNS, HDW and Navantia.
- Initial design studies for an updated Collins class submarine with Kockums.
- An analysis of options to conduct cost and capability trade off analysis with all options.
- A capability modeling study by Electric Boat.
- Scientific and technological studies primarily by the Defence Science and Technology organization (DSTO).
- Future Submarine Industry Skills Plan (announced in December 2011).

The studies, when complete, will form the basis for the government's First Pass approval, which is the decision for Defence to

move forward with further development including its first Request for Tenders (RfT). Second pass approval, scheduled for 2017, is the defined scope for the program and first allocated budgets followed shortly after with the construction phase.

Any delays past 2017 in the construction phase will create a capability gap as all six of the Collins class are currently scheduled to decommission from 2025 through 2031. The first unit would have to be in the water by 2022 in order to commission prior to the first Collins decommissioning in 2025. This equates to a razor thin margin assuming construction begins in 2017. Five follow-on units would have to commission at the rate of one per year in order to retire the Collins on time, a schedule that will be extremely difficult to meet.

The second and most ominous question for the program is if the Australian government can fully fund all twelve units when considering defense budget cuts (up to US$4B) were announced on the same day as SEA 1000 was entering its latest phase.

CHILE—Indigenous Mini-Submarine Program Development

On 24 April 2012, Chilean Minister of National Defence (MINDEF) Andres Allamand visited Vapor Industrial, S.A. on the occasion of the commencement of construction on the *Crocodile Class 250* submarine, the first of its kind built in Chile and in the Caribbean-Latin America (CLA) region. Vapor Industrial, is a privately-owned engineering and design entity specializing in pressurized storage and transport vessels of varying sizes and capabilities.

Beside the MINDEF, also present at the event was the Commander in Chief (CinC) of the Chilean Navy (Armada de Chile (AdC)), Admiral Edmundo González Robles.

The MINDEF explained, "A team aboard the vessel could descend 300-meters, (984.2ft) carrying divers who have been prepared by an onboard hyperbaric chamber, could conduct research and search and rescue operations. The AdC CinC expressed, "We see much interest in this submarine and it would

allow rescue from stricken aircraft, sunken ships and work at great depths."

The sea service could be considering it as a deep submergence rescue vehicle (DSRV) for its two Thompson (Type 209/1400) and two O'Higgins (Scorpene) class submarines. Currently, the AdC is relying on the US, which in 2008, tested the USN's rescue diving and recompression system (SRDRS), with the Chilean submarine CS SIMPSON (SS-21). The SRDRS was designed to be rapidly deployed to any location in the world via air or ground and can be installed on military or commercial vessels when a call for assistance is received. It could also be utilized for sea floor mineral exploration.

The prototype will be constructed by Vapor Industrial and one of its subsidiaries, Industrial Steam. AMI believes if the program expands past the concept phase, it is likely Astilleros y Maestranzas de la Armada (ASMAR) Shipyards could become a participant in the program. Chile strongly supports indigenous naval production and has significant assets in its three ASMAR shipyards that could be lent to an expanded submarine program.

According to the Vapor Industrial, the submarine will have a length of 33m (108.2ft), a diameter of 3.5m (11.4ft) and an approximate weight of 250-tons. It will have an operational range of about 2,500nm and carry 14 personnel (four of which are crew) to reach depths of up to 300m (984.2ft). It will carry sonar equipment that will allow it to study sea life, geological research, or detecting ships and other submarines. Lastly, the submarine will have a low cost of operation, requiring very few crewmembers to operate. The press release concerning the event stated it will cost approximately US$5.3M and take about 12 to 18-montsh to build, per unit.

UNMANNED SYSTEM DEVELOPMENTS

LDUUV Program Update: the US Office of Naval Research (ONR) has made increased efforts to advance the large displacement unmanned underwater vehicle (LDUUV) program as of late.

