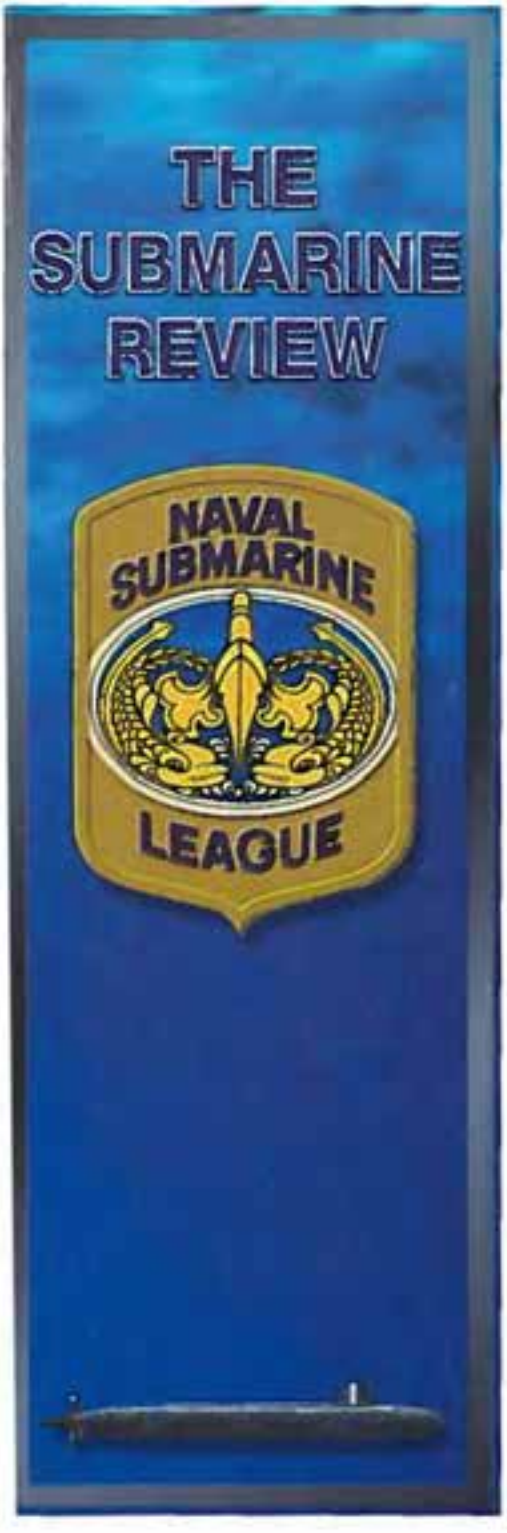
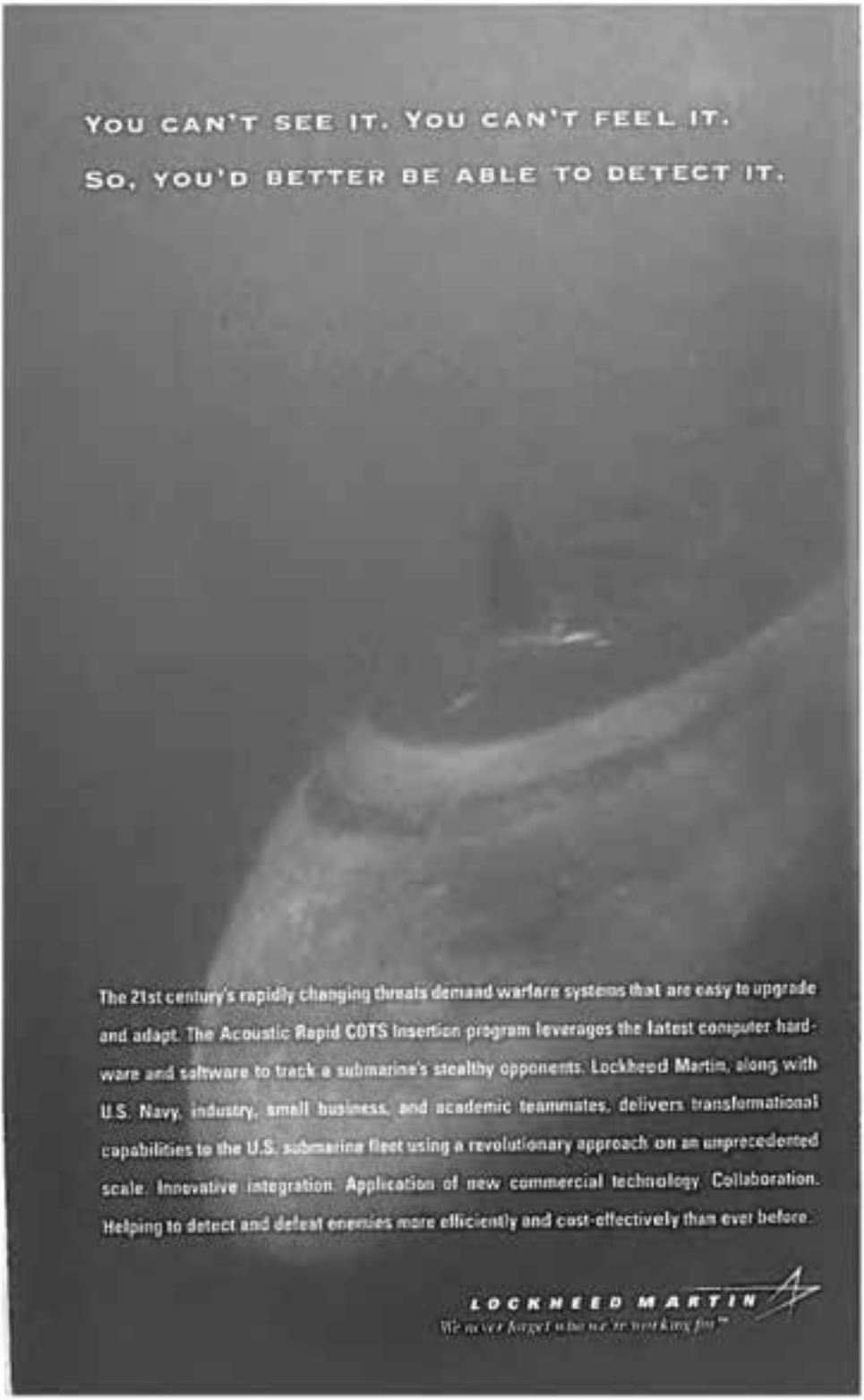


OCTOBER 2003


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

Three of the four FEATURES in this issue of THE SUBMARINE REVIEW concern the recent christening of VIRGINIA, the first of our new class of multi-mission attack submarines. VADM John Grossenbacher, then Commander, Naval Submarine Forces, led off the various remarks by dignitaries with a brief update on submarine performance in the Iraqi War, recognition of the advanced capabilities of VIRGINIA and a call for an increase in the rate of production of this new class. As one of his last public pronouncements as leader of this nation's Submarine Force it was classic Grossenbacher–concise and to the real points to be made. With that speech we lead off this issue.

The second FEATURE is a *tour* of the Virginia-class program by RADM John Butler, the Program Executive Officer (Submarines) and, as such, the man responsible for bringing those boats to the fleet. He describes here the very unique, indeed singular, complete cooperative program between major defense contracting competitors to build this class. In addition, the highly sophisticated design processes, organizational practices and fabrication procedures used to maximize participation at all levels, during all phases, of design, acquisition and integration of ship, systems and components form a model of efficiency and cost consciousness. There is also a fine description of the advances in war fighting capability and mission flexibility due to the introduction of advanced technologies and increased use of modularity. Finally, RADM Butler provides us with some comments on the Virginia-class acquisition profile, or current funding picture, and how/why the submarine Navy recommends a near term, and significant, increase in that funding picture.

Our third VIRGINIA related FEATURE is a piece by Mr. Bob Hamilton, an experienced defense reporter and very knowledgeable observer of the submarine scene, about that christening ceremony (many of us remember when we had *launchings*-but even that event has been over taken by technology) and what the people who spoke said about the people involved. There is a lot of credit due for bringing about this complex construction and at least some of those responsible could be cited at the ceremony.

The fourth FEATURE focuses on a much broader, but still very

much Virginia-class related, topic of interest to the submarine community–the need for a cogent ASW policy, and the programs to support that policy, to be worked on now so we are ready when the requirement for *then-modern* ASW is imperative and urgent. Captain Sam Tangredi has done a precis of Dr. Owen Cote's policy analysis which was prepared for the Naval War College's Newport Paper series. As noted, the Cote paper is not a compendium of technical details but a construct of approaches to a very difficult problem. By using such a logical construct, we may see our way ahead to avoid the pitfalls of the distant past and apply the perseverance of the recent past. Both Owen Cote's original paper and Sam Tangredi's comments give us much to think about.

