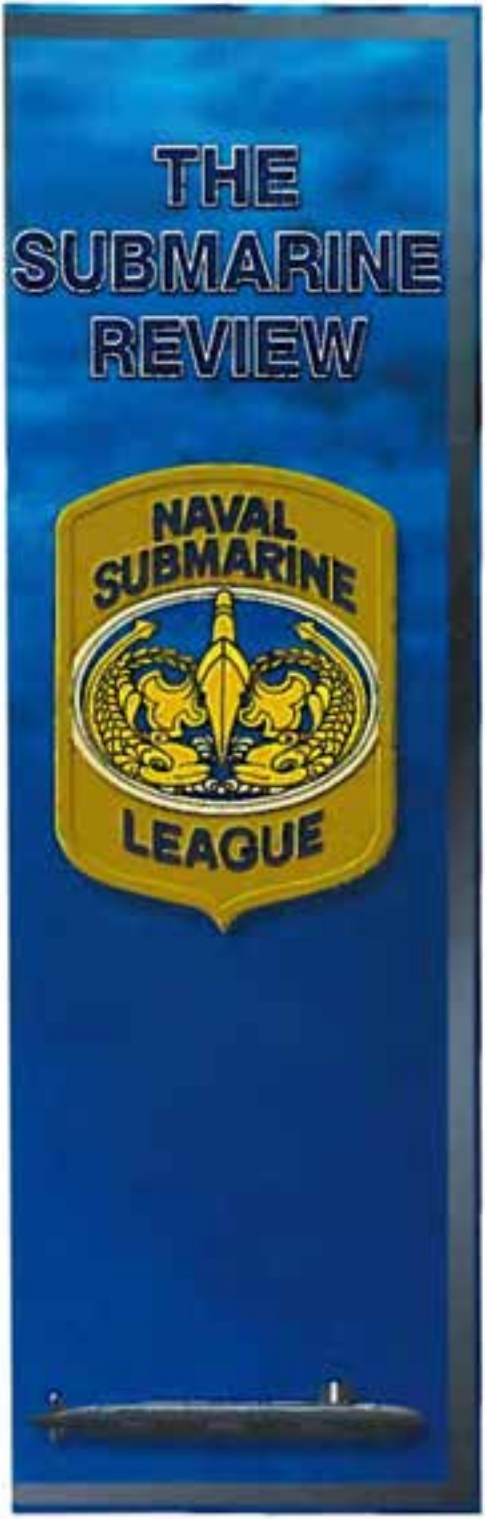

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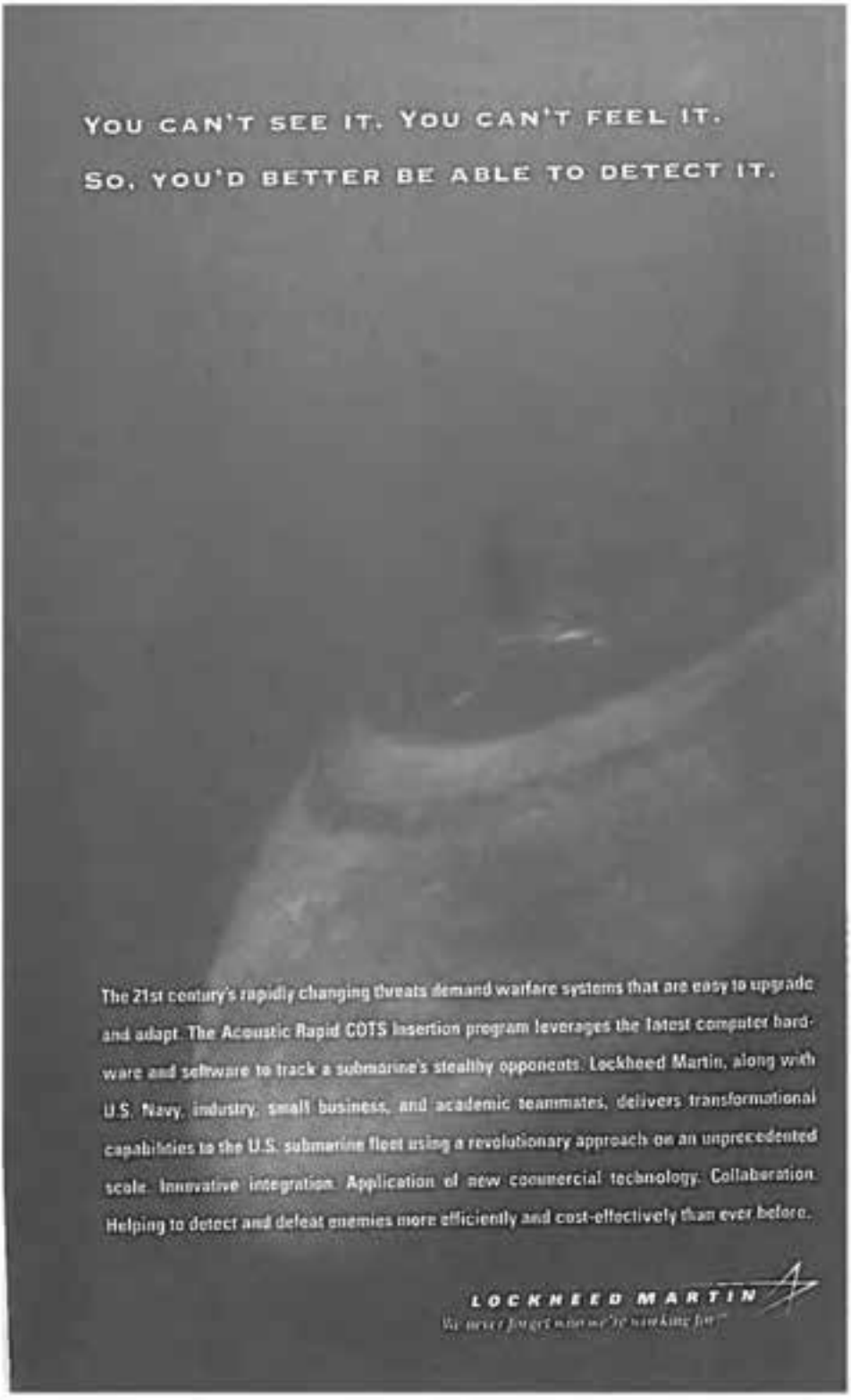
YOU CAN'T SEE IT. YOU CAN'T FEEL IT.
SO, YOU'D BETTER BE ABLE TO DETECT IT.
The 21st century's rapidly changing threats demand warfare systems that are easy to upgrade and adapt. The Acoustic Rapid COTS Insertion program leverages the latest computer hardware and software to track a submarine's stealthy opponents. Lockheed Martin, along with U.S. Navy, industry, small business, and academic teammates, delivers transformational capabilities to the U.S. submarine fleet using a revolutionary approach on an unprecedented scale. Innovative integration. Application of new commercial technology. Collaboration. Helping to detect and defeat enemies more efficiently and cost-effectively than ever before.
LOCKHEED MARTIN

EDITOR'S COMMENTS

With this first issue of a new year THE SUBMARINE REVIEW presents the first message to appear in these pages from the new Commander, Naval Submarine Forces. For those who do not keep abreast of the latest in USN organizations, ComSubLant, or Commander, Submarine Force, US Atlantic Fleet, is also double-hatted as CNSF. The lead FEATURE in this issue is his presentation to the National Defense Industrial Association meeting at the Naval Submarine Base New London in Groton, Connecticut. Most of us know this get together more familiarly as the *Annual Clambake*. Rest assured this will be the only lesson in new naval terminology offered by the Editor in this issue. Of course, as you read the FEATURE about Non-Tactical ADP being built into the Virginia-class you will find plenty of new terms needed by the Navy to keep pace with rapidly changing technologies.

One of our reviewers (who has been in positions to know about these things) commented that VADM Donald's *Clambake talk* sets the standard for presentations of this sort. Clearly, it is in the interest of all in the submarine community to read what the new leader of the operational submarines is seeing in the past, present and future. Our second FEATURE is an adaptation of a paper done by a submarine officer while at Naval War College. The paper won the Naval Submarine League Prize and is presented here as an in-depth look at the concept of a Submerged Battle Group. The new point about all of that, or at least new to the post-WW II Navy, seems to be in having the tactical command of a submarine action group vested in a submarine officer on scene with first hand, enduring knowledge of the environment and the diverse capabilities available to him. Perhaps that is what the policy makers mean by *transformational thinking*.

There are also two ARTICLES which deal with new concepts in submarine employment. The *Deck Gun* article by LT Lehmann is an innovative think-piece about the possible submarine adaptation of a weapon system developed for other forces. The piece about *Submarine Space Power* by Mr. Elhefnawy, is an articulation

and particularization of the general concept of using submarine uniqueness in direct applications to the extension of world-bound conflict to the regime of space. It would seem that is further evidence of *submarine transformational thinking*.

There is, of course, much more of interest, and thought-provoking value, in the many other articles, sea stories, tributes and book reviews in this issue. One, in particular, must be remarked upon specifically so that it is not missed. It is The Saga of a SCULPIN Survivor. It is a classic submariner story and was first published in Polaris, the magazine of the Submarine Veterans of World War II, many years ago. Don't miss it.

Jim Hay

FROM THE PRESIDENT

As we close the book on 2003, you can take pride in the accomplishments of your Naval Submarine League. Our fiscal integrity has been improved, the quality of the 2003 programs was maintained or improved and we have initiated several new activities.

First, let me bring you up to date on changes in League leadership. RADM Joe Henry took over the duties as League Secretary, allowing RADM Larry Marsh to take on his new duties as Vice President. New members of the Board of Directors are RADM Mike Tracy, Director, Submarine Warfare Division and Captain Jamie Foggo, our new Liaison Director currently stationed on the Joint Staff. Admiral Bruce DeMars, our Chairman, added three new members to the Advisory Council, Dr. Bill Browning, Dr. David Stanford and RADM George Voelker.

The fiscal status of the League is sound. For the last year and a half the officers, Board, staff and Corporate Benefactors worked together to recover from the fiscal realities of supporting the Centennial Celebrations and the depressed economy. We will end this year with a surplus for the first time in five years. We intend to continue this trend. Next year's budget will include money to reinitiate our grant program. It has been on hold since we started funding the Centennial Celebration. We look forward to reengaging museums, educational institutions, and fellowship programs. The surplus in the budget to be presented to the Board of Directors for approval at our February meeting is the result of a lot of hard work, a modest membership dues increase and the increased fee for the Submarine Technology Symposium.

With respect to new activities, RADM Henry is standing up an initiative that will assist members in identifying career opportunities. This initiative, approved in concept by your Board of Directors

will allow members to place their résumé in a database on the League's server making them available to our Corporate Benefactors and other organizations. The League leadership will assist organizations seeking submarine professionals in finding an appropriate match. Details are still being formulated. Joe has also taken on the responsibility for implementing the results of the Programs and Initiatives Review completed in 2003 by RADM Jack Kersh and members of his Advisory Council team.

Dr. Bill Browning, our 2003 Distinguished Civilian, is setting up the framework for a Naval Submarine League Submarine and National Security Studies program. The program will provide credible, fact-based studies that promote the value of submarines in the Joint Forces environment. The studies would be approved by League leadership and released after briefing the Executive Committee and Submarine Force leadership.

A third initiative is improving our web page infrastructure and databases. This initiative is receiving support from our Corporate Benefactors. We plan to have these improvements in place early in 2004. The additional capability will assist in maintaining our membership database and our on-line registration processes.

The first League event in 2004 will be for our Corporate Benefactors. ADM Skip Bowman will kick off the Corporate Benefactor Recognition Days on the evening of February 16th with his assessment of the state of the submarine program. VADM Kirkland Donald and RADM Paul Sullivan will provide their perspectives of our current force structure and operations. Other speakers already confirmed include VADM Stan Szemborski and VADM Phil Balisle. This promises to be an outstanding opportunity for our Corporate Benefactors to receive up close and personal perspectives from the Force leadership.

The Submarine Technology Symposium will be 11-13 May 2004. The theme is **"Developing & Demonstrating Submarine Technology In Support of Fleet Operations".** Over 90 papers have been submitted for presentation. We have five outstanding session chairs to review the papers to select the most appropriate for our topics. Chairman VADM George Emery has early commitments from ten plenary speakers including the CNO, ADM Vern Clark, and ADM Tom Fargo, Commander Pacific Command. Registration for this event will open up in February. Watch for an

announcement in NSL UPDATES of the date when you can sign up on-line.

The Annual Symposium will be on 9-10 June 2004 and will feature the breakout sessions that were so popular in 2001. RADM Steve Johnson and RADM Mike Sharp have again teamed up to provide updates on exciting new technologies being developed for the Fleet. We will also be honoring six fleet awardees and the 2004 Distinguished Submariner and Distinguished Civilian. The mailing for the Annual Symposium with the agenda and registration information will be in April 2004.

Finally, Jan and I thank you for your thoughts, prayers, cards, notes, emails, and calls regarding my recent surgery. I am on the mend, gaining strength and face no follow-on treatment.

Jan joins me in wishing you a very Happy, Healthy, Prosperous, and Joyful New Year.

J. Guy Reynolds

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NAVAL SUBMARINE LEAGUE · Box 1146 · Annandale, VA 22003
(703) 256-0891 Fax (703) 642-5813 E-mail: sublengue@starpower.net
Web Page: www.navalsubleague.com

FEATURES

VADM DONALD REMARKS AT NDIA 2003 JOINT UNDERSEA WARFARE TECHNICAL CONFERENCE

Naval Submarine Base, Groton CT
23 September 2003

Good morning, thank you, it's good to be here. Admiral Bowman, New London Submariners, Admirals, Captains of Industry, Leaders in our Undersea Technology Acquisition and Warfighting Communities, Ladies and Gentlemen. It is an honor and a privilege to be here and be back in Groton CT, the home of our Submarine Force. Before I get too far into my remarks, I want to take the opportunity to thank Joe Walsh and Jim Ratte for the work they've done to put this conference together. It takes a lot of work, especially if you consider all of the things that have happened over the last week or so preparing for and successfully dodging hurricane Isabel, something we weren't quite as successful doing down in Norfolk. We know what kind of work it takes for your staff to pull this conference together and I really appreciate it.

It's good to be with you here today and to talk with you about where the Force is today, but more importantly where we want to be in the future.

I want to acknowledge the creativity, ingenuity, and just plain hard work of those of you in the industry who have supported us not in only our day-to-day operations but in the transformational efforts of the Submarine Force over the years. I had the opportunity to observe first hand the contribution and performance of our ships in OPERATION IRAQI FREEDOM and it struck me just how far we have come in the decade plus since OPERATION DESERT STORM. Through our cooperative efforts, we are seamlessly connected at the joint and combined force level through Internet protocol communications and with equipment that ensures we can use every bit of the bandwidth we are given.

When the maritime component commander or the air component commander communicates with us, we are sounding more and more like everybody else and less and less like a unique submarine. Our weapons are not only precise, but we can deliver them in volume and we can launch on minutes notice as opposed to hours. There is more good news that stems from this partnership. We have a new class of attack submarine, led by VIRGINIA, that's very nearly ready for sea.

We have OHIO class ballistic missile submarines being converted to SSGNs, a platform with capability potential we have only begun to imagine. You have, we all have, very much to be excited and proud about. However, this is not the time to be getting cocky and resting on your laurels. I'm going to ask more of you.

The CNO has given us the vision in Seapower 21 to chart our course for the future, the future of this Force, and given us the standard to measure our progress. In his Seapower 21 statement, the CNO said that we, and I'll quote, "often cite asymmetric challenges when referring to enemy threats, virtually assuming such advantages belong only to our adversaries. Seapower 21 is built on a foundation of American asymmetric strengths that are powerful and uniquely ours. Among others, these include the expanding power of computing, systems integration, a thriving industrial base, and the extraordinary capabilities of our people, whose innovative nature and desire to excel give us our greatest competitive advantage." Now, when you translate these strengths into sea power through naval forces and then further translate sea power into sea superiority, you truly have an asymmetric advantage that will contribute to decisive victory.

We have seen it in our recent conflicts, the importance of *access*. When deprived of land bases for strike aircraft in OPERATION ENDURING FREEDOM, carrier based aviation and sea based cruise missiles provided the striking power required. Similarly, because we had sea superiority, and consequently *access* to littoral waters surrounding Iraq, we were able to amass unprecedented firepower, essentially invulnerable firepower, in range to support that campaign. We had a *Sea Shield* of sorts; it's just that in that campaign we didn't have to work very hard to get it because of limited Iraqi capability to deny us that access, and I suspect that

was not lost on some of our potential adversaries. We can't expect, nor should we plan on things always being so comfortable. Our *Sea Shields* of future conflicts and, consequently, our access will likely be threatened by diesel submarines, mines and high speed cruise missiles from sea and shore based launchers.

To be deterred or even impeded by these threats is unacceptable. So let's talk about the role of undersea warfare in the *Sea Shield* concept and in making sure our access is assured.

I remember a movie called *City Slickers*. In that film there was this gnarly, old cowboy named Curly, played by a perfectly gnarly Jack Palance. Throughout this film Curly espoused the virtue of something he called "The One Thing". Whatever that "One Thing" meant to him, and I admit I never did really figure out what it was, it certainly helped to keep him focused on what was important to him. Well, I've got my own "One Thing" when it comes to where submarines fit in Sea Shield, and I won't be as cryptic as my friend Curly. We **must be able to operate, with impunity, across our mission spectrum, in the contested littoral.**

Assuming our potential adversaries learn from history and *harden the outer edge* of their maritime domain, a submarine's stealth and endurance will be essential to early and persistent access to the increasingly important pre-hostilities phase of any operation. We can't be deterred by the presence of mines. We must have the capability to locate, avoid, and if necessary neutralize those mines that are an impediment to sustained presence in the areas we deem to be operationally significant. We can't be deterred by enemy submarines. Whether operating independently or as an element of a combined arms task force, we must be able to locate, hold at risk, and destroy on call, any submarine that leaves port to threaten our forces. We must use our honed surveillance capabilities and the resultant profound situational awareness we develop to inform and advise the Joint Force Commander of the capabilities and intentions of our adversaries.

This may mean deployment and monitoring of a wide variety of unmanned netted sensors or execution of intrusive intelligence, surveillance, and reconnaissance, where joint special operations forces deployed ashore can either observe activity of the enemy directly or leave behind unattended ground sensors extending our reach ashore. We have to be there to prepare the battlespace such

that the Joint Force Commander can engage the enemy with speed and decisiveness at a time of his choosing. This may mean more extensive mine survey, mapping, and neutralization. It may mean the rapid destruction of the submarine threat to allow access of our maneuver forces. And finally, when things go hot, we must be ready to mass fires and strike where necessary at a moment's notice to neutralize any threat to either our sea based or our maneuver forces.

Today, we in the United States, do have a competitive advantage in undersea warfare. Our expanding experience base of operating against quiet diesel submarines shows us that, while formidable, they are not *black holes*. We're extending the range at which we can detect and track these contacts. Similarly, we are making significant progress in mine detection and avoidance through our experimentation with high frequency active sonars and by focusing the Force on practicing their skills on our mine seeded ranges. We have the best littoral torpedo in the world with the MK 48 ADCAP, and it is getting better. We are experimenting with and deploying unmanned undersea vehicles designed to increase the fidelity, reach, and dwell of our sensors. Our relationship with special operations forces has never been closer. We are on the cusp of operationalizing an SSN/SOF capability as never before.

We've got an aggressive experimentation effort; it's a leader among the services in integrating innovative technology into submarines and testing them in realistic joint operating concepts. GIANT SHADOW was this year's mission evaluation of the warfighting power and flexibility of the SSGN/SOF striking group. It was in a Global War on Terrorism scenario and it was the first experiment under the Navy's *Sea Trial* process. It showcased the potential of what a large volume undersea platform can do for the commander. We're going to do it again in SILENT HAMMER, our next *Sea Trial* experiment on the SSGN. This time we're going to delve into the possibilities the SSGN will provide the Joint Force Commander in a regional conflict scenario. We have an additional series of experiments and demonstrations that are in progress to expand our budding capability to meld information operations with other submarine missions such as SOF delivery and support.

We are pursuing a disciplined, determined, problem-solving approach with focused management attention in all of these areas

as we build ever more robust, real capability. Emphasis on **real** capability. While I am optimistic, I am by no means satisfied. We must not just get better — we must dominate in this area.

So how can you help? It's approaching the time of year when everybody fills out their holiday wish list. I've filled mine out early, so here it goes.

First, let's talk about SSGN a bit. I mentioned earlier that the conversion is in progress and we've got an experimentation effort that is well underway. It is critically important that we deliver SSGN on time, ready to deploy and fight.

People are really getting excited over this capability. In June I had the opportunity to host the Chairman of the Joint Chiefs of Staff on an overnight ride on USS RHODE ISLAND. I got to explain to him personally what it meant to take that wonderful ship, USS RHODE ISLAND, and convert one just like it to SSGN and how that could be melded in with such capabilities as SOF and Strike and things we haven't begun to think of yet. He was struck by the idea to the point where he requested that we brief the Service Chiefs on the SSGN/SOF capability in an effort to spur thought on how to make it more joint. We will do that briefing next week. The week before last the CNO, when presented with the brief we prepared for the tank, commented that he could envision the SSGN as a large undersea "raiding platform" with SOF, strike, and surveillance, staged where we need it during the pre- hostilities phase of operations, on call to the joint force commander. This SSGN-SOF Strike Group, *Triple S G* I'll call it, is capable of myriad missions across the warfighting spectrum. Admiral Ellis, at STRATCOM, sees a clear role for the SSGN in his concept of Global Strike.

What I need for you to do is open your apertures looking for opportunities to exploit what we have in the huge undersea volume and large ocean interface of the SSGN and to demonstrate the true joint warfighting capability it brings. Admiral Bowman has urged us to *Get Real* with technology and get real hardware and software in the operating environment quickly, test it, and build on successes. This is particularly applicable to the SSGN. That same attitude applies to development of joint operating concepts. We need smart people looking beyond the obvious, developing and testing new ways to integrate into the joint force and ensuring that

our solutions remain compatible in the joint architectures of the future.

Item two, Connectivity. I think you've gotten the picture of our submarines operating in hostile waters, close to enemy shores, where others are denied access, for extended periods of time. If we are going to be effective in this joint force, we not only have to be there, but we have to be connected and able to exchange information with the joint force. Warfighting today demands real time, high bandwidth communications and that demand is only going to increase. Further, we are going to have to be able to communicate without yielding our stealth. We have to continue to pursue communications at speed and depth. There are solutions out there that show tremendous promise, we want to test them. We need technology to increase our communications capacity and make more efficient use of the bandwidth we have. If there's anything IRAQI FREEDOM taught us it's that we'll use every bit of bandwidth we have and then some. This connectivity is not only critical outside the hull; it is critical inside the hull as well. What I mean by that is our tactical systems must be fully integrated inside the ship. The days of developing and delivering independently operating and singular function tactical decision aids should be over. It is asking too much of our Sailors to operate and maintain them and to stay trained on them, and we can't afford it.

Item next, Weapons and Sensors. If submarines are going to be a persistent force in the contested littoral, in the very van of the *Sea Shield* for our operating forces, we are going to need a wider variety of sensors and weapons that give us more response options and keep us in the fight longer.

For instance, we should be able to engage small, high-speed vessels or aircraft that could threaten our battle forces or be impediments to either our freedom of movement or the movement of our Special Operations Forces. We need a fires capability that is immediately responsive, at the tactical level, to the land component commander's requirements at any time in the campaign. Off board sensors, aerial, underwater, unattended, that expand our reach and accelerate our sweep rate will significantly improve our effectiveness. Additionally, our off board sensors should have the capability and connectivity to fill critical tactical and operational ISR gaps for the Joint Force Commander. These are only a few examples; I

am sure there are more ideas out there, and this is exactly the right group to be thinking about those things.

Let me drill down a bit to some specific issues:

The ADCAP torpedo, as good as it is, must become more reliable and more environmentally capable. We are extending the range of detection with our Acoustic Rapid COTS Insertion and our Advanced Processing Build program, but we need to work similarly to extend the engagement effectiveness of our torpedoes.

1. The Tomahawk cruise missile was clearly showcased in OPERATION IRAQI FREEDOM. And I'm sure you're with me, I could not have been prouder of our crews' ability to deliver the goods during that conflict. Our years of training, grooming and incremental improvement on the Tomahawk system clearly paid off, but there is still room for both system and weapon improvements. My partner and CTF 54 during IRAQI FREEDOM, Rear Admiral Joe Enright, I think would agree with me when I say there is too much overhead associated with system grooms and reliance on real time *technical chat* and Sailor savvy to achieve weapons reliability standards. As we have come to expect, our crews and technical support folks did a great job overcoming some system and weapon faults to ensure we put steel on target when it was needed. But we can take some lessons learned, and we can make system improvements to make the *TACTOM* even better.

2. As promising as our advances are in processing sensor information, I am less sanguine that we are where we need to be on the wet end of the problem. We need to match our processing gains with improved sensor capability.

3. I am very encouraged with the gains we have made in high frequency passive and active sonar performance and specifically its contribution to mine warfare, collision avoidance and close-in tactical control. We have to be able to do that and we're getting there. It has directly translated into improved submarine operating and tactical capability in the littorals.

However, our towed sonar systems are still burdened with handling system reliability issues. We have got to improve the duty cycle of these arrays and the arrays have to be able to detect and track during own ship maneuvers and they must remain usable at the tactical speeds we expect to see in the contested littoral.

Item last, People. We've got a tendency at gatherings like this to focus on high-minded strategies, visions, and cleverly designed hardware and software. Based on what I have chatted about so far, I'm guilty as charged. Let me shift the tack though, for a moment, and talk about our people and what they need from you.

I marvel every time I go on one of our ships and see the proliferation of advanced technology and the exponential progression of capability that it brings with it. I love gadgets and I'm easily entertained. However, in the same vein, I am concerned with that same explosion of capability and what it means in terms of preparing our fine Sailors to get the most warfighting utility from what it is we are giving them. We need help in a couple of areas. First, I've touched on this briefly before, but we need better integration of the data and information in these tactical systems and more intuitive displays and decision aids. I don't know how many of you have had the opportunity to go on a LOS ANGELES class submarine recently, but if you get the chance you ought to do it and look at the dozens of flat screens we have in the control room, with the mind boggling number of display options on each one of them.

We have inundated the watch standers with data and, in many cases, with the expectation that they will interpret and synthesize it into tactically meaningful knowledge, and then act upon that knowledge. I don't think that is what happens as frequently as we would hope. Why is it that the PCO Instructors and Tactical Readiness Teams tell me, that during sub on sub engagements, submarine initial detections are most frequently made by the Commanding Officer? Not the operator on the stack. Why is it that during battlestations, we see over 30 people in the Control Room of a submarine? The Sailors are taking this issue on themselves. Converting data to knowledge using brute force – more manpower. Is that all we want from this processing capability? We can do better. We will do better. I am particularly pleased to see the

addition of a Human Systems Integration working group to the technical agenda.

Second, we need help in getting more efficient and effective in our training, particularly in our tactical systems. If you combine the multi-mission responsibility we put on our crews these days and add to that the rate of change of capability that we are now able to deliver to our ships, I question whether we can achieve true competence in our employment if we train the way most ships are training today. It's kind of the same way I was doing it when I was in their shoes. There's a little more automation. We're a little more clever in our Power Point slides. But I think we're only nibbling around the edges. Admiral Bowman's folks at Naval Reactors are taking a bite out of it with the Interactive Display Equipment for propulsion plant training. It's a great option. It's a great choice. It's going to make a difference. It's going to make us more efficient. Similarly, higher fidelity shore tactical and navigation trainers have great potential.

But along with those, we need better sharing of knowledge and best practices among our crews, better tools and techniques for self assessment, and better leveraging on knowledge residing in our shore schools and in our technical institutions.

Let me wrap up with a few final thoughts for you.

First, always remember, we are a part of a team much broader than just our Submarine Force. It's a Navy team. It's a joint team. Seapower 21 envisions, and I'll quote, "future naval operations that will use revolutionary information superiority and dispersed, networked force capabilities to deliver unprecedented offensive power, defensive assurance, and operational independence to Joint Force Commanders. Our Navy and its partners will dominate the continuum of warfare from the maritime domain—deterring forward in peacetime, responding to crises, and fighting and winning wars", end of quote.

We, the Submarine Force, have a vital role to play in this concept. We need to keep thinking hard about joint and combined operations at all levels, and especially, because no one else is going to do it for us, at the tactical level.