In essence, the LDUUV program seeks to develop vehicle and subsystem autonomy and long endurance propulsion systems in order to create a large unmanned submarine capable of performing intelligence, surveillance, and reconnaissance (ISR) missions lasting more than 70-days. While deployed, the LDUUV will act as a mother-ship, deploying and operating static and mobile sensors for persistent surveillance in coastal waters. The USN envisions the LDUUV will be most useful in mine warfare missions, including mine-laying and mine disposal applications. While in the mine disposal role, the LDUUV will be capable of detecting and locating mines before engaging and neutralizing them. In the opposite role, the LDUUV lays networked sensors across a wide area; these sensors track, identify, and engage any vessels within a given range by either an anchored weapon or a torpedo from the UUV itself.

Currently, the USN is focused on establishing endurance and autonomy requirements for the LDUUV program. The autonomy requirement involves software, computer hardware, and sensors integration. The endurance requirement pertains to propulsion technology that can operate independently for several months. The development of technologies to meet each requirement will occur in two phases. In regards to the autonomy requirement, the first phase will last 18 months, during which time the LDUUV will work in shallow water depths (no more than 100 feet), while calling on an operator via satellite link to navigate around aquatic obstructions. The second phase, which will last some three years, will extend operations to open ocean, without human intervention.

The first phase of development of endurance technologies will last two years, during which time the vehicle will operate uninterrupted for up to 30-days. During the second phase, the LDUUV will deploy for 70-days.

LDUUV

Boeing's Echo Ranger Autonomous Underwater Vehicle (AUV) is the current benchmark for LDUUV technology. Weighing more than five tons, the 18.5-foot-long Echo Ranger dives to a maximum depth of 10,000 feet. With 28-hour endurance, the AUV is also capable of traveling up to eight knots and going as far as 80 miles without resurfacing.

In order to hasten the development process, the USN is sponsoring various academic and foreign oceanographic research projects that will establish technologies to be implemented into the LDUUV program. For example, in March 2012, the USN awarded Charles River Analytics (CRA) a US$2.7M contract for the development of technologies that will minimize the energy need in order to maximize the endurance and support the ONR LDUUV energy plan. Also, in April 2012, the ONR awarded a US$5.9M contract to Hydroid Inc, a subsidiary of Kongsberg Maritime, for the development of an autonomy testing system for the vehicle. Hydroid will utilize its own Remote Environmental Measuring Units (REMUS) UUVs as autonomy testing systems for the LDUUV technology.

In the summer of 2013, the Navy plans to demonstrate a universal launch and recovery module as an alternative method to launch and recover a LDUUV without having a dry-dock shelter on the back of a ship. Potentially, this method could be used on a ballistic missile nuclear powered submarines (SSBNs) as well as Virginia class submarines.

The USN intends to release a Request for Proposal (RfP) for the LDUUV concept in 2014. It is reported that as many as ten LDUUV vehicles will be procured for this program.

DID YOU KNOW?

United States: On 13 April 2012, US Secretary of the Navy (SECNAV) announced the names of five Virginia class submarines as USS ILLINOIS (SSN-786), USS WASHINGTON (SSN-787), USS COLORADO (SSN-788), USS INDIANA (SSN-789) and USS SOUTH DAKOTA (SSN-790).

DISCUSSION

Comments on "Operational Requirements for Conventional Submarines In the Future" by Commander Frank Theide, German Navy, *THE SUBMARINE REVIEW*, Winter 2012.

by RADM Jerry Holland, USN (Ret)

In his very nice forecast on the future use of conventionally powered submarines, Commander Theide's enthusiasm has led him into unfamiliar territory and thence to intuitive assumptions that are not correct. Straying from the subject of his expertise, he ventures comparisons between battery powered and nuclear powered submarines. He asserts, "It has often been done, but I doubt it to be feasible – and certainly unsafe – to operate even a smaller nuclear boat in confined and shallow waters, when it is probably continuously nailed to periscope depth." Commander Theide's non sequitur in this quotation seems to be lost on him. Indeed, large nuclear powered submarines have operated effectively and safely in shallow waters where they were "...continuously nailed to periscope depth". Though he has acknowledged that nuclear submarines have done just this, he continues without justification, "SSKs can perform these tasks a lot closer to shore than the SSN". For those without experience these judgments seem intuitive. But this intuition, no matter how often repeated, is wrong.