Two presentations which were given at the Naval Submarine League's Annual Symposium in June could not be included in the July issue of THE SUBMARINE REVIEW due to space requirements, but they are of sufficient interest and importance to warrant this wider publication even at a somewhat delayed date. One is an excellent, near end-of-tour, report on the status of the Submarine Force by VADM John Grossenbacher. There is a lot packed into this status report and for those members who often field questions about submarines, and who like to talk about submarines, this is a must-read source for all the latest information.

The second is, like John Butler's *tour* of the Virginia-class program, a survey of a complete ship program–the SSGN conversions. Captain Brian Wegner's description of the *only other* Submarine Force major ship program is a very interesting, and satisfyingly detailed, overview of just what is going on in this *transformation* from (24) ballistic missiles to (154) cruise missiles and (66) special force troops. Brian outlines the acquisition history, the program schedule and the key participants as well as providing information about the details of the new capabilities. Of equal interest, is the operating concept provided for these boats inasmuch as they **will be in demand as soon as each is completed.** This is much more than just another ship program; it is about a different way to fight wars, and certainly, as the operations of these boats evolve, it will be about a new level of submarine involvement in naval operations, but there will be more on that subject in the January 2004 issue of THE SUBMARINE REVIEW.

In addition to all these high-level, here and now, big-thinking

subjects, this issue has eight ARTICLES of diverse interest ranging from Depth Charges in World War I, through the first and last submarines lost in World War II to a Submarine Tender in Operation IRAQI FREEDOM. And there is as broad a scope in subject matter as there is in historical setting. Captain Jim Patton has a suggestion aimed as much at educating non-submariners about the constraints of submarine communications as it is focused on our internal readiness. Captain Bruzelius of the Swedish Navy has produced some interesting conjecture on early SSBN operations which illustrates what can be put together from non-specific sources, and perhaps reflects a particular Scandinavian concern. It is appropriate here to emphasize that no involvement of USN sources is intimated in confirmation or denial of Captain Bruzelius' hypotheses. In addition, Mr.Joe Buff has continued his examination of submarine vulnerabilities in light of claims in certain quarters that the oceans can be rendered *transparent* under postulated developments in sensors.

There are also five sets of SEA STORIES in this issue and they range from early WWII by Captain Charles Styer through the ending of WW II in a San Francisco liberty by Mr. Erickson to post-war diesel boat ASW ops to a SubRoc shoot and even include one Rickover story. They are all good reads, don't miss them.

To tie this issue up in a neat package we have reviews of five books instead of the normal one or two. It is true that Captain Mickey Garverick has included three of those five in a package treating several recent (or recently republished) accounts of submarine Salvage and Rescue events. This includes a full report on the Robert Moore book A Time to Die , about the KURSK tragedy. The lead book review is highly recommended for all considering participation in the civilian nuclear industry, and even for those already there, and the old timers who have been and retired. RADM Don Hall, himself well experienced in those fields, has reviewed Ted Rockwell's book Creating the New World.

Jim Hay

FROM THE PRESIDENT

The Naval Submarine League is taking an active role in promoting the acquisition of nuclear submarines for the US Navy in the numbers required for national security. A special edition of the *Review* was sent to all members of Congress just prior to their voting on the Defense Authorization Bill. The special edition provided the first four articles from the July *Review*. I trust that the Naval Submarine League contributed to the success in achieving the multiyear procurement of the next five Virginia class submarines.

The big submarine event of the summer was the christening of VIRGINIA (SSN 774) on 16 August 2003. VIRGINIA was the first submarine to be christened in six years. VADM John Grossenbacher provided the attendees with a great state of the Submarine Force message. He made the point that submarine acquisition is on the right course (the VIRGINIA class), but the wrong speed (only one per year)! His remarks are included in this issue along with several other updates on the VIRGINIA class. Mr. Michael W. Toner, President of Electric Boat, recognized the key roll played by two Naval Submarine League members, Admiral Bruce DeMars and Mr. James E. Turner, Jr., in making the VIRGINIA class a reality.

We are making great progress in the planning for next year's symposia. Corporate Benefactor Recognition Days will be 16-17 February 2004. At this event we will recognize those benefactors who have supported the League for over 20 years. So far this year we have added eleven new benefactors with more in the works. VADM George Emery has identified the session chairs and set the theme of our Submarine Technology Symposium (STS). STS will be held 11-13 May 2004. The Call For Papers has been mailed and abstracts are due on 28 October. You can find more information on our webpage. The Annual Symposium is scheduled for 9-10 June 2004. Breakout sessions will be conducted on Thursday, 10 June. RADM Steve Johnson, Director, Undersea Technology, and RADM Mike Sharp, Vice Commander, Space and Naval Warfare Command will support these sessions. The symposium will have a full agenda of Submarine Force Leadership, including our new Force Commanders, VADM Kirk Donald (Commander Submarine Force) and RADM Paul Sullivan (COMSUBPAC). Mark your

calendar for these three events.

RADM Jack Kersh reported to the Executive Committee on his committee's review of League current Programs and Initiatives. We are reviewing his recommendations for improving our overall program for meeting the goals and objectives in our Charter.

This is an exciting time to be associated with the Submarine Force. SSGN put the Submarine Force in the lead of maritime transformation. New missions such as missile defense are being evaluated. The League is supporting the Force by working with members and Corporate Benefactors. We have engaged the new Submarine Force leadership to partner with them in recognizing outstanding submariners. We continue to provide forums to explore and discuss opportunities to use submarines in transformed roles and missions. I recommend that you provide your thoughts in the form of an article for *Review*. I am pleased to represent you in the leadership of our League and look forward to our continued success together. Please recommend membership to your shipmates and friends.

Finally, Jan and I wish you a refreshing fall season and ask that you continue to pray for the safety of our troops deployed around the world.

J. Guy Reynolds

THE SUBMARINE REVIEW IS A PUBLICATION
OF THE NAVAL SUBMARINE LEAGUE

NAVAL SUBMARINE LEAGUE • Box 1146 • Annandale, VA 22003
(703) 256-0891 Fax (703) 642-1615 E-mail: sublague@starpower.net
Web Page: www.navalsubleague.com

FEATURES

VADM GROSSENBACHER REMARKS AT CHRISTENING OF USS VIRGINIA (SSN-774) ELECTRIC BOAT DIVISION GENERAL DYNAMICS CORPORATION, GROTON, CT 16AUG 2003

Our sponsor Mrs. Robb, crew of USS VIRGINIA, distinguished guests, ladies and gentlemen.

I can't begin to tell you how proud I am to be here today as the Commander Naval Submarine Forces.

Last week we celebrated the return home of USS PROVIDENCE and USS AUGUSTA, the last 2 of 12 submarines we deployed directly in support of Operation Iraqi Freedom. Launching over thirty percent of the 800 Tomahawk Cruise missiles fired, rapidly deploying when we needed them, in some cases having just returned from a 6 month deployment, and remaining deployed for as long as nine months, all of our 12 boats, plus the additional 5 we had deployed outside of the Central Command Region, did a great job. And as soon as they had enough time to load food and weapons, they were ready to go again. America has good reason to be proud of its submarines and submariners.

That pride will increase when VIRGINIA enters the fleet next year. The Submarine Force has waited a **long** time for this submarine. It's been six years since we christened our last one, USS CONNECTICUT back in September of 1997. This is in stark contrast to the 3 to 4 christenings per year of Los Angeles class subs in the 1980's. Now, VIRGINIA should be followed by TEXAS in a year, and others following at a rate of one per year. That is good, but not good enough. We're on the right course but not the right speed. To have enough submarines to support our country's future security, we need to be building two

Virginia–class attack submarines a year.

One of the explanations for this slow build rate is cost.

I suspect most here have heard the discussions surrounding the cost of this submarine. In my opinion, if you want the highest performance, most advanced, and most reliable submarine in the world, and we do, it will never be cheap. In addition to the inherent cost for such a capability, some industrial based decisions that have been made, some inflation estimates that were required to be used and some important acquisition decisions have added substantially to that cost. I will leave a detailed accounting of these issues to others. Speaking for our country's Undersea Warriors, the bottom line is that we think VIRGINIA is worth every single penny of the taxpayers dollars, we need her and her sister submarines and we need them delivered faster than we are buying them today.

This submarine is superbly suited for the world we live in and for the foreseeable future. Virginia is designed for undersea, surface and near shore dominance across a broad spectrum of missions. With a focus on the littoral battlespace, the shallow coastal areas, VIRGINIA has improved magnetic stealth, sophisticated surveillance capabilities, and unique Special Warfare enhancements. Although externally she may look like a Los Angeles or Seawolf class submarine, she is very different! She is the most flexible and adaptable submarine we've ever built, and has revolutionary Combat systems and sensors. All an American submariner needs to do is walk into the control room or the maneuvering room, where we operate the propulsion plant on this boat, and it's obvious that this is a very different submarine indeed.

With VIRGINIA's christening today, we will mark yet another milestone in the extraordinary history of improvisation, adaptation, experimentation and transformation that is part of who we are as American Submariners.