Second, we need to be careful shepherds of the force's fiscal resources. Now be careful here. I'm not looking for Saks Fifth Avenue stuff at K-Mart prices. I know you get what you pay for.

As we embark on spiral development programs to rapidly field capability to the fleet, we need to ensure that we go about it as efficiently as we can. Experimentation and spiral development imply there will be some failures. That's o.k., but we need to make sure that we carefully assess, as best we can, the technical and programmatic risk, as we head down those paths.

Finally, always think about those operators out there. Those fleet sailors. If we haven't made it measurably more capable, easier to operate and more efficient, then we probably need to take another look at it before we deliver it to the fleet. We owe it to our Sailors.

I thank you for your time today. I couldn't be more thrilled to be here. I couldn't be more thrilled to be in this job. It's the dream of a lifetime. It's exciting; it's challenging; it's a great time for our undersea forces, our Navy, and our Nation. We, collectively in this group, have had some significant successes in the past. You have made a significant contribution to that. The talent we have here in Dealey Center today speaks to the tremendous potential of the future. I look forward to hearing all the agenda's speakers here today and look forward to talking with many of you during the course of the conference. Thank you NDIA for sponsoring this event.■

Today's transformational technologies enable our nation's submarines to influence events in ways that could only have been imagined a few decades ago. Now we can launch and retrieve an Advanced SEAL Delivery System, resupply special warfare teams from UUVs, and deploy airborne and undersea intelligence-gathering equipment. All that adds up to a force multiplier connected to the battle group and joint forces ashore. More missions, more capability plus stealth and survivability. At Electric Boat we're changing tomorrow by changing today. For details, visit gdebi.com.

GENERAL DYNAMICS
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THE SUBMERGED BATTLE GROUP
A Synergistic Capability for the Joint Operational Commander

by CDR William R. Merz, USN

Editor's Note: This paper won the Naval Submarine League award to a student at the Naval War College for excellence in a submarine-related project or essay. The detailed criteria for this award and the judging is the province of the Naval War College.

ABSTRACT

The Joint Forces Commander, and subordinate Operational Commanders, need the ability discretely and quickly to monitor hot-spots around the world, while maintaining the ability to react using special operations forces (SOF) and strike weapons in response to developing conflicts. Properly employed, the nuclear submarine can provide these and other capabilities simultaneously. New employment concepts for current submarines and submarines coming into service in the next few years give Operational Commanders a significantly enhanced capability across the full spectrum of combat operations. To that end, the Navy must rethink employment options and fully exploit emerging capabilities to support the likely mission needs of the joint community.

One capability-enhancing concept is the formation and joint integration of the Submerged Battle Group (SBG). By employing a fighting force that incorporates the individual capabilities of the different submerged platforms (SSN and SSGN), a holistic, and layered, synergy will result that offers autonomy, endurance, and devastating fire power to the Operational Commander. The SBG

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

centers on the SSGN and is supported by at least two Advanced Swimmer Delivery System (ASDS) capable SSNs. The SSGN serves as the command center for all operations of the SBG and supports a Navy led joint staff that includes SOF, air, sea, and land representatives.

The SBG is a self-contained contingency force that the Joint Force Commander can use to mass weapons on-scene, independently of political considerations or overseas infrastructure. Should a diplomatic solution present itself and tensions ease, the SBG departs the area leaving no inflamatory perception of hostile intent—yet the capability was there all along.

INTRODUCTION

In the world today, there are not enough composite combat forces deployable as a battle force adequately to cover all U.S. areas of interest nor to address the full spectrum of potential combat operations. Some areas are served well by an impressive show of force commensurate with a 90,000-ton aircraft carrier and its associated escorts, or a slow methodical buildup of infantry and mechanized ground forces. Other areas are better served by the less inflaming presence of a single platform performing isolated Intelligence, Surveillance, and Reconnaissance (ISR) missions; while the rest, and overwhelming majority, fall somewhere in between.

The Joint Forces Commander, and subordinate Operational Commanders, need the ability to monitor hot-spots around the world discretely and quickly while maintaining the ability to react using special operations forces (SOF) and strike weapons in response to developing conflicts. Properly employed, the nuclear submarine can provide these and other capabilities simultaneously. This platform has the sought after attributes of speed, agility, lethality, and independence to support joint operations, and it brings broad capabilities to respond to the myriad unpredictable time-sensitive tasks that may be required. Inherently stealthy, it can operate freely in a high threat area of denied access without the need for either sea or air supremacy or forward basing— major decisive points for most military operations. Nuclear submarines have long been used for sensitive operations in the littorals because

of their ability to operate undetected operations and to remain unsupported for long periods of time. Now these capabilities are, or should be, available to Joint Commanders.

THESIS

New employment concepts for current submarines and submarines coming into service in the next few years give Operational Commanders a significantly enhanced capability across the full spectrum of combat operations. To that end, the Navy must rethink employment options and fully exploit emerging capabilities to support the likely mission needs of the joint community. One capability-enhancing concept is the formation and joint integration of the Submerged Battle Group (SBG).

JOINT POTENTIAL

As demonstrated by Turkey in Operation Iraqi Freedom, political pressures, either domestic or international, may compel even our allies or coalition partners to deny the United States access to forward bases during regional conflicts. Additionally, if the enemy is able to deny access to conventional surface and air assets, even for a limited time, then the ability of the Navy to support the operational commander becomes limited and complex. Accordingly, high value should be placed on the ability to project power to areas where there are no facilities or military support and where the enemy has the ability to deny access.

Able to navigate with impunity, nuclear-powered submarines are multi-mission platforms that can make significant contributions in a number of joint roles. Maneuvering silently and swiftly beneath the seas, they operate without a logistics tail or supporting assets and have the inherent advantages of stealth, flexibility, agility, and endurance. Operating under the ocean surface, their umbrella of stealth affords them a unique penetration ability while providing protection against the threats that dominate a Joint Commander's force-protection concerns. Their flexibility, agility and endurance support planning and execution of various taskings in a multi-missions environment without the need to resupply or reconfigure, nor the requirement to come off station.[1]

Historically, submarine missions have been conducted primarily as independent operations. Nevertheless, today's relevance in the battle space will rest on their ability to integrate into the joint force. Accordingly, the question facing the Navy in general, and the Submarine Force specifically, is how best to apply the characteristics of stealth, agility, and endurance to support the joint commander. Since submarines have already been performing persistent ISR tasks that contributed to the target-acquisition process, have been firing Land Attack Tomahawk Cruise Missiles (TLAM) as directed by the air tasking order (ATO) against assigned targets, and are maturing as Special Forces (SOF) insertion platforms, these missions are the most likely and appropriate way to fully integrate submarines into the joint force.[2]

What this means is that the Navy must align the tremendous fire power and flexibility of the submarine with the needs of the Joint Force Commander to support all phases of conflict. By employing submarines collectively instead of individually, a new operational capability will emerge that fully exploits the attributes of stealth, endurance and speed through the combined efforts of mutually supporting platforms.

CONCEPT: SUBMERGED BATTLEGROUP (SBG)

With funding now in place for converting the first two OHIO class submarines from strategic missile (SSBN) platforms to guided missile (SSGN) platforms, and two more requested in the FY 2004 budget[3], the Navy will soon have the most capable land-attack sea-based platform ever. The SSGN effectively will be the Arsenal Ship that was championed by the late Admiral Boorda in the nineties but eventually cancelled due to cost.[4] Unlike the Arsenal Ship, however, the SSGN is self-sufficient, flexible, stealthy and survivable. SSGNs will be able to operate in otherwise denied areas to provide unique capabilities that will serve as enablers to other U.S. forces. These capabilities include the rapid fire employment of up to 154 Tomahawk cruise missiles, sustainment and employment of several platoons of SOF personnel and equipment, a swimmer lockout shelter, and an Advanced Seal Delivery System (ASDS) – a dry mini-sub capable of transporting a SOF squad over

120 nautical miles.[5] The SSGN retains the multi-mission capability found in SSNs and also will provide large payload volumes for future mission adaptation.[6] Included in these forecasted payloads are the quickly developing Unmanned Aerial (UAV) and Underwater Vehicles (UUV). As remarked by RADM Sullivan,

> ". . .we can take vehicles, ones that swim, fly, and end up crawling on the beach and use an SSGN platform to provide the host services that are required. The SSGNs have unlocked the Rosetta Stone on UUV technology."[7]

The SSGN conversion, integrated into the SBG concept, meets the Secretary of Defense definition of transformation because, with its tremendous payload, it can employ technologies to create an entirely new capability for the joint force very affordably.[8]

With the SSGN, for the first time the Navy will have the tools necessary to field a battle group completely invisible to hostile forces. By creating a fighting force that incorporates the individual capabilities of the different submerged platforms (SSN and SSGN), a holistic, and layered, synergy will result that offers autonomy, endurance, and devastating fire power to the Operational Commander.

The Submerged Battle Group (SBG) centers on the SSGN and is supported by at least two ASDS-capable SSNs. The SSGN serves as the command center for all operations of the SBG and supports a Navy-led joint staff that includes SOF, air, sea, and land representatives. Through coordination with the SSNs, the SSGN can be positioned on the perimeter of the littoral to support continuous communications with Operational Commanders while relaying mission requirements to SBG assets.

While the SSGN provides larger payloads, fire power and superior communications capabilities, the SSNs provide shallower depth capability, agility, and higher speed; effectively translating all SBG missions closer to shore as an extension of the SSGN. With the SSNs serving the SSGN, coastal ISR, strike, and SOF capabilities are force-multiplied by a factor related to the number of supporting platforms. As an example, this flexibility provides Operational Commanders with the ability to transport SOF personnel along the coastline and enables multiple, simultaneous,

entry points from multiple submerged platforms, using various combinations of SSNs, SSGN and ASDS.

In the strike role, the SBG is capable of rapidly positioning assets to various launch baskets to generate sustained joint fires from various azimuths. With two-hundred or so cruise missiles deployed in a given SBG, available on short notice, the SSGN will be capable of coordinating strikes by serving as the SBG Launch Area Coordinator (LAC). The same holds true for in-shore ISR collection. As one of the United States' premier collection assets, the SSN, serving as an integrated extension of the SBG, can transfer real-time information back to the SSGN for digestion and dissemination, notionally without leaving station—multiple missions, multiple platforms, all invisible, and all coordinated through one on-scene commander.

The supplementary strength of the SBG is the stealth and agility to deploy without fanfare, adding nothing to media pressures to heighten tensions or shorten time lines.[9]

The SBG achieves the Chief of Naval Operations Sea Power 21 initiatives of Sea Strike, Sea Shield and Sea Basing by clearly supporting every defined objective. These objectives are met through:

- Employment of Special Operations Forces (and future unmanned aerial and submerged vehicles and sensors) to extend the submarines reach, critical to gaining and sustaining battle force access;

- Use of onboard equipment and Special Operations Forces (and future aerial and submerged unmanned vehicles) to develop and share knowledge with Joint Force, Combatant and National Commanders;

- Conducting covert organic Intelligence, Surveillance and Reconnaissance and employment of Special Operations Forces (and future unmanned aerial and submerged vehicles and sensors) to shape the battlespace and counter weapons of mass destruction;

- Large volume Strike and Special Forces (and future submarine launched munitions) to project close-in power with surprise.[10]

These basic operational capabilities are the proverbial *tip of the iceberg* and represent only demonstrated capabilities of existing platforms through both real world examples and concept demonstration. As capital ships ranging from 8,000 to 9,000 tons for an SSN to over 18,000 tons for an SSGN, the ability to reconfigure (either in port or on station) and adapt to mission requirements is unprecedented. Combining what we know with what we can imagine, the future employment options are limitless.

SBG OPERATIONAL CONCEPT

By deploying as a cohesive, layered submerged battle force, the SBG will provide services from shaping the battle space to post-conflict monitoring of nation building and peacekeeping operations.[11] As crises develop, the SBG can be on scene early and be able to operate well within a potential enemy's defensive perimeter. Depending on the threat to other joint forces, the SBG will serve as the forward ISR asset— feeding information for enemy intentions and target generation at all levels of the joint targeting and planning chain. As conditions change/improve, the SBG will integrate with other forward-deployed forces to help fill gaps in the collective information process. Off-board sensors launched by the SBG include SOF, recoverable UUVs, expendable UAVs, and, as demonstrated by the Russians, potentially submarine-launched theater satellites.[12] These sensors will complement the SBGs organic sensors to help maintain a complete picture of the battlespace throughout the conflict.

During recent conflicts involving U.S. forces, utilizing SOF personal in an ISR role before hostilities commence has proven to be very effective. Traditional SOF operations from specially configured SSNs, however, are limited in the number of personnel, number of missions, and available insertion/recovery options. Additionally, the space on board an SSN is insufficient for larger SOF units or for the physical conditioning that SOF must perform every day to maintain their readiness; requiring them to be

embarked immediately before and debarked immediately after the operations. There is, however, space on board an SSGN to accommodate several SOF platoons (over 100 troops in surge conditions) for 90 days without readiness degradation.[13] Combined with the stowage capacity of numerous seven foot diameter (1,500 ft.^{3} each) converted missile tubes, the capability to carry more substantial equipment significantly expands SOF employment options.[14] Within the SBG, SOF personnel can be rotated between platforms via ASDS for recovery, training, and conditioning, as missions require. This SOF employment concept combines the flexibility and agility of the SSN with the sustainability of the SSGN. Involved with the SSGN conversion planning from conception, the U.S. Special Operations Command (USSOCOM) immediately recognized the potential and has fully embraced this upcoming capability:

> . . .USSOCOM remains committed to the Navy's SSGN program. The transformational changes incorporated into the SSGN will allow SOF to deploy a larger and more flexible force package than has ever been possible. Additionally, the command, control and communications capabilities designed into these platforms will permit SOF to operate independent from, or in conjunction with, any land or sea-based Joint Task Force.[15]

By coordinating with personnel on the beach via direct secure communications, either with SOF or other ground troops, and employing the Tactical Tomahawk (TACTOM), or potentially the Land Attack Standard Missile (LASM) and Navy Tactical Missile System (NTACMS) strike weapons[16], the near shore platforms of the SBG can support call-or-fire missions within minutes of receiving targeting data, including flight time, with no warning. While in a SOF role, components of the SBG can loiter off a hostile coast, executing mission after mission while still maintaining the ability to launch other sensors or weapons in support of the Joint Force Commander.

When the conflict transitions from pre-hostilities to open hostilities, friendly surface and air forces operating under pre-hostilities rules of engagement, prior to achieving air and sea

superiority, are at high risk. The SBG is generally immune to that risk and can continue operating unimpeded in a variety of roles. SSNs and SSGNs can remain close-in to the enemy coast and either preempt hostile action, launch on warning of an impending strike, or lead a retaliatory strike that opens the door for follow-on forces by creating holes in the enemy's defense systems. A preemptive launch from an undetected SSN or SSGN (standing just offshore) can be devastating. Moreover, with timely intelligence, either gained organically or through other means, they can target and destroy defense sensors directly. With large inventories of precision guided munitions (PGMs), the SBG can perform this function repeatedly without any external support.[17]

If, on the other hand, the Joint Force Commander is driving the transition to hostilities, he or she can elect to commit some or all of the SBG's payloads to exploiting appropriate enemy critical vulnerabilities or striking decisive-point related targets—achieving an element of surprise not possible with other types of strike platforms. With its array of PGMs, the SBG could be employed to target leadership, command and control, and communications sites to *decapitate* or *silence*, in an attempt to disable a center of gravity. Through concentrated operational fires, its large inventory and persistence can shape the battlespace and pave the way for higher levels of effort using other joint assets.*

As the battle matures and additional forces are brought to bear through air and sea dominance, the SBG will assist in the general effort of *direct attacks* on enemy centers of gravity or specific tasking such as Joint-Suppression of Enemy Air Defense (J-SEAD). The SBG can expend its attack munitions in operational or combat-supporting fires, and then remain on station to continue a SOF campaign of ISR, traditional submarine ISR, direct action, and combat search and rescue. The SBG Commander can also dispatch individual SSNs for independent tasking, maintenance, or re-supply.

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* Transitioning through the different levels of hostilities is taken from Capt. Kennedy's concept of potential SSGN operations, but here is further expanded and applied to the different elements of the Submerged Battle Group and the needs of the Joint Force Commander. See Floyd D. Kennedy Jr., CAPT, USN, "Transforming the Submarine Force," *Air & Space Power Journal*, Fall 2002.

The SBG both complements and supplements existing and planned platforms of the Navy and other services. Because of their stealth and endurance, they complement other forces by being able to penetrate high-threat areas with relative impunity. This unique ability affords the Joint Forces Commander considerable planning options in establishing position, magnitude, and direction of fires from which the SBG can complement other forces giving the high-risk areas to the submarines.

Because they carry the same weapons as other missile-launching platforms, SBG assets supplement other platforms by providing an additional weapons inventory to area commanders when access is *not* denied. This would be particularly true when operating in areas where sea and air supremacy are assured, or the threat is significantly removed from the coast (e.g. Afghanistan).[18]

SBG OBSTACLES

All is not perfect with the SBG concept, however, and considerable doctrinal development needs to be conducted. The following discussions address some of the tactical and operational level issues that must be resolved.

Additional Missions: Even with projected submarine new construction and the life extension of current platforms, there are still not enough submerged assets to cover the required missions. Since the end of the Cold War, the war responsible for the development of the modern nuclear submarine, per-submarine mission requirements have actually increased.[19] With an average of 30 to 40 regional conflicts[20] per year since the end of the Cold War, U.S. armed forces are continually short-handed, particularly in assets dedicated to ISR collection. Unfortunately, the SBG concept does not significantly mitigate this problem. However, it does make relevant submarine capabilities more available and more responsive to the Operational Commanders.

Submarine Tradition: The *Silent Service* has always been fiercely protective of its independence and isolation, self-contained fighting machines operating under the dictum of "no news is good news." Some of those traditional roles, however, are no longer

pertinent. For the last two decades, ISR aside, traditional submarine missions have had little relevance to operations conducted by the rest of the joint community. Additionally, this independent attitude has retarded advancements in critical competencies needed for full integration. In order to fully support joint operations through employment of an SBG, the Submarine Force must reevaluate some of its traditional roles such as ASW and force protection, and evaluate some of its historic shortfalls such as force management and communications limitations.

Anti-Submarine Warfare: Properly armed and operated, both considerable accomplishments for most countries (including the U.S.), nuclear and conventional submarines could be significant threats to America's sea lines of communications (SLOC) and forces flowing from the United States into theater. If that happens, and it may someday, there will be a hurried search for ASW assets. With the deterioration of the Maritime Patrol Aircraft mission, it is likely that only the Submarine Force will be able to respond.[21] However, that possible eventuality does not justify disproportionate resources in training, weapons, and mission assignment. ASW is a perishable skill, but the degree of dedication to proficiency must reflect improvements in employment tactics, weapons capabilities and the limited capabilities of aggressor nations. The United States would be better served by dedicating submarine capabilities to joint requirements in supporting real-world missions prevalent since the end of the Cold War. ASW will work itself out and it is extremely unlikely that a *capable* submerged threat will materialize on short notice without our ability to respond and preposition – it is simply too difficult to develop the technology and the skill.

Force Protection: Pull the SSN away from the Battle Group. For the foreseeable future, the SSN adds little to the capability of a Carrier Battle Group (CVBG) when compared to its potential contribution to the SBG. In the CVBG, the SSN provides token force protection and a minor percentage increase in available cruise missiles. With the SBG, however, the SSN becomes a considerable force multiplier as a key component of an integrated fighting force through all phases of combat. The chance encounter with a rogue submarine, without precursor, is remote and the presence of an

SSN might not prevent an attack anyway.[22] Because the SBG will notionally be in a forward position ahead of the Battle Group, when working in the same regions, the proposed layered employment of the SBG will also act as a buffer of protection for Navy assets further off the coast. Should information reveal a potential submerged threat to the CVBG, SSNs could be selectively released from the SBG to protect the carrier. Keeping a carrier surrounded by SSNs full time is a waste of otherwise very valuable platform resources.

Force Management: Another hurdle to overcome is the actual management and physical maneuvering of a SBG regarding waterspace and operational responsiveness. To that end, submarines must learn to operate in close proximity to each other while avoiding blue-on-blue engagements or collisions. There are numerous technological solutions used routinely in training environments that allow reliable locating of friendly submerged platforms. Many of these solutions compromise underwater stealth to some degree but could be managed as the threat level dictates.

Fundamentally, to be truly responsive without oppressive waterspace management, submarines must learn to avoid each other using organic sensors instead of geographic separation. When operating in shallow water, or when operating with continuous communications requirements, submarines move out of the three-dimensional world and into the two-dimensional world. In order to support operational commanders, the SBG must be able to communicate freely and maneuver quickly. This is a new skill set for historically independent platforms that must be mastered by all deployers in order to support surging units into and out of SBGs as determined by world events.

Today, submarines are controlled through several layers of authority with ultimate control usually residing with the Submarine Force Commander. By assigning the SBG to the Joint Force Commander, and subsequently to the appropriate Operational Commander, Submarine Force control of the assets would be relinquished and undersea de-confliction managed in-situ onboard the SSGN by the SBG Commander. De-confliction of surface and air assets would remain with the Operational Commander, with undersea assets managed via the SSGN as a node in the sensor grid.

Communications: Continual communications with submerged assets is problematic at best. One of the challenges of operating a fleet that includes dispersed and stealthy forces such as submarines and Special Forces has been the development of command and control processes that optimize the use of each component and coordinate individual capabilities to maximize the total effort. Even within a single service, procedures to optimize fires from a variety of platforms on a variety of targets and to employ stealthy vehicles in a centralized decision/decentralized execution mode is a skill set hard to develop.[23]

When balancing connectivity with stealth and ship safety, the submarine is often not available when summoned from above. To that end, submarines need operational freedom to be effective and are best employed independently, not tied tightly to the movements of other forces. Invariably, attempts to employ submarines by commanders not familiar with their capabilities and limitations are severely limited in their effectiveness by paradigms that fit surface and air assets.[24]

Using a layered employment approach, the SSGN will normally keep station further off the coast and maintain the communications guard while the SSNs operate in near-shore, deep-penetration postures. This layered approach is necessary to allow the SSNs to carry out their more aggressive missions near the coast such as the intercept of low-power communications or to ease the transportation burden of SOF missions.[25] In this posture, the SSN will almost assuredly not be able to support continuous communications.

If rapidly changing conditions require immediate response from the SBG, the SSGN can either summon the SSNs to communications depth to support emergent tasking using various underwater communications techniques, or carry out missions directly. In either case, the SBG could respond immediately and then build on the response as additional SBG assets rapidly become available. To minimize vulnerability and to maximize surprise, the communications posture within the SBG will depend upon the phase of hostilities: infrequent communications during ISR and battle space shaping operations, increasing communications during pre-hostilities and SOF missions, and near continual communications during strike operations. Rules of engagement must incorporate freedom of the SBG to respond to predetermined indications

commensurate with the communications posture.

Should the SSGN be required to penetrate the littoral, particularly to support call-to-fire strike missions in a hostile environment, her communications posture will likely change. For example, continual communications could be interrupted as a result of ship vulnerability, ship repositioning requirements, or electronic jamming. In this case, communications requirements could shift to one of the SSNs and be relayed to the SSGN by other means, e.g. leap-frogging communications.

Advancements in EHF, bandwidth expansion, and hardware have provided the communications capabilities necessary for full integration of the SSGN into the joint arena. Because of the size of the platform, the SSGN can support virtually all joint communications requirements and separately relay necessary information to the supporting SSNs (in submarine speak). With the addition of bottom devices, acoustic intercept equipment, underwater voice communications, and active sonar,[25] the SBG has the tools necessary to maintain cohesion in a quickly maturing battle space.

Deployment Cycle: Because the SBG is centered on the SSGN, now a tactical vice strategic asset, the underway schedule will naturally migrate towards emulating a traditional eighteen-month deployment cycle: twelve months to support six months deployed. By forward deploying SSGNs, two in the Mediterranean and two in the Western Pacific, dual crews could keep the ships on station to meet quick response operational needs. However, with the SSGNs forward deployed, training individual components of the SBG, both SSNs and joint assets, to create a cohesive, efficient fighting force will be difficult, especially as new capabilities emerge. Additionally, the SSGN will eventually require stateside maintenance that will create gaps in coverage for the Joint and Operational Commanders.

The obvious solution is to convert more SSBNs to SSGNs. Applying the rough thumb-rule that it takes four SSNs to keep one deployed (1-deployed, 1-preparing, 1-returning, 1-maintenance), then another four SSGNs are needed to sustain continuous presence in both oceans—under the traditional deployment cycle using one crew per submarine. This may be somewhat mitigated by using two crews per SSGN. These are exceedingly complex issues that will

have to be addressed long-term in order to sell the SSGNs (and SBG) as reliable, deployable assets.

CONCLUSION:

Nuclear power enables submarines to deploy worldwide for months at a time without dependence on any forward infrastructure. This precludes the need to preposition stocks in theater, provides the flexibility to go wherever there is a need, and allows the ships to stay as long as necessary. SBG deployments can be conducted in relative obscurity if desired, and forces can be in place in any littoral of the Atlantic, Mediterranean, or Pacific within a week.[27] Undersea assets are particularly effective in sensing enemy intentions, observing ports and lines of communications, laying the basis for the sensor grid, and negating the effect of anti access preparations. With their short flight times and their ability to launch from unsuspected locations and azimuths, missiles from submarines can be decisive in the first days of operations.[28]

The high speed, unlimited endurance, and logistic independence of the SBG afford Joint and Operational Commanders the ability to mass weapons in theater before an engagement, at the first outbreak, or later as desired. Because submarines can so swiftly close the area of operations, the SBG can quickly and silently bring a multi-mission capability to bear, not in a single platform but in a number of platforms, to provide considerable flexibility in SOF, ISR and Strike combat operations. The SBG is a self-contained contingency force the Joint Force Commander can use to mass weapons on scene independently of political considerations or overseas infrastructure. In a world punctuated by unexpected and unanticipated crises, speed of response and the ability to manage risk become highly sought commodities.

The Joint and Operational Commanders will soon have the ability to employ a self-contained submerged battle force capable of conducting sustained operations in support of myriad taskings covering the entire range of joint combat operations. Additionally, if needed, this battle force can re-position and re-configure with unprecedented speed and agility. To that end, the Navy will likely be tasked with expeditiously completing the planned SSGNs and being ready to pull more TRIDENT submarines out of the nuclear

deterrent role of the strategic dyad and into real-world conflict management. Doctrine needs to be developed and historical submarine shortcomings must be addressed. As soon as Operational and Joint Commanders see what the SBG can do, everyone is going to want one.■

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THE NON-TACTICAL DATA PROCESSING SYSTEM – MODERN TOOLS FOR THE 21ST CENTURY

by CAPT. Patrick H. Brady, USN
Deputy Program Manager,
VIRGINIA Class Submarines

Imagine yourself—riding with the commissioning crew in USS VIRGINIA (SSN 774), on her first trip to the Caribbean, sometime in the fall, for sound trials of the first ship in this new class. So here you are, the ship at 400 feet, not much happening now that Virginia Capes are far behind, and you have the opportunity to see how things are done in this new ship. Naturally, you begin in Control – startling for its openness now that the periscopes no longer dominate, and for the large screen displays that give you an overview only observed in surface ships before. Can this really be a submarine? The ship control station directly ahead of you—it's in the traditional place, but seems to be about half the size, and missing most of the old layouts you knew so well. Now, looking a bit longer, you realize that it has everything needed for steering, diving, ballast control, alarms, and so on. Yet the controls all seem so accessible and you notice how easily the pilot controls the ship. Remarkable.

So you step over to a display that has the traditional sonar patterns on it. Soon, you find the Sonar Technician (ST) has something different to look at, and in explaining what he's doing, you learn a little about the new Lightweight Wide-Aperture Array (LWWAA). Then he shows you how he could get pictures from the periscope right on his display surface, too, and even recalls a couple of images from a database that show the trip past the Chesapeake Bay Bridge-Tunnel to prove the point. This is really different.

Continuing through the ship, you notice another man at a sonar-type display, and find that he is an off-duty ST who is going through some training sequences to keep up his proficiency. He tells you that he's not tied in to the tactical system at present, but is using *NTDPS*—the Non-Tactical Data Processing System. After

he shows you what he'll be working on, you continue your walk through the ship.