Like others who proclaim this aphorism, Commander Theide fails to appreciate that the sizes in question have significance only in relation to the water column and bottom gradient. There relative size is what counts and there the differences are small. All submarines operate around a keel depth of fifty to sixty five feet depending upon sea state and periscope/mast extension. In shallow waters, e.g. 100 feet, the 12 foot difference in draft between a battery powered boat (KILO = 20 feet) and a big nuclear powered attack boat (VIRGINIA = 32 feet) adds little to the challenge of

maintaining ordered *keel* depth. Having power to cope with transients by giving the planes lift is the real key to operating in shallow waters – not the hull diameter.

Similarly comparing the size of submarines to the area in which operating demonstrates the relativity that size makes. For example, at a scale of one inch to one mile, a COLLINS is 15/100 inches long, a VIRGINIA 20/100 inches long. On an eight by ten inch plot representing 80 square miles only close examination would detect the difference. The same relationship holds in the ocean – and in shallow waters.

The widely accepted assertion that a battery powered submarine with Air Independent Propulsion is stealthier than an SSN relies on instantaneous comparison. Submarines operating on a battery at low speeds are very quiet but in ASW ("Awfully Slow Warfare"[1]) the real issue is noise over time. In this context the sounds generated by modern SSNs are also very low but consistently so whereas those from the battery powered submarine must on regular occasions be large.

As Commander Theide emphasizes, "...it is speed that is essential for everything". He acknowledges that Air Independent Propulsion does not provide propulsion – these devices support only house keeping. If the AIP submarine needs to go somewhere, the battery or the engine must be used. The state of the battery is a constant concern for the skipper of a battery powered submarine; keeping it above 50% or so is the minimum in order to be ready to make such a move. Proceeding at any speed above slow for an appreciable time must be followed by a charging evolution, the give away for a submarine.

Commander Theide repeats another commonly misunderstood characteristic suggesting that conventionally powered submarines are more ". . . highly maneuverable at lower speeds..." than nuclear powered submarines. Turning radii are smaller for shorter ships but this characteristic is also related to propulsion power and size of control surfaces. The large control surfaces and big propulsors on modern submarines add maneuverability not only in depth keeping but also in turning radius. However, ASW is NOT dog fighting. Maneuverability for a submarine has meaning only

in terms of closing a target or opening a datum and in both cases the advantages of nuclear powered submarines are obvious.

ENDOTE

1. Vice Admiral Walter Cebrowski, USN.

LIFE MEMBERS

Mr. John P. Casey
CDR Michael James Leonard, USN
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THE SUBMARINE COMMUNITY

SECURE SNORKELING

by RADM T. J. Robertson, USN(Ret)

In the beginning, St. Marys, Georgia was a bit of a quiet southern backwater. Enter the United States Navy, and certain changes were inevitable. Among the commercial enterprises the Navy helped make productive was the semi-notorious Snorkel Bar on the St. Marys outskirts. Even those traveling to Kings Bay on submarine business in the 80s were made aware of this infamous establishment, I among them. Snorkels apparently put in various stints as an off-limits establishment, but enjoyed a generally relaxed oversight under the eye of the Camden County Sheriff Department.

As one might predict, Snorkels became an oasis of choice among submariners and submarine support sailors. Snorkels worked hard on coming up with specialty nights to encourage their patrons, many of whom needed little encouragement. One particular specialty event, sometime in the late 80s, brought a new level of notoriety to Snorkels. The feature entertainment was to be a contest to determine which couple could engage in the longest, most passionate kiss. All this to be performed on stage in a backseat removed from a '57 Chevy. One can easily imagine the enthusiasm and creativity submarine and support sailors can throw into such an event. In the end, one particular couple went so far beyond the less imaginative efforts of other contestants that they were exuberantly and unanimously proclaimed winners. When they finally secured snorkeling and resurfaced from the depths of the Chevy backseat, they were duly crowned champions.