If you look at our history, in 103 years we've gone from:

- Little torpedo boats capable of submerging for short periods of time to nuclear powered submersibles that can stay submerged almost indefinitely and roam all the oceans of the world.
- From land attack capabilities consisting of deck guns, then rockets, to Regulus missiles, Polaris, Poseidon, and now Trident and Tomahawk missiles.

- From being able to surface and land small reconnaissance or sabotage teams, to submarines that launch and recover Special Operations Forces while remaining submerged and supporting Intelligence collection, Surveillance and Reconnaissance in the war on terrorism.
- From boats using relatively simple warfighting technology to submarines that can deliver unmanned vehicles of all kinds and employ Information Operations weapons.

Transformation is familiar to submariners and embraced by them; we are now poised for the first time in history to see nuclear submarines achieve their full potential as stealthy general purpose warships.

The on–going conversion of four Trident Ballistic Missile submarines to SSGNs (guided missile submarines) capable in the near term of carrying 154 Tomahawk missiles and a 66 man Special Operations Force, bodes well for the future of the VIRGINIA class, as the VIRGINIA class bodes well for SSGN. With 20 times the payload of an attack submarine, SSGNs will deliver unprecedented stealthy firepower and Special Forces capability today, while serving as our foundation for naval unmanned vehicle development tomorrow.

These unmanned systems will have a huge impact on naval warfare. They will certainly change what submarines do, and how they look. At the same time, new technological advancements already conceived which are possible for VIRGINIA will, if funded, have useful applications in the SSGN program.

The United States has, today, a unique, competitive advantage in Undersea Warfare, an advantage we do not have to the same degree on the oceans' surface, on land, or in the air. Among the other nations of the world few can compete with us. The barriers to being competitive in the world of undersea warfare include: advanced and unique technologies, sophisticated engineering skills and disciplines, unique infrastructure and most importantly, experience.

We should use our competitive advantage to confuse, confound, disrupt, disarm, discourage and, if that's not enough, defeat our adversaries. We should exploit it to its fullest extent not only to command the seas, but to dominate the coasts, littorals, and indeed far inland. This competitive advantage offers the opportunity not

for marginal superiority, but for warfighting dominance. It is one of our great military opportunities, in this post-cold war world, to deter or prevent war and enhance stability.

VIRGINIA and her sister ship's will contribute to our maintaining this competitive advantage and advance our opportunity for dominance.

Ladies and gentlemen, I ask you to pause and think about this ship, her future and all who will sail in her. Captain Kern and this fine crew will do their utmost to finish building her, testing her and taking her to sea for the first years of her service to show all of us what she can do.

Other crews, other submariners will follow and take her through the oceans of the world, fighting the war on terrorism certainly, preparing the battlespace and providing the U.S. and U.S. Navy an important competitive advantage in other wars almost certainly as well.

So, on this 16th day of August, 2003, the day of the Christening of USS VIRGINIA (SSN 774), it is appropriate for us to reflect upon her future and express our wishes for her and her crews with this verse of the Navy Hymn:

O Father, King of earth and sea,
We dedicate this ship to thee.
In faith we will send her on her way;
In faith to thee we will humbly pray:
O hear from heaven our sailor's cry
And watch and guard her from on high!

Thank you.■

VIRGINIA: THE SILENT LEADER FOR THE 21st CENTURY NAVY"

Rear Admiral John D. Butler, USN
Program Executive Officer (Submarines)

"In the name of the United States I christen thee VIRGINIA." On 16 August 2003, Lynda Johnson Robb, daughter of President Lyndon B. Johnson and wife of former U.S. Senator Charles S. Robb, spoke these words and formally named the lead ship of a new and transformational class of submarines for the United States Navy. VIRGINIA (SSN 774) Class submarines will be the quietest, most technologically advanced, most capable submarines ever built. VIRGINIA was designed from the outset to be versatile, at home in the open ocean as well as the littorals. These submarines are the future of the Navy's underwater force and they will successfully meet and adapt to the new and changing threats of the 21st century. They will be key elements of the CNO's Sea Power 21 concept and a primary enablers of ForceNet. Not only will her warfighting capabilities set the standard for the future of Naval warfare, but with her unique design process and procurement strategy, she will set the standard for the future of Naval shipbuilding as well.

LOS ANGELES (SSN 688) Class's original replacement, SEAWOLF (SSN-21)–Class, was designed to do everything LOS ANGELES could do, but better. However, despite being the best blue-water Anti-Submarine Warfare submarine in the world, the program was truncated after the authorization of only three SEAWOLFs. The decision to halt the SEAWOLF program afforded the submarine community an opportunity to go *back to the drawing board*, and design an entirely new class of submarine with the versatility to meet the rapidly changing threats of today's world and adapt to advances in technology.

Unique Design Process

To design the submarine, the Navy formed an Integrated Product and Process Development (IPPD) group. This group was comprised of submariners, naval engineers, and industrial partners–almost everyone who would play a part in a VIRGINIA–Class submarine, from design to decommissioning. Engaging all of VIRGINIA's stakeholders from the outset fostered an atmosphere of communication and allowed all members of the group to voice their opinions. Consequently, those involved in VIRGINIA's development have a better understanding of the concerns of the other contributors, the result being that we have been able to provide the U.S. Navy with the best submarine in the world.

The IPPD group worked to determine exactly what capabilities VIRGINIA needed, and decided on the best way to go about providing those capabilities. The new design would be cheaper than SEAWOLF, with capabilities focusing on stealth and the ability to operate in the littorals while performing a wide variety of missions, including Anti-Submarine and Anti-Surface Warfare, Strike, Special Operations, and Intelligence, Surveillance, and Reconnaissance.

VIRGINIA is the first warship designed entirely by computer. State of the art Computer Aided Design (CAD) and Computer Aided Manufacturing (CAM) drastically curtailed the use of expensive wooden mock-ups and reduced the number of design changes by over 90% compared to SEAWOLF. The design effort for the lead ship, VIRGINIA, is over 99% complete. The entire Navy is now leveraging the lessons learned during VIRGINIA's design process.

New Technologies, Increased Adaptability, and Improved Warfighting Capabilities

The VIRGINIA Class will utilize innovations and revolutionary new technologies that will greatly increase its capabilities over any previous class of submarine. One of these is the Command, Control, Communications, and Intelligence (C3I) system. The C3I system is an open, distributed, real-time networked system that integrates formerly stand-alone subsystems such as sonar, radar, combat control, and navigation. This integrated system makes extensive use

of Commercial-Off-The-Shelf (COTS) hardware and software, as well as an Open Systems Architecture (OSA). With the OSA approach, the Navy can more readily upgrade its software and processors to meet emergent needs or introduce new technologies as they become available.

The C3I system mostly resides on the Command and Control System Module (CCSM) and was installed and tested at the Command and Control System Module Off-hull Assembly and Test Site (COATS) in Groton, Connecticut. COATS allowed all the non-propulsion electronics systems to be completely tested, and even upgraded, two years prior to this module being end-loaded into the submarine hull. Thanks to COATS, the Command and Control system, for the first time in the history of submarine construction, was not the limiting path in the construction schedule. COATS has also proven useful in operational and developmental testing.

VIRGINIA's Ship Control System will be unlike anything currently in the Navy, with the possible exception of the control system used in modern naval aircraft. VIRGINIA's designers chose to dispense with hydraulics and yokes in favor of fly-by-wire technologies and touch-screen panels that control depth, speed, course, and angle amongst other commands. Because of these improvements, instead of having three sailors on duty at any one time to drive the submarine, VIRGINIA will have two–one to control the ship and the other to act as backup. In fact, through technological and design improvements, VIRGINIA will have 27 fewer watchstanders than LOS ANGELES Class submarines–dropping from 105 aboard LOS ANGELES (SSN-688)–Class submarines, to 78.

To help VIRGINIA's crewmembers get up to speed on this new technology, we developed a Ship Control Trainer for VIRGINIA, which was delivered to Groton in September 2002. This full-up trainer, built on gyros to provide a realistic training environment, will prepare our sailors for driving the ship more thoroughly than ever before.

Another major advancement found aboard the VIRGINIA Class is her revolutionary telescoping, non-hull-penetrating, Photonics mast. The Photonics mast replaces the traditional periscopes with color, high-definition black and white, and infrared cameras that are linked via fiber optic cables to computer workstations in the Control

Room. Removal of hull-penetrating periscopes allowed for increased flexibility in VIRGINIA's design. Since the periscopes no longer link the sail and the Control Room, the placement of both could be optimized. The sail was moved forward for improved hydrodynamics, and the Control room moved aft and down one deck where there was more available space, affording a more utilitarian design. Now, Combat Control, Sonar, Ship Control, and Navigation stations all reside in a single space with multiple large-screen displays allowing the submarine's Commanding Officer the unprecedented ability to monitor all aspects of the battlespace simultaneously.