NTOPS Applications

- Digital Library (Search/Retrieval)
- Training Program Management
- Digital Status Boards (ICAS fed)
- Work Flow Processes
- Automated links to operating/casualty procedures
- Media Management
- Evolution Tracking
- Ship Home Pages (w/flexible-assignable portlets)
  (Frequently used procedures/Watch Bills/Quick Links)
  * Department
  * Division
  * Organization
  * Watch Standing
  * Rig Tracking and Reporting
  * Rig for Dive
  * Passdown Logs
  * Watch Relief automation/tracking

As you stop by the storekeeper's office, you find that he is getting an order together for transmission this afternoon. This means that a few critical items will be ready when the ship returns to Norfolk on Friday. In the same office the cooks are checking quantities they'll need for tomorrow's meals. NTDPS again.

Browsing around the ship some more, you find yourself talking to a Machinist's Mate (weapons) reviewing hoist operation on a laptop in the torpedo room. When asked, he says that the Chief told him to review the tube loading procedure before this afternoon's practice. Hence, more use of the training features of NTDPS, which he says also contains the technical manuals for troubleshooting.

Lunch time, and you pick up your food from the galley. While at chow you find that the crewman you're eating with has been taking a look at his personnel and training status, having downloaded that information before you submerged. He will be off to Portsmouth, New Hampshire in December, where his next ship, USS PROVIDENCE (SSN 719) is in overhaul. He'll be checking

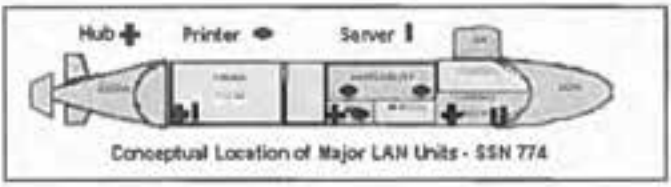
on the training he needs, and planning out how he'll get it done WITHOUT EVER LEAVING THE BOAT. Yes – NTDPS again.

NTDPS is a computer application that is designed to allow a submarine to operate with limited hard copy stowage, and give the crew computer access for personal as well as official use. The application runs a number of programs on a collection of computers connected via a Local Area Network (LAN), and they're able to communicate via the same LAN to exchange information if needed. What are the gains? *Storage space*; availability; instant access; rapid documentation updates (remember *change pages*?); an e-mail capability; and training that's done without the need for a crewman to travel for temporary additional duty to be trained at a Navy school.

The time has come to take the technology that's available in so many American homes and make it available to our men and women that are bearing the nation's defensive burden. So, we're putting it in all 30 of the new Virginia Class ships, and it will be backfit to the rest of the Submarine Force as part of the SUBLAN installations.

NTDPS – A System Whose Time Has Come

The Virginia Class NTDPS is a secure computer system that streamlines and automates many of the non-tactical functions on board, providing a high level of connectivity and information sharing that will improve crew efficiency and accuracy. This LAN-based hardware and software system was created with VIRGINIA in mind, and it leverages Navy, DoD and commercial sources.



Conceptual Location of Major LAN Units - SSN 774

VIRGINIA is the first class of submarines specifically designed for limited hard copy storage. We've long wanted to do this, and

now we're getting there. Nearly all the key functions of data recording and storage have been digitized, allowing greater efficiencies throughout the ship, and making better use of the intelligence of the crew.
A few key system concepts:

4. It's network-based, interconnection is easy, and it has a large remote storage;

5. It's designed to allow access to all essential information

   - Interactive Electronic Technical Manuals (IETMs)
   - Operating procedures
   - Rig reporting and tracking
   - Damage control reporting
   - Other watchstanding functions

6. It's accessible from all non-propulsion electronics system (NPES) consoles, on laptops at each watch station, and on mobile computers supporting various shipboard duties;

7. It has nearly eliminated the need for stowage of paper manuals and procedures;

8. It streamlines distribution and access to all information

9. It also provides for training, qualifications, and exams

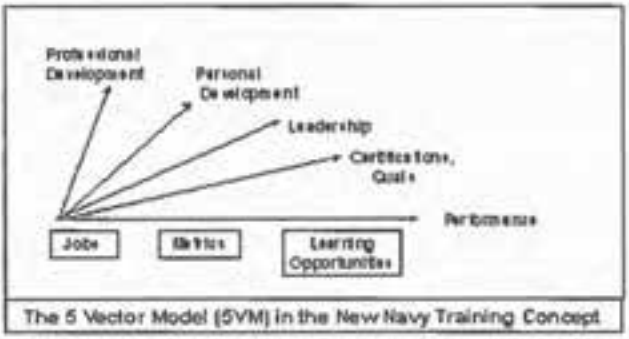
10. It accommodates configurable home pages for departments, divisions, and other groups.

This increase in computerization and automation will transform how the crew conducts daily operational readiness. While it functions entirely within the boundaries of the ship, it interfaces

with the shore via the Secure Internet Protocol Router Network (SIPRNet).

NTDPS, Task Force "Excel" and the "Revolution in Navy Training"

The next NTDPS application build that will be delivered later this year introduces an Integrated Learning Environment, a key element of Task Force "Excel" and the "Revolution in Navy Training" to the Submarine Force. As a result of that work, the Navy has EXTENSIVELY revised its entire training approach, tailoring it to the individual's needs and accomplishments, and streamlining our training methods. Termed the Five Vector Model (or 5VM), it bases its approach on the concept that there are 5 areas in which each individual develops during a Navy career. These include:



The 5 Vector Model (5VM) in the New Navy Training Concept

- Personal development
- Professional development
- Leadership
- Certifications and Qualifications
- Performance

In support of this approach, the Navy has opened the website "Navy Knowledge Online" or NKO [https://wwwa.nko.navy.mil]. This site places a wealth of information at the fingertips of the interested and the motivated Navy sailor, from personnel records

to recommended advancement planning to training qualifications, and to the training courses themselves. Naturally, there is a large amount of training information serving as the basis for this system, and it gets updated electronically to keep abreast of our ever-changing Navy.

The Integrated Learning Environment (ILE) will include a Learning Management System (LMS) and a Learning Content Management System (LCMS), supported by Navy Knowledge Online-Afloat, the Navy Training & Management Planning System (NTMPS), and the Technical Data Knowledge Management (TDKM) that are provided via the Navy Distance Support Portal.

The ILE is Extensive

To realize the vision of providing the right training at the right time, including at sea, NTDPS is developing an afloat ILE in conjunction with the Submarine Non-Tactical Application Delivery Interface System (SNADIS) project and the efforts of the Submarine Learning Center (SLC) in Groton, CT. As part of the Navy's Shore ILE Infrastructure, the Submarine Learning Center is implementing the ILE transformation strategy and architecture. It is also assisting in the Naval Personnel Development Command's effort to standardize and integrate the requirements, systems, and network architectures to support our sailor, ashore and at sea.

Formerly independent programs (e.g., Navy E Learning, CANTRAC) and multiple system interfaces (e.g., Electronic Training Jacket) will be managed as a single, integrated capability as part of the Navy Training Management and Planning System (NTMPS). The ILE, accessed through NKO, will house the Technical Data Repository (TDR), the LMS, the LCMS, and the Navy's Data Warehouse. The Navy ILE contains three major components: Learning Management, Content Development and Management, and the Knowledge Management portal. For the afloat ILE, the LCMS is the software application that is most critical. Much of the other shore based functionality does not need to be brought onboard, allowing the physical footprint of the shipboard system to be accommodated within the Virginia Class boats and the Space and Naval Warfare Command's (SPAWAR's) Submarine Local Area Network (SubLAN).

The LCMS is a Web-based application that allows learning centers to easily develop online educational content that can be presented in a structured, yet adaptable, learning environment. It will allow the sharing and re-use of learning objects, dramatically improving the quality of learning material. These systems are designed to enable subject matter experts, with little technology expertise, to rapidly design, create, deliver, and measure the results of e-learning courses. The LCMS application in the ILE is fundamental to its ability to deliver e-learning content to individual learners without bearing a prohibitive cost or manpower burden. Moreover, the LCMS provides the functionality for direct measurement and reporting of the results of e-learning performance, which enables greater accountability for learners, a direct link to performance, and subsequent links to operational readiness.

Knowledge Management and the Integrated Shipboard Learning Environment (ISLE)

The current Knowledge Management training program exists for the purpose of scheduling all types of training events, tracking the program, assessing accomplishment, and reporting results. This system revolves around the development and manipulation of general training goals, which are linked to specific lectures, seminars, drills, evolutions, exams, and other training techniques, plus subordinate goals with their own items. The system permits a training group manager to plan a training program for his group by accessing the ship's schedule, higher-level goals, plans, and directives, and identified weaknesses including prior exam and drill results. A secondary function is collecting and tracking the details of lectures and seminars in an auditable system.

Under the current plans for the Integrated Shipboard Learning Environment (ISLE), training will start when an individual receives orders to the ship. All pertinent personnel and training records will be made available to the ship, and all training and personnel information will be transmitted to and from the ship via the SIPRNet. The ISLE provides automation tools that establish individual training records and assist training managers in the development of orientation, qualification, and formal training plans that comply with established qualification requirements and are

tailored to the needs of the ship and individual. Immediate Seniors in Command (ISICs) (or other relevant commands) will have the ability to conduct orientation programs to support the needs of deployed units or to realize economies of scale by conducting single training sessions attended by individuals from multiple ships.

Under the design requirements of the new ISLE functionality in NTDPS, the following concepts will be supported:

- Notification of individuals with training/learning responsibilities (leader, monitor, etc.) will occur via onboard e-mail. Training/learning authors and leaders will be able to readily search for guidance, content, and identified weaknesses associated with the assigned topic based on past performance, such as examination grades or drill comments.

- Available content has already been developed by various Navy Learning Centers, and Navy technical documentation has been provided by the Systems Commands. Advance reading, pre-examinations, or pertinent Computer Based Training (CBT) can be readily assigned and completion monitored by training/learning leaders.

- Suitable examinations can be easily developed, and examinations can be administered and graded on line. Assessments of learning effectiveness will be made using analysis of both monitor critiques and examination results.

- CBT courses and modules will be readily available and easily employed to support onboard qualification and continuing training programs. All CBT and Distance Learning courses that support an individual's improvement along a SVM vector will be stored in the onboard library and periodically synchronized while deployed, or will be available to crew members via the SIPRNet or the Non-secure Internet Protocol Router Network (NIPRNet).

- Training can be constructed via LCMS tools that can promptly and effectively respond to emergent or ad hoc requirements for training individuals, groups, and the entire command. Examples of such responsive training requirements include corrective maintenance, change of operational tasking, inspection results, Force-wide safety stand-downs, and succession training. Automated analysis will be available to identify training shortfalls relative to those required to support the ad hoc requirements.

- Planning and execution of off-hull training will be fully supported and highly integrated with the shore ILE. Quotas for desired schools will be easily obtained via the SIPRNet or NIPRNet. Planning and management for personnel left ashore will be fully supported by the ISLE and the shore ILE. Records of off-hull training will be kept by the shore ILE and delivered to the ship via the SIPRNet or NIPRNet when adequate connectivity is available.

- Commands will be notified of pending personnel losses along with indication of the receipt or non-receipt of orders for replacements. The most suitable available replacements from on board and ashore will be identified. Training gaps will be identified and managed based on the skills of individuals involved.

- Fully interactive access to 5VM will be available to individuals on board via the SIPRNet or NIPRNet when in port. A crewmember's 5VM information will be available when at sea. Changes to 5VM information occurring at sea will be queued for synchronization when adequate SIPRNet or NIPRNet connectivity is available.

- Significant libraries of training content will be maintained on board. Items held will be tailored to the needs of specific platforms and crews, and will be changed as those needs change. Non-standard items will be easily ordered and received via SIPRNet or NIPRNet.

- A robust authoring capability will be available to shipboard users including easy incorporation of CBT and multimedia. Existing content related to an authoring effort will be authoritative and will be easily identified and located. Training content will be more uniform and will enable more consistent learning delivery from command to command. Locally-authored updates and improvements will be reviewed by subject matter experts for inclusion in the authoritative content database.

Program Plans and Future Capabilities

Growth in hard copy stowage and limited available space has made NTDPS functionality a necessity, but the integration and assimilation of many standalone applications has enabled an environment where Shipboard Knowledge Management can increase warfighting capability and provide more proficient and efficient watch standers. This will allow faster access to current information, more effectively managed training, and automation of administrative workflow processes. The NTDPS/SNADIS application model provides all of these functions.

Integrated Shipboard Network System (ISNS)

In an attempt to coordinate and minimize Navy lifecycle support costs, an effort is underway to have the NTDPS software be provided as part of SPAWAR's ISNS program to deliver a SPAWAR-supported network to all ships. This will be accomplished in the Submarine Force by the fielding of 11 SubLAN 1 configurations in Los Angeles Class ships in the late FY 04 to early FY 05 timeframe. The NTDPS software is currently installed at the VIRGINIA, TEXAS and HAWAII Pre-Commissioning Units (PCUs) and will be included in all Virginia Class submarines.

Expected Results

We are already seeing the benefits of NTDPS in information access and watch stander capabilities. NTDPS hardware is based on mature Commercial Off-The-Shelf (COTS) products, which provide a robust, high performance LAN. Software development is based on a COTS system baseline with thoroughly tested functions. With future LAN connectivity among squadrons and potentially battle groups, these improvements can have tremendous impact.

Proving this system works will stimulate the process of other existing or developmental applications in joining the NTDPS *umbrella*, and will enhance the migration of NTDPS to additional platforms.

Significance Of Submarine Knowledge Management

With submarine installations already planned, this project could be extended to interface with other shipboard programs such as LPD 17 and CVN 21 that will move NTDPS towards the Navy's vision of a fully integrated Information Technology/Knowledge Management system. NTDPS will ease each individual's workload for training, learning preparation, and administration.

Efficient use of these technologies will ease workloads and improve quality. For example, NTDPS will promote increased automation of work routines, such as log taking and evaluation of information, and condition-based maintenance becomes possible since technical data is more easily interpreted and manageable.

NTDPS is opening up exciting possibilities for more efficient and better-trained people, and we are confident that it will become the model for similar future programs.■

ARTICLES

TIME TO RE-MAN THE DECK GUN

LT John Lehmann, USN

Lt. John Lehmann is a naval intelligence officer assigned to the Navy & Marine Corps Intelligence Training Center and a former nuclear trained enlisted submariner.

Fall 2009: USS FLORIDA (SSGN-728) is at periscope depth several miles off the coast of a hostile nation. Her embarked SEAL platoon has been ashore since the previous evening gathering vital intelligence and will return to the boat once darkness falls. Before the SEAL platoon can exit the area and return to FLORIDA via their Advanced Swimmer Delivery Vehicle (ASDV), they are detected by hostile forces and call for fire support. Due to the clandestine nature of their mission, tactical air assets are not suitable for this operation. FLORIDA receives the call for support and the coordinates of the attacking force. The coordinates are entered into the fire control computer, the OOD orders "ahead standard, broach the ship." FLORIDA's bulk rises out of the sea, missile tube number eight is opened and twelve GPS guided 155mm projectiles are fired from the boat's single 155mm vertically mounted gun. FLORIDA shuts missile tube eight and slides beneath the waves. Total exposure time, less than three minutes.

The development of revolutionary technologies and weapon designs enables the US Submarine Force to explore many new and exciting missions previously unavailable or prohibitive in nature. The Vertical Gun for Advanced Ships (VGAS) originally designed for DDG (X) can be incorporated into the

OHIO class SSGN conversion. This package will provide Marines and Special Operations Forces (SOF) with a highly mobile, stealthy, rapid-fire platform capable of delivering massed, precision fires onto point and area targets. The SSGN platform is ideal for this mission as it is invulnerable to counter battery fire, coastal defense, ASW capabilities of our near term adversaries.

The current OHIO SSGN design has facilities for up to 154 Tomahawk cruise missiles (7 per missile tube/22 tubes) and 66 SOF personnel for Swimmer Delivery Vehicle (SDV) Operations.[1] A combination of the above may be carried as each missile tube is operated independently of the rest. Modifying United Defense's 155mm vertical gun and inserting the unit into one or two missile tubes would greatly enhance the overall mission capability of the vessel, without appreciably diminishing long-range cruise missile firepower.

Equipped with the 155 mm gun, the OHIO SSGN can deliver long-ranged, precision fires onto targets over 75 nm distant. The GPS equipped, land attack guided projectile has a planned CEP of 20 to 50m. Equipped with a variety of warheads, including DPICM[2], the sub can deliver an astonishing volume of fire. Utilizing a fully automated magazine, a sustained rate of fire of 12 rounds per minute, per gun, is achievable.[3] Direct, secure communications links with forces ashore will enable the boat to answer fire support requests immediately upon receipt of relevant coordinates. For the first time, SOF personnel will have an indigenous means of supporting fires.

By the very nature of the OHIO SSGN platform, multiple guns can be carried in multiple missile tubes. The guns would be spread out within the 24-tube cluster to minimize the axial torque placed upon the vessel during a rapid-fire mission. Determination of the SSGN tactical load out would depend upon mission requirements and available assets. Installation or removal of the gun modules could be accomplished at forward bases. By utilizing the same ammunition as the DD 21, the OHIO SSGN could rearm virtually anywhere.

The Marine Corps' doctrine of Operational Maneuver From the Sea (OMFTS) stresses the use of rapid, decisive action with firepower and maneuver from the sanctuary of a secure sea base. The OHIO SSGN equipped with the 155 mm vertical gun supports

this concept; it is a secure, stable, long endurance platform possessing massive firepower. Incorporated into the naval surface fire support (NSFS) plan, the OHIO SSGN provides the Land Force Component Commander (LFCC) with a readily available, high volume, supporting fires asset. Outfitted with multiple 155 mm guns, the SSGN could provide more direct NSFS than an entire Expeditionary or Carrier Strike Group.[4] Since the demise of the battleship, the Corps has been lobbying for increased numbers of gun tubes available for fire support. The OHIO SSGN easily fills this requirement.

The incorporation of unmanned aerial vehicles (UAV) capability into the platform greatly enhances the overall fire support capability of the gun equipped SSGN. UAVs bring the advantage of real-time target acquisition, validation, and damage assessment to an already highly capable asset. A properly configured OHIO SSGN has sufficient capacity to control the UAV during the mission, but must pass over control of the UAV once it leaves line of sight.[5]

The Navy abandoned the vertical gun concept for DDG (X) due to its unique ballistic profile. Because the projectile has to turn in flight, it has a severe minimum range restriction. Threats within this *myopic zone* were a danger to DDG (X), which theoretically could not protect itself. In effect, DDG (X) would need two gun systems, the vertical gun for long range and an additional gun to be used in the surface direct fire mode. The OHIO SSGN does not have this vulnerability, as it would not need the gun to deal with surface threats. In fact, the OHIO SSGN retains all the built in capability of its original submarine design, without the ballistic missile, and could use torpedoes and mines in traditional submarine missions.

Coastal threats to the SSGN are minimized or negated easily by the mobility and stealth inherent in the vessel. Once the boat completed a fire mission, she would dive deep and move 3-5 nm away at a high rate of speed; defeating any counter-battery fire. The short exposure period of the masts, sail, and hull when broached, would not provide sufficient time for coastal defense cruise missile (CDCM) fire control radar to lock on and launch. Even if a CDCM were launched by an alert crew, once the sub dove, the missile would loose target lock. Finally, the inefficiency and inexperience

of our adversary's ASW forces enables this platform to operate with near impunity. If ASW units detect and prosecute the ship, the OHIO SSGN retains its full self-defense capability.

Expeditionary forces in the 21st century will have to face the new and unique challenges of the evolving battlefield using new technologies in a revolutionary manner. Our forces, going into harm's way, need every advantage to ensure victory. The combination of Tomahawk, artillery projectiles, SOF, torpedoes, and mines; coupled with the inherent stealth and survivability of the submarine, makes the OHIO SSGN the multi-mission platform of the early 21st century.

ENDNOTES

1. Global Security. wW.gLOBALSECURITY.ORG/SSGN-726.HTM.
2. DPICM (Dual purpose Improved Conventional Munitons) projectile filled with 87 dual-purpose grenades capable of penetrating more than 2.5 inches of rolled homogeneous armor.
3. United Defense, Advanced Gun System. www.uniteddefense.com/prod/ags.htm.
4. NSFS is the "fire provided by navy surface gun, missile and electronic warfare systems in support of a unit or units tasked with achieving the commander's objectives" *(Joint Pub 3-02 Joint Doctrine for Amphibious Operations)*.
5. In 1996 USS CHICAGO controlled a Predator UAV while submerged during fleet testing. See *Aerospace Daily: U.S. Navy Mulls Sub-based UAVs, 14 February 1996.*

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SUBMARINES AND SPACE POWER, Part II

by Nader Elhefnawy

Nader Elhefnawy holds a B.A. in International Relations from Florida International University and is a doctoral student at the University of Miami. He has published on space warfare in several forums, including Parameters and Astropolitics as well as The Submarine Review, where his article "Submarines and Space Power" appeared in the October 2001 issue. This is his sixth article in the Review.

With every major conflict fought in recent years, American forces have demonstrated new capabilities, and much of that has been related to the development of space power, particularly in areas like reconnaissance, navigation and communication. There is one realm, however, where these enhanced capabilities have comparatively little effect and that is beneath the sea.[1] Submarines are broadly immune to space-based surveillance, at least in the absence of truly effective non-acoustic sensors. This gives them the potential to slip past aerospace surveillance in performing missions like attacking shipping with torpedoes, laying mines, gathering intelligence, launching cruise missiles and landing special forces teams.

In other words, they would afford a power which has lost aerospace and surface superiority to an opponent to continue fighting. **However, it is conceivable that their stealth may allow them to play an even more active role in conflicts increasingly geared toward space activity in the future.** *(Ed. Note: emphasis added).* The move generally is toward more versatile submarines, capable of carrying a broad assortment of payloads, and also toward their tighter integration with other fires in military operations.[2] The conversion of four Trident missile submarines into platforms dedicated to launching cruise missiles and landing

special forces teams is a major step in this direction. It is also possible that submarines could also play a more active role in space warfare than has generally been thought possible to date.

Exercising Space Control *Earthside*

Of course, space conflict remains highly hypothetical. Nonetheless, the American military is moving toward a doctrine of space control.[3] In the event of a conflict with a high-tech opponent, shutting down their space launch capabilities may therefore be a primary task for U.S. military forces. While this conjures up images of killer satellites, in the shorter term space is principally significant as a conduit of information, making space forces a tool of *force enhancement* rather than *force application*, as Barry Watts recently put it.[4] Moreover, the reality is that while satellites may be built to function in space, they are built, launched from and controlled from Earth. This has led some observers to suggest that attacks on space systems may be a less efficient way of pursuing space control than targeting the information flows from the space systems to the air, sea and land units using them, perhaps through attacks on the *Earth-side* infrastructures facilitating those flows.

Accordingly, the ability of submarines to deploy cruise missiles or special forces teams against land targets like ground stations would let them play a significant role in weakening an opponent's space capabilities. Particularly given the preference for coastal facilities for space launches, and the capability of submarines to approach a hostile coastline undetected and loiter there for long periods, they could also target space launch sites, destroying space vehicles (or for that matter, ballistic missiles) in boost-phase.

Submarines can also be deployed discretely to *space choke points*, points which satellites being launched must pass over on the opposite side of the planet on the way to orbit. For instance, one writer has observed that a single naval vessel in the South Pacific could have shut down the Soviet space program in a conflict, provided it mounted the appropriate missiles. It has since been suggested that the idea's usefulness has declined with the growth of the commercial space industry and alternative types of floating or aerial launch platforms, widening the options of the countries using them. However, political and security concerns might narrow those

options where the launch of explicitly military systems by a belligerent state in wartime is concerned, so that the idea can not totally be discounted.[5]

Submarines as Space Launch Platforms

Of course, one possible way of making a launch capability more survivable in the face of an increased threat from submarines or other systems may be to rely on relatively compact, mobile launchers, which can now include floating platforms such as the Sea Launch system. Such a system has obvious advantages. Seventy percent of the world's surface is water, greatly widening the range of possible launch points – and in the event of a conflict, the amount of territory that an opponent would have to cover, a key issue when such launches are threatened by hypersonic air-to-surface missiles. This also simplifies the problem of getting a satellite launcher into an equatorial position, since access to a suitable launch site on land is not required, something the Sea Launch system—a joint American-Ukrainian-Russian-Norwegian venture—is expressly designed to do.[6] First demonstrating its system in 1999, the company has launched several satellites since October of that year.

Nevertheless, surface-going ships would be relatively easy for a sophisticated military to track, which would not be the case with submarines. Systems based on submarines can hide from aerospace power and enjoy lengthy loiter times even in hostile waters. They would also expose their location only at the moment that they go into action, making them highly suited to *shoot-and-scoot* tactics. Indeed, even that may cease to be necessary, given the prospects for systems like supercavitating ballistic missiles (or as the case may be, space rockets).[7] While this idea may seem radical, in actuality submarines have been taken for granted in this role, as launchers of long-range ballistic missiles which are capable of putting a satellite in space. This potential became a reality when in 1998 the Technical University of Berlin successfully launched a satellite from a Russian Delta IV-class submarine, using a converted submarine-launched ballistic missile.

The question, of course, arises as to what use such capabilities might be put. The most obvious is the launch of anti-satellite

weapons, and this possibility also has not entirely escaped notice, even if it has received relatively little discussion in recent years.[8] In the 1970s and early 1980s, the Navy explored the use of a sub-launched Poseidon ballistic missile to put an anti-satellite missile into orbit.[9] Nevertheless, such an approach poses some significant problems. A space launch from a submarine may be easily taken for a ballistic missile launch and the opening shot in a nuclear attack, so that such an approach carries with it some risk of escalating a conflict.

Additionally, while submarines have widely proliferated, the vast majority of these are small, conventionally-powered boats like the German Type 209 or the Russian Kilo suited principally to attack operations in coastal waters. Such submarines are poorly suited for space launch operations, in contrast with the nuclear-powered or ballistic missile submarines presently operated by only a handful of nations, namely the members of the United Nations Security Council. The list is not expected to get much longer in the near future, though India has announced interest in such systems. Admittedly, this leaves a few states with systems of this kind, and certainly more could acquire them if they proved sufficiently advantageous. Besides, the miniaturization of satellites and launch vehicles, and a willingness to deploy smaller loads of them, would let smaller subs perform this function; after all, not every ballistic missile submarine must be an OHIO or a TYPHOON.

Submarines and Directed-Energy Weapons

Moreover, the capacity of submarines to attack space systems already in orbit is not limited to their space-launch capability. While missiles are the most obvious way submarines have of performing these missions, they could also be performed by a sub mounting a directed-energy weapon comparable to the Mid-Infra-Red Chemical Laser (MIRACL). Aside from the economy such systems may afford in destroying thin-skinned launch vehicles, the MIRACL possesses a demonstrated anti-satellite capability.

Laser weapons, certainly, are not without their problems. Smoke, bad weather, fog and dust can significantly reduce their range, which not only means that their effectiveness will frequently be reduced, but suggests some obvious countermeasures against

laser weapons. It also means that submarines would have to be surfaced to get much use from their weapons, whereas they can fire their missiles while submerged. Nevertheless, such exposure would be much briefer than is the case for a surface ship, and work could be done to further reduce the comparatively small signature of a surfaced submarine.

The size and weight of today's directed-energy systems is also a problem, the MIRACL system weighing around two hundred tons. Reductions in the size of laser weapons, however, are widely anticipated, and there are presently plans to pack the MIRACL's power into something a tenth that size, a twenty-ton system that could be airlifted in two cargo containers inside of a C-130 transport. There is also a great deal of optimism about solid-state laser technology.

Some foresee it creating an effective battlefield laser small enough to mount on a fighter aircraft or even a jeep, and proponents of such systems are arguing that a revolution in this area is imminent.[10] The move toward electric drive in naval vessels, including submarines, makes them well-suited to mounting solid-state lasers, which could derive their power from such a drive rather than cumbersome stocks of chemicals. A real breakthrough in this area would enable laser weapons to be built into smaller submarines, widening the number of potential users. Additionally, unlike the case with missile systems, gravity would not be a factor, so that the users of Earth-based laser systems need not worry about being on the *wrong end of the gravity well*. On the contrary, Earth-based systems are more physically accessible to their users than their counterparts in space where supply, maintenance and communications are concerned, and their design less constrained by factors like size and weight, giving them a possible edge.[11]

Consequently, while it may be difficult to imagine any opponent the United States is likely to face turning its submarines into space launchers (save perhaps for a large peer competitor); it is much easier to picture a future adversary mounting a compact laser weapon, at least a couple of decades down the road. So armed, even a relatively small number of such submarines—a force potentially within the reach of a 2020s equivalent of a rogue state—could try and wreak havoc by fighting a submarine-based guerrilla war against American satellite networks.