As fate would have it, the winners were both active duty sailors, and word of their feats spread like wildfire. Understandably, local Navy leadership saw few upsides to this titillating story,

and plenty of negative public relations potential. So they decided to cover their bosses in Norfolk with an appropriate OPREP incident reporting message. I happened to be visiting at COMSUBLANT headquarters the day the message showed up in early morning message packages. What normally was a fairly calm, pro-forma morning conference became a chorus of stifled snickers and guffaws as the various captains sequentially came upon the Snorkel report. Not surprisingly, rendering such *interesting* circumstances into a very stiff report format is a challenge too great. The harder one tries, the more the result comes off sort of like *Humor in Uniform*. In the end you simply have a humorous story that, no matter how carefully stilted the language—is still funny. As for our senior leadership, better to be forewarned I suppose. But I got the impression they would have been quite happy not to be informed of the Snorkel exploits. There is that unwritten law of the Navy: "Don't tell me something that I'd be better off not knowing."

Some things have gone full circle in the 25 or so years since the Snorkel Incident. Camden County's Sheriff routinely won reelection—once while under indictment, surviving until recent years through bluster and cunning. And, I might add, through appreciative treatment of Navy people! After being run out of office, he now threatens to run again, with plenty of local support likely. And Snorkel Bar, after several benign attempts to regenerate the atmosphere of bygone days into the *modern* Navy cultural environment, is now a substation for the Camden County Sheriff Department.

BOOK REVIEW

FIRING POINT

by George Wallace, USN(Ret)
Author - Final Bearing and Firing Point

CDR George Wallace is a retired submariner. He commanded USS HOUSTON (SSN 713) from 1990 to 1992.

When I first retired from the Navy, my wife and I moved from San Diego to Durango, Colorado. Being over 7,000 feet up in the San Juan Mountains is just about as far from the ocean as you can get and still be in the US. Normally not even the water from the Animas River makes it to the ocean. People living there had very little concept of the Navy or the Submarine Service. I was actually asked by a co-worker, in all seriousness, if the Sub Force was part of the Coast Guard. I, of course, had to explain that we normally operated in water too deep for the Coast Guard.

Durangotans were enthralled by tales of life under the sea, or at least that was my read of their reactions to my sea stories. I was repeatedly urged to write down the stories to share them more widely. Again, this was my interpretation of their motives. They could have merely understood that while I was busy writing, I wouldn't be pestering them with tall tales of people who mysteriously disappeared for months at a time, and made their own air and drinking water. It's my article, so it's my interpretation.

After mulling this over for a considerable period, I came to realize that writing a book was in order. For a number of reasons, I chose a novel as the format. Chief among these reasons was the classification of the work we do. Although VADM Richardson has lobbied for several years to have the modern submarine story actually told, realistically much of that story will stay classified

well into the future. Any attempt at writing a Cold War version of SILENT VICTORY will have a readership limited to submariners with active clearances. I wanted to familiarize a larger general audience with the men who manned their submarines and the jobs they did. That meant fiction, but with the descriptions as close to accurate as possible within the strictures of security.

At this point, I need to say that all characters in our novels are purely fictional. That's our story and we're sticking to it. Although actual events may be the impetus for some parts of our novels, except for mentions of Navy legends like Admiral Rickover, none of our characters portray anyone real, living or dead. However, after reading our first book, multiple people have each claimed to be the basis for the most of the characters. Amazing!

The other major reason to use fiction as our medium was that, quite frankly, our job as submariners, if done properly, is very boring. I know many of you will argue this point, remembering a few terrifying minutes on a SPEC OP where your heart rate was up on the limiter. But remember, that was a minute or two out of sixty days on station. The rest of the time, your definition of excitement was pizza for midrats. And the dangers of a xenon precluded start-up would be exciting only to a nuke (although we tried that plot line in FINAL BEARING). A novel is, by definition, a story that is meant to be entertaining. If not, it fails in its mission.