Also planned for VIRGINIA, and destined for installation aboard all in-service submarines, is the Common Submarine Radio Room. Utilizing COTS components, the Common Submarine Radio Room will keep our systems at the cutting edge of technology. The Common Submarine Radio Room is also interoperable with the Command, Control, Communications, Computers, and Intelligence (C4I) infrastructure and other communications systems. It not only offers easier upgrades to out-of-date systems, but, once installed aboard all in-service submarines, will also allow sailors to transition from one submarine class to another and still have familiar and up–to–date systems. This standardization effort will help to ensure that every U.S. submarine has the best, most affordable, easily upgradeable, state-of-the-art communications systems– a requirement of Sea Power 21's ForceNet initiative.

Another of VIRGINIA's key improvements involves the sonar suite, which is optimized for the littoral environment where mine detection and avoidance are crucial. The ship's Spherical Active/Passive Array, the Lightweight Wide Aperture Array (LWAA), which is optimized for detecting quiet diesel-electric submarines, and the TB-29(A) Thin-Line Towed Array make up the heart of the sonar suite, while a sail and chin-mounted high-frequency active array complete the system. With the addition of the improved processors and software, VIRGINIA has the world's most capable blue–and littoral–water sonar system.

VIRGINIA will be a primary enabler of ForceNet, a central component of all future naval warfare. It will link our people, platforms, sensors, and weapons together to form a complete tactical picture of the battlespace. It will also permit secure communications

between our forces and those of our allies, an essential component in modern naval warfare. Through ForceNet, VIRGINIA will communicate with strike groups, troops ashore, planes in the air, and UUVs and UAVs operating in contested territory. Because they offer a non–provocative, covert forward presence, whether in the littorals or the deep ocean, VIRGINIA-Class submarines will be able to collect and disseminate intelligence to any follow-on forces through the photonics mast and associated ISR systems.

VIRGINIA will have a substantially greater weapons load-out than the LOS ANGELES Class. VIRGINIA can carry 38 weapons vice Improved LOS ANGELES Class' 34, including heavyweight torpedoes and Tomahawk Land-Attack Missiles (TLAMs). Twelve Vertical Launching System (VLS) tubes and four 21-inch torpedo tubes enable VIRGINIA to launch salvos of up to 16 missiles. With slight modifications, the VLS will also be able to launch future payloads such as Unmanned Aerial Vehicles (UAVs) and Unmanned Undersea Vehicles (UUVs). The torpedo tubes can also double as launch and recovery points for UUVs, such as the Long-term Mine Reconnaissance System (LMRS)–currently scheduled to enter service in 2003 (one year prior to VIRGINIA), or could be used for the deployment of UAVs, if tube-launched versions are developed.

A submarine's greatest asset has always been its stealth. VIRGINIA will have SEAWOLF's stealth and be quieter at 25 knots than a LOS ANGELES is pier-side. This not only makes it an ideal Anti-Submarine and Anti-Surface Ship platform, but it also makes the ship attractive to Special Operations Forces (SOF). From the beginning, VIRGINIA was designed to meet SOF needs, especially those of the Navy SEALs. Thanks to the ship's Reconfigurable Torpedo Room, VIRGINIA can carry ten percent more Special Operations Forces than LOS ANGELES for fifty-percent longer because the SEALs will have their own berthing, mission planning and equipment stowage space, and physical fitness area inside the torpedo room. This is accomplished by removing the torpedo storage trays and erecting a series of bunks in their place. The Reconfigurable Torpedo Room will make both the SEALs and the submarine's crew less cramped and therefore better able to remain mission-focused.

Navy SEALs will also benefit from the fact that VIRGINIA was designed with an integrated Lock-in/Lock-out chamber built into

the hull. This chamber can allow direct access to the sea or to a mated Dry Deck Shelter (DDS) or an Advanced SEAL Delivery System (ASDS). The DDS provides SEALs with a compartment outside the submarine to store equipment such as the SEAL Delivery Vehicle (SDV), and a place for combat swimmers to ingress and egress. ASDS, a 65-feet, 60-ton combat submersible, allows SEALs to ride to a staging point aboard VIRGINIA, then transition to ASDS to get to their objective in secrecy. Currently, SEALs must rely on SDVs that require them to use SCUBA gear as they are open to the water, are slower, and a have shorter operational range than ASDS. In contrast, ASDS will get the operators to their objective in a warm, dry, one-atmosphere compartment, while eliminating most of the physically demanding aspects associated with SDVs. ASDS will also help enable ForceNet thanks to its advanced communication systems and ability to act as a forward-deployed node, able to go where other manned assets cannot go.

One of VIRGINIA's most important innovations is her increased modularity. The Navy is working on future improvements that will make her an even more potent warfighter. Progress has already been made with the Composite Advanced Sail, which will be adaptable to new payloads, and modular payload plugs, which may allow us to switch some modules simply by hooking and unhooking cables. Soon, mission-specific, self-contained hull modules could be designed, engineered, and inserted into future submarines–both during construction and even pier-side prior to deployment–to expand VIRGINIA's capabilities in numerous mission areas. VIRGINIA's modular construction is the key to the Class' future. Not only will the Class be able to easily and readily accept material upgrades, but it also allows designers to change the ship's configuration to accommodate next-generation payloads.

These improved capabilities, new technologies, and increased adaptability will deliver battlespace dominance in both blue water and the littorals, and make the VIRGINIA Class submarine an indispensable part of all phases of the CNO's Sea Power 21 concept for 21st century naval warfare. This concept includes offensive capabilities–"Sea Strike"; defensive capabilities–"Sea Shield"; and the ability to project U.S. sovereignty on the high seas–"Sea Basing."

The Road Ahead

Since September 11, 2001, submarine missions have increased by 300 percent. The need for these submarines is as strong today and as it ever has been and is not projected to diminish. Today, the Navy has 54 fast-attack submarines, and with the LOS ANGELES (SSN 688) Class submarines nearing the end of their service life, the number of attack submarines could dip as low as 28 if we continue to build only one ship per year. Therefore it is imperative that we start building more than one ship per year as soon as possible. This helps maintain the required attack submarine force level and, combined with multi-year procurement, significantly reduces the unit price of these valuable assets. This is the right way ahead for the Navy, the shipbuilding industry, and the American taxpayer.

Unlike other industries, submarine builders do not have a commercial market. Many of the components that go into submarines are unique and have no other use. Because the Navy cannot guarantee our shipbuilders and their suppliers consistent business, ship set costs are inflated as the manufacturers have to re-tool once a year to build a single component, and that is an expensive undertaking. The companies, too, cannot take the financial risk to build multiple ship sets in the hope that the Navy will order all anticipated submarines.

To help the Nation's shipbuilding industrial base remain strong, the Shipbuilders formed a unique, Congressionally–authorized teaming arrangement that brought General Dynamics' Electric Boat and Northrop Grumman's Newport News Shipbuilding together to build the VIRGINIA Class. With only one submarine being built per year, competing contract awards between the two companies would risk diminishing the level of expertise at the shipyards. The teaming arrangement is reaping great benefits for the Nation by retaining the people who have the specialized skills needed to build submarines.

On 14 August 2003, the Navy signed a block buy contract for six submarines from Fiscal Year (FY) 2003 to 2007. The contract stipulates that the Navy will order one VIRGINIA in FY 2003, and that it has the option to order one submarine each subsequent year until 2007 when the build rate is slated to go to two submarines

per year.

The current contract is an innovative step towards controlling shipbuilding costs in this unique environment. It provides both positive incentives to underrun the target cost and reduces the profitability if the target is exceeded through a novel mix of incentives, cash-flow provisions, and cost-sharing ratios. However, there is a smarter and more efficient way to build submarines: taking advantage of economies of scale and the discounts realized when shipbuilders have a stable work outlook by pursuing a multi-year procurement strategy with Economic Order Quantity funds.

The new block buy contract allows for the Navy to enter into a multi-year Procurement arrangement in FY 2004 for up to seven FY 2004 through FY 2008 submarines should Congress provide authorization. Multi-year procurement will allow our industrial partners to build multiple ship sets because the Navy would commit to ordering all of the submarines stated in the contract and doing away with having to exercise the yearly option. This strategy would provide extensive cost savings of a minimum of $80 million per hull for 5 submarines and as high as $155 million per hull for 7 submarines. Instead of suppliers building one ship set a year, they would be able to build multiple sets at one time, thereby lowering the per-unit cost. This approach would also maintain the level of expertise needed within the industrial base, as our low build rate has forced many suppliers to move into other business avenues. Saving the taxpayers millions of dollars per ship and ensuring the continued viability of the few companies still fabricating submarine-specific components in an efficient and cost effective manner is right for the Navy, and right for the Nation.

The multi-year options do have a means by which the Navy can opt out of buying one of the two ships in FY 2007, one of the two ships in FY 2008, or both. If Congress or the Navy deems that it is in the Nation's best interest not to order two VIRGINIAs in FY 2007 or FY 2008, the Navy has until January 2006 to execute an option that would cancel the ships and increase the price for the remaining submarines. However, any material purchased for the cancelled ships would not be wasted. Instead, they would go aboard a future VIRGINIA Class submarine.