Conclusions

Arguably, if equipped with the requisite missiles (and perhaps even more promising, directed-energy weapons), submarines can perform in the anti-space role. Aside from impacting how the United States or other nations may use their submarines in the future, this underscores a larger issue, namely the likelihood of low-cost counterspace approaches and systems, here exemplified in a sub outfitted for the anti-satellite mission.

Such a possibility raises two important points. First of all, traditional land, sea and air forces, including submarine forces, should not be neglected in the pursuit of space-based systems—or the capabilities of other states in these areas overlooked. Second, the United States, while likely to win any conceivable confrontation in space, is not invulnerable in this area. Critical military space systems may prove quite vulnerable down the road even to minor opponents, should armed satellites and attacks on space objects become a routine, accepted practice in warfare (to say nothing of the civil and commercial space systems of increasing import to the world economy). Consequently, the most effective way to use America's lead in space may be as part of a broader strategy to at least slow down this more fundamental kind of militarization. While a subtler tack than space control or space dominance, it may provide the greater level of security in the long run.■

ENDNOTES

1. Nader Elhefnawy, "Submarines and Space Power," *Submarine Review*, October 2001, pp. 71-76.
2. Floyd D. Kennedy, Jr., "Transforming the Submarine Force: Integrating Undersea Platforms into the Global Joint Strike Force," *Air and Space Power Journal*, Fall 2002.
3. Karl P. Mueller, "Totem and Taboo: Depolarizing the Space Weaponization Debate" (8 May 2002), pp. 15-16. Accessed at http://www.gwu.edu/~spi/spaceforum/TotemandTabooGWUpaperRevised[1].pdf. This article also appeared in *Astropolitics*, Spring 2003.
4. Barry Watts, *The Military Use of Space: A Diagnostic Assessment* (Washington D.C.: Center for Strategic and Budgetary Assessments, 2001).

5. Lieutenant Commander J. Todd Black, "Commercial Satellites: Future Threats or Allies?" *Naval War College Review*, Fall 1999.
6. The Sea Launch company web site is accessible at http://www.sea-launch.com/.
7. Steven Ashley, "Warp Drive Underwater," *Scientific American*, April 2001.
8. More ambitiously, submarines may be used for "rapid space force reconstitution," replacing satellites destroyed in the course of fighting, deployed submarines perhaps carrying a cargo of spare satellites and the launch vehicles for them, though this would be a much longer-term concern.
9. Gary Federici, *From the Sea to the Stars* (June 1997). Accessed at http://www.history.navy.mil/books/space/index.htm. The Defense Advanced Research Projects Agency also developed a manned anti-satellite space cruiser, also to be launched by a Poseidon. For descriptions of this and other early ASAT concepts, see Norman Friedman, *Seapower and Space* (Annapolis, MD: Naval Institute Press, 2000).
10. Ian Hoffman, "Warfare at the Speed of Light," Oakland Tribune, October 19, 2003. Accessed at
http://www.oaklandtribune.com/Stories/0,1413,82~1865~1709759,00.html.
11. Nader Elhefnawy, "Four Myths About Space Power," *Parameters*, Spring 2003, p. 126.

REALLY NEW SSNs

by Jerry Holland

In the June issue of the Naval Institute *Proceedings*, Captain Tom Jacobs, USN (Ret.), chases a will of the wisp that infects every acquisition program. Lamenting the high price of the submarines presently under construction, Captain Jacobs suggests that with humility, courage and "...a clean sheet of paper", we could have a smaller, simpler and cheaper albeit "... a little slower..." ship that would be built in quantity. While policy makers are particularly prone to this disease of thinking that if only we would start over somehow the end product would wind up cheaper than the present building program, it is unusual to find engineers and operators falling into this abyss of wishful thinking. Captain Jacobs' misses the main point of building and operating a ship. His argument focuses only on initial costs; he offers only that we don't need Cold War capabilities without specifying what those excess features may be while entering no argument on how this lesser capable ship would meet the needs of the United States: not even why his planned slower speed is satisfactory.[1]

This view is not unique, having a long but not encouraging, pedigree. The Navy's experience in these sorts of efforts date as far back as Jefferson's gunboats. This testifies to the stupidity of efforts to waive away experience to reduce construction costs with little serious contemplation of the ship's potential missions. But even if one does not acknowledge that missions will creep, history records that the equipment to go in the new boat grows, e.g., hydrophones get longer, antennas larger, weapons heavier. Just the lengthening of core life adds investment cost because maintenance accessibility becomes more important in ships with long periods between upkeeps and overhauls.

The lessons of the programs of the interwar period from 1920 to 1940 are instructive. In this period, those submarines larger than their predecessors were more successful than those planned to

reduce construction cost. The end result of this ever larger, ever more capable submarine was the Fleet boat. After World War II, the SSKs were attempts to reduce investment costs without much regard to what the ships were expected to do: they were retired almost before they finished sea trials. The Skate class ships, designed to contain costs, were relatively slow, could not carry much of a weapons load, were cramped and difficult to maneuver and were absolute dogs to maintain. Even THRESHER/PERMIT was too small to allow reasonable access for maintenance and crew comfort was minimal. Not until STURGEONS was a really satisfactory long lived submarine achieved—and even there, late versions of the class had to be enlarged to accommodate electronics and crew that had not been imagined at the class's conception. During their planning and construction, the loud concerns voiced about excessive cost and size were among the precursors of Captain Jacob's argument.

Captain Jacobs's concern centers on force size: "...we cannot have size and numbers". But force size is determined more by the utility of the component units than by their individual investment cost. Numbers by themselves are not useful. A million men in rowboats with hammers to smash periscope windows do not make an effective ASW force. This numbers argument always focuses on the investment cost like an accountant absorbed in the quarterly report, missing the measure of value. The leadership of the submarine community since the seventies has been careful to avoid being sucked into arguments on costs with critics unencumbered with operational responsibilities and hopefully will continue to be able to remain so.

The lessons of designing future warships are instructive. Carrier aviators committed to big deck carriers forty years ago and have never wavered in spite of repeated critical attacks on their cost from the highest levels of the Defense Department, Congress and the almost every defense think tank in existence. As a result of their persistence and the commitment of their fellow professionals—including three successive CNO's who were submariners—the United States today can employ more than a half dozen of these irreplaceable assets in wars that were unthinkable when they were designed and built. And more are being built though the expected cost of CVN(X) is 11.2 billion dollars!

Contrast this record with the efforts to build the next class of surface warships. Arguments on mission and cost tradeoffs have stymied this project for years. In the interim, the only new ship, the Cyclone class, has been transferred to the Coast Guard or retired – the unfortunate fate of the small, cheap to construct ships that prove themselves to be the most expensive ships the country buys. Only now with a commitment to try three differently sized ships do these efforts appear to go forward.

Slow growth and smaller force sizes are inevitable products of the world ahead in which the Navy's role, while the most prominent of the services, will be substantially less than the missions forecast for the 600 ship Navy. The missions of the ships being built today cannot be predicted in detail so building ships dedicated to restricted roles or special missions will inevitably result in their low utility, short lifetime, and high operating costs. Congress shows little appetite for enlarged naval construction: there is little likelihood that substantially more submarines would be authorized even if their unit costs were significantly reduced. Every unit of tomorrow's Navy should be as capable as possible from the time the design leaves the drawing board. History shows that designing to contain construction cost just defers investment necessary to make them functional and is likely to leave them limping late into action with worn crews and low reliability.

Veterans of the *Diesel Boats Forever* nostalgia of the sixties can recall the arguments advanced by many, including senior leaders of the Submarine Force, that we could have two diesel boats for the price of a nuclear powered ship. The arguments used in these debates are the same as those used to justify the horse cavalry in 1930, the unrifled musket in 1860, and the retention of sail in 1880.

There may be answers other than VIRGINIA, to what new submarines should look like, what they should carry or how they are built, but such answers won't be cheaper.

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[1] Captain Tom Jacobs, USN (Ret), "Where is the *Really* New SSN?", *Proceedings*, June 2003

THE SUBMARINE FORCE IN THE IRAQI WAR
PART III

by Robert A. Hamilton

Bob Hamilton is an experienced reporter on Defense issues and is currently a correspondent for the New London Day. His previous articles on the Iraqi war appeared in the July and October issues of THE SUBMARINE REVIEW.

After completing a depot maintenance period in December 2001, USS SAN JUAN had spent several hectic months doing a shakedown cruise and completing its POM (pre-overseas movement) certification, then left its homeport of Groton, Conn., right on schedule on September 12, 2002, for a six-month deployment.

But in February, about the time that SAN JUAN should have left the Mediterranean on the last leg of its trip, it became clear that Saddam Hussein was going to disrupt the SAN JUAN's schedule.

"By that time we could see the president was working very hard to get the UN resolutions passed and to force the Iraqis to give up weapons of mass destruction, so we were on hold," said Commander Edward L. Takesuye, captain of SAN JUAN.

On March 13, the day it was supposed to come pulling back up to its berth, it was instead queuing up at the northern mouth of the Suez Canal, preparing for a trip into the Red Sea. About a week later, it fired its first salvo of Tomahawk missiles into Iraq. On March 31, when it was supposed to be in the middle of its 30-day stand-down following a deployment, it was instead throwing a line over to the tender USS EMORY S. LAND in Souda Bay, Crete, to take on a couple of weeks' supply of food before heading for home, arriving April 23, six weeks later than it was originally scheduled.

Operation Iraqi Freedom threw most submarine deployment schedules into disarray, because it required a massive amount of firepower for the *shock and awe* opening phase of the war. Coincidentally, as SAN JUAN was leaving Groton, it passed the USS TOLEDO in mid-channel. TOLEDO, skippered by Commander Michael T. Poirier, was arriving from a six-month deploy-

ment on September 12, 2001. Given a nuclear attack submarine's two-year operating cycle, it should have been doing maintenance, local operations and other work close to home for at least 18 months, until March 2003. In short order, two of its department heads, three of its most experienced junior officers and four of its chiefs were parceled out to other jobs, since it would have more than a year to prepare for its next major mission.

But even before its missiles were offloaded TOLEDO would be pressed back into service. It was pulled off an exercise in the Caribbean the following January, ordered home to take on a 60-day supply of food, and dispatched to the Gulf. In fact, it wound up several spots ahead of SAN JUAN in the Suez Canal.

"That gave us some challenges that we had to work through, deploying so soon after we had come back, but the guys did great," Poirier said.

"We were all pretty sleep deprived," said Torpedoman 2nd Class Fred W. Hurtz. "But none of us could sleep anyway. We were standing by, just waiting for the next tasking." Most of the men *battle napped*, he said, grabbing a half hour on the hard cold steel of the torpedo racks, even inside the spent missile canisters when they had to.

"When you're as tired as we got, you can fall asleep anywhere," Hurtz said. "Besides, our racks aren't that much more comfortable anyway," he added with a grin.

TOLEDO had been scheduled to take aboard an inspection team for a Tactical Readiness Evaluation in late February, which had to be cancelled because by then TOLEDO was on its way to the Red Sea. But Poirier noted wryly that TOLEDO's flawless performance in the Gulf, by itself, should be validation enough for the inspection team.

USS PROVIDENCE, meanwhile, had to cancel its last weekend with family members and deploy 10 days ahead of schedule out of Groton. That means that five Groton-based boats that took part in the strikes against Iraq, only two—USS AUGUSTA and USS PITTSBURGH—did so within a normal deployment.

In fact, across the fleet, most of the submarines that took part in the strike were either surged during the middle of their interdeployment training cycle, or extended on station anywhere from a few weeks to a couple of months. A dozen submarines total,

including three from Norfolk, Va., and four from Pearl Harbor, took part in the strikes. Most of them had special circumstances surrounding their deployment as well, including:

- USS CHEYENNE spent nearly nine months at sea as part of the USS ABRAHAM LINCOLN strike group. The LINCOLN became the center of national news attention when it returned to port, but CHEYENNE's return was considerably more subdued on April 24, despite the fact that it was the first submarine to fire in the conflict on the opening day of the war.
- USS LOUISVILLE, out of Pearl, spent about eight months on station when it was extended for Operation Iraqi Freedom. It got home to a special welcoming ceremony that included the presentation of a Kentucky Long Rifle to the captain, Commander Michael Jabaley, and Louisville Slugger baseball bats for the entire crew. Jabaley later presented one of the bats to the Naval Submarine League at the annual symposium in Alexandria, Va.
- In Norfolk, USS NEWPORT NEWS returned home April 24 after 202 days at sea, and USS BOISE had been surged in a fashion similar to TOLEDO.

Other submarines taking part in the strike included USS KEY WEST and USS COLUMBIA out of Pearl, and USS MONTPELIER out of Norfolk.

PITTSBURGH and LOUISVILLE were the only two submarines that took part in the 1991 Persian Gulf War. But many of the submarines that took part in the strike predate even that conflict: AUGUSTA, PITTSBURGH and PROVIDENCE were commissioned in 1985, about the same year their youngest crewmen were born. LOUISVILLE was put into service in 1986; KEY WEST in 1987; SAN JUAN in 1988; NEWPORT NEW in 1989. Only five of the 12 boats were commissioned in the 1990s, and the newest of them was the CHEYENNE, commissioned in 1996.

Takesuye said the submarines might not be the newest models, however, they still did their job, bringing stealth, forward presence and endurance to the mix. He was more concerned that, despite the fact that submarines have been involved in land attack missions for a dozen years now, the constant turnover of crews means that most

of the men had never been on a combat submarine before. Even he had served on five attack submarines before taking command of SAN JUAN, and never fired a missile in combat.

"We had to keep telling the crew, 'hey, you've practiced and practiced and practiced, and you're ready to do this.' But when the time came everybody lined up at their battle stations and things went off without a hitch," Takesuye said.

"For me, the biggest pressure was the responsibility to make sure all the missiles went off on time. The only way I can think to put that into perspective for most people is, imagine that you're playing baseball, and you get called in to pitch at the bottom of the ninth, you're up by one run, but the bases are loaded and there are two outs. That is the feeling. You get a knot in your gut and it just sits there. The missiles are ready to go, you're counting down, and the five minutes it takes are the longest minutes of your life. You don't want to touch anything because the slightest thing can cause your navigation system to freeze up and you have to start all over again."

Poirier said, having taken command in 2001, and finished one six-month deployment, he didn't expect another major deployment before he moved on to another job this year, but he was hoping for another chance to take the boat to sea.

"It's what we trained for. The opportunity to come out here, do our job, and do it well, was very satisfying. And everybody is sharing in this success," Poirier said, "The guys were fired up to come out here and do this mission."

While getting surged less than five months after returning to port, and after a hectic period of maintenance and training, put a lot of pressure on his crew, but it also made them feel proud that, when the national command authority needed a combat-ready submarine, it pulled TOLEDO out of the bullpen.

"I didn't even get a chance to think about how fast we moved," said Chief Fire Control Technician Rick Lopez, who got a chance to fire a Tomahawk for the first time in his nine-year stint in the Navy. "There was so much to be done, so many preparations to make, so many repairs to do, I didn't have a chance to think about it at all. Everyone was focused. We knew we had an important mission, so everyone put their best foot forward, and now we're enjoying the benefits of all that hard work."

"Someone's got to do it, and we were proud to have been chosen," Lopez said. "Everybody from the captain to the food service attendants had a role to play. If one piece is not in place, the whole machine suffers."

Morale could also be measured by the number of re-enlistments. Although even the Navy's biggest boosters will acknowledge that the tax-free status of bonuses that are earned by re-enlisting in a combat zone are a major incentive as well (it's the equivalent of getting a 30 percent larger bonus at home), the sailor has to want to stay in the Navy no matter where he makes the decision. Aboard TOLEDO, Electronics Technician 1st Class Michael D. Justice, the career counselor, had re-signed 33 sailors by the time the boat pulled into Souda Bay, dispensing $938,000 in selective re-enlistment bonuses that ranged from $2,000 to $45,000.

"This is the most re-enlistments I've seen, by far," Justice said. "We've got two nukes flying here from the states, and as soon as they get here I'm going to see how much they like the Navy."

The challenge now, Poirier said, will be to make sure that TOLEDO gets the time it needs to rest its crew, repair its systems and prepare for its next deployment—when that will be is still up in the air, as the Navy reconsiders the deployment schedule for all its combatants.

"They'll look at our schedule, and they'll make adjustments as they need to. Our guys will get plenty of time off. They are going to have a nice, long in-port period coming up."■

SLOW-SPEED CONTROLLABILITY-A NEW TACTICAL REQUIREMENT?

by CAPT. James H. Patton, USN(Ret.)

Captain Jim Patton is a retired submarine officer who is an active consultant in submarine matters to government and industry. He commanded USS PARGO (SSN 650).

Background

In a distant galaxy a long, long time ago, a 637-class submarine was given an unusual *one-time* tasking. It was to spend what turned out to be about three weeks operating throughout about one square mile of ocean, at 10 or so feet above the bottom, in about 600 feet of water. A diurnal tidal shift of more than a knot existed in the area and the tasking would require frequent periods of zero speed with respect to the bottom or even slight sternway. Precise control of the pitch and yaw axes and positioning of the ship to within a few feet of areas of interest were also necessary. Fortunately, acoustic quietness was not an overriding consideration.

The tactical solution to this unusual problem was to rig out the Secondary Propulsion Motor (SPM), a single speed high RPM electric motor, at 000 degrees relative, and run it continuously. Safety procedures required that the SPM only *be* rigged out or retracted while above 200 feet, but once out and locked, the ship could operate down to test depth. The same procedures, however, required that it be trained in azimuth only when de-energized. Since frequent adjustment of ship's heading was anticipated, this was an unacceptable alternative to control the yaw axis.

With the SPM running, a backing bell was put on the Main Engines. When about 30 turns astern were applied, their thrust just counteracted the SPM, and the ship was essentially Dead in the Water (DIW). At 20-25 turns astern, the ship acquired slight headway, and at 35- 40 turns, sternway. At all times, however, there existed significant *wash* over the stern planes and rudder which permitted a quite nice control of both pitch and yaw. Although pitch control combined with some head or sternway provided a degree of vernier depth control, the greater burden in this dimension fell upon the Diving Officer of the Watch. Great

skill was required in keeping on top of fore-aft and overall trim, particularly during periods of watch change or blowing of sanitaries and steam generators.

In any case, all concerned were impressed with the fact that there are some things that a large submarine might be asked to do that would require an unusually precise degree of slow-speed controllability, an almost NR-1 level of finesse in the x, y and z planes (and their first derivatives).

Discussion

Slow-speed controllability in the vertical plane is not a new phenomenon for large U.S. nuclear submarines. The entire feasibility of the submerged launch of a ballistic missile, essentially an airframe which was unforgiving of shear forces across the deck from any headway at all, required that the SSBN be DIW. When this evolution was further complicated by the rapid and violent changes in displacement as many missiles left and launch tubes back-flooded, incredible design innovation had to be exercised in the hovering and ballasting systems, now taken so much for granted, to nicely control the z axis. It's interesting to note that the control system for the hovering system employed not only depth error, the difference between ordered and actual depth, but also its first derivative, vertical velocity, the second derivative, vertical acceleration, and even the third derivative, a parameter called quickening, the time-rate of change of acceleration. There was something decidedly non-intuitive about having the boat below ordered depth and sinking, yet having the system (correctly as it turned out) actually flooding water into the hovering tanks. Precise control of the x and y-axes and heading, however, were of little concern during the launch evolution. After all, if you're not going anywhere, it doesn't matter in which direction you're pointed.

From about 1999 to 2001, the Defense Advanced Research Projects Agency (DARPA) ran a Submarine Payload and Sensors program in which consortia of commercial and government agencies were challenged to envision what U.S. nuclear attack submarines would evolve into within a decade or two. During this period, the two competitive consortia were selected and both converged on amazingly similar visions. Not only would submarines increase their payload by an order of magnitude or more, and

have far greater *access to the environment* but modularity would also permit more rapidly converting to an increasingly broad range of missions. Many of these missions would require the same degree of near-bottom slow-speed maneuverability discussed above, but not necessarily with the luxury of not having to be concerned with acoustic covertness. In fact, the ability to conduct covert in-theater replenishment/change of payload or stores was not ruled out as a *value-added* characteristic.

It is one thing to envision the great things to come, but quite another to deal with the things that are, and the transitions that must occur as today's reality becomes that of the future. There are now two SEAWOLFS, JIMMY CARTER with its greater access to the environment is well along in construction, the first of four SSBN to SSGN conversions (with an order of magnitude greater payload) will show up during the last half of this decade, and VIRGINIAs will begin trickling into the inventory in a few years. However, as a point in fact, the Submarine Force will consist primarily of 688 class SSNs until officers just now reporting to their first submarine become Commanding Officers. If there is a frequent need for good slow-speed controllability between now and then, how will it be provided?

Perhaps the SPM gimmick described above also works on a 688, but the author is unaware of its having been tried. Besides, even in third world littoral waters, the noise levels associated with a 688 SPM might easily be unacceptable. TRIDENT-class SSBNs have two (to achieve enough thrust to propel the much larger hull) *non-trainable* SPMs, but it is not as yet clear as to whether those four to be converted to SSGNs will have any alterations that would better support slow-speed controllability in shallow littoral waters. The SEAWOLF's have an altogether different secondary propulsion device – the Secondary Propulsion Unit (SPU). The SPU is still single speed, but this shrouded, rim-driven induction motor propulsor incorporporates a much higher number of electrical poles, and therefore offers intrinsically quieter performance at lower RPMs. Also, the SPU does not penetrate the pressure hull mechanically, as the SPM does, but only electrically. (Although not unsafe per se, it was somewhat unsettling while operating near the bottom at slow speeds in deep water to dwell too much on that 10 or so inch cylinder that penetrated the pressure hull to support the

SPM). SPUs designed for JIMMY CARTER are not only even quieter than those on SEAWOLF and CONNECTICUT through improved propulsor design, but are also capable of variable speed. VIRGINIAs will receive SPUs that are variable speed, but are not the quieter JIMMY CARTER variant.

Employment

If indeed the bulk of the U.S. Submarine Force had quiet, slow-speed controllability as a general characteristic, how would this enable new missions or make existing missions safer or more effective? As starters, those who would benefit greatly are the SEALs and other Special Forces who are more routinely operating on and off these ships. It is rumored that the 688-class, as it exists today, has a terrible reputation among SEALs for being very difficult to get on and off, due to very poor submerged controllability at speeds much below 4-5 knots. Since anything over one knot of relative velocity represents a challenge to even as accomplished a swimmer as a SEAL, any improvements in this regard would pay immediate dividends. Launching and landing such as the Swimmer Delivery Vehicle (SDV) and the Advanced SEAL Delivery System (ASDS) would also be significantly easier and safer.

It has become apparent, not only through studies and the DARPA Payloads and Sensors program, but also through Fleet experiments such as last year's GIANT SHADOW exercise where a large Autonomous Underwater Vehicle (AUV), Penn State University's *Sea Horse* was launched from an SSBN's missile tube, that great benefits can be gained in the near term through exploitation of AUVs and their cousins, tethered Remotely Operated Vehicles (ROVs). The Navy will soon deploy the Long term Mine Reconnaissance System (LMRS) – a torpedo-sized vehicle which will conduct an independent search for moored and bottom sea mines and return to its launching ship for recovery. It is patently intuitive that the launch, recovery, and even mission profile of such vehicles are significantly enhanced, if not basically enabled, through quiet slow-speed controllability. In addition, much is read about submarines aspiring towards the ability to implant or retrieve devices such as temporary bottom-mounted sensor arrays, evolutions that imply a fine degree of positional control at very slow speeds.

Conclusions

In general, the Cold War saw very few requirements for the vast majority of U.S. attack submarines to possess or exercise precise 3-axis slow speed controllability. Many indications imply that may no longer be the case. As the entering sea story implies, there may have been cases where ad hoc solutions had to be invented in response to emergent problems, but these solutions probably do not satisfy the existing and emergent requirements in all respects as regards precision and/or acoustic stealth. A serious shortcoming in the near and mid term is that the mainstay of the Submarine Force for many years, the LOS ANGELES class SSN, has a reputation of having especially poor maneuvering characteristics at slow speeds. It would appear almost a certainty that, sooner or later, some sort of backfit to this class will be operationally desirable to provide it with the near-zero speed controllability that VIRGINIAs are likely to have. Similarly, with as much hype that the forthcoming SSGNs are rightfully receiving as regards a quantum jump in littoral submarine operations, attention to their ultra-slow or zero speed capabilities is warranted.■

REFLECTIONS ON A TIGER CRUISE

by Joe Buff

Mr. Joe Buff is a novelist with several submarine-related books to his credit. His most recent novel is Tidal Rip. He also has been a frequent contributor to THE SUBMARINE REVIEW. His first article was undertaken at this magazine's request to look at submarine warfare in the far foreseeable future using a novelist's method of forecasting from unclassified sources. That article was titled Looking Forward-Submarines in 2050 and appeared in the July 1998 issue of THE SUBMARINE REVIEW.

Introduction and Purpose

Back in October, 1999, the present writer was privileged to join a Tiger Cruise aboard USS MIAMI (SSN 755), from the Naval Submarine Base New London to Halifax, Canada. Commander (now Captain) Jim Ransom was MIAMI's CO. MIAMI departed Groton, CT, on a Friday at 1000, and I debarked from the ship in Halifax the following Monday at 1400.

Many readers of THE SUBMARINE REVIEW will be aware that Tiger Cruises ordinarily embark close family relations of a Navy ship's crew, and can be an excellent vehicle for enhancing morale, cohesion, recruiting, and reenlistment rates. In this voyage, the *Tigers* were primarily fathers or sons of MIAMI's officers, chiefs, and enlisted personnel. Due to a last minute cancellation, I was invited by a Navy League contact to participate. As a professional writer at that time engaged in the final editing of my first novel of future undersea warfare, the voyage was an invaluable formative experience. I remain forever grateful to the Department of the Navy, and to everyone else involved, for this wonderful learning opportunity.

Submariners may wonder what value this personal reminiscence could provide them, as it might appear to be *preaching to the choir*.

However, many public naval forums have stated the importance of the Silent Service communicating effectively to the broader military audience, and to the public in general. Perhaps this documentation by someone *on the outside looking in* might help aid submariners to better grasp the perspectives and possible knowledge gaps of their wider constituencies—and thus act in some small way as a tool or referent for those *on the inside speaking outward*.

It was not my intention in joining the Tiger Cruise to compose an article about it afterward, but rather to obtain only what journalists might call *deep background*, for additional novels and non-fiction writings I planned—the idea of this present piece came slowly in the months that followed. More than four years passed since the voyage, as intervening world events repeatedly gave pause: KURSK disaster, USS GREENVILLE collision, the attack on USS COLE, the horrors of 9/11/01, and the ongoing global War on Terror triggered by that infamous day. Yet in retrospect, these events all underscore a significant point: that serving on a nuclear submarine is a risky but absolutely vital calling.

Enough of preliminaries. Let's go to sea!

First Impressions

I reported to MIAMI at 0800. The sky was clear and sunny, the air refreshingly cool and brisk—some thin mist on the Thames dissipated rapidly. Crewmen were busy making final preparations to leave port.

I had been on a number of SSN dock tours, so I had some idea of what to expect when inside the ship. But I knew that in the hours to come, I would be thrust into an overcrowded environment in which physical, mental, or even *acoustic* privacy hardly existed, and from which there could be no escape. This would be a social test of a sort I had never faced before. I knew the crew had all been carefully selected, tested, and trained, and had bonded strongly as a group—for instance, when MIAMI made naval history by firing Tomahawk land-attack cruise missiles in two different theaters of quasi-war on a single deployment. Unlike the Tiger Cruise blood relatives, I was a complete outsider. Yet my concerns vanished from the start: Everyone was very friendly, clearly proud of their work, eager to talk shop (within the bounds of security), and made me feel warmly welcome.

One thing that impressed me as I got settled in that Friday morning, and we got underway, was the considerable ethnic diversity of the crew. Here was a true melting pot, men of all backgrounds welded into a single organic whole.

Since I was sponsored by the ship's Chief of the Boat, I ate meals in the enlisted mess. Lunch that Friday was a chance to experience further the relaxed and open mood of the crew, their high morale, and their obvious competence and pride. And yes, the food was terrific!