I have used *our* several times up to this point. It is time that I explained. Don Keith and I co-write these stories. Don is a former communications executive and established novelist (he prefers *storyteller*), living outside Birmingham, Alabama. He has no military background, but since we started working together he has become one of the most prolific submarine historians currently writing. When I was first starting out, I submitted to a literary agent (Robbie Robinson, formerly a torpedo-man on ARCHERFISH SS311) what I thought was a finished manuscript for a book, but in retrospect, probably read too much like a tech manual. Writing fiction is a skill set not well-developed in military circles, except for the occasional fit-rep. Robbie suggested that Don and I work together. We decided to give it a try. Don is

really, really good at character development. I shelved that first novel for later. Starting over with a skilled and seasoned writing partner would be simpler if we just started with a completely blank page. I guess you can say that the rest is history.

Although we did not physically meet until after FINAL BEARING was published and was already a best seller, through the wonders of the internet we developed a unique collaboration technique that has worked very well for us.

Essentially, we start with a short, three to four page, synopsis of where we think the story line will take us. Ideas for the storyline come from many sources. For FINAL BEARING, I wanted to tell about the challenges of life on an older submarine and the attachment that men build for those old ships. Those of you who sailed on any boat with a hull number less than 688 will remember what a challenge it was to maintain those boats, especially as they neared the end of useful life. Every underway was an adventure.

A chance news article in the late 90's about a mini-sub that one of the drug cartels was building high in the Andes brought on that part of the story. Since FINAL BEARING was released the drug lords have resorted to mini-subs on a routine basis. Did they read FINAL BEARING?

When on a surface run down to the old Carr Inlet sound range (it wasn't old back then) I looked at the charts and realized that a submerged transit was doable. Remembering that trip was the foundation for our fictional SPADEFISH's action in chasing the mini-sub down Puget Sound.

For FIRING POINT, we wanted to show the life of going North and playing with the Bear, except in a modern context. Here was our chance to tell about life on a 688I and how capable those boats are. We did play a little loose with reality here. We kept both the DSRV and the ASDV alive to keep the plot moving, and frankly because they are both capabilities that we as a Submarine Force still need.

It normally takes several iterations of rewriting, emailing the synopsis back and forth to reach something that we are happy with. Then we start the serious writing. Normally I will write a chapter and zap it to Don. He will make changes and pass it back

to me. A chapter may take five or six re-writes just to get the basic story down. While writing, we will frequently riff on the story line. Some action one of the characters takes will open up a new vista to explore a bit before we return to the central theme. You might compare this to writing an incident report and investigating all the causes and effects, although this is a lot more fun.

We are frequently asked which of us wrote which parts. I don't think either of could honestly answer that question. It is truly a collaborative effort. Except that any factual mistake is mine.

Authenticity is more than a byword with us. It is at the heart of our story telling. We have had many rather ***warm*** discussions with our editors, and even ***warmer*** ones with the movie screen writers, about what they considered trivial, and therefore unnoticeable details of submarine life. The boat in the story has to look, sound, and smell like the one really going to sea. If I can't use words to paint a picture of the control room when you are coming to periscope depth on a stormy night that has you looking for a green poly bag, then I'm not doing my job.

There are a couple of central themes in all our works. Don and I try to tell a story that paints a true picture of the people who man our submarines; the challenges and dangers they face on a day-to-day basis, the level of dedication and integrity that it takes, and the sacrifices they all make. We try not to make anyone ten feet tall, but to portray the mental pressure and the physical exhaustion realistically. We want old shipmates to pick up one of our books and smell the amine while a new reader feels that she really understands what's happening and why.

Telling the technology tale is a bit of a challenge. It' a balancing act. The technology is vital to the plot and writing about the incredible capabilities of today's boats is almost like writing science fiction. To the uninitiated, the technology is the neat stuff, but it's only a part of the real story. It is not the story, it only enhances the story.