CONCLUSION

VIRGINIA will be the heart of the U.S. submarine fleet for decades to come, able to adapt to meet future requirements. From design, to construction, to float off, this new class of submarine has been one of the Navy's silent transformational leaders. From her all-computer design, to her revolutionary Photonics mast, Command and Control Systems Module, and her state-of-the-practice COATS facility, VIRGINIA has been breaking new ground. Once commissioned, VIRGINIA will demonstrate her expanded operational capabilities and prove that she is the stealthiest, most capable submarine in the world. All we need is the green light to start building them in the numbers we truly need and at the fairest price to the American people.■

A VIEW OF VIRGINIA'S CHRISTENING

by Robert A. Hamilton

USS VIRGINIA was christened on a slightly overcast day this summer in a ceremony that was familiar to anyone who has spent time around a shipyard. The red, white and blue bunting on the speakers' platform. The 375 ml bottle of Korbel brut champagne smashing against the hull. The sponsor, Lynda Byrd Robb, the daughter of former President Lyndon Johnson and wife of former Virginia Senator Charles Robb, used the same words used on almost 200 other nuclear submarines: "In the name of the United States, I christen thee VIRGINIA. May God bless her and all who sail in her."

But VIRGINIA represents a dramatic change in the way ships are built, the way they will be operated, and the way they will be maintained over the years. From the day that Electric Boat Co. in Groton began the design 12 years ago, everything about the process has changed. The christening of the SSN 774 marks a new era in undersea warfare.

At 377 feet long, displacing 7,835 tons and capable of carrying 40 weapons, commandoes and a variety of associated gear, this new class of submarine will represent the most robust platform for fighting in near-shore water the Navy has ever put to sea, and it has been designed to accommodate new technology quickly and easily. "America has good reason to be proud of its submarines, and its submariners," said Vice Admiral John J. Grossenbacher, who at the time of the ceremony was Commander, Naval Submarine Forces. "That pride will increase substantially as the VIRGINIA enters the fleet next year. The Submarine Force has waited a long time for this submarine."

He noted that over the last half-century submarines have evolved from being limited to torpedoes and deck guns to having cruise missiles that can strike targets 1,000 miles inland, and the ability to launch and control aerial, surface and undersea drones. Their role in special warfare operations has also increased significantly as the capability to deploy commandoes while still submerged has developed, an ability that will reach its peak with VIRGINIA. And VIRGINIA will be able to participate in network centric warfare

better than any previous class. "We are now poised for the first time in history for submarines to reach their full warfighting potential," Grossenbacher said. U.S. submarines, he said, hold an unprecedented edge in undersea warfare anywhere in the world. "We should use that competitive position to confuse, confound, disrupt, discourage, and when that's not enough, to defeat our enemies. This platform offers the opportunity not just for marginal superiority, but complete warfighting dominance."

Acting Navy Secretary Hansford T. Johnson said VIRGINIA represented "a giant leap forward in capabilities," with its design driven by the needs of the Navy in the coming century. He said the partnership between the Electric Boat shipyard, where the VIRGINIA was assembled, and its partner Northrop Grumman Newport News Shipbuilding in Virginia, where most of the front end of the ship took shape, worked out as well as the Navy could have hoped. "They, together, have truly built a state-of-the-art platform that will assure our submarines can dominate the seas for decades to come," Johnson said. But the value of any Navy ship in history has been vested in its crew, said U.S. Senator George Allen, R-Va., who predicted VIRGINIA skipper Captain David J. Kern and his 132 men will bring honor to the Virginia name. He recounted the tale of John Paul Jones who wanted a fast ship because he intended to sail it into harm's way.

"The reality is, USS VIRGINIA will go into harm's way, and it will bring with it the technology it needs to do the job, and the people with the courage to do the job. Captain Kern and his crew represent the best of America," Allen said. "We are the land of the free because we are the home of the brave."

Rhode Island Senator Jack Reed, whose district includes the EB plant at Quonset Point, R.I., where all hull sections for Virginia-class submarines are made, said he rests easier knowing the young sailors standing on the deck of the ship have been well trained, and knowing how much care went into the ship's manufacture.

"We are certain they will never fail us, and this ship will never fail them," Reed said.

About 7,500 people crammed onto the EB waterfront for the August christening ceremony, which marked the end of a long dry spell for the shipyard. Michael W. Toner, president of the Marine Systems division of EB parent company general dynamics, noted

that VIRGINIA rolled out of the building shed six years to the day after the last ship to emerge, USS CONNECTICUT in 1997.

Toner said former EB President James Turner reorganized the company starting in 1988 to survive the low-rate production of the 1990s, and then in 1991 completely overhauled the design process for the Virginia class.

Instead of having designers complete the blueprints and turn them over to the shipyard workers, the trades experts were invited in to provide advice on how to make the design better. So were the people who will operate, maintain, and eventually commission the ship.

"Everybody who will come to touch the ship at any point in its life would have a say in its design," Toner said. In addition, Turner decided that VIRGINIA would become the first ship designed entirely on computers, and enforced that decision by removing all drafting boards in one weekend, forcing designers to learn the software to design ships.

"We knew there had to be a better way through technology, and we decided we would find it – and with lots of help, we did," said Turner on the day of the christening. "Now, as you can see with the testimony before you, the vision was right."

Retired Navy Captain David Burgess, who was the first VIRGINIA-class program manager, and his successor, Rear Admiral Paul Sullivan, won kudos from the company for accepting the innovations that EB proposed.

"These guys took on the sacred cows, and slayed them whenever they could," Toner said.

Burgess said no first-of-the-class nuclear submarine was ever delivered with so few problems, thanks to that design-build process that EB pioneered for warships.

He noted that more than eight years ago, before the detailed design work started, long before the first steel was bent for the hull, the Navy set a schedule that would see the ship commissioned by this year. Every goal was met or exceeded, he said.

"For a lead ship, that is absolutely an unprecedented achievement," Burgess said. "It gives you goosebumps."

"There's almost always something that goes wrong, and from what I've heard there were some things that did not always go as we planned for VIRGINIA, but the team has pulled together every

time," Burgess said. "They've done a little re-engineering here and there, but they basically did not miss a step. They made it look so easy, but I don't think most people have an understanding of the complexity of this undertaking. VIRGINIA is arguably the most complex thing that man has ever built."

And the shipbuilders said it was done better than ever before. On commissioning day, VIRGINIA was 91 percent when the water started flooding in and the hull floated off, the most complete any ship has ever been at that point in the process, Toner said. He predicted VIRGINIA will be delivered to the Navy about 41 weeks from christening, compared to the best-ever record of 47 weeks for a Los Angeles class boat.

Toner said VIRGINIA contingent at the christening was the largest ever from a namesake state, no doubt the result of the unique teaming arrangement reached with Newport News (Va.) Shipbuilding in 1997 to co-produce the Virginia class.

EB builds the command and control module, engine room and the main propulsion unit for each submarine in Groton, while the pressure hull sections are made in Rhode Island. Newport News builds the bow, sail, stern, living quarters, auxiliary machine room, and weapons handling module. Final assembly alternates between Groton and Newport News. With four ships underway — next year, Newport News will christen the Texas, the following year EB will christen the Hawaii, and so on.

"I never came close to predicting how well this would work," said Newport News President Thomas C. Schievelbein. "It has been absolutely phenomenal."

He noted that Connecticut, Virginia and Rhode Island were three of the original 13 colonies, known for their pioneers, "People who were not afraid to push the envelope of possibility." And USS VIRGINIA shows that spirit continues today, he said.

U.S. Rep. Edward L. Schrock of Virginia, a retired Navy captain and a member of the House Armed Services Committee, said the partnership between the two shipyards has strengthened the Navy and the nation, and he looked forward to it lasting "many, many years to come."

Toner said all the lessons from the Trident and Seawolf programs guided the shipyards as they developed more than 10,000 detailed drawings that comprise VIRGINIA plans. An example of how

advanced the design is: USS NAUTILUS, the first nuclear submarine, had to be refueled after two years; VIRGINIA carries a reactor core that will last its entire 33-year life.

VIRGINIA has also made extensive use of commercially available technologies to reduce costs. The combat system for the USS SEAWOLF, for instance, cost $1.2 billion; VIRGINIA's system cost one-sixth that amount, and will bring seven times the processing power to sea, and it can be *refreshed* so easily that its first major upgrade is planned for its post-shakedown availability repair period, in 2005.

Senator Allen observed that there have been eight other Navy warships bearing the name of his home state, most of them establishing the standards for the rest of the fleet. One of the first frigates authorized by the Continental Congress bore the Virginia name, and helped establish the United States as a maritime power. Virginia the ironclad of the Civil War era helped establish a new era in naval warfare, the battleship VIRGINIA was part of Teddy Roosevelt's "Great White Fleet" in the pre-World War II era, and the guided missile cruiser VIRGINIA helped fight Desert Storm, the first Persian Gulf War in 1991. He said he expects similar historic achievements by the latest USS VIRGINIA.