When we were out past the twelve mile limit, the Officer of the Deck gave me permission to climb up the bridge trunk and stand in the tiny cockpit atop the sail. Lookouts wearing safety harnesses scanned in every direction using binoculars. The radar was running— and metal radar reflectors were in position to enhance *our* signature for *other* vessels. Someone kept track of surface contacts using erasable marker pen on the Plexiglas windscreen of the cockpit. Seawater cascaded smoothly over the bow; looking down through that clear water I could see the vents for the forward ballast tank group, and the hatches for the Tomahawk launch tubes. MIAMI's wake, a churning brilliant white against the sparkling blue of the ocean, stretched behind us endlessly. I gazed toward the distant nautical horizon.

I said to the OOD, "So these are international waters. Nobody owns them, and here we are. Now I understand what 'seapower' means." The OOD agreed.

Dive! Dive!

It took until about 2000 to pass the edge of the continental shelf and be ready to submerge. The Tigers (guests) were asked to assemble in one corner of the control room, between the ship control station and the navigation plotting table. It was fascinating to watch the instruments and readouts as the men carefully made preparations for diving, and then MIAMI descended beneath the waves. Except for a slight down-angle of the deck, and increasing depth indicated at the ship control station, I might never have known that the massive vessel had left the surface. Rather than feeling nervous or claustrophobic, my thoughts ran more toward "Ah, at last I get to see, and feel, and savor what a nuclear submarine is really designed for. Operations submerged on the high seas."

The close interpersonal contact to me felt cozy, the ship's hull like a protective womb for all of us inside. With trained paramedics and firefighters only seconds away, and with nuclear-qualified people held to the highest imaginable standards of preparedness always nearby, I believed (and still believe) I was as safe as one could ever ask for. The more time I spent on the ship, in fact, the more I learned to move deftly among her people and their tightly packed equipment and machinery; as the hours passed during the cruise, MIAMI actually seemed larger.

Sleep? What's That?

From several years of research before the Tiger Cruise, I knew that SSN crews worked very hard. I also knew—by studying fiction and non-fiction on various naval topics ranging from the Age of Fighting Sail to the post-Cold War era—that once underway one quickly becomes accustomed to the rhythms of the ship, including the regular watch-change schedule, and the cares of the land often tend to fall away. Now I had a chance to see this first-hand. I can state unequivocally that no amount of reading accounts written by others comes even close to experiencing this special and unique land/sea transition personally.

My sleeping quarters were in the Los Angeles-class design's *Nine Man* compartment. I was assigned the top rack in a tier of three. Access to my tier was partly obstructed by another—the opening to my rack was about four feet wide, and my mattress was up at about the level of my chin. Getting in there, and doing so quietly in the dark (because crewmen around me were sleeping) was quite a challenge that first night.

I "slept "about four hours. I put "slept" in quotes here on purpose. While I lay on my back, dozing very fitfully because of the sheer excitement of being there, I kept hoping I wouldn't roll over in my sleep and fall to the deck! Then, once I did finally manage to fall asleep, the ship descended to a considerable depth to perform engineering tests. These tests included firing a number of water slugs from the torpedo tubes. The release of compressed air with each simulated firing made my ear canals ache. Then the ship suddenly put on a steep up-bubble and made toward shallower

depth at what felt like flank speed. Upward I went with the ship, lying in my rack, ascending toward the surface feet first (i.e., with my head downhill). *Then* the ship slowed and leveled off and the 1MC blared "Secure from deep submergence." So much for my first night's sleep! It became clear that work aboard MIAMI never ceased, and while underway the ship herself did not for one instant slumber. Every minute, *every* activity, went toward helping maintain and operate the ship, or toward improving crew training and *maintaining* basic bodily needs—so the crew could go back and maintain and operate some more.

I had turned in to my rack at midnight, local time. I was awake and on my way to the head by 0400 Saturday morning. For me, this Tiger Cruise was a business research trip; I was determined to make all of it count.

There was one poignant note when I went to sleep that Friday night: I had traveled extensively on business in my previous career, and spent many nights in hotels. My last act before bed was always to call my wife from the hotel room. But there, aboard MIAMI submerged somewhere in the North Atlantic—alone behind the closed curtain of my rack—there was no way whatsoever to *phone home*. I felt strong homesickness. Then I reminded myself that, for MIAMI's crew, this isolation from their loved ones happened *every* night, for months at a time. I came to better understand the sacrifices made by all who earn and wear the silver or gold Dolphins. (I "slept" another four hours on Saturday night; the being unable once again to phone home didn't get any easier—perhaps it never gets easier for Sailors either.)

My first real *Navy shower* on Saturday morning was an additional learning experience. The use of squeegees and sponges to constantly wipe down damp surfaces in the heads, to prevent the possible spread of germs, was yet another indication of how mutually interdependent and collectively self-reliant any submarine's crew really are. I liked the idea of this sponging for cleanliness so much that I adopted it in my kitchen and bathrooms at home after the cruise!

I then learned a *pointed* lesson in exactly how crowded a submarine can get, while flossing my teeth. My elbows almost poked in the face the men on either side of me. This garnered some justified dirty looks, and I immediately grew more careful.

I ate a hearty breakfast along with the off-coming watchstanders. I was impressed by the variety of entrees available even at breakfast—on Sunday morning, for instance, steak and eggs were one menu item. The coffee was strong and very good: exactly what I needed to get ready for my long and interesting first full day on the ship. The camaraderie among the crew as they dined was impressive, and gratifying. Again I felt very welcome, almost as if I were one of them for the duration of my visit.

The skill and dedication of the mess management specialists was just one of many things on MIAMI that positively amazed me. These men provided extremely good service to their *customers*. In fact, at one point when Reuben sandwiches were being served for lunch, I casually mentioned that I followed a low-carbohydrate diet and would have to select something else. The mess management chief overheard, and at once offered to grill me a plate of corned beef with sauerkraut and melted cheese. Outstanding! And thus, the *breadless Reuben* was born, a small but important moment in Silent Service culinary history. The Navy definitely takes good care of its people.

Extreme Eco-Tourism

At one stage, while we were running deep in about seven thousand feet of water, I spent a couple of hours in the sonar compartment. Besides observing the different display screens, and hearing the sonarmen announce each new contact, I was permitted to listen to the noises outside the ship by borrowing a spare set of sonar headphones.

This was one of the most unforgettable moments during the cruise. I was able to hear whales calling, dolphins whistling, and shrimp *popping*. (To me, though, the shrimp gave off something more like a repetitive clickety-clack.) Hearing these biologics from deep underwater via sonar, on what amounted to a billion-dollar nuclear-powered sound system, was *extreme eco-tourism* at conceivably its most extreme!

To Be the Hunted

Saturday afternoon, as we made our transit north toward

Halifax, MIAMI did some cost effective double-duty by serving as a training target for P-3 Orion maritime patrol aircraft crews. We went to periscope depth to establish radio contact while an Orion was still at a distance, and then submerged so it could practice trying to find us using sonobuoys.

For most of this exercise, I returned to the sonar compartment and donned spare headphones and watched the console screens again. I could see and hear the sharp *plops* as each air-dropped sonobuoy hit the water. Sometimes the Orion would overfly MIAMI, and the aircraft's noise signature would streak diagonally across the broadband waterfalls like a comet. Talk about your high-bearing-rate contact!

For a little while, I pretended those Orions were enemy aircraft, hunting MIAMI in anger during war. I came to understand more vividly the importance of stealth and secrecy. Knowing those aircraft might have been carrying anti-submarine torpedoes, and in a real combat scenario—had they been hostile—could have launched a full-scale attack, drove home to me two issues: the power an SSN or SSBN (or SSGN) possesses when it can shrewdly hide in the depths of the all-concealing ocean, and the extent to which everyone in the crew was so fully dependent on each other's courage, and calm, and focused skill. In fact, in that moment of *make believe*, I came to most completely experience how we were all truly living and working inside a *warfighting machine*. Each of us aboard, and every thing we did or didn't do, were analogous to components, or functions, of that all-surrounding and all-demanding machine that was also our home.

The supreme importance of good naval intelligence, of diligent counter-espionage, and of keeping classified information classified, could not have been more dramatically demonstrated than for me to be—if only in my imagination—sitting in the *hot seat* during an enemy attack in hostile waters.

The Tigers were allowed to witness a casualty drill, a simulated fire in the ship's galley. The expression of concern and urgency on one crewman's face as he dashed right past me to grab a fire extinguisher showed that MIAMI's crew trained the same way they would fight. Believing the *make-believe* in drills and simulations, clearly, was essential to survivability of the men and their ship.

"Helm, ahead flank"

Dramatic and exciting in a different way was to be permitted to man the helm *under instruction*. I did this while the ship was submerged at a few hundred feet. I was very closely supervised, and there were known to be no collision hazards anywhere in the area.

Steering the ship wasn't, at first, as easy as it looked. The officer at the conn began barking out helm orders in rapid succession and I became hopelessly confused. At one point I turned the rudder the wrong way, and we went so far off course that the sonar compartment called the control room to inquire if there had been a course change they weren't told about! But I was allowed to learn from my mistakes—to the credit of my instructors, as this is the best way to learn—and soon enough I was acknowledging and executing helm orders with some confidence. The highlight was when the OOD ordered flank speed. To steer such a mighty and sophisticated undersea capital ship, while her nuclear reactor and whole propulsion plant were working very hard, called for total concentration, and yet was immensely satisfying.

"Surface the ship"

Later in the cruise, on Sunday night, we surfaced for the long approach to our destination. Halifax was a vital assembly point for convoys during World War II, and is a historic seaport dating back to British colonial times. It remains today one of the busiest harbors in the world.

That night, the sea was engulfed in pea-soup fog. When permitted to observe through one of the periscopes, I could see a murky intermittent glow around relative bearing 180— MIAMI's blinking rudder light was illuminating the fog.

That last night, like many aboard, I never went to sleep. Hence I was able to share yet another submariner experience: *channel fever*, the adrenaline surge that comes with knowing you'll soon be making a port call on leave. At 0100, I offered to man the helm under instruction again. I was curious to see what it was like to steer the ship on the surface, as opposed to while submerged. From 0100 to 0300, I manned the helm. The bridge was also manned, with extra lookouts because of the fog. The radar was going constantly, of course. So was the ship's fog horn. Now, as

submariners reading this article will know, while the bridge is manned the sail trunk hatches are always kept open as a safety measure for the men topside. At the helm, I was seated almost immediately below the bottom of the sail trunk. Every two minutes, a crewman on the bridge would shout down the trunk, "Blow the ship's whistle." This, I quickly learned, was done to warn control room personnel that all conversation was about to become impossible for several seconds. Then, the whistle (fog horn) would be blown. It was truly deafening! Yet the steady rhythm of it, blowing for some ten seconds every two minutes for the entire two hours I steered the ship, was also uplifting and soothing. My concentration on the ship control station instruments and control wheel was total. The gentle, smooth pitching and yawing as we cut through moderate cross-seas added to this almost transcendental clarity of mind. The fresh air coming down the sail trunk was delightful. My being felt purified in a manner I never imagined possible.

Because of the need for extra lookouts, the midnight watchstanders were working slightly short-handed. I hoped that by manning the helm for two hours during this period, I was doing some useful small thing to help out, to give back in return for the lifelong memories this voyage was giving to me.

In the morning, that Monday, come full daylight I was permitted onto the bridge again for a short while. There was a heavy mist and no horizon was visible. I quickly became drenched, but the experience was quite *atmospheric*.

Back below, I was able to observe all hands in the control room and sonar compartment working intently together. To enter such busy shipping lanes in such poor visibility was perhaps one of the most dangerous but necessary evolutions a submarine can perform in peacetime. The bow sphere's active sonar probed continually for contacts. The surface-search radar rotated and rotated; its display screen glowed at a station beside the fire controlmen's consoles. When in range, MIAMI also maintained unbroken radio contact with the Halifax harbor-traffic approach coordination center. All these on-board and remote sensors and communication links were tightly integrated to produce an accurate plot of MIAMI's position: relative to land or other potential hazards to navigation, and relative to all other vessels in the area and their projected tracks.

Arrival

Visibility improved sometime after sunrise. As we entered the roads to the harbor, even though running on the surface, both periscopes were put into heavy use. Bearings were taken off different landmarks constantly, to plot the ship's position in the channel using visual data. The steady, purposeful ballet of the men at the periscope eyepieces, and the practiced speed and precision of other men marking the chart on the plotting table, bespoke an intensity of teamwork rarely seen in civilian life.

In late morning, in driving rain, USS MIAMI docked safely in Halifax.

Conclusion

I returned to New York by commercial airline from Halifax. I quickly noticed a pattern to the questions about my voyage that friends and relations would ask:

1. Was I nervous? As already addressed above, I explained to them that I never felt safer during my entire adult life. The taxi ride home from LaGuardia Airport was probably vastly more dangerous.

2. *Why do we still need submarines?* I would explain the many essential missions performed by SSNs even in *peacetime*, such as stealthy forward presence and deterrence, intelligence gathering, Special Warfare operations, accompanying carrier battle groups, and indications, surveillance, and warnings. I would tell people how our SSN fleet had been virtually cut in half at the end of the Cold War, and new construction rates were inadequate for anticipated needs. After 9/11/01, things changed. People no longer asked me why we still needed submarines. Instead they asked what America was doing to make sure we always had enough.■

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DIESEL BOATERS AND NUCLEAR SUBMARINERS ONE BROTHERHOOD

by CAPT. David Marquet, USN

Captain Marquet is currently serving as a Military Fellow to the Council on Foreign Relations in New York. He Commanded USS SANTA FE from 1999-2001.

With the cryptic message "Underway on Nuclear Power," the Captain of USS NAUTILUS, Commander Eugene P. Wilkinson, USN heralded a new age in submarine warfare.[1] Freed of the need to periodically come to the surface or periscope depth to run diesel engines and recharge their batteries, submarines could now remain submerged indefinitely, creating a true submarine, rather than a part-time submersible.

The period of the next two decades were ones of dramatic technological achievements for the Submarine Force—starting with the nuclear power plant, and later extending to submarine launched ballistic missiles, advanced torpedoes and acoustic quieting. Together, these revolutionized submarine warfare and created a discontinuity in the history of the force.

At the time, this technological transition was combined with a cultural transition. Admiral Rickover hand-picked men to attend his nuclear power training programs, and inculcated them with a belief in disciplined and deliberate operations based upon intimate technical knowledge. There were shifts in training and in responses to monitoring and reporting problems (today we'd call it transparency). Combined, these changes resulted in tension as the cultural transition was made to a nuclear-powered Submarine Force.

Despite the technological rift and initial cultural divide, submarine operations today strongly resemble the operations of our World War II predecessors. World War II submarine commanders like Dick O'Kane and Gene Fluckey would quickly feel at home on board and in the control room of a modern fast attack submarine. More significantly, the spirit that drove them to victory is infused in today's Submarine Force. This connection with our predecessors is an important link for our heritage that has not been decoupled by the shift to nuclear power.

Return to Shallow Water

Following the dissolution of the Soviet Union in 1991 and the first Gulf War, Operation Desert Storm, our nuclear-powered submarines shifted operational emphasis from the deep water contest with the Soviet Navy to operating in the littorals. This coincided with a new naval strategy, "...From the Sea," published in September 1992.

While it is true that this was a new role for the *nuclear-powered* Submarine Force, viewed in the longer lens of history, it was a return to our diesel boat roots. In a broader sense, the deep water missions of the Cold War were a departure from a norm that we have now returned to.

On board nuclear-powered submarines operating in the Western Pacific, one will find charts of World War II war patrols and Plan of the Day notes commenting on how the ship will be operating near a certain submarine's war patrol area.

The modern nuclear-powered submarine is significantly heavier than the World War II submarine. However, the current 688-class submarine at 360 feet long is only 15 percent longer than the 312-foot long World War II fleet boat. Place the silhouettes side by side, and the difference looks trivial. Just as our predecessors learned to handle a 300-plus foot long submarine in shallow water, we are doing the same.

Photographic Reconnaissance

As I would practice photo-reconnaissance around the Hawaiian Islands, I would remind my photo team that this was born of a legacy starting with USS NAUTILUS (SS 168) in September 1943, during the Gilbert Island campaign.

NAUTILUS conducted the first full-scale submarine photo-reconnaissance mission in support of the amphibious landings at Tarawa and the Gilbert Islands. During this first photo-reconnaissance mission, the team aboard NAUTILUS found the two navy supplied cameras to be wanting and ended up successfully using a Primarflex single-lens reflex camera volunteered by one of the officers. Today's photo-reconnaissance teams would find this excerpt from her patrol report quite familiar:

> "The method used in photographing the beaches was to take a group of pictures at one time. One officer turned the periscope between each exposure. Another took the pictures. The average time to take a roll of twelve pictures was a little under two minutes. The time required could be shortened some by special equipment. The greatest cause of delay was spray on the lens, vibration, or rolling of the ship. Unfortunately No. 2 periscope, which was used because of its larger field, turned with great difficulty and was occasionally responsible for some delay between exposures."[2]

Throughout the remainder of the war in the Pacific, submarines were called upon to conduct photo-reconnaissance missions prior to the amphibious landings. In all, submarines completed 13 missions. (The last mission, tasked to USS SWORDFISH against Okinawa was not completed as SWORDFISH was lost.) These missions reconnoitered landing sites including Saipan, Palau, and Iwo Jima—saving the lives of Marines going ashore.

Land Attack

Today's Submarine Force is armed with long range and highly accurate ballistic and cruise missiles. In fact, the first weapon

launched in Operation Iraqi Freedom was a submarine launched Tomahawk cruise missile from USS CHEYENNE.[3] These Tomahawk missiles provide an important stealthy striking force and submarine carried missiles can comprise a third of a carrier strike group's Tomahawk missiles. Accurate and secure submarine-launched ballistic missiles have formed a vital leg of our strategic nuclear deterrence capability.

Launching missiles from submarines is a continuation of trends in weapon systems inaugurated by our World War II predecessors. Indeed, at 0150 on the 22nd of June, 1945, the word was first passed aboard an American submarine to "Man Battle Stations Rockets". This was Gene Fluckey's BARB. They launched rockets with a 5000 yard range and 9.6 pound warheads against industrial targets in Hokkaido and Karafuto (the southern half of Sakhalin island). The procedure for Fluckey was cumbersome. First, he needed to be on the surface. Then, after announcing battle stations, the rocket launcher was brought on deck and loaded. The only control on the rockets was the range. Hence, aiming needed to be done by pointing the bow of the ship in the direction of the target, accounting for its deflection. In all, would take about 30 minutes to get the salve off.[4]

Today's submariners had significant advantages—being able to launch submerged and on any course, the missiles having their own steering and guidance systems.

Torpedo Firings

During World War II, the U.S. Submarine Force sank 55% of Japanese merchant tonnage although they comprised only 2% of the U.S. Navy's personnel.[5] One of the key reasons the Submarine Force was so effective was the effectiveness of their torpedoes. It was not always so, however. The initial Mk 14 torpedoes were plagued by run depth and exploder problems. The new Mk 6 combination magnetic and contact exploder—introduced in the summer of 1941—was temperamental and unreliable. Sometimes the torpedoes would explode prematurely, sometimes they passed under the target without exploding, and sometimes they would even hit the target, but not explode.

It was not until the Rear Admiral Charles Lockwood, then COMSUBPAC, and Captain (later Vice Admiral) "Swede" Momsen, conducted their own testing in 1942—firing torpedoes into nets to accurately measure their run depth—was the Submarine Force able to convince the Bureau of Ordnance that there were serious problems with the torpedoes. Eventually, these problems were solved, with the more reliable Mk 18 torpedo introduced in September 1943.[8] The Submarine Force learned the hard way that realistic test firing was the only way to ensure our torpedoes would work.

We have not forgotten that lesson and today's Submarine Force shoots hundreds of exercise torpedoes in realistic scenarios against other submarines and surface targets each year. These exercise torpedoes are equipped with data-gathering capabilities that can be thoroughly analyzed. Additionally, we shoot unaltered warshot torpedoes against hulks, testing the torpedoes entire capability up to and including detonation. Some of these torpedoes are tested in locations most likely subjected to potential conflicts. We have fired our exercise torpedoes in each of the 5th, 6th, and 7th Fleet Areas of Responsibility (AORs).

Operating with Battle Groups

Following the demise of the Soviet Union, today's nuclear-powered Submarine Force has emphasized a shift toward operations with Carrier Battle Groups. Just as the 688-class submarine was designed with the speed to keep up with today's fast carriers, escorts, and resupply ships, the World War II diesel submarines were called *fleet boats* because they were originally designed to operate with the fleet. Although the majority of submarine operations in World War II were conducted independently, submarines did operate with battlegroups on several occasions.

One such occasion occurred during Commander Dick O'Kane's second patrol with TANG in March and April of 1944. He was assigned to Admiral Marc Mitscher's Task Force 58 in support of Operation Desecrate. This operation was designed to damage Japanese shipping in the Palau Islands as much as possible. The operational plan was for the carrier-based airplanes to strike ships

in the harbor, and those that fled would run into submarines stationed at the outlets of the main channels.

TANG was assigned a position 60 miles from the outlet of one such channel, Toagel Mlungui. This required a transit of 3500 miles from her previous operation for a position that O'Kane felt did not optimize the strengths of his ship. To make matters worse, O'Kane later discovered that the channel he was guarding was mined on the first days of the operation. Needless to say, TANG did not sink a single target during this time.[7]

At the end of any operation, in the enduring legacy of the post-deployment debrief, submarine skippers tell all to their operational commanders, including the good, bad and ugly. Following this operation, O'Kane reported to Rear Admiral Lockwood that ". . .if a senior submariner had been ordered to Admiral Mitscher's staff, and if operational control of the submarines had passed to the task force commander for the strike on PALAU, TANG and TRIGGER would not have been left guarding mined channels."[8]

We have learned these lessons and are now detailing senior leaders to the battle group staffs. Operational Control is being passed to the battle group commanders more and more. During my 1999 deployment in SANTA FE, operational control of my ship was assigned to three different carrier battle groups: CONSTELLATION; THEODORE ROOSEVELT; and KITTY HAWK.

The Spirit is Alive

More important than these operational parallels, today's Submarine Force continues traditions that keep the spirit of our World War II predecessors alive.

On modern submarines, one will find World War II Presidential Unit Commendations and Medal of Honor citations being read when dolphins are awarded to our newly qualified submariners. On my ship we altered the language when shooting torpedoes, replacing the suggested language with the "hot, straight, and normal" of our predecessors. Instead of "night steaming boxes," we had areas designated "Wahoo" and Tang." For my crew, these were more than mere words, but served as a tangible reminder every

time we fired a torpedo that we were continuing an important legacy from our predecessors.

Operating out of Pearl Harbor allows one to develop a special connection with our submarine forefathers. Departing from the Pearl Harbor *Sierra* piers, and passing the USS ARIZONA, now a memorial, gave me and my crew a sense of comradeship knowing that these were the same piers and sights our World War II predecessors saw as they turned their bows west, heading for uncertain times. Yet, thanks to the actions of those men, we now pass the battleship MISSOURI as well, upon whose decks the surrender of Japan was signed.

And we know that it is with the Sailors that the spirit is strongest. Men like O'Kane and Fluckey were able to operate independently thousands of miles from home port because of the ability of their crews to persevere, and the innovation they used to keep their ships operational. The same is true today, and we would not be able to operate for 6-, 7-, 8-, and recently almost 9-months from home port without the untiring efforts of the Sailors who make up our crews.

More than the equipment and the operations, the men of today's Submarine Force are acutely aware of the awesome legacy we have inherited. We are keeping the spirit alive—that heritage of:

Patriotism
Sacrifice

And relentless pursuit of the enemy until he is on the bottom.

ENDNOTES

[1] This message was sent at 1100 on January 17, 1955 as USS NAUTILUS got underway for the first time on nuclear propulsion from the Naval Submarine Base, New London, CT.

[2] USS NAUTILUS (SS 168) Patrol Report for patrol number 6, reprinted from the Full Fathom Five web site at
http://www.geocities.com/pentagon/1592/nautilus6.htm

[5] COMSUBPAC press release, http://www.csp.navy.mil/news/cheyennereturn.html
[6] Eugene B. Fluckey, Thunder Below, University of Illinois Press, Urbana and Chicago, 1992, p. 324.
[7] Theodore Roscoe, United States Submarine Operations in World War II, Naval Institute Press, Annapolis, MD, 1949, p. 493.
[8] Roscoe, p. 146.
[9] Richard H. O'Kane, Clear the Bridge!, Presidio Press, Novato, CA, 1977, p. 136.
[10] O'Kane, p. 199.

NARWHAL LIVES ON!

by Tom Schram

Tom Schram is the Executive Director of the National Submarine Science Discovery Center (NSSDC) in Newport, Kentucky. He served 7 years as an Intelligence Officer (1610) after graduating from the Naval Academy in 1969. He spent 15 years with Procter & Gamble before becoming an independent marketing consultant. He began work on this project in August of 2002.

President Bush signed the FY 2004 Defense Appropriations Act on September 30, 2003 and provided a non-profit organization an opportunity to not only save the ex-Narwhal (SSN 671) but also to develop a science center on the bank of the Ohio River. Section 8145 authorized SECNAV to transfer NARWHAL to NSSDC in Newport, KY. This transfer can only take place after removal of the Reactor Compartment (RC) and other classified or sensitive military equipment and upon receipt of a satisfactory donation application by the Navy from NSSDC.

Background. The Navy inactivated NARWHAL at Newport News in 1999 and towed her to Puget Sound Naval Shipyard for water borne storage to await hull recycling. In August of 2002, NSSDC began investigating the feasibility of developing a science discovery center with a decommissioned SSN as its centerpiece. The Navy has not previously donated an SSN to a non-Navy organization.

Concept: NSSDC pursued the feasibility of a concept with three elements: (1) the **BENEFITS** to the region and the community, which had to have significant educational value and be viable economically; (2) the potential **LOCATION**, which had to provide high visibility and synergy with nearby attractions; and (3) a

decommissioned **SUBMARINE** (SSN) to serve as the centerpiece for the project. The investigation focused on these elements in turn.

1a. Educational Benefits. NSSDC wanted to deliver improved science education for students in grades 5-12, with specific emphasis on having a proven program available within months. NavOps Deep Submergence™, a 9-month science and math curriculum for the 5th grade was selected as the first program to implement. The NavOps curriculum was developed with a Navy grant by Purdue University Calumet School of Education for students in the 5th grade. This was critical since students not having a positive science experience by the 5th grade have a low probability of taking an elective science or math course in later academic life. Since the U.S. has an annual shortfall in technical college graduates, this program made strategic sense.

The accompanying NavOps submarine control room simulator and software was developed by a submariner, CWO-4 Fred Huddleston USN(Ret.). The combination of curriculum, classroom experiments, and simulation exercises started in the Gary, IN school district in the fall of 1997 in one pilot school and expanded to all 22 district schools in 1998 and is still the district's science program.

NSSDC introduced NavOps to potential pilot schools in the Northern Kentucky, Southwestern Ohio region for consideration. The response was positive and NSSDC concluded there was sufficient potential with the NavOps program, and other programs for grades 6-12 already on the drawing boards to meet the educational benefit criteria.

1b. Economic impact and feasibility. An analysis of the region indicated this project could have a potential impact of over $20 M annually. Additionally, as the only science discovery center for 150 miles in any direction, it would be unique and represent a *draw* for multiple visitor segments. These included regional/local visitors, national tourists, military reunions, educational visitors (stimulated from the NavOps classes) and special events. The facility would be self-supporting from the first day and could continue so at 70% of the minimum anticipated visitation level. Net, it made sense economically.

2. Location. After the concept had been identified, studied, and proposed on a contingent basis to the region, with a very positive response, NSSDC began seeking a location to ensure a high probability of success. Newport, KY (directly across the Ohio River from Cincinnati) agreed to donate an ideal site. It is on the river directly adjacent to a local family entertainment center (Newport-on-the-Levee) that draws almost 4 M visitors annually and includes the Newport Aquarium. Additionally, the NSSDC site can be seen from almost every seat in the new Cincinnati Reds venue, the Great American Ballpark, as well as from all over downtown Cincinnati and adjoining communities.

3. Obtaining a decommissioned SSN. Once the NSSDC had a viable concept and a location, we pursued donation of a decommissioned SSN. After discussions with NAVSEA representatives, NSSDC concluded the best process to follow was a legislative one. This would assign a specific SSN to NSSDC. In NSSDC's case, the program and location were strong but the precedent in asking for an SSN was unusual. Therefore, potential contributors would participate only if an SSN was available and that assurance could only come from legislation.