Even in our fiction, the laws of physics still apply. The limitations are integral to the story. Why can't Joe Glass just shoot the bad guy as soon as he picks him up on the towed array? That takes some explanation. But a four page dissertation on bearing

ambiguity or the mechanics of an ADCAP launch breaks the tension we tried very hard to build to a peak as TOLEDO is evading incoming weapons and counter-firing a self-defense weapon.

One trick that we employ is to run an exercise or two early in the story. There we will spend some time with a technical explanation. In FIRING POINT we meet Joe Glass and the TOLEDO as they are getting their butt handed to them by a Brit sub in a TORPEX. We spend some time explaining what is going on. Later, when Glass is evading a Russian torpedo up under the ice, we can keep the tension high and the details in the background. The reader can see that the TOLEDO crew learned their lessons back in the Irish Sea.

Here is an excerpt from FIRING POINT that should illustrate a little of what we have been discussing (and frankly to whet your interest):

> Master Chief Tommy Zillich was listening to the towed array sonar hydrophones, well aware that there could be a stalker out there somewhere in those dark, icy waters. His mouth still dropped open when he heard the launch transients from *Volk*.
>
> There was no mistaking the sound. Torpedoes inbound!
>
> He grabbed the 7MC microphone and yelled the words all submariners fear.
>
> "Launch transients! Torpedoes in the water! In the baffles. Best bearing zero-nine-zero and they're close!"
>
> Without hesitation, Perez yelled, "Ahead flank! Launch the evasion devices! Right full rudder! Steady course south."
>
> TOLEDO leaped ahead as the throttle man poured steam into the boat's big turbines. Fifteen knots. Twenty. Twenty-five. The sub's speed climbed. But it was no race because of the velocity of the Russian torpedoes. There was one hope, to get outside the acquisition cone on the two incoming fish so they would lose the scent.
>
> The deck rolled violently as the sub banked through the

high-speed turn. Maybe, just maybe, the evasion devices would confuse the torpedoes long enough to allow them to escape.

Glass ran out of his stateroom into the control room. He took in what was happening and realized at once how close they were to death. "Make your depth a thousand feet, forty-down angle! Keep me just off the bottom! Snapshot tube one on the bearing of the incoming weapon!"

He grabbed the metal stanchion by the periscope stand and held on. This was going to be close.

Or maybe not. Maybe they were dead already.

They had to get out of the acquisition cones somehow. Or else they would be little more than another skeleton on the floor, lying dead right next to MIAMI.

The deck slanted down steeply as TOLEDO clawed for the safety of the depths.

"Torpedoes bear zero-nine-zero," Zillich reported, his voice calm and workmanlike. "I have them on the sphere now. They're active."

"Weapon ready!" Weps yelled.

"Shoot tube one," Glass ordered, doing his best to match Zillich's all-business tone.

Thank God they had the torpedo loaded, the door already open.

He watched the weapons officer throw the brass handle to *Standby* and then to the *Fire* position. At least they would get a chance to shoot back. Glass knew that it would do little more than scare the bastard who had ambushed them. He was probably hiding in the noisy ice near the surface and it would be next to impossible for a normal weapon to ferret him out.

TOLEDO lurched as the torpedo ejection pump forced three-thousand-psi water up around the back end of the ADCAP torpedo and flushed it out of the tube. Sensors in the torpedo detected motion down the tube so that the Otto-fuel engine started as soon as the weapon cleared the enclosure and was outside. Its steering vanes pushed the

four-thousand-pound weapon around until it pointed at a course of zero-nine-zero. All the while, the engine accelerated until the torpedo was traveling at better than sixty knots. It was already busy, searching for its target.

This was no ordinary torpedo. The special under-ice algorithms built into its software easily picked out the VOLK from the surrounding ice. Still, just as it was programmed to do, the weapon looked away and then back, verifying that what it had found was a real submarine target. Its logic now satisfied, the ADCAP drove at maximum speed toward the target, its arming mechanism activated to sense any large metal object nearby, both by sonar and with an interferometer.