"We christen a submarine that will help assure the United States Navy's undersea supremacy well into this century," Allen said.

Several of the speakers also noted that while it was encouraging that the Navy is finally back in the business of christening submarines after a six-year hiatus, the fleet needs to get production up to more than one per year, which is all that is planned for at least the next four years.

"That's good, but it's not enough," said Vice Admiral Grossenbacher. "We're on the right course, but not at the right speed ... we need to get to two a year." The audience of EB workers and supporters responded with enthusiastic applause.

Admiral Frank L. "Skip" Bowman, the head of Naval Reactors, who was a platform guest but not a speaker, was similarly forthcoming during an interview after the ceremony.

"We need, as Admiral Grossenbacher said, to get to two a year as soon as possible," Bowman said. "And we absolutely need this submarine in the worst way right now. There is no question that this ship is needed today, and we need to get out there as quickly as

possible."

VIRGINIA will be put into commission next year after work is finished and it has undergone sea trials.

Grossenbacher observed that during Operation Iraqi Freedom the Navy had 17 submarines at sea, 12 that took part in combat and five more keeping a watch on other potential trouble spots. Some of those boats deployed right after they had returned from six-month missions, and some of them were extended on station for as much as three months beyond their normal six-month deployment.

Submariners are growing increasingly worried about the ability of the force to sustain the pace of operations that has been demanded of them, and the new Seapower 21 plan promulgated by the Chief of Naval Operations, Admiral Vern Clark, will likely demand even more of submarines.

Admiral Bowman noted that submarines are going to play a key role in all three themes of Seapower 21: Sea Strike, using its precision guided missiles for offensive operations; Sea Shield, using its advanced sensors to detect threats and employing its weapons to protect friendly forces; and Sea Base, using its inherent stealth to provide a command and control platform in areas where surface craft might be at too much risk.

"In denied areas, submarines may be the only platform that can get in and out safely at any time," Admiral Bowman said.

Admiral Bowman said opponents of boosting the rate of submarine production claim that VIRGINIA is an untried design, and the Navy and its shipbuilders need more time to work out the bugs in it.

But Admiral Bowman said VIRGINIA is being built in a more modular fashion than any previous ship, so that each module is fully tested before it is installed in the ship. Sea trials on VIRGINIA will be more to validate the initial results than to gather test data, because it will be the most fully tested ship ever to go to sea for the first time. "Unfortunately, some in Washington are missing that point," Admiral Bowman said. "They don't understand how much testing has already gone on. We think VIRGINIA is worth every single penny of the taxpayer's money that will be spent on it. We need her, and we need every one of her sister ships, and we need them faster than we're buying them today."■

A REVIEW of Dr. OWEN R. COTE's
THE THIRD BATTLE: Innovation in the U.S. Navy's Silent Cold War Struggle with Soviet Submarines

Newport Paper 16, Newport, R.I. Naval War College Press, 2003
reviewed by Captain Sam Tangredi, U.S.N.

Editor's Note: The subject of this War College Paper is considered important enough to the readership of this magazine to include here as a Feature, instead of with other Book Reviews, these knowledgeable and thought provoking comments by Captain Sam Tangredi, a frequent contributor to THE SUBMARINE REVIEW and himself a holder of a PhD in International Relations. Dr. Cote is Deputy Director of the Security Studies Program at the Massachusetts Institute of Technology's Center for International Studies.

It is not the richness of detail that makes The Third Battle the best short, unclassified summary of the anti-submarine efforts of the United States throughout the Cold War struggle against the Soviet submarine fleet. The details themselves still remain classified. Rather, it is the analytical framework that this monograph provides, first by dividing the history of submarine and anti–submarine warfare into three *battles*, and then by analyzing the Cold War anti-submarine struggle in terms of four *phases*. In short, this book makes historical sense of the operational nature of anti-submarine warfare, and, in doing so, points to the spirit of innovation that was a constant feature of U.S. submarine/anti-submarine operations.

Dr. Cote is well known to readers of THE SUBMARINE REVIEW as one of the premier outside–of–the–Navy scholars of submarine operations as an element of national strategy. [Editor's Note: In fact, he provided (with Dr. Harvey Sapolsky) a short summary of his overall, larger project on naval innovation in the July 1997 NSR.] And he does provide rudimentary descriptions of the systems and techniques of anti–submarine warfare. But the book is not a catalog of systems, submarine classes, or operational tactics. Nor is it by any means a history of the technical development of the Submarine Force. Unfortunately, there is no index, so I cannot easily verify the fact, but I don't recall encountering the name Rickover even once in the text. But what the reader does encounter

is the logic behind the decisions on how ASW was conducted—such as why the submarine replaced the surface ship as prime ASW asset, why the U.S. had considerable early success in tracking Soviet submarines, why the U.S. issued a declaratory strategy that implied we would crack the Soviet SSBN bastions, and why the Walker spy ring's treachery and the sale of the Toshiba nine-axes milling machine were major blows to our efforts.

The *first battle* of the analysis is the submarine campaign of the First World War. Cote briefly identifies the features of nascent anti-submarine warfare and what worked: convoys, the mass production of convoy escorts, initial efforts at sonar (ASDIC), and HF direction finding—which the author characterizes as *brute force* techniques. The Allies literally could flood the datums with surface ships. Yet, if the size of the German submarine fleet could have kept pace with the Anglo-American ASW effort, the Reichsmarine just might have won.

What was needed for the *second battle* was a coherent anti-submarine warfare doctrine that moved beyond mere attrition and allowed the submarine to maximize its potential as the ultimate sea control platform. As Cote points out, German Admiral Karl Doenitz—starting from the loser's vantage point—studied this problem during the interwar period and developed a doctrinal solution that could be implemented by a numerically inferior submarine force: wolf-pack operations. In contrast, the British put their faith in technological improvements in ASDIC, but did not develop an innovative or comprehensive doctrine for ASW. Since wolf-pacts were intended to conduct attacks while surfaced, improvements in ASDIC were not the optimal counter. Thus, by 1942, losses of Allied merchant vessels exceeded their speed of production. It was the additional weight of American assets, combined with improvements in patrol aircraft radar, and a little help from Ultra, that suppressed the wolf-pack threat, not a sound initial ASW doctrine.

From these examples, Cote makes two conclusions: (1) that doctrine, rather than technology alone, is the key to ASW success, and (2) that winners do not have the incentive to develop innovative doctrines. But when Cote gets to his analysis of the *third battle*—the Cold War submarine war—he is struck by the fact that the Second World War winner (the U.S. Navy) did indeed work hard to develop an ASW doctrine. He notes that even before the Soviet Navy

embarked on an expansive submarine building program, then CNO Admiral Chester W. Nimitz had already identified ASW as a mission area for the Navy "equal in importance to dealing with the threat of atomic attack." Cote attributes this to the U.S. Navy's realization that the German Type XXI diesel–electric submarine would have invalidated much of the Allied ASW doctrine had it appeared at sea in great numbers. With the Type XXI now in the hands of the Soviets as well as the Americans and British, the potential submarine threat appeared poised to outpace ASW capabilities.

How the U.S. proceeded to tackle this threat, continually working to improve both technology and doctrine is the main focus of Cote's monograph. In breaking the third battle into four phases–roughly corresponding to "four major steps forward in Soviet submarine design," Cote gives the struggle a logical evolution that even its participants might find hard to articulate.

The first phase (1945-1950), which was initiated by the expectation of Soviet adoption of the Type XXI, marked the development of *both a new sensor and a new platform*: passive acoustic sonar arrays and the ASW submarine (SSK). This was truly a turning point in the history of the submarine force because it is then that the submarine first became the primary ASW platform. Sonar became the primary detection method because post-war exercises indicated that the Type XXI was very noisy while snorkeling. The Hartwell Report concluded that aircraft radar detection, the previous prime method, would eventually lose the "radar-vs.-submarine contest." At the same time, the discovery of low frequency propagation in the deep sound channel prompted the initial development of SOSUS.

The second phase (1950-1960) consisted of *the two nuclear revolutions* for the sub force: weapons and propulsion. Trials by USS Nautilus indicated a monumental change in the ASW equations—subs were now very fast and effectively undetectable by radar. Passive acoustics now became the dominant tool, along with an effective doctrine that combined submarines, air– and surface–deployed sonobouys and SOSUS into an effective ASW triad. Meanwhile, sub hulls were being optimized for ASW, both for strategic and tactical purposes. Cote concluded that the U.S. Navy had "effectively preempted" the Soviet submarine threat.

This preemption continued into the third phase, *the happy time*

of ASW (1960-1980), when the entirety of the U.S. fleet held corresponding responsibilities in the joint ASW mission. A wealth of ASW assets was developed to complement the submerged ASW force, such as HS squadrons, LAMPS, and ASW frigates. Submarine ASW capabilities improved while the U.S. maintained its lead in quieting. ASW was naval job one.