Legislation. Senator Jim Bunning of KY submitted an amendment to the Defense Appropriations Act Joint Conference Committee authorizing SECNAV to designate NARWHAL for NSSDC. The Navy had no objection to the proposed legislation and it was signed into law on September 30, 2003. Transfer of NARWHAL is at no cost to the Navy other than what would normally be incurred in a typical SSN recycling.

PLANNING EFFORTS

Design elements for modification. The RC and all equipment aft of it, which is sensitive military equipment, must be completely removed. As shown in the illustration, NARWHAL will be displayed completely out of the water, sitting on keel blocks or a keel cradle on the deck of a double hulled and ballastable barge, similar in look to a floating drydock but with water tight ends.

About 40% of the NARWHAL's hull will be visible above the barge sides when viewing it from a distance. A barge is needed to structurally support the modified hull and to enable towing to and transit on the Mississippi and Ohio Rivers, where a vessel can draw only 10 feet.

Hull modifications. The illustration shows NARWHAL's current and planned configuration. NSSDC will insert a sleeve identical in dimension to the RC. The space aft of the RC will be open and will be used for displays, interactive exhibits, or historical presentations. Access to NARWHAL from the barge deck will be via a ramp leading to a double door entranceway onto a quarterdeck. Forward would be the restored operations and bow sections. Aft would be the open area created from RC removal, etc. Nearby would be a building for other elements of the Discovery Center.

Cost. It is estimated that the total project cost will be about $50 M - $55 M with over half coming from *in kind* contributions such as the sub, its modifications, and donated berth location. NSSDC's costs are estimated at about $25 M and will be finalized as a result of engineering studies, economic analysis, master planning, and scope of the berth preparation. Initially, the engineering and planning effort to develop an acceptable ship donation application will cost about $2.2 M.

Next steps. Effort is underway now on several fronts to develop an engineering design package while, at the same time, preparing a master plan for the facility. An opening date in 2007 is contemplated. To learn more about this project, please visit http:///www.NSSDC.us and send an email via the web site for more information.■

SAGA OF A SCULPIN SURVIVOR

This is the saga of George Rocek, MoMM1c, USN, one of the survivors of the sinking of USS SCULPIN (SS-191). It was published in Polaris magazine in December 1979. This classic tale is reprinted here with permission of the current Editor of Polaris.

On the night of 18 November 1943, SCULPIN made a radar contact on a fast convoy and made an *end around* at full power. Submerging on the enemy track for a dawn attack, SCULPIN began what promised to be a successful approach. However, she was detected in the attack phase and the convoy zigged toward, forcing her deep. There was no depth charge attack at this time. About an hour later, the submarine surfaced to begin another end around, but immediately dove again, having surfaced 6,000 yards from a destroyer, which was lagging the convoy. Depth charging started as soon as SCULPIN dove again.

The Japanese destroyer, YOKOHAMA, dropped eighteen 600-pound charges on her first run directly over SCULPIN. Initial damage included a crack in one of the after-engine room's exhaust valves, damage to the shallow and deep depth gauges and pressure gauges around the diving station, broken lights and valves backed off their seats although they had been set with wrenches. Rocek recalls water gushing in on the forward starboard side at the engine coolers. He pulled himself up to that point and saw the seawater spraying out between the pipe flanges from hull to coolers.

"It jarred holy hell out of us!"

The second string of explosives knocked the lighting system out and worsened existing leaks; oxygen was in short supply, the temperatures inside the submarine rose catastrophically. All this time the air is getting worse, the heat is terrific and still he doesn't let up on us. Once we could hear his screws going right over us.

It was like a message from heaven when "sound" reported a rainsquall off to starboard. SCULPIN headed for the protection

provided by the high noise level of the rainstorm. After running in the squall for about 25 minutes, it appeared as if SCULPIN had shaken the destroyer.

At this time the captain decided to risk noise by pumping water from the after engine room to the forward torpedo room, in order to give the boat a better trim and to reduce the speed required to maintain depth. This would help conserve the batteries. However, neither the drain nor the trim pump would take suction. Captain Connaway then relieved Lieutenant Brown, the Engineering Officer, from the diving station, so that he could report the damage throughout the boat.

"Upon inspection," Brown reported, "I found the after engine room had flooded to such an extent I believed it unwise to attempt to place a bubble in No. 4 Main Ballast Tank, which would have aided the trim considerably. The flow of water forward might short the main motor leads. We decided to bail the water forward to another compartment until we could trim the ship without endangering the main motors."

"While a bucket brigade was being run by exhausted men in temperatures well over one hundred degrees, the temporary diving officer broached the ship. However, no one could be blamed for this as the depth gauge was stuck at 170 feet and the pressure gauges around the diving station were all flooded out."

"When SCULPIN stuck her nose up, the destroyer saw it and came over again, dropping another string of depth charges which tore the radio transmitter from the bulkhead and smashed the receiver, popped light bulbs and severely damaged outboard vents in both torpedo rooms." SCULPIN momentarily lost depth control and was down over 500 feet before regaining control. The steering mechanism had been damaged to such an extent that it was next to impossible for exhausted, heat-stricken men to operate the wheel by hand.

"At this time our evasion tactics were about at a standstill. The heat was terrific. However, in spite of the seriousness of the situation, it was decided to hold out for at least one more string which was received at about 12:30PM. At this time the forward and aft torpedo rooms reported cracks around the torpedo tubes. The sound heads were driven up into the boat, shearing the holding down clamps. Thus we were now without *ears*. It required about

170 turns to maintain depth. The battery was about exhausted and it was six hours until sundown, so Captain Connaway decided to surface and fight it out with the destroyer." "Connaway had been so calm, resourceful persevering during these five hours of severe depth charges that it was hard for the crew to realize that the situation was as serious as it was. Connaway explained to Captain J. Cromwell (Wolfpack Commander, who was on board SCULPIN) that he did not think SCULPIN could take another string of depth charges and he owed his crew the chance to fight it out on the surface. If all, finally, was lost, they could abandon ship with an even chance of survival."

"Make sure SCULPIN is scuttled in case we lose this one-sided engagement." Connaway calmly instructed Brown, as he started up the conning tower.

"The next thing we know," recalled Baker, the fireman, "the word is passed through the intercom phones, 'Standby to Battle Surface!' Up to the surface we go, the hatch is open and we dash out on deck quickly to man the deck guns and have it out with him once and for all."

"The day was a pretty one, with white caps coming over the decks. At first when we went out on deck we couldn't see the destroyer. Then one of the men spotted it on the starboard side... right against the sun. He was about 3,000 yards off. Immediately we went to our stations on the gun and began to fire at him. We got off the first shot, which went over him. The second fell short. In the meantime, he had begun to fire at us with machine guns and his 5-inch-70. All we had was a 3-inch-50. One of his shots hit us in the main induction, another went directly through the coming tower and came out the portside, killing a number of men inside, and also some men who were out on deck, hiding from the gunfire. Men were being killed from the machine gun fire as they were coming out of the hatches. We had a fine crew... the guys really showed the guts they had. A.B. Guillot, Fireman first class, from Louisiana, was on the 50-caliber gun. The Japs made a direct hit on his gun and wounded him severely. I still remember how he looked with blood streaming from great rips in his chest, passing ammunition to the 3-inch gun until he fell over the side. J. Q. Harper, Torpedo-man third class, stuck at his 20mm gun until the very end."

The odds were uneven. SCULPIN lost her captain in the surface

battle. The Executive Officer, Lieutenant J. Nallen, was killed at his station in the conning tower. Lieutenant Joe Defress was killed commanding the fire of his 3-inch gun. Brown, who had been at his station in the control room, succeeded to command of the dying SCULPIN.

Though badly shaken by the continual bombardment, he rallied to his new duties since it was apparent that the destroyer now had their range. It was feared that a shell on the next salvo might damage the hydraulic system, rendering it impossible to operate the main vents, which Brown planned to use in the scuttling operation. Thus he decided it was unwise to postpone the scuttling of the SCULPIN.

With reluctance, Brown approached Cromwell, still a study in poise, to advise him of his decision to scuttle.

"I informed Commodore Cromwell, who was in the control room, of my intentions. He told me to go ahead and he said he could not go with us because he was afraid that the information he possessed might be injurious to his shipmates at sea if the Japanese made him reveal it by torture. I then rang up, 'Emergency speed' and passed the word, 'Abandon Ship', and sent Chief Hemphill forward and Chief Haverland aft to pass the word in case the P. A. system was out. When they returned to the control room we waited one minute by the clock, then ordered the vents opened, knowing that it would spell the doom of the submarine in minutes and thereby rob the, Japanese of a valuable war trophy.

The wounded SCULPIN went down like a great boulder plunging into the sea, "in a whirlpool of white foam", carrying with it Captain Cromwell and others to the sands and coral of the South Pacific.

Chief Machinist's Mate H. E. Hemphill later reported that while he was forward passing the word to abandon ship, he encountered Ensign Max Fielder in the wardroom playing cards and talking with one of the crewmen, E. Apostol. "We do not choose to go with you," Fielder replied to Hemphill's entreaties that he hurry. "We prefer death to capture by the Japanese."

There was not time to argue with them. In spite of the order to abandon ship, many others apparently could not believe that the SCULPIN was lost; that she could not do other than surface and return victoriously home. Instead, a number of the faithful

submariners, almost like automatons, were last seen at their normal duty stations.

In nine hours of blasting by YOKOHAMA, SCULPIN had been rocked by an estimated 52 heavy depth charges. But for the survivors, their hell had just begun.

As Rocek reports, "On reaching topside, I saw one man bloody and dead. I started running for the sail and looked to see where the *can* was, which was on my side . I started through the *doghouse* to the portside when a direct hit was made. I was momentarily stunned and numb all over. After seeing I was intact, I jumped over the side, once in the water, I watched SCULPIN submerge in a normal manner. Pete Gabrunas was manning the hydraulic manifold and on scuttling the boat, he and others were unable to escape due to the wreckage in the conn. I could feel explosions, apparently from the batteries."

The wet, oil-begrimed survivors were hauled aboard YOKOHAMA. One was tossed back into the sea after his captors decided he was too badly wounded to live. Another, bleeding, fought free from similar attempts.

Rocek noticed he had numerous amounts of watch-spring shaped metal imbedded in his skin and minor shrapnel wounds in both legs, apparently from the direct hit in the conn.

"That night," reported Baker, as the destroyer carried the three surviving officers and 38 men of SCULPIN toward the island of Truk, we were all left on deck. Our hands and feet tied, with only a piece of tarpaulin stretched over all 41 of us for protection in a hard rainstorm, against a raging sea many of the men were in terrible agony, because of their wounds and were losing blood."

They had their hands tied and were blindfolded when they were taken off the ship onto Truk and "this is where some of us received our first slugging because we were curious and tried to see from beneath our blindfolds." The 41 survivors were placed in three eight by seven-foot cells, which included a small outhouse in one corner. They were kept there for 12 days— "a living hell for everyone concerned...at first they wouldn't feed us or give us any water to drink we were questioned about our sub and other military information. Many of us took some hard beatings."

H. J. Thomas, a Torpedoman First Class, resorted to the ruses of warding off beatings by giving the Japanese erroneous informa-

tion. He said, for example that American submarines were refueling at a secret island between the Gilberts and Truk. Their inquisitors produced charts, some of them dating back to the last century, but could find no such island. His buddies solemnly repeated the fable. "The men," said Thomas, "were subjected to constant questioning, during which they were stimulated by frequent beating with clubs and fists. It appeared that the officers received the worse treatment, with the radar men being next in line."
Now we continue with Rocek's story.

Truk

We arrived in Truk and were taken to their outdoor prisoner's compound, an area of about thirty square feet with 3 cells on one side. Each cell had a hole in the floor for a toilet.

Our food rations consisted of one rice ball a day and a few ounces of water. Water was a scarcity on Truk; they relied on rainwater for their supply. We had three wounded men in our cell, so we all took turns standing to allow more room for them. Lieutenant George E. Brown, Jr., tried repeatedly to get medical attention for the wounded men, to no avail. After the fifth or sixth day, their wounds were beginning to smell and finally they were taken to the hospital.

We were let out of our cells twice a day for about 10 minutes, an event to which we gratefully looked forward. Repeatedly, we were taken out of the compound for questioning, always blindfolded. If you hesitated in answering a question, you received a whack across the rear with a piece of wood larger than a bat. I learned to bide for time by saying I didn't understand the question. The Japs had their own interpreter and he couldn't speak English too well so I was able to get away with it sometimes.

About the tenth day, they shaved all our hair off and issued us Japanese Navy undress blues to wear and a square, flat, wooden block with Japanese writing on it to wear around our necks. Then the three wounded men returned from the hospital. One man had his hand amputated and the other, his arm. They told us the amputations were done without any anesthetic and they were questioned at the same time.

We were then taken to the shoreline in trucks, blindfolded. Here

we were divided into two groups, there were 21 prisoners in my group and 20 in the other, and put aboard two Japanese aircraft carriers. Our group went aboard CHUYO, where we were taken below decks to a small, locked compartment. This group of prisoners included the wounded men.

Death of a Carrier

On board the carrier, CHUYO conditions were bad. Food was available, but very little water, we only received a few ounces a day, per man. The compartment was crowded and the ventilation was practically non-existent.

But this torture was to end in the death of the Jap carrier. At midnight on 31 December 1943, the ship was rocked with a terrific explosion as it was hit with a torpedo from USS SAILFISH (formerly SQUALUS), whose crew had no way of divining that their own countrymen were on board. Submariners themselves, the prisoners cheered the blast even though they knew if the carrier went down they would probably never survive.

A few of us were sitting on deck, and when the torpedo hit, we flew straight up about 2 or 3 feet in the air. We could sense she lost power and smoke filtered into our compartment. We heard various alarms sound off and damage control men running and yelling.

On deck below we could hear the frantic Jap crew attempting to shore up the bulkheads with timber, but a heavy sea was running and nullifying the efforts of the damage control party. Soon we heard the bulkhead collapse and water pouring into the compartment below us.

As the water rose to our compartment, we yelled and pounded on the locked hatch. We undogged the hatch but it was locked on the outside and we couldn't break it open. We then removed the metal pump handle from the head (about 3 feet long) and used it as a pry bar, then we all pushed and pulled and on the second try, the hatch broke open. I don't think you could do this on an American ship.

We held hands and let one man try to find the way to topside. It was dark and the air was full of smoke. Through smoking compartments we tried to reach the main deck. Frenzied Jap damage

control men ignored us and we finally reached topside, which by now was covered with smoke. A small compartment yielded life jackets, which were quickly donned. Further along we found the galley, which was hastily looted of food and particularly bottled soft drinks. This is where we finally filled up on liquids to quench our parched throats.

Beyond the galley we found a ladder leading to the flight deck and here, frantic Japs were passing timber for life rafts by means of a human chain. On the flight deck they were lashing the poles together to make rafts. I saw only one 12-foot boat in the water with three high ranking officers in it. A Jap officer pulled us out of the line and escorted us to the flight deck where we were stripped of our life jackets and they started to tie us. In the confusion, however, only eight men were tied and the others quickly freed them. There were many life jackets in the compartment below, why they didn't use them, I'll never know. Only about a third of the Japs had life jackets on.

An internal explosion rocked the ship and the Japs began passing out stores of beer, candy, canned goods and rice with even the prisoners coming in for a share.

Despite the explosions, the carrier remained afloat. But high winds, mist and huge swells made good submarine weather and the prisoners waited for the submarine to close in for the kill. SAILFISH made its second strike despite the protective Jap destroyer. A violent explosion shattered the carrier, a column of smoke billowed up on the port side and within minutes the ship started down with a heavy port list.

Japanese crewmen and American prisoners together crowded to the starboard side, including Jap officers with their long swords stuck between their life jackets and overcoats. In the melee, the prisoners were separated.

Dinty Moore, (Chief Signalman) and myself were holding on to a collapsible searchlight on the flight deck, about thirty feet off the starboard side. As the carrier was going down, about a hundred feet from the water, I yelled to Dinty, "Let's go" and I slide down the flight deck into the sea. The suction was so great that I could not break surface after going under. I then believe an air pocket pushed me closer to the surface, for I could see light and I made one more attempt and broke surface near a raft. I swam over to it and hung on

for dear life. I never did see Dinty Moore again. Already on the raft were an officer and a messboy from the SCULPIN.

Fearful of stopping because of the lurking submarine, the Japanese destroyer circled the rafts for about five hours before they finally made a run to pick up the survivors. She came by with one Jacob's ladder and a number of lines trailing over the side.

When you grabbed the lines and the ship rolled, you slid right back into the sea. Your best chance was one Jacob's ladder. One time I grabbed the ladder while the other two men grabbed the lines. A Jap officer stepped and crawled over me, forcing me under. I was very weak by now, but luckily a huge swell pushed me onto the Jacob's ladder again. I threw my arm through the ladder and latched onto my wrist with the other hand. They pulled the ladder and me both topside. The other SCULPIN men were not able to pull themselves up and the Japs jabbed at them with poles trying to knock them off the lines.

That was the last time I ever saw any of my shipmates from the carrier CHUVO.

Aboard the Jap Destroyer

Apparently, being dressed in their undress blues, the Japs must have thought at first, I was one of their sailors. They hauled me and the ladder up and left me lying on deck. I was just too weak to move. Then four sailors picked me up and carried me to the fantail. I was sure they were going to throw me overboard, but then they must have been ordered to return me amidships, and I was put in their laundry compartment. They did not tie me up or even close the hatch. Later that afternoon, I felt the turbines wind up and the ship picked up speed.

I was left alone in the compartment and as night came on, I began to get very cold and started shaking badly. There was a metal tub or tank that was filled with water in the compartment, the water felt warm, so I climbed in the tub and sat down, with only my head above water. I stayed there for the rest of the night.

The next day I received numerous visits by a Jap chief who did a lot of talking and then slugged the hell out of me and then left. Every hour or two later he would return and do the same thing over

again. He also mentioned Tokyo, Doolittle, and gave me the cutthroat sign.

One young Japanese sailor came and he managed to motion that he worked in the engine room. I managed to convey to him that I did the same kind of work. About a half an hour later he came back and gave me a hard cracker and motioned me not to say anything. It took me a long time to eat the cracker because I couldn't work up any saliva.

The next morning we arrived in Yokohama. I was never given any food or water on that ship except the one cracker.

As we entered the port, I saw many of their merchant and naval ships that were heavily damaged. After tying up, along comes that same chief again with three men and about 50 feet of rope. They tied and blindfolded me so I couldn't even move. A few hours later another chief, larger than the average Jap, came in and untied me and loosened my blindfold so I could see downward. He then tied my wrists together and led me with the loose end to the gangway where I had to put on a pair of *go-aheads*. I was put in a small craft and rode for about 15 minutes. I now began to realize I was the only SCULPIN crewmember from the carrier CHUYO to survive. After reaching shore, I was led through a part of the city. I could see the women's shoes and bottoms of their kimonos. I felt a little funny at first, because the seat of my uniform was torn out from sliding down the carrier flight deck. We arrived at a railroad station and sat down on a bench. I heard the chief talking to a woman and after a few moments, he removed my blindfold—apparently she wanted to see my face. She was a doll and dressed stateside with a short skirt and high heel shoes. He replaced my blindfold and a short time later we boarded a train. The train was very crowded so we had to stand for about an hour or two. After getting off the train, he insisted I run. I could see the road, which was narrow and stony. I pointed to his shoes, the rocks and my *go-aheads*, which kept falling off. He understood, but then motioned he wanted to get me there (Camp Ofuna) in time for eating, which we did.

On arriving at Ofuna, I was turned over to a stateside-dressed Jap, who spoke perfect English. Most of their Jap intelligence interrogators spoke good English and were educated in the States. He asked where the rest of the men were and when I told him about the carrier being sunk he became very irritated."

They had moved most of the GRENADIER crew out to make room for us. The Jap Commander of Ofuna could not speak English and refused to believe a Jap carrier got sunk, but could never understand what happened to the other men.

It was at this camp that I was reunited with the remainder of the SCULPIN crew, who had sailed on the other carrier. We believed we would become registered prisoners of war, but were sadly mistaken...it was a secret questioning and intimidation camp run by the Japanese Navy for nothing else but to pump or beat military information out of the prisoners. It was mainly comprised of aviation and submarine POW's only, except for a few civilians.

One man was designated to a cell and no talking allowed. Every week or two, you were questioned by a different interrogator. They then would compare notes to see if you lied on certain questions. We all had made up fake stories on Truk and memorized them. I believe most of us said it was our first patrol. My story was that I spent a year each at New London, San Diego and Pearl, and the sinking was my first patrol.

If you were sitting outside on the bench and had your eyes closed, periodically the guard would silently stand in front of you and put his bayonet close to your eyes. Since no talking was allowed, we had leg pressure warnings, to let you be aware of the s.o.b. This was not a work camp. Every Saturday was bath day and shave. We were shaved by their barber, or butcher.

Most of the wounds I received in my lower legs were not healing. The Japs had no medication to speak of, you had to wash your own bandages. The medication I received looked and smelled like fish oil. I remembered my father's advice—to urinate on wounds. So I had Ricketts, MM1c, urinate on my legs. After a period of time, all wounds healed except one, which was near my left leg shinbone.

The SCULPIN's only surviving officer, Brown, was kept in solitary confinement when not being interrogated, put on reduced rations, given frequent beatings, and threatened with death if he refused to answer questions. He divulged only information, which was contained in Jane's Fighting Ships, to which he was allowed free access. He was able to convince his tormentors that, being the engineering officer, he knew nothing concerning matters of policy, fleet organization, plans or logistics.

The Copper Mines of Ashio

In January 1944, a small group of about twenty men from SCULPIN, GRENADIER and S-44 were transferred to Oman. It was the Japanese Army POW Headquarters in Tokyo. We spent a few days there and then transferred to Ashio, a copper mining camp, north of Tokyo. In the copper mines, with the back-breaking hours and noxious sulfur fumes, the Americans nonetheless bore up better than the other prisoners who were constantly collapsing. The death rate among the latter was appalling. The Navy men resorted to every ruse in the book, and invented a few besides. They hid out behind the steam boilers and took full advantage of air raid alarms to dive into storehouses, out of which they would steal all sorts of plunder, from rice to clothing.

The mine was located in a huge mountain, the POW camp on a smaller mountain, separated by a stream. A bridge about five feet wide connected both sides and the only means of bringing in supplies was on a two-wheeled cart.

The camp comprised of two oblong barracks, two tiers on each side with lice infested straw for bedding. At the rear end of the barracks was the head, outdoors type. During the winter months, the fresh water lines would freeze up, therefore, no baths for months.

The majority of the prisoners (about 125) in Ashio, were Dutch and Javanese, captured in Java. There was a Dutch doctor, a British Army corpsman and a U.S. Army medic. Due to the extreme cold, many of the Javanese died. They were taken into town for cremation. I recall crewmembers of TANG, GRENADIER, S-44 and PERCH being at Ashio. One of our camp cooks was Tony Duva from S-44. Medical aid was no better in Ashio than Ofuna. My wound in the left shinbone area began to get worse and smell. The Army medic (captured in the Philippines) had secreted a few sulfa tablets and used them only in emergencies. He ground one up and sprinkled it on my wound every day, and eventually it healed. A year later I had a small piece of metal work out of my left knee. All enlisted men had to work unless you were ill or on light duty. Those that were not working received only two meals a day, except hospital patients.

The food was the same every day, which was a mixture of 40 percent each of barley and maize or Indian corn and 20 percent rice. No salt, sugar, vegetables, oil or meat. Once a month they would butcher old horses for the civilians' meat supply and some of the bones were given to us. These were boiled for a week to make them soft and then rationed out to the men.

We broke them up and ate what we could. One man had a large piece stuck in his rectum and the corpsman had to use a fork to dislodge it. Most of us had a difficult time in adjusting to the food, having the runs quite often.

The last winter in Ashio, most of the camp was unable to work due to beri beri. The Japanese doctor in charge of all POW camps came to Ashio to examine us. The examination took place outside the barracks in January. About twelve men at a time had to line up before him. We were naked and told to do six knee bends. From this he designated about 30 men that were to work. The rest were put on light duty. A few weeks later we received some Chinese cabbage, oranges and boxes of baby sharks that were so strong with ammonia odor, you held your nose to be able to eat the soup.

The Japs had their own medic and he designated if you were well enough to work or not. They had a punk-like fuzz which they rolled into a ball about a quarter of an inch in diameter and put this on your skin and lighted it. When it burned into the skin it hurt more and did more harm because of infection. I believe this was their form of acupuncture. Regardless of what you complained of, it seemed these punk balls were placed the farthest from your ailment. For diarrhea we were given charcoal to eat.

We understood the mine was worked out and closed before the war, but reopened due to a copper shortage. The work was hard, dirty, and dangerous. Inside the entrance of the mine, there was a shrine, which we had to bow to on entering and leaving the mine. Considering the earthquake tremors you felt on the inside, we said our own prayers.

You were issued a small hand hoe, scoop and a large sledge-hammer. You had to break up the large rocks small enough to lift. You were always leery of the overhead, which occasionally would shed rocks.

One day, about five of us were sitting down taking a break and felt sand drifting down from above. We scattered quickly, but one

man had his leg broken by a huge rock that fell from the overhead. We had carbide lamps for light, which we were permitted to take back to camp. On occasion, we were in a position to steal a little grain and used these lamps to cook it.

We learned to be able sometimes to arrange some flat rocks in the copper cars to make it appear full. After months of getting away with this, they caught on, and they would tap the side of the car, if it sounded hollow, they dumped the car over and made us refill it.

After a year of filling cars, some of us were *drillers.* We used an air drill with drill bits of various lengths, about 3 to 5 feet long. After drilling the holes, packed them with dynamite sticks, but we were never allowed to ignite them. Occasionally when we spotted an air drill used by the Japs, and no one was in sight, we would pour the carbide dust into the air supply. The drill would work for a short time and then was put out of commission.

Some of the Koreans who worked in the mine treated us well, sometimes giving us part of their food.

Occasionally a newspaper would be stolen by the prisoners working the night shift. We had an Australian in camp that could read and speak Japanese, and he would write down the condensed war information, which was passed throughout the camp.

Two of us had the personal satisfaction of ripping off a Red Cross food package from the Jap C.O.'s room. Being on light duty for a few days, I noticed the package while washing windows in the Jap headquarters. On returning back to work in the mine, I acquired twine and a spike. In one of our outhouse stalls, I drove the spike under the deck opening to one side. We took the package late one night, ate our fill, wrapped same with twine and hung it on the spike. Every night we ate our fill. About four days later, all barracks had to be vacated and the guards ransacked the whole camp. If any submarine POWs remember that day, it was the package they were searching for.

I learned later, the theft was blamed on a group of young secret police trainees that were in camp for a few weeks and left prior to the discovery of the missing package.

Our first indication of the war ending was observed when the day shift was brought back to camp and no one left camp thereafter. A few days later, we fell in for quarters and the Japs began to abide by the Geneva Convention rules concerning POWs. They

painted the rooftops with large POW letters and doled out their supplies of clothing, shoes, etc. that we so desperately wanted and needed. The supplies and some food packages were donated by the Canadian Red Cross.

About a week later, some of our carrier planes buzzed the camp in the process of locating all POW camps, as we learned later. A few days after that, one of our four-engine bombers made a food parachute drop about one hundred yards in front of the camp. We really feasted then—day and night.

We then made up a list of the Korean and Japanese mineworkers who had treated us decently. They were brought to camp and we gave them all the supplies of clothing, food, etc. that would be left behind. They all left with tears in their eyes.

A week later, we were escorted to town and boarded a train for Tokyo. The secret police or Kampia, were posted throughout the town and we saw no civilians outside. On arriving at the station, the first person to greet us was a U.S. Army Nurse with cigarettes and candy bars. What a beautiful sight! We were put in a large waiting room and waited for trucks and busses to take us to the wharf where they had a decontamination station set up and hospital ships alongside. We were told if we ate too much we could get ill, but I can't recall anyone doing so.

Some POWs were flown back to the states. I was sent to USS OZARK. They had more than enough volunteers for messcooks. You could go through the mess line as often as you wanted until the food ran out. I went through three times, but I know some men went through 5 or 6 times. It was like putting food in an acid vat. We were still hungry during the night and the commanding officer gave orders to break out the C-rations.

We stopped in Guam for a few weeks for thorough physicals before heading for the states. Enroute to the states, a few men would lose their senses and had to be taken to sick bay. During the first year, I believe we all had to fight down the sensation of going over the deep end.