The weapon passed underneath the Russian submarine once, without the arming mechanism being triggered.

Serebnitskiv could hear the pinging of the onrushing ADCAP through the hull, even without the aid of sonar. There was nothing to worry about. It couldn't find them up here in the midst of all this ice. It would soon fly harmlessly by and eventually explode into the bottom when it ran out of fuel.

The ADCAP circled around and came back again, but shallower this time. The arming mechanism still saw VOLK plainly. It sent an electric pulse to the firing mechanism, which detonated the firing squid.

The firing squid set off the six-hundred-fifty-pound PBNX warhead just as the ADCAP was beneath the sub's operations compartment.

The vicious shock wave tore through the double hull as if it were little more than tissue paper. Most of the superheated gas bubble vented through the rent in the sub's bottom, incinerating most anything it touched as it ripped and tore through bulkheads.

The crew members on VOLK had less than a millisecond to realize what had happened. Igor Serebnitskiv was thrown violently upward and across the control room. He had no chance to grab anything. He was brutally impaled on

a protruding valve stem, high up on the outboard bulkhead.

Admiral Alexander Durov's nephew died instantly.

Even if the catastrophic explosion had not been enough, the expanding gas bubble it set off lifted VOLK upward like some child's toy and crushed it against the ice pack above.

Smashed and mortally violated, the mangled, lifeless hulk sank to the bottom of the cold, cruel sea.

"Torpedoes passed astern!" Tommy Zillich yelled as he listened to the headset, his hands pressing the earpieces closer to his ears so he could hear everything going on out there. "We may be clear!"

TOLEDO was still angling sharply downward, toward the bottom, racing to get clear of the Russian weapons. They had all heard the deep rumble of the other submarine as it exploded. Now the control room was silent, everyone listening for the high-pitched scream of the incoming weapons.

That sound, as all the men aboard knew, would signal their immediate death.

A few of them breathed a sigh of relief when they heard Zillich's report. Glass knew better. They weren't free yet. Those two torpedoes were still out there, still searching doggedly for them.

The sonar man confirmed his worst fears.

"Torpedoes! Both coming out of the baffles!" Zillich yelled over the 7MC. Now he had lost his calm demeanor. His voice was high and strained. "They're closing!"

The Russian weapons had crossed astern of them and then turned back, looking once again for TOLEDO. They were both still relentlessly coming after them.

"COB, get me thirty feet off the bottom!" Glass ordered Sam Wallich. "Do it now!"

Wallich nodded and turned to his helmsman and his planesman. "Okay, guys. It's up to us. Keep the forty-down angle until I tell you. Then pull out with everything you got."

Wallich stared hard at the depth meter as it reeled off

the numbers. It was too late to pray that the gauge was calibrated, that the chart was accurate, but he did anyway.

Hitting the bottom at this speed would be like driving a 747 into a granite mountain. There wouldn't be much left of a fine American submarine and its crew.

It seemed they had been diving forever before Wallich screamed, "Pull up now!"

Somehow, TOLEDO managed to stop her sharp descent and pull out of the dive a few precious feet before her nose would have burrowed into the muddy bottom of the Barents Sea. With her momentum still at a maximum, she raced blindly across the sea floor, the screw kicking up a thick cloud of mud in its wake. No one wanted to ponder the possibility of a rocky crag or sudden undersea hillock popping up in their path.

Edwards could hold it no longer. "Skipper, suggest we come up to—"

"Hold her where she is! Stay on the bottom!" Glass ordered.

Don and I hope that the explanation of how and why we write like we do and the excerpts from FIRING POINT that we included in this article have piqued your interest. We look forward to hearing your comments and critiques.

FIRING POINT will be published 3 July by Penguin/Signet and available wherever books are sold. A major motion picture based on the book is now in pre-production. FINAL BEARING is available in hardback, paperback, and as a Kindle ebook at Amazon.com.

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