But the *happy time* was followed by a fourth phase, in which Soviet subs achieved *acoustic parity* (1980-1990). According to Cote, the Maritime Strategy was the doctrinal counter to the increasing ASW threat.

Of course, the Soviet Union collapsed amidst the fourth phase which leads Cote to speculate on the nature of the future post—Cold War *fourth battle*. Cote identifies new ASW systems even as he acknowledges that ASW was no longer job number one for U.S. naval forces. Will that lead to an upcoming ASW failure in the next global conflict? Cote makes no conclusion, but emphasizes the absolute need for current strategists to study how the U.S. stayed the course of revolutionary ASW development following its past (Second World War) victory.

The Third Battle is an excellent study for the re-launch of the Naval War College's Newport Papers series. Without overloading the reader with technical detail, it helps operational ASW make historical and strategic sense. If the Naval Submarine League is not ensuring its further distribution to decision–makers and the academic world, it is surely missing the boat.■

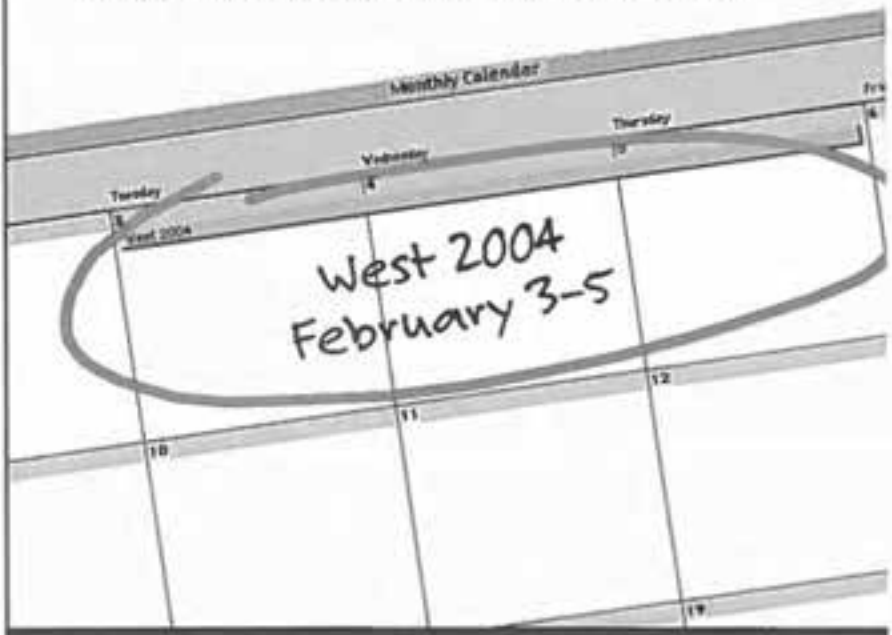
U.S. Navy submarines have always been major strategic and tactical assets. And now with the application of transformational technologies, their impact is growing. Soon each SSGN will carry up to 154 cruise missiles, and will have the ability to launch and retrieve UUVs and UAVs that will see, hear, and touch terrain far inland. Critical covert operations will be more effective than ever. Not only can a single submarine change the outcome of a conflict, it can alter the need to begin one. For more, visit gdeb.com.

GENERAL DYNAMICS
Electric Boat
Stealth starts here.

Mark Your Calendar!

WEST 2004

February 3–5, 2004 | San Diego, CA Convention Center



The largest event on the West Coast for communications, electronics, intelligence, information systems, imaging, military weapon systems, aviation, shipbuilding, and more. This is a one-of-a-kind forum featuring the people you need to hear from, the products and services you need to do your job, and the critical issues of today and tomorrow.

February 3-5, 2004 • San Diego, CA Convention Center

More information will be available at **www.west2004.org**

ANNUAL SYMPOSIUM

VADM John J. Grossenbacher, USN
Commander, Naval Submarine Forces
Remarks at 2003 Naval Submarine League Symposium
Report from the Submarine Force Senior Commander
11 June 2003

It's my pleasure to be here. This is the third year in a row now for me and this will be my last briefing here as Force Commander. A lot of you know Rear Admiral Kirk Donald will be relieving me on the first of August. I'm very pleased to have it be Kirk. He's an exceptional officer and a great guy. I couldn't have picked a better person to relieve me. I can't imagine a better job in which to finish a career in the Naval Service than being a Submarine Force Commander. I was thinking about it the other day. It comes the closest to being the Commanding Officer of a submarine than any other job I've ever had. It's been a privilege to have this job.

I have to tell you, over three years I've grown to understand better the importance of the Naval Submarine League and the industry people, interested supporters and retired submarine leaders that the Naval Submarine League brings together for us. Thank you all for what you've done, what you continue to do, and what you will do in support of our Navy and specifically our Submarine Force in the future.

I've always viewed this presentation as a State of the Union address, of sorts, for the Submarine Force and that's what I'll try to do here today. The force is doing great work. The people are performing very well, and as always the future is not without challenges. I'll try to talk to some of those.

Today's Submarine Force

Operationally the force did extremely well last year and we're poised to continue to do so. On a typical day, on an average day, this is what you would see in terms of our boats: ten of 54 attack submarines (SSNs) deployed, seven of 16 ballistic missile submarines (SSBNs) at sea, and for the next five to six years or so, six to ten submarines in the shipyard.

Of course, Operation Iraqi Freedom was not a typical series of days. We deployed 16 submarines to support the effort. We extended six submarines beyond six-month deployments, with USS CHEYENNE being the longest at almost nine months. We also deployed two submarines several weeks early and surged two submarines, USS BOISE and USS TOLEDO, out of cycle. They both deployed after having been home about two months from previous deployments. I can't say enough about the performance of the ships and their crews; the material condition; how the crews handled themselves. I couldn't have been prouder. It was wonderful to watch. They really didn't need much help.

Our first two OHIO-class guided missile submarines (SSGNs) USS OHIO and USS FLORIDA have entered the shipyard for overhaul and conversion.

Atlantic Fleet Submarine Force Focus

When we look at the world from the Atlantic Fleet Submarine Force, our focus includes the Arctic, North Atlantic and Russia. And I'll say that Russia is and must remain a concern of ours. She is the highest end technological competitor the U.S. has in Undersea Warfare, and is also a country that increasingly exports sophisticated Undersea Warfare technology to China, India and others.

Included in our focus are the Baltic countries and those of Northern Europe, who are the leaders in conventional submarine technologies and enormously experienced and influential world leaders in this business, the Undersea Warfare business, around the world. It's good to remember that the German Type 209 really is the Volkswagen of the undersea world. The North Atlantic waters are of course the only area in the world where two close allies, the United Kingdom and France, as well as the United States, operate

SSBNs, a matter of some sensitivity, and SSNs every day in numbers.

The Mediterranean is a busy place with submarines from Israel, Egypt, Serbia and Algeria as well as the North Atlantic Treaty Organization (NATO) Alliance and of course we have concern with and are focused on terrorist activity in Libya, Syria.

In the Indian Ocean and Persian Gulf, as long as we have access through Suez, submarine needs anywhere west of India are most efficiently provided from the East Coast and we provide those submarines in conjunction with Commander, Submarine Force U.S. Pacific Fleet. Our operations in the Global War on Terrorism are centered here in the U.S. Central Command Area of Responsibility (AOR) as well as the Mediterranean.

South America with 30 diesel submarines is increasingly important to us. Our South American friends, particularly Peru, Columbia and Chile, are skilled operators of modern conventional submarines and extremely important to us for our mutual training and tactical development. And of course, any contribution we make to the war against narco-trafficking also occurs here.

And last but not least, Canada will bring her three Victoria-class submarines on line soon. We're very excited about that. They'll split them between the Atlantic and the Pacific. We look forward to some great mutually beneficial work together.

I haven't mentioned the Arctic yet, but I'll be talking in a minute about some of our activities there.

Atlantic Fleet Forward Deployed Submarines

USS SEAWOLF is off on her second deployment. Also deployed are USS AUGUSTA, USS ALEXANDRIA, USS MONTPELIER and USS PROVIDENCE.

Fleet Response Plan

I suspect some of you have heard or read about the Fleet Response Plan. What this plan says, fundamentally, is that our ability to surge a large portion of our Navy as we did in Operation

Iraqi Freedom is more important than maintaining a steady state, routine forward deployed presence. Our Navy plan to execute this calls for more efficient and more optimally planned maintenance and training. This plan will probably manifest itself in slightly reduced carrier forward presence, and a slightly extended interval between carrier deployments in order to give us more carriers available day-to-day to surge if we need them.

The plan for our attack submarines is to remain on about a 24-month cycle. Obviously from ship to ship there will be some variation in that. But, six months deployed, 18 months in maintenance and operations out of homeport before the next deployment. Our models, our existing models, for maintenance and training minimize the readiness decline between deployments for our ships.

I foresee no decline in the number of SSNs we have deployed day-to-day. The demand for deployed attack submarines is based on critical operations in the Global War on Terrorism and pre-conflict activities that prepare the battlespace for the next war, and the war after next. In addition to engagement with our allies, we have to ensure operational familiarity and proficiency in all the ocean environments of the world.