We arrived in Frisco and all submarine men were the first to depart. The Submarine Force had individual cars, with an officer assigned, for each man, and they took us to a hotel for a large welcome dinner. We were all impressed and proud to be submariners, and knew that we were not forgotten.

We were then supposed to proceed to the Oakland Naval Hospital, however, that took quite a while, as many unscheduled stops were made along the way.

A month later, some of us were transferred to the Great Lakes Naval Hospital, to be nearer home. Eventually, I was sent back to duty.

Burned, beaten, starved, brutally overworked, forced to exist with vermin as bed fellows, humiliation their unfailing daily fare, the survivors of SCULPIN proved to be tough and ready. Twenty-one had entered the prisoner-of- war camps. Twenty-one started home after VJ Day.

Last Minute Recalls

One feeling I experienced when the Jap carrier sunk was one I'll never forget.

When I was underwater trying to break the suction and reach surface, I could no longer hold my breath and began taking in water. At this point, my whole life flashed before me, even the details that I normally never recalled before. It was an eerie and serene sensation.

I looked upward, saw light and no suction. I believe an air pocket must have pushed me closer to the surface. I made one last effort and broke surface, saw the raft about 20 feet away and made it. The carrier was completely out of sight.

Also, before and during the war, some of us spent a lot of time in the pool at Pearl playing water polo, so were in good physical condition.

In Manila we used to spend our 48s or 72s at a Villa north of town which had 3 sulfur waterpools. It was a Spanish type hacienda in the mountain area. It was owned by a German who was married to a Filipino girl and had several children who helped run the place. It was super. On arrival you put your money and valuables in a huge walk in safe behind the bar. From that point on you signed slips for food and drink. When down to your last 2 pesos, you were notified, which was cab fare back to Manila. I'm sure many sub sailors remember this place. The name Casa Del Rio, or similar, comes to mind.

At Ashio there was an American Army man, Jackolone, from St. Louis, and he told me about a beer there called Griesedieck, which

I did not believe.

While waiting to enter the Decontamination station, a U.S. sailor asked me if I cared for a beer. I replied that I swore off of booze, but anything stateside was OK now. He brought me 3 bottles of that Griesedieck. I removed one label and on locating Jackolone showed him the same. His reply was, "See, I told you so."

During the entire capture period the primary thought was only of food. I used to write down some of the weirdest recipes, sounded good then, such as a Milky Way Pie, Hershey Bar Sweet Potatoes, etc.■

U-BOATS IN OUR BACKYARD

by Harry Cooper

The brilliant tropic moon shines peacefully over the warm waters by Bimini in the Bahamas, a Crown Colony of Great Britain in the year 1942. This Paradise of a thousand islands is a mere 45 miles to the east of Miami. A few men of the off-duty watch lounge at the rail of the tanker as she plods on through the Atlantic. She is loaded with high octane gasoline from the refineries at Aruba in the Dutch East Indies, destined for England and the fighter planes of the Royal Air Force. The winking lights of Bimini are faintly seen to the east while the glow of Miami lights the horizon to the west. The war in Europe is so far away.

Other eyes are watching this tranquil scene—through the periscope of a prowling German U-Boat! The periscope slides smoothly back down in its well, eager hands press the firing switch twice and two torpedoes slice through the inky water. The tanker erupts in a sheet of flame! Her cargo will never send British pilots into the skies against the Luftwaffe.

The periscope again breaks the surface, the skipper smiles as the flaming remains of the tanker slip from sight beneath the burning water. The periscope slides back down again. The Skipper is reminded by the I.W.O. that they are running dangerously low on fresh water. The Captain nods, then tells the I.W.O.: "Plot a course to our supply base in the Bahamas to take on fresh water and food."

The Japanese attack on Pearl Harbor was as big a surprise to the German High Command as it was to the American people that Sunday morning in December of 1941. Hitler quickly ordered a force of U-Boats to cross the Atlantic, enter the former *Pan-American Neutrality Zone* and attack shipping. While pleased with the decision to let him send his U-Boats against America, Admiral Karl Dönitz's joy diminished some when he realized he had but 6 boats available to attack at this time. As it was, one was laid up in the shop, two got late starts, so only three U-Boats departed on schedule to attack the United States of America. Operation PAUKENSCHLAG had begun.

Operation PAUKENSCHLAG was named for the striking of the kettle drums in a Wagnerian march, descriptive of the Third Reich— and the Type IX U-Boats headed for their assigned patrol stations from the Gulf of St. Lawrence to Cape Hatteras. They were U-66 under Zapp, U-123 under Hardegen and U-130 under Kals. Soon they were joined by U-109 under Bleichrodt and U-103 under Winter.

The U-Boats arrived on station in time to begin their attacks on the pre-set date of January 13, 1942 timed to coincide with the darkness of the new moon. It was like shooting fish in a barrel! The entire east coast of the United States was still operating as if it were peacetime. Cities were fully lit up at night, ship's radio operators used the normal frequencies without code, almost no United States Navy patrols were operating, and those that did were broadcasting their positions over the radio.

Kapitänleutnant Reinhard Hardegen drew the most choice patrol area of all, and he watched the swimmers on Coney island through his binoculars while running on the surface. He wrote in his diary:

> "It is a pity there weren't a couple of mine laying boats with me on the night I was off New York, to plaster the place with mines! And if only there had been ten or twenty boats with me here tonight! They would all, I am sure, have had successes in plenty. I have sighted something like twenty ships, some blacked out, and a few tramps. They were all sticking very close to the shore."

Other U-Boats quickly joined the original PAUKENSCHLAG group, and suffered no lack of targets. Nor did they have any interference from the US Navy. Kapitänleutnant Jochen Mohr, skipper of U-124, entered the following poem in his war diary:

"The new moon night is black as ink,
Off Hatteras the tankers sink.
While sadly Roosevelt counts the score,
Some fifty thousand tons - by Mohr!"

Mohr's glee was short lived. Less than a year later, he ran afoul of HMS BLACK SWAN and HMS STONECROP to the west of

Portugal. The pair of Royal Navy U-Boat hunters did their job—Jochen Mohr and his entire crew are permanently entombed in U-124 on the sea bottom at 41°02'N x 15°39'W.

1942 was known as the *American Shooting Grounds* and U-Boat skippers competed fiercely at their French bases for an American patrol. They knew that they could sink the required 100,000 tons to earn the Knight's Cross to the Iron Cross quickly and without danger. Not only did the returning U-Boat skippers boast to their counterparts in France of the Allied ships they sank, but they showed off their sunburned crews as proof that they thumbed their noses at the United States, daring to remain on the surface for hours in broad daylight.

Soon Admiral Dönitz was able to send more and more U-Boats across the Atlantic, blanketing the American east coast from the Gulf of St. Lawrence to Miami with as many as 19 U-Boats at any one time. Other U-Boats cruised the American shores around the Gulf of Mexico, sinking freshly-built ships as they came from the shipyards at Galveston, New Orleans, Pascagula and Pensacola. Other U-Boats were plying the Bahamas and Caribbean, sinking ships at will.

Why did the US Navy allow this? Simply because our Navy had nothing to fight back with in 1942! There were practically no destroyers or aircraft on the eastern seaboard, a fact that was kept from the American public. So were reports of the havoc that the U-Boats were causing all through 1942, right in our own backyard. U-Boats mined American harbors at Boston, Jacksonville, Charleston, New York Harbor itself and at Norfolk, right in front of the US Navy base.

U-161 under Captain *Ajax* Achilles was running wild in the southern Caribbean, first sinking a number of ships right in the Port of Spain on the island of Trinidad, then entering the harbor at Castries in the British West Indies. Not only did Achilles sink several ships in Castries Harbour, but he left the harbor on the surface, showing his running lights!

Captain Hartenstein was nicknamed *Mad Dog* by his fellow U-boaters for his fearlessness in battle. In February 1942, Hartenstein took his U-156 to Aruba. His mission was to destroy the gasoline storage tanks with shellfire from the 10.5 cm deck gun. The anticipated fire and explosions would quickly engulf the entire

Lago Refinery complex and destroy hundreds of thousands of gallons of this vitally needed fuel, stranding Montgomery's troops in the African desert and leaving a struggling America without gasoline.

U-156 moved in on the surface to a point only 3/4 mile off the reef, directly opposite the tank farm on a bright Sunday morning. The gun crew manned the 10.5, aiming it at the huge sides of the tanks just up the beach—they couldn't miss. Leutnant Dietrich Alfred von dem Borne, the Gunnery Officer, spotted some people walking along the road in front of the tanks and he held fire, assuming they were going to church. They walked clear, and he gave the order to fire!

The deck gun erupted in a sheet of flame and flying bits of steel, splattering the deck of U-156 with deadly steel and wood splinters, and blood. They had forgotten to remove the water-tight plug from the end of the gun barrel and it exploded. One man was dying on the deck, and von dem Borne's leg was a bloody mess.

The gun was ruined, one man was dying and another in terrible pain. Hartenstein broke off the attack, but instead of plotting a course back to his base at Lorient on the French coast (the famed 2nd U-Bootflouttille) to get aid for the wounded von dem Borne, he put in at Fort de France on the island of Martinique in the central Caribbean.

Fully a year earlier, a British agent had recommended to his Home Office that this island be blockaded, as it was a prime potential U-Boat refit base. This French island was under the control of the Vichy French, not De Gaulle's Free French forces. The threat was thought to be so serious by the British that as far back as May 16, 1941 Winston Churchill had sent the following message to General Ismay, his Chief of Staff and Defense Minister:

> "What is the situation at Martinique? Are the fifty million pounds of gold still there? What French forces are there? What French warships are in harbour? I have it in mind that the United States might take over Martinique to safeguard it from being used as a base for U-Boats in view of Vichy collaboration."

That message and its warning came a full year before

Hartenstein took U-156 into Martinique with his wounded Gunnery Officer. He had no fear of the Allies, even right here in America's backyard. One must wonder why.

It turned out to be fortunate for von dem Borne that he blew his foot off—he is alive today. But the war ended a year later for his shipmates on U-156. While lying on the surface off Barbardos in the Caribbean, some of the off-duty watch were sunbathing on deck. A lone US Navy PBY CATALINA dropped out of the clouds and dove straight on the U-Boat. From low level, two of the bombs directly straddled the deck of U-156, breaking the sub into three sections which sank instantly. Only the sunbathers and the bridge lookouts survived the bombing, and they were struggling in the water. The PBY dropped life-rafts and radioed for a sea search, but none of the survivors were found.

Oberleutnant zur See Kuhlmann was a very polite Skipper. His patrol area was off the Mississippi Passes, outside New Orleans and he spent his torpedoes sinking ships not far offshore just as they came from the builder's yards on sea trials. When one such ship went down, he surfaced in broad daylight in sight of the American shore and cruised among the lifeboats. He yelled out to the American survivors, asking if they were in need of medical help. He apologized for having to sink their ship, but he reminded them that we were at war. Then he passed out cigarettes and fresh water, told them that he hoped they would make it safely ashore.

They made it—he didn't. On August 1, 1942 his U-166 was sunk with the loss of all hands by a US Coast Guard plane in shallow waters off the mouth of the Mississippi River. The wreck of U-166 has never been found.

In fact, it was April of 1942 before the US Navy even scored a single U-Boat sinking, even though the U-Boats were operating so close to our shores that Captain Hardegen saw the swimmers on Coney Island through his binoculars from the bridge of his U-123. Some operated on the surface with the shores of New Jersey in the distance. Strollers on Atlantic City's Boardwalk often saw tankers close to shore suddenly erupt in huge fireballs—victims of U-Boats lying just offshore. The first U-boat casualty came too close to shore.

Oberleutnant zur See Eberhard Greger had his U-85 lying on the surface, charging his batteries in water far too shallow to allow him

to dive to escape if caught on the surface. Was this arrogance? Was this stupidity? In either case, he was caught on a dark April night.

The old four-stacker USS ROPER came upon the sub, then still an unidentified silhouette in the darkness, and began pursuit. U-85 could not dive in the shallow water, so Greger attempted to outrun the destroyer on the surface until they could reach the deeper water. But with the top speed of the U-Boat at 17 knots and the destroyers approximately 22 knots, it was going to be a short race. In a frantic effort to shake the ever-closing tin can, Greger ordered a torpedo fired from the single stern tube, but the shot missed. The crew of ROPER now knew they were on the tail of a U-Boat.

The distance closed until ROPER's spotlight pinpointed U-85 in the water, and the gun crews opened up with the forward deck gun. Several hits were made on the U-Boat and she began to sink. Greger ordered his men to abandon ship, and most of the 44 men made it into the water to await rescue.

After the U-Boat was abandoned and sunk, and the German crew were swimming in the water, ROPER did not pick them up. Instead she criss-crossed the area through the survivors and dropped 11 more depth charges among the swimming survivors! None lived out that night of April 14, 1942 - many still had the mouthpiece of their rebreather clenched tightly in their teeth.

What's especially interesting about U-85 is that she was not the long range Type IX boat but a Type VII with more limited range. The Type VII boats were not designed to cross oceans and fight, but to carry on their battles within an area much closer to their home ports. They carried a crew of 44 officers and men, fuel for 8,000 miles at best, and not much fresh food. After the initial thrust of the U-Boats in the opening stages of the U-Boat war in the Western Hemisphere, so many of the U-Boats operating along the American east coast, in the Gulf of Mexico, throughout the Caribbean, along the coast of Central and South America . . . were Type VII boats.

How did these U-Boats expect to make a 5,000 mile crossing of the Atlantic from their French bases to the American east coast or into the Caribbean, then operate for four to six weeks (sometimes longer) in their patrol area then make the return crossing home, when they could carry fuel for a radius of action of only 6,500 miles?

The fresh food was used up by the time the Type VII boats got to the shores of the US, but their food and fresh water was restocked— how? In order to carry even more fuel, the crews of some Type VII boats *volunteered* to have diesel fuel stored in the fresh water tanks. Even though there were primitive desalination devices on board, most of the fresh water made in the stills went to the boat's batteries and only about one gallon per man per day was available for cooking, drinking etc. Yet they got fresh water—where?

During the War and for years thereafter, the FBI flatly stated that rumors of U-Boats receiving fuel and supplies in the Western Hemisphere were false. Many U-Boat Captains also state there was no supply help on this side of the Atlantic. But that simply was not the case—the U-Boats were getting supplied on this side of the Atlantic.

Much of the refueling in Western waters was done by *milk cows* or U-tankers. These were the Type XIV boats that had no armament, but were submarine tankers stationed throughout the Atlantic to replenish fuel for the front boats. They could usually supply only fuel, they did not have space for extra food, fresh water or anything else. For that matter, the era of the *milk cows* was very short. As soon as more long-range land based bombers became available and they were able to extend their range well out to sea, the Type XIV boats were all quickly sunk.

An American pilot returning to Miami from Nassau, capital of the Bahamas, noticed a large three-masted schooner loafing along with only a small jib set. She was in the Gulf Stream, only about 35 miles off Miami. Since he was flying low, the pilot could see that the cargo hatches were open and the holds empty, as the schooner was floating high on her waterline. He circled the schooner once—then he saw the U-Boat surface less than a mile from the schooner. Upon landing in Miami, the pilot phoned W. W. Diamond of US Navy Intelligence and told what he saw. The men were arrested upon reaching port in Miami.

Some tankers of Standard Oil (now known as Exxon) were running from the Lago Refinery in Aruba, Dutch West Indies, to the Canary Islands where they supplied German tender ships. A few of these tankers were under command of German officers and one, the GDYNIA ESSO was captured by a British warship.

As for the food and water that could not be supplied by any of the TypeXIV U-tankers, that problem was solved as well. Some U-Boats were in the habit of stopping small coastal fishing boats in the Bahamas and along the Cuban coast and taking whatever food and water they could find on board. In these early stages of the war, best-selling author Ernest Hemingway, outfitted his private yacht, PILAR, with weapons garnered from the US Navy. Included in his *armory* were a couple of bazookas, several cases of hand grenades, a .50 cal machine gun and other assorted small arms. His crew was made up of a millionaire athlete, an out of work Spanish cook, a somewhat famous Jai-Ali player, and a US Marine gunny sergeant.

Hemingway's plan, called Operation FRIENDLESS in honor of one of his favorite cats, was to laze about on deck with one of his buddies, pretending to fish and offering a potential prize to any U-Boat in the area. When the U-Boat would surface and open the hatches to send the prize crew to board PILAR, Hemingway planned to crank up the throttles and head straight for the U-Boat. The .50 cal. would rake the German crew from the deck of the U-Boat and the remaining Americans would rush, in true John Wayne fashion, from hiding below decks and lob grenades down the still-open hatches.

It looked great on paper, but although Hemingway's *Hooligan Navy* patrolled the waters of the Bahamas and along the Old Bahamas Channel off the coast of Cuba for nearly six months, they never got a chance to try their hand at U-Boat killing. They constantly heard radio messages back and forth between U-Boats on their radio and even saw one in the far distance and gave chase. But by the time they arrived where they had seen the U-Boat, it was long gone. Hemingway soon disbanded his little Navy and went with the ground forces in Europe.

But the U-Boats that stopped the fishing boats were the rare exception rather than the rule. Were there supply bases set up in the Western Hemisphere specifically for the U-Boats to receive food and fresh water? It was reported by Ernest's brother, Leister Hemingway, that the Corn Islands off the coast of Nicaragua were being used as a U-Boat supply base. And a number of U-Boats lie sunk within a few hundred miles of the Corn Islands. Leister Hemingway *committed suicide* some years after the war - at the time he was doing this research.

The Duke of Windsor (the abdicated King Edward VIII of England) was then in Nassau as Governor General of the Bahamas in a sort of exile. He cabled to London in February of 1942:

> "Enemy submarines attacked shipping in Florida Straits about 130 miles NW of Grand Bahama. Am informed that the United States Naval Air Base at Exuma will not be opened until May and am taking up with Commander-In-Chief, American and West Indies, possibility that enemy submarines are sheltered among unoccupied cays and that air patrol is necessary."

Owned by Englishman Guy Baxter and named for his native Derby, England, Darby Island was unique in that it contained 26 fresh water wells and supported a small plantation. Not only did he live in regal splendor in a huge mansion atop the highest hill on Darby, he set to work building the rest of his base. Quick to follow his *castle* were a barracks, a radio shack and a steel reinforced concrete dock for his two trading vessels named MASTER D and LEANDER.

By and large, none of the workers on Darby Island knew where the fresh water and vegetables were going. Nor did they know where the freshly slaughtered pigs and goats went, even though one worker told me that after days of killing,

> "We'd come into the cold room of a morning, and there wouldn't be a piece of meat on the entire island big enough to stick in your eye!"

The fresh water, the meat and the vegetables had all been taken by either MASTER D or LEANDER to a U-Boat waiting in the deeper waters of Exuma Sound during the night, so we are told by the old Bahamian caretaker of the island. He reported that the operation on Darby Island continued only a short time until the German supply people were shot, the dock dynamited and the U-Boats were having trouble staying alive in Western waters by May of 1943.

Approximately 80 German U-Boats lie sunk in waters of the Western Hemisphere and of those, two dozen are down in Ameri-

can waters. While it was an extremely long trip for the Type VII boat to make it to the American coast with their limited range, it is even more difficult to believe they could travel to South America and return—but they did . . . with the help of some friendly *service stations* right in our own backyard.■

Note: SHARKHUNTERS is the world's largest research center (outside Germany) on the history and activities of the German U-Boats. New and news-breaking information about U-Boats, their Skippers and crews, their missions etc. is published first by the KTB Magazine of SHARKHUNTERS. For free information on this group and their monthly magazine, send a stamped, self-addressed envelope to:

SHARKHUNTERS
P.O. Box 1539-AT9
Hernando FL 3442
Fax (352) 637-6289 Phone (352) 637-2917
sharkhunters@earthlink.net
or check our website at www.sharkhunters.com

FOREIGN SUBMARINE NEWS

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Editor's Note: Items of news concerning modern submarine acquisition are becoming of increasing interest. In addition to the fact of modernization by navies not known for submarines, it has been noted that submarine proliferation will be encouraged by the advent of near Air Independent Propulsion for diesel-electric submarines. AMI International has graciously consented to our reprinting several of those items.

DENMARK/SWEDEN
VIKING PROJECT MOVES FORWARD

On 06 October 2003, Kockums Naval Systems signed a contract with the Swedish Defense Material Administration (FMV) for the next phase of the Viking Submarine Project. The US$16.8M (SEK130M) contract covers part two of the Project Definition Phase, which will run through the end of 2004. Part two involves the development of a balanced technical and economical basis for a decision on all follow-on phases of the program.

Kockums' (owned by HDW) share of the part two contract is worth US$13.8M, and the company has also signed a subcontract with Odense Steel of Denmark for the remaining US$3M. Both companies are sharing the majority of the work in which six

submarines are expected to be procured for the Danish and Swedish navies. Sweden will procure two submarines beginning in 2006 (commissioning 2010 and 2011) and Denmark will procure the remaining four beginning in 2007 (commissioning 2011 through 2014).

The Viking project is an interesting case study in the environment of competition in today's naval defense exports, in that a government policy of protecting one's defense industrial base continues to override the issue of competition and EU consolidation. Denmark and Sweden are prime examples. Even though both nations are two of the smallest in Europe and are cooperating in the Viking project, there is still a competition between themselves and the larger industrial bases such as Germany. Although Sweden's Kockums is owned by Germany's HDW, Sweden is determined to maintain its own industrial base at Kockums as well as the long-term employment benefits that accompany it. The same can be said with Odense Steel in Denmark, a country with a small defense industrial base, where is it considered critical for the nation to maintain a naval shipbuilding capability. It must also be reasoned that other Swedish and Danish companies such as Saab Tech and Terma will play major roles in outfitting the future submarines as well.

That being said, with the Viking project now down to only six submarines, Denmark and Sweden are investing a lot of funding for what is currently a total class of six units between both nations. It has become apparent that both nations are aiming higher than the planned six hulls. Sweden and Denmark are actively pursuing future clients for the program, specifically Finland and Poland and of course there is always the remote chance that Norway may return.

Although Kockums is owned by HDW with its Type 212 and 214 designs, the Viking design may still be attractive to other future players in the submarine market. Viking along with the Type 212 and Type 214 could be a very powerful combination in a future submarine market where the potential exists for up to US$32B over the next 15 years, and could include up to 95 hulls. Industrial base protection for Germany, Sweden and Denmark may be well worthwhile.■

PORTUGAL
EVALUATING PROPOSALS FOR ITS SUBMARINE PROGRAM

On 25 September, the Portuguese Defense Minister Paulo Portas, announced that the German Submarine Consortium (GSC) was the preferred bidder for the Portuguese Navy's Diesel-Electric Submarine Program. The Defense Minister stated that the GSC, with its Type 209 was selected over the Armaris bid with its Scorpene design due to a lower bid by the GSC. Although this announcement was made public, it may not be the final word in the Portuguese submarine procurement.

Due to very limited funding by the Portuguese Navy, cost must be considered a primary factor in this procurement. If one would quickly compare the bids, the GSC with its bid of US$980M (EUR845.6M) for two Type 209 submarines would beat the Armaris bid of US$1.1B (EUR949.9M) for two Scorpene submarines. However, in the offsets arena, Armaris proposed up to 200% of contract value with the GSC only offering 100%. It must be noted that the final details of the offset agreement are still being worked out and will not be final until around mid-2004 and could change the preferred supplier decision.

The press release in September follows the 27 February 2003 Portuguese Government announcement that it was seeking new proposals from GSC and Armaris for its submarine program in order to realize additional savings and benefits due to the country's financial and economic situation.

GSC and Armaris responded to the initial RfP in 1998 and after being down selected, submitted their revised bids in summer 2000. Since that time, the Portuguese Navy has been faced with an insufficient budget for the program as well as uncertainties due a new government in 2000. In April 2002, the government took the project back to the financial drawing board, and reduced the requirement from three to two units in order to move forward with the program.

However, as this project continues the alternatives are appearing stronger.

- The first is that government may decide that Portugal really doesn't need to maintain a submarine fleet. During the past months, you have read in HOT NEWS how one NATO country after another is reducing their fleet size and in some cases completely closing down a capability. Maintaining only two submarines is really a questionable expense. Further, the construction would not take place in Portugal and therefore would not benefit jobs in the defense sector.

- If the government wishes to keep a submarine fleet, perhaps three used submarines would meet the requirement. In fact, when Portugal started this project the original budget was for the purchase of three used Royal Navy Upholders (now in Canada). Further, the Navy is already looking at used ships to replace its older frigates, why not submarines too.

In the interim the Portuguese Navy continues to operate its Albacora (Daphne) class, at least until 2006 when they are tentatively scheduled for decommissioning.■

From the November 2003 issue of AMI Hot News is the following late breaking item concerning Portuguese submarine intentions:

PORTUGAL
DOWN-SELECT FOR DIESEL-ELECTRIC SUBMARINE PROGRAM

On 06 November 2003 the Portuguese Navy officially made their final down-selection in its Diesel-electric Submarine Program. The German Submarine Consortium (GSC) was selected to provide two Type 209s to the Portuguese Navy with an option for a third. This information confirms the 25 September announcement by the Portuguese Minister of Defense that the GSC was the preferred bidder in this program.

However, it must be noted that even though the GSC is the preferred supplier in this program, AMI considers that an actual signed construction contract may still be a while off. The budget

for this program, commencing back in 1998, has always been too little. Therefore, AMI considers that there still exists a significant difference between what has been offered and the Portuguese Navy's target budget. A properly equipped Type 209 costs a minimum of US$250 and the number rumored to be sought by the Portuguese is significantly less.
Http://www.amiinter.com/wnpr/portugal/PO2201.html■

INDONESIA - RDM Search for a Sale

In mid-October 2003, AMI received information from industry sources that RDMS submarines are also being offered to Indonesia to fulfill its submarine requirement. This information follows Indonesian press reporting on 19 September that the sea service was continuing to discuss modernization plans. One aspect of the modernization plan was for the acquisition of at least two submarines from South Korea by 2008.

However, sources indicate that there may be an alternative plan on the table. Information received suggests that the Indonesian Navy is also being offered two new-construction Moray submarines by RDMS, the second time that the Moray has been offered to Indonesia, with the first being in 1994. As an interim measure until the Moray class can be delivered, the Indonesian Navy would take possession of the two Zwaardvis class submarines (formerly of the Royal Netherlands Navy) that have been stranded in Malaysia since 2000. The two Zwaardvis class submarines were shipped to Lumut Naval Base in Malaysia under a private venture between PSC-Naval Dockyard and RDMS, apparently under the same circumstances that Indonesia is being offered the submarines, as an interim measure until new-construction Moray class submarines could be delivered.

The entire Malaysian Zwaardvis/Moray deal was subsequently canceled in January 2002, when the Malaysian Navy selected the French Scorpene design. The cancellation of the Zwaardvis/Moray deal puts even more pressure on RDM as it has still not been able to sell the Moray design. What was once hoped to be a success on the foreign market, has turned up empty handed. Failures in

Indonesia in 1994, Egypt in 2000, and Malaysia in 2002 does not bode well for the Moray design as most foreign navies are putting forth the requirement of a proven hull before purchase, and the Moray still has not been sold, not even to the Royal Netherlands Navy (RNLN).

With the Moray design still being unsold, RDM is finally hoping to make a sale to the Indonesians the second time around. If accepted by Indonesia, there are two Zwaardvis class submarines in Lumut waiting for a new home until the Morays can be delivered. It must also be noted that the Indonesian Navy has already publicly announced their desire to procure the South Korean Type 209s, when they are replaced by the Type 214s in 2007 and 2008. The Indonesian Navy currently operates Type 209 (Type 1300) class submarines and it would be easier to integrate the South Korean Type 209s rather than the Zwaardvis and Moray designs.

However, nowhere have we seen any budget figures for the Navy that would support any acquisition of this magnitude. Further, the Navy isn't only speaking about acquiring submarines, it is also speaking about acquisition of new corvettes. Without a government-to-government agreement that covers the costs, these programs will only take place in the distant future when the economy is stronger.■

PERSONAL TRIBUTES

EULOGY
WILLIAM J. "BILL" RUHE

by CAPT. Robert C. Gillette USN(Ret.)

There are going to be some changes made up *there* and I don't mean just in the name of a song. St. Peter is going to have to make a lot of room for Bill and change the tempo of operations. There will be the piano, the bass viol, the ukelele, the barbershop quartet, lacrosse sticks and all manner of athletic equipment. There will have to be meeting rooms for sing-a-longs and for serious discussions and for parties for his friends, the church group, the choir, the book club and for "Good Ole '39".

We are going to miss all this. However, there is the compensating thought that we all can join in the festivities up *there* some sunny day, as everything will be up and running. . . thanks to Bill.

On a more serious note, the class of '39 has lost a truly class act in Bill's passing. I will list a few of his outstanding contributions to the class and accomplishments during his Naval Academy tenure and during his naval career.

In the formative years of any class, a common phenomenon involving leadership often occurs. Certain individuals become accepted as leaders in their group for no apparent reason or special training. These individuals seem to be accepted as leaders purely as a result of their personal impact on that organization and its members. This phenomenon usually follows the individual through his entire career. Such an individual was Bill Ruhe. His qualities are scarce and are of great value to the initial group and were carried over to all the follow-on organizations where he plied his trade.

As I said before, such an individual was Bill Ruhe . . . '39 classmate, fellow submariner and good shipmate. It seemed that in every command Bill joined, that command came alive and became a desirable place to work. I believe this attribute is called leadership. Bill, however, never revealed to me how he came to develop this capability—I wish he had.

He made his mark at the Naval Academy academically, athletically and in the arts. He was a star man, graduating in the top 5% of 600 graduates. He was a major force on the lacrosse teams which won the national championship one year. He was the author of plays put on by the academy theater group, the Masqueraders, and wrote great songs such as "Flossie was an Aussie" commemorating R and R in Perth, Australia between submarine patrols. He also wrote and had published numerous books and was the first editor of The SUBMARINE REVIEW.

Bill was a Submarine warrior, receiving 3 silver stars and other combat awards for successful operation against the Japanese during which his submarine, USS CREVALLE, sank ten ships. During these patrols CREVALLE weathered many life threatening attacks.

Following submarine duty, Bill became the Commanding Officer of several surface ship commands, including a cruiser, which indicates the high regard in which he was held by the Navy.

Post-war life centered around his six lively children and his ever-devoted and supportive wife, Carol, who somehow kept up with this whirling dervish and who deserves a gold medal for service beyond the call of duty.

His post-Navy career was marked by a successful tour as manager of marketing for General Dynamics and as editor of The SUBMARINE REVIEW, the magazine of the Submarine League.

In closing, Bill was a constant *contributor* to every organization, to his family and to his friends. In short, he gave more to all than he took.

Bill was a good shipmate, which, in the submarine business is the highest compliment one can pay to an individual. He will be greatly missed. We wish him fair winds and following seas.■

CAPTAIN BILL RHUE
First Editor of
THE SUBMARINE REVIEW

by CAPT. Jim Hay, USN(Ret.)

Bill Rhue was a fine Naval Officer and among his many other accomplishments; submariner, musician, and author, he was an accomplished editor. By no means does that skill flow automatically from any of the previously named fields of endeavor, but Bill brought forth real talent in the early 1980's and got the Naval Submarine League's magazine off to a fine start. The founding fathers of the League wanted an effective way to carry out the prime mission of the League, educating the public about effectiveness of American submarines, and they called on Bill Rhue to create a professional journal for the submarine community. Bill guided, prodded and even wrote extensively for the magazine during its first seven years. During that time he established THE SUBMARINE REVIEW as a source of submarine commentary which helped lead the way to recognition of the Naval Submarine League as an independent and authoritative voice for submarine matters.

Bill's contribution to the League's magazine did not stop when he left his post as Editor to pursue his authorship of books. In January of 1997, the REVIEW carried an article by Bill entitled Submarine Lessons from World War II. There is a lot of good information in that piece. Bill made the specific point that lessons he cited are for **submarines**, not just for diesel-electric boats. His main case is for understanding, and taking maximum advantage of, a submarine's unique strength in its stealth. It follows that he disapproved, strongly it seems, of those in higher naval authority who did not understand that basic rule and thus wasted submarine value in less than effective dispositions. To Bill, those commanders who caused submarines to disclose their position by communication requirements were even worse than those who did not use submarines correctly, and he specifically cited one egregious USN example.

It would be fitting tribute to Bill Rhue to recommend that article as a *thought piece* for those still on active duty with the potential

for making future decisions on the employment of submarines. Indeed, most of Bill's writings for the magazine reflected his study of submarine warfare for the lessons to be learned. One of his ways of illustration was to publish accounts of well handled, and very successful, war patrols. Those accounts were always fascinating and very instructive. His grasp of the larger meaning of submarines also came through in his articles which he often wrote under a pen name. An excellent example is his Nuclear Submarines and the Principles of War in the July 1988 issue of THE SUBMARINE REVIEW.

It is true that not all of Bill Rhue's observations, opinions and conclusions about the world of submarine warfare met with universal agreement within the community. He did give forum, and voice, to discussion of those matters, however, and for that as well as for the legacy he left us in this magazine, we are very grateful. He was as he wanted to be, a student of submarine warfare, and certainly added significantly to the body of that knowledge.■

A TRIBUTE TO NED BEACH

by CDR Al Steele, USN(Ret.)

It has been about a year since the world lost Ned Beach. Certainly, he was a well-known and highly decorated submarine veteran, successful author and submarine advocate; however, to me he was more. To me he was the ultimate *skipper*—submarine hero, cool under pressure, educated, polished, naval history authority, a true gentleman and in some way perhaps a surrogate father. Indeed, no one influenced my life more in those early years than Ned.

From the time I first read Run Silent, Run Deep as a high school student, I knew what I wanted to do in life. As fate (and BUPERS) would have it, three years later I was serving under him as a commissioning crew member of TRITON. I recall now how surprised I was to find him so friendly and genuine when I was introduced to him upon my arrival on board in October of 1958. This was particularly evident having come from a submarine where I had qualified and spent seven months on board, and never met or spoke to the skipper.

It was clear that Ned had far more confidence in me as a young Seaman than I had in myself, as he gave me advice and direction for my career. Even after an abortive attempt at the Naval Academy Prep School (that darn math) he still had confidence in me and tried to get me into the Naval Academy through football. To ensure I had the proper atmosphere in which to study, he invited me to use his stateroom on the barge at night. Upon leaving the Navy for college in 1961, Ned wished me good luck, told me to study hard and enjoy college, and stay in touch, and that we did for the next 42 years through letters, phone calls, reunions, and visits to his home in Georgetown. Ned was truly surprised when we had a chance meeting while I was attending Officer Candidate School and he visited as a guest lecturer. Shortly thereafter I was the surprised one (and so was OCS) when I received TAD orders in the middle of my OCS training to join him at the National Boy Scout Convention in Chicago. Ned was to give the keynote speech and he asked me to

make a few concurrent remarks. Clearly, Ned had been at work behind the scenes as he engineered this most unusual assignment for an officer candidate under instruction.

Later in my career after I had chosen a wonderful mate, I had to take her back to meet Ned and Ingrid almost as a *show and tell*, proud that I too had found a California girl--and one that reminded me of beautiful Ingrid. Ned took time out of his busy day to tour us around the Capitol, introducing us and taking us to lunch at the U.S. Senate Dining Room. When my daughter was born, I again had to proudly show her off to Ned and Ingrid. Ned quickly demonstrated his fatherly experience and his ease with small children as he quickly won her over to his side. At TRITON reunions Ned could always be found with a stack of books, tirelessly and unselfishly signing autographs when he wasn't chatting with old shipmates or whirling around the dance floor with Ingrid. At one reunion he showed up with dolphin tie clasps that he had laboriously made for all crew members.

His last letter to me in October lamented the fact that he had hoped to make the upcoming Triton reunion, "but it was not to be." The eulogies at Ned's memorial service in January at the Naval Academy by Admiral Bowman, Jim Hay, and Mr. Stilwell were fitting, poignant, and well deserved, deeply touching all of us there, but for my family and me, his loss was even more personal.■

SEA STORIES

WARTIME MEMORIES OF *TILEFISH*

by CAPT. Charles W. Styer, USN(Ret.)

My second wartime submarine was USS TILEFISH. She was on the building ways at Mare Island Navy Yard, Vallejo, CA, when I was the first crew member to report in the fall of 1943. I attended her launching and, as chief engineer, participated in the three month completion and outfitting period. The officer ordered to command, failed to appear when expected, we learned later that he was on a boat presumed lost. A new C.O. finally showed up, Commander Myers Keithly, well experienced as exec of *Tunny* on several patrols. He was a professional and affable skipper, well respected and liked by his crew. Five of the eight officers aboard were qualified in submarines, but only four of us (skipper, executive officer, a newly commissioned ex-enlisted officer, and myself) had any war patrol experience. Three of the others were fresh out of Sub School. Only about a third of the enlisted personnel had any patrol experience. The quickened submarine building program was having its effect on the experience level of most submarine crews.

The building period afforded opportunity for welcome recreation in nearby San Francisco. One interesting diversion for us was attending dinners at *Mom* Chung's home. *Mom* was a Chinese-American surgeon who practiced in San Francisco. Some of her patients and good friends were leading lights in the entertainment world. Early in the war, she had adopted a group of naval aviators, known as *Mom Chung's Fair Haired Bastards*. A similar organization of *bastard son* submariners soon followed, which she called her Golden Dolphins. The principal activity was a periodic Sunday night dinner Mom cooked at her home for her invited adopted sons and their spouses or dates. The several times my wife and I

attended these dinners, there were 30-35 well-fed guests. Occasionally, a celebrity or two appeared. I recall the pleasure of meeting Andre Kostelanetz and his wife, Lily Pons, at one dinner. After several such dinners, I was formally adopted by Mom and presented a ring and a certificate of membership. She doted on her sons (even in the years after the war). However, the dotage ended at the end of each meal—her bastard sons were required to wash and dry mounds of dishes while all other guests chatted and enjoyed after-dinner drinks.

At the end of TILEFISH's Mare Island post-commissioning period, we had a short trial and torpedo attack training session in the San Diego area. Then on to Pearl Harbor. There, our executive officer was reassigned and I was designated to relieve him. We trained for two weeks at sea out of Pearl, including making repeated night surface mock attacks against U.S. convoys on their way to Oahu from the mainland. One of the exec's duties was ship's navigator. Towards the end of one such convoy attack exercise, I had difficulty establishing our position. The constant rainy weather, frequent diving, many course and speed changes, and lack of any star or sun sights made my dead reckoning position worthless. Fortunately, the last night on the way back to Pearl, a passing merchantman saved my bacon by blinking his position to us by signal gun. Actually, once I got the hang of it, I loved navigation, particularly the challenge posed when taking star sights with a sextant in the dark of night on the surface when the horizon was barely visible.

The first TILEFISH patrol began on departure from Pearl in April 1944. We headed for a patrol area east of Honshu, the Japanese main island. We sighted many enemy aircraft but found few torpedo targets. We were hampered by failure of our fathometer, periscope fogging, and continually overcast weather which ruled out celestial navigation. We attacked one small convoy, sinking a troop transport. Diving amid the sounds of explosions, we inadvertently took on a large amount of water, making a hair-raising dive to 580 feet, considerably below our designed test depth. We evaded the inevitable depth charge attack.

After our first patrol, we refitted at Majuro Atoll, now a U.S. base in the Marshall Islands. We moored alongside an anchored submarine tender for two weeks as a designated tender refit crew

took over repair and replenishing tasks. A complete submarine rest camp had been set up on a small island in the atoll. The life at the rest camp was uneventful, but with plenty of barbecues, beer, baseball, and swimming. There was little else to do except read and relax in our quonset hut village. It was rumored that Navy nurses were quartered on a nearby atoll—we never saw them. What we did see were plenty of movies.

Speaking of movies, I had been in correspondence in 1943 with an executive at Columbia Pictures regarding the possibility of provision of first run movies in 16mm format for submarines to show on patrol. Up to that time, the Navy Motion Picture Exchange leased 35mm films for issue to all ships and stations; available 16mm formats were generally pretty old movies. The exchange's contract with Columbia (and presumably with other studios) precluded tying up the films for the length of time submarines were at sea on patrol. My efforts were brought to fruition in March of 1944, when the Columbia District Manager in San Francisco wrote to me. He said that his New York boss, the president of Columbia, would "supply the men with entertainment on those tough jaunts made for us Americans who can contribute so little by comparison." Columbia's president did, indeed, write to COMSUBPAC, Vice Admiral Lockwood, who replied with his appreciation, stating that "Next to sinking Jap ships, motion pictures are the chief entertainment and amusement factor to our submariners." Columbia's (and other studios') arrangements with BUPERS followed shortly and the quality of the movies we took on patrol was greatly enhanced. On the few occasions we met up with other U.S. submarines in the patrol areas, exchange of movies by highline was always a priority as exchange of information and pleasantries took place.

While we were in Majuro, we replaced two of our plankowner officers—one went to a boat which was lost on its next patrol run. Each time we came in from patrols, word circulated that this or that boat was overdue and presumed lost. Fifty-two boats were lost from all causes during the war. The resulting personnel casualty rate, 22 percent, was later said to be the highest for any branch of the military.

TILEFISH departed Majuro in May, 1944, with a three-ship attack group headed for the Luzon Strait area in the Philippines.

The pack commander embarked with us was our division commander, Commander Warren Wilkin. Operating in a *wolf pack* mode was new to us and depended largely upon short coded three-letter radio messages between boats. These communications, either while on the surface or with a raised antenna, were rudimentary and not very reliable. The tactics were, to say the least, adventuresome, what with the three boats racing around in and out of a convoy on the surface at night (or submerging if forced down by escorts) and firing torpedoes from both sides of the convoy formation. Accompanying screening destroyers with *bones in their teeth* added to the fun.

Our pack proceeded to an area between the Philippine island of Luzon and Formosa. There, we launched a torpedo attack on a large convoy and had the satisfaction of seeing a freighter sustain two hits. Meanwhile, one of our pack mates had joined in the attack and was being held down by a destroyer of the convoy's screen. In midmorning, we made a submerged torpedo attack on the destroyer. The enemy ship attempted to evade the torpedoes, but the first one hit under its forward mount and wrapped her bow around the bridge. A second hit added to the destroyer's damage. Before *Tilefish* was forced down by enemy aircraft, our skipper caught one last glimpse of the destroyer, listing and dead in the water. For the first time, we had no depth charging after this attack, thanks to the new electric wakeless torpedoes we carried.

In late July of 1944, the pack took submerged daylight stations to ambush Japanese submarine I-29. Her intended routing, contained in a message decoded by U.S. intelligence, had been provided to us. She was en route from Germany to Japan with some highly important unidentified, equipment aboard. I had the periscope watch and sighted I-29 running on the surface shortly before another of our pack mates launched a three-torpedo attack on her. She exploded, leaving behind only smoke and flames, which we sighted as we surfaced immediately thereafter.

We returned to Pearl Harbor in mid-August. The submarine rest camp at the Royal Hawaiian Hotel was a far cry from our Majuro diggings. TILEFISH's third patrol in the fall of 1944 was in the inhospitable Okhotsk Sea and off the Kurile Islands. Icy rough seas produced swells reaching 30 to 40 feet. Bridge watches were cold and wet! We sank a small trawler with our 4-inch gun, torpedoed

two small cargo vessels, a cargo ship, and a small anti-submarine vessel. In addition, we blew out the stern of a vessel grounded west of Shimushiru Island. A diversion on this run was the adoption of a Russian owl that perched on the bridge one night, refusing to fly off. A crew member took it below, where it was bunked and fed in the Forward Torpedo Room. Of course our ship's yeoman insisted upon preparing a service record book for "Boris Hootski, Owl 2/c," and designation as a lookout. Hootski was exercised by tying a string to a foot and letting it fly topside for a few minutes, then retrieving it by pulling in the string. Hootski earned his or her keep by sitting on top of a torpedo tube, leaning forward or aft as the boat changed angles, thus providing a convenient clinometer for all to observe. TILEFISH ended her third patrol at Midway in late October 1944.

We had a humdrum refit in Midway, marked for me by receipt of mail and some gifts to put away for the coming Christmas expected to be away from home. I also received a package, care of the skipper of a new boat fresh out of New London. It was a crate marked *Haig and Haig*. My father, then New London Sub Base skipper, had arranged for this welcome delivery. I tore open a corner of the crate and extracted a handsome well-known dimpled shape bottle of *pinch*, which I and my BOQ neighbors quickly disposed of. When I went back for a second bottle, I found to my dismay that the rest of the case was filled only with homemade jams and jellies, which my thoughtful mother had carefully placed therein.

In November, we headed again for the Kuriles and the Okhotsk Sea. We were hampered by bitterly cold weather, poor visibility, and hurricane-force winds. Snow frosted the periscope and prevented accurate identification of possible targets. A problem in this area was to distinguish between Japanese and Russian shipping. We carried out one splendid daylight submerged approach against a large cargo ship, interrupted at a great firing position when we realized it was a U.S.-built Russian liberty ship. Two days before Christmas, we sank a small escort type ship, evading without damage a Japanese counterattack of depth charges and aerial bombs. This patrol ended with a refit in Pearl Harbor. A new skipper came aboard, Commander Wally Schlech. He had just completed a PCO run in DRAGONET.

TILEFISH left in late January for Empire waters, refueling at Saipan, where there was now a new U.S. Submarine base. There, we transferred a *plank owner* officer to another boat to replace one of her officers killed in an auto accident. That boat was lost on its first run.

My fifth, and last TILEFISH patrol was in the Nansei Shoto, close to Japan. Here we sank a small cargo ship in a morning surface gun attack. We then took up a surfaced station in support of Navy air strikes on Okinawa and nearby islands. These strikes were scheduled in preparation for the expected major U.S. invasion landings in Japan. Assigned as a unit of the *Lifeguard League*, we rescued a USS HANCOCK aviator whose plane had been hit by Japanese antiaircraft fire. He splashed his damaged plane only 500 yards off our bow and we fished him out and took care of his wounds. He asked for a transfer back to his carrier, but was dismayed to find he had to spend the remaining 30 days of our patrol with us. We also picked up a Japanese prisoner from the crew of a fishing trawler we sent to the bottom by gunfire. Our orders in those days were to pick up at least one prisoner per patrol for return to base for questioning. He was willing to give us all the information he had on shipping traffic that we could glean with the limited language books we carried. His knowledge was actually pretty sparse. In the course of one attack on a freighter, we sank its escorting minesweeper. We also performed lifeguard duties several times in support of B-29 air strikes on Nagoya and other Japanese targets, although we were not called upon for assistance.

After patrolling the approaches of Tokyo Bay until mid-March of 1945, we set course to Midway to fuel and off-load our prisoner and the HANCOCK aviator (the latter kept in touch in post-war years, attending one annual TILEFISH reunion to rehash his cruise with us.) TILEFISH headed for San Francisco for overhaul. There, I was detached to command a New London school boat, USS MACKEREL, for the last few months of the war. Having that command was great, but it didn't compare to the excitement and professional pride involved in making war patrols. Still, the nine patrols in which I participated had accounted for a respectable share of Japanese shipping sent to the bottom—and that's what it was all about.■

FUDDY DUDDY BUDDY

by Dick Boyle

Being a movie officer in trouble is not easily forgotten. In the old days, an EMFN at the Movie Exchange could put our skipper on report for torn sprocket holes. Loss of a reel or an entire film brought forth thoughts of a cell at Leavenworth.

I was new on SEA OWL on a Mediterranean deployment in 1954. As movie officer, I knew the number of films we loaded for the trip, but it never entered my mind to check the contents of each container.

Mississippi Gambler was being shown underway, and when reel 3 was put on the projector, instead of a continuation of the featured film, we found a cartoon entitled *Fuddy Duddy Buddy*. It turned out that reel 3 was made up entirely of short cartoons spliced together. We searched every film container on board, but could not come up with reel 3.

Sometime later (and my memory is not up to speed), we sent a message from Commanding Officer SEA OWL to COMSIXTHFLT which read something like: "Does anyone have reel 3 of *Mississippi Gambler*? Will swap *Fuddy Duddy Buddy* for it." Nothing came of this plea for help.

Upon return to home port, I approached the Movie Exchange in somewhat of a state of anxiety. After relating our problem, the EMFN at the counter said something like: "Gee, we've been looking for that reel of cartoons for months. Reel 3 of *Mississippi Gambler* is right over here on the shelf."■

SPEED x TIME EQUALS ???

by CAPT. C.A.K. McDonald USN(Ret.)

I was the Gold Commissioning Commanding Officer of ULYSSES S. GRANT (SSBN 631) in the spring of 1964 at the Electric Boat Division in Groton, Ct. We were all busy preparing for the imminent Initial Builders Trials at which Admiral Rickover would be present. Captain Larry From, the Blue Commanding Officer, had asked me to meet Admiral Rickover upon his arrival on the evening before the two-day trial. I had assured Larry that I would indeed do just that.

I ascertained the Admiral's itinerary and knew of his planned arrival at LaGuardia airport in Long Island. I also knew that he would indeed be chauffeured to the shipyard by the Electric Boat's limousine. So I made a calculation of his expected arrival time based on a simple time/distance formula. I then applied a generous safety factor. I absolutely did not want to miss the Admiral's arrival, particularly since I would be the de facto host of the pre-trials meeting.

When I arrived at the agreed rendezvous I was surprised to see that everyone else was already there. The President of the Electric Boat Division, the Supervisor of Shipbuilding, the Atomic Energy Commission on-site representative, and others were patiently waiting. Not only that, almost immediately, in the gathering dusk of a June evening, around a building came a large, black limousine with headlights on. It slowly approached the waterfront rendezvous point and I just knew that the *Man* was arriving. After the Admiral had disembarked and everyone had made a private greeting, I led the group to the wardroom of GRANT's waterfront barge where we had placed a large bowl of grapes at the head of the table for the Admiral's noshing pleasure.

The Admiral then proceeded to hold court. There was simply no escaping the withering gaze and the acerbic diction that were so expressive of his displeasure. The *meeting* broke up just before midnight and I was pleased. It meant that I could get four hours sleep before the events of the morrow commenced.

Captain From, under the Admiral's watchful eye, conducted an extremely successful Initial Builder's Trial. A bit hectic at times, but successful, and completed right on schedule. A few days later, it bothered me how I almost missed the Admiral's arrival. It was, after all, a basic time/distance calculation which is relatively simple. I resolved to find out where I had erred in my assumptions. So I made an appointment the next day to meet with Mr. Joe Wornam, the Public Affairs official of the Electric Boat Division. Mr. Wornam was one of those rare individuals in most organizations who always seems to know what is really going on.

After arriving and the pouring of coffee was completed I related that somehow or another I had missed in predicting Admiral Rickover's arrival time. Was it perchance because the Admiral had taken a different flight? Joe broke into gales of laughter. After his laughing subsided he explained that Admiral Rickover had stated that he needed to spend quality time with the various officials at EB and therefore he needed to get to Groton in a hurry after arrival at LaGuardia. That meant that EB needed to make a Special Run with the limo. And for Special Runs, Mr. Bill So and So was always engaged to be the chauffeur.

He was a retired executive with the Connecticut State Police and was well-known in police circles. After he had picked up the Admiral and had driven onto the Parkway he floorboarded it. "You know our Cadillac limousine can cruise quite comfortably at 120?" All I could say was "Oh".

The story might have ended there except that a month later I was pinched for doing 70 on the Parkway. Because of that, my license was suspended for thirty days.■

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BOOK REVIEWS

DARK WATERS: AN INSIDER'S ACCOUNT OF THE NR-1, THE COLD WAR'S UNDERCOVER NUCLEAR SUB
By Lee Vyborny and Don Davis

by Dr. Richard Thompson

Occasionally, interesting things fall into the sea. Aircraft, missile reentry vehicles, nuclear weapons, film capsules from reconnaissance satellites, submarines, all have plunged to the bottom of the ocean at one time or another. If the item is relatively small and falls in deep water, finding it from the vantage point of the surface can be very difficult indeed since the high resolution, high frequency sonar needed to find it doesn't have a very long range. Also, in most cases you'd just as soon the other fellow didn't know you were looking for whatever sank. For both reasons, the best platform for hunting this kind of treasure on the sea floor is a submarine. Most submarines built for deep submergence, however, have poor endurance: they require a tender be nearby and they must return to the surface every few hours. Forty years ago Admiral Rickover decided to build a submarine to find these interesting things, a submarine with nuclear power having unlimited submerged endurance. Lee Vyborny and Don Davis have crafted a fascinating book to tell the story of that submarine, NR-1, and the men who sailed her.

Vyborny (one of the original crew members) and Davis have given us as comprehensive a look as they can at the gestation, launching, and missions of NR-1. Of course, many details of the ship itself and its activities remain highly classified, and laboring

under that handicap they do very well indeed. In addition to details of the fore-end of the ship they provide the first glimpse of the sub's remarkable nuclear powerplant, which provided only 120 hp running flat out, and which could be operated by one man. I was fascinated with the precision with which the hull must be fabricated to withstand the pressure of 3000 feet of sea water. The stories of Rickover's insistence on using off-the-shelf technology for as many systems as possible in this one of a kind submarine (and the risks that were created) will resonate with today's submarine community. In these days of habitability concerns onboard ship, the episodes of being towed on the surface thousands of miles, sleeping on the deck plates, freeze-dried food, and the *rustic* sanitary arrangements serve to remind us how much more comfortable ships are today. There are plenty of harrowing adventures described in the book, enough to give most sailors a dry mouth and wet palms. I found the episodes of becoming entrapped in wreckage on the sea floor particularly unnerving.

Vyborny and Davis also write in some detail about two operations in deep ocean recovery: the recovery of the H-bomb from the downed B-52 off Palomares, Spain, in 1966, and the recovery of the F-14 Tomcat and Phoenix missile off Scotland in 1976. The difficulty and delay associated with the H-bomb recovery was probably a prime justification for NR-1. The evident Soviet attempts to recover the F-14 with its sophisticated radar and state of the art Phoenix missile would appear to have justified constructing the NR-1, which recovered both the plane and the missile. When one considers what the CIA is alleged to have spent on the Glomar Explorer to attempt to recover a sunken Soviet missile submarine, the more than thirty years of service NR-1 and her crews have provided would appear to be a bargain.

Finally, the authors discuss a little of the stillborn attempt to build NR-2, a successor to NR-1; Rickover balked at the proposed billion-dollar cost (in the Seventies!). Interesting things still sink to the bottom of the ocean, and presumably it will continue to be in our national interest to find and recover them. However, merely matching NR-1 would be fantastically expensive today. Unlike forty years ago, the technology for deep ocean search and recovery is commercially available internationally, so the (more or less)

undisturbed leisure of searching for sunken items enjoyed by NR-1 is likely to be a thing of the past. Finally, the sensitization of the world to the value of submarines as intelligence gathering platforms by the disclosure of operations like *Ivy Bells* by the traitor Pelton and books like Blind Man's Bluff makes it much harder to discreetly perform search and salvage operations. NR-1 is one of a kind; we may not see her like again.■

THE PEARL HARBOR AVENGER, U.S.S. BOWFIN
by Dr. Robert P. Beynon
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Review by Susan K. Morrison

The Pearl Harbor Avenger, U.S.S. Bowfin is a collection of facts and crew reminiscences covering the launching and commissioning of BOWFIN, it's nine war patrols, and post-war service. Author Robert Beynon, who was on board during the eighth and ninth war patrols, wrote the book to highlight the experiences of those who served on BOWFIN during World War II. He weaves their anecdotes and sea stories into each of the patrols and includes their answers in an interesting question and answer section regarding submarine life.

USS BOWFIN, launched at Portsmouth Naval Shipyard on the anniversary of the Pear Harbor attack, Dec. 7, 1942, was nicknamed the *Pearl Harbor Avenger*. She made nine war patrols under four commanding officers, whose biographies are included in the book: Commander John H. Willingham, Jr., Commander Walter Thomas Griffith, Commander John Corbus, and Commander Alexander Kelly Tyree. One of the most dramatic incidents of BOWFIN's service occurred in June, 1945, when she penetrated the Japanese minefields and moved into the Sea of Japan as part of a submarine wolf pack. She continued to serve after the war, and in 1971 her name was removed from the navy list of ships. She was eventually obtained by the Pacific Fleet Submarine Memorial Association to be made into a museum to preserve the history of the submarine.

The book also includes chapters on the characteristics of diesel submarines, the history of the submarine service, and the stories of the submarine Medal of Honor winners, who are prominently honored in the BOWFIN museum. The text is accompanied by charts, diagrams and photographs, including the handsome cover photograph of BOWFIN at her present mooring

at BOWFIN Park in Pearl Harbor.

Beynon's love for the ship and his fellow submariners makes up for some of the editing inconsistencies and loose organization of the book, which tend to make reading confusing at times. However the book represents a solid and well-researched effort in adding to the submarine lore of the Second World War.■

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