In my opinion, we are operating the attack submarine force today about as efficiently as we can and doing all we can to minimize the impact of our force structure shortfall. I think every one in this room is familiar with this. We have 54 attack submarines and we really need about 70. At this low number, operational commanders are not getting all they need and we struggle to allocate the shortfall. We struggle to support tactical development, provide for operational testing and other critical long-term self-investments that are a lot easier when you have a larger number of ships. We compensate for these non-deployed shortfalls, submarines that we don't have in the inter-deployment training cycle (IDTC), by recruiting allies like our South American friends to provide submarines as opposition force in training and exercises and we use our SSBNs as substitutes for attack submarines. *[Rear Admiral]* John Padgett and I closely monitor how hard we're running the ships, what the fuel expenditure is, and short of wartime demands, wartime surges, if necessary we will reduce their operations in order to prevent depletion of their reactor cores and having to retire those ships early. We're walking that fine line now. Again, I think we're getting about as much as we can out of the Force and running at the fastest pace we can

sustain over time, maintain long term readiness, and as well have something in the bank for surges.

Our submarine Fleet Response Plan we think is a good one. A notional 24-month SSN schedule has the submarine return from a 6-month deployment and go into a 1-month stand down period. Following stand down are 17 months of training and maintenance, which can include a 3-month Selected Restricted Availability (SRA) period for shipyard maintenance or a modernization period, which is also longer than a standard five-week upkeep. Six months before the next deployment the submarine will begin the Pre-Overseas Movement (POM) period which consists of specialized training and maintenance. In the 18 months following return from deployment, the SSN is considered "Emergency Surge Ready" except for a "Not Ready" period consisting of the SRA or modernization period and a month prior to and after. This plan will result in, if we set aside those submarines that are in depot availability, over 80% of our attack submarines being "Emergency Surge Ready" or better day-to-day. For example, applying this model to the Atlantic Fleet Submarine Force today results in 17 SSNs available to surge. I think that's exceptional operational availability. We also need little or no reconstitution time as was demonstrated in Operation Iraqi Freedom. Our planners were able to handle the requirements so as to not interrupt any depot availability schedules, which are really the anchors in our schedules, and as a result what we needed to reconstitute the Force was more Tomahawks. That's all we needed. So, no reconstitution time and where our deployment timing is out of synch with Carrier Strike Groups and Expeditionary Strike Groups, we will work up, join up, plug and fight with full effect as we did in Operation Iraqi Freedom and have done so many times before.

The costs of maintaining this surge capability will be the full funding of our maintenance accounts and ensuring that we remain fully manned.

Atlantic Fleet SSN Highlights

In the past 12 months, nine SSNs departed on "normal"

deployments, 2 SSNs surged from the IDTC for Operation Iraqi Freedom, and our SSNs conducted a total of 27 classified missions. A significant amount of their time was focused on the Global War on Terrorism.

Submarine Roles vs. Global Terrorism

The kind of contributions our submarines are making and can make in the Global War on Terrorism include intelligence, surveillance, and reconnaissance (ISR); information warfare; strike warfare; special warfare; and homeland defense. We've done some extensive experimentation to develop and refine our Special Operations Forces (SOF) and information operations (IO) capabilities and our ability to serve as an undersea base of operations for employing SOF and IO tools.

ICEX 1-03

We sent USS CONNECTICUT to the Arctic to conduct ICEX 1-03, complete underice testing of the SEAWOLF class and perform extensive weapons testing. Our force structure shortfall makes this hard but we are committed to working in the Arctic and must remain so as long as our country has interests in that important body of water. USS CONNECTICUT steamed for 29 days and almost 6,000 miles underice and surfaced 5 times. To conduct weapons testing we set up an ice camp that supported a portable tracking range. The camp was located about 200 nautical miles North of Prudhoe Bay and was there for about 7 weeks. It housed 65 people and also supported 3 weeks of Arctic scientific research that was unrelated to the military tests.

SURVIVEX – 2003

We also conducted a survival exercise. We continue our efforts to experiment and perform real world tests in the areas of submarine survivability, escape and rescue.

We did it aboard USS DALLAS in March with a scenario in which we simulated that Engine Room flooding resulted in the

submarine on the bottom below escape depth with no AC power in the forward compartment and 94 survivors awaiting rescue. We tested a lot of things and we learned a great deal. You always do when you really test it. For example, we collected a lot of good data on the rate of pressure increase in the boat when we put everybody in EABs. We tested some new CO_2 removal devices, they're called Battelle Curtains. You fill them up with Lithium Hydroxide, and we found them to be extremely effective. We also found that they generate more heat than we had anticipated, up to 90 to 110°F. We were surprised to see that the temperature in the boat actually increased. We expected it to get cold, but we also hadn't accounted for whatever the R factor is associated with the external hull coating we put on the boats. We discovered other things and we will continue our exploration and experimentation. These exercises are important to us and we need to do them as long as we keep learning important things.

SSBN Highlights

On the SSBNs side of the house we were very busy this year. We transferred USS PENNSYLVANIA and USS KENTUCKY to the Pacific as part of the move to an all TRIDENT II D-5 missile force. In addition to our patrols we also provided important fleet services, exercised our Homeland Security / Homeland Defense role and offset in part our attack submarine shortfall with SSBNs in Tactical Development Exercises and other areas of what I call critical self-investment. We continued our invaluable end-to-end testing of the TRIDENT Missile system with Follow-on Commander Evaluation Test (FCET) missile launches. USS ALASKA and USS NEVADA have completed conversion to D5 with USS NEVADA completing her Demonstration and Shakedown Operation (DASO) missile launch. With the conversion of USS HENRY M. JACKSON in 2007 and USS ALASKA in 2008 we will be an all D5 missile force.

Giant Shadow Experiment

You've heard a lot about Giant Shadow. It was an absolute home run. It even made 60 Minutes II. I wasn't sure in the beginning if that was good or bad, but I think it turned out pretty well.

I think it was exceptionally successful. Certainly launching Tomahawk missiles and launching a large Unmanned Undersea Vehicle from a TRIDENT missile tube was unprecedented. But an extremely important part of this was demonstrating a concept of operations that other people either hadn't thought about, or weren't willing to accept. We used a submarine with SOF to do intrusive ISR with people on the beach, Unmanned Aerial Vehicles (UAVs) in the air, and Unattended Ground Sensors all in a Counter-Terrorism / Counter-Proliferation scenario. I think it was very powerful.

Giant Shadow's Local Tactical Data Nets

The other aspect of this that we, at least initially, underestimated the importance of was the employment of Ultra-High Frequency (UHF) transponders and transmitters on virtually anything that moved, any person, any vehicle, any aircraft, and sensor to create our own local network without reliance on satellites. The UHF tools provided by the Freewave Company, Army/Marine Corps gear like the VRC-99 radio, the UAV from Boeing/Insitu and a High Frequency (HF) groundwave antenna, based on very interesting technology, that ARL University of Texas provided, all those things in combination were a great example of how a platform like an SSGN can provide FORCEnet locally, and do it today.

Mighty Guardian V

Another effort of great significance this year was Mighty Guardian V, a Nuclear Weapons Security exercise that was conducted at Submarine Base in Kings Bay by the Defense Threat Reduction Agency (DTRA). It was a big deal with hundreds, literally hundreds, of Army and Air Force drill monitors, controllers, and other personnel. We ran topside and below deck scenarios in the

most realistic and practical test of security measures that I've ever seen. It was exceptionally useful and will have a significant impact on how we provide security for our SSBN facilities and all our submarines. We'll be implementing some of the lessons learned here for quite a while.

Status of the Force – People

And now the status of the force, my State of the Union comments.

First, People. We are making recruiting and accession goals, officer and enlisted, nuclear trained and non-nuclear trained. We continue to have the best enlisted retention in the Navy and our officer retention improves and is to the point where we can control Department Head tour length about where we want it to be.

Our enlisted attrition is the lowest in the Navy. Currently 18.5% of those who graduate from Basic Enlisted Submarine School don't complete their first tour. The whole Navy number is about 35%. We're still not satisfied that it's as low as it can be, as it needs to be. The key issue for us is that by the time we get them through Submarine School, every single one of those submarine Sailors is precious. We keep asking ourselves "How do we reduce attrition further?" We're working on it.

Our key challenges remain:

First, managing increased officer joint requirements in an already jam packed, full career path.

Second, determining what kind of operators we need for our increasingly complex and interrelated tactical systems. This is a big issue; a core issue. How will we train enlisted operators to handle these complex interrelated systems that we can now change rapidly? Do we need more officers on the boats? Do we need more officers because of the educational background and broader perspective they can bring to a task? We're off to figure this out.

Third, disparate events and well-intentioned policies have reduced the tactical experience level of our people. How much is enough? What is the minimum experience level required and how do we know that we have it?

Fourth, the demands on our crews in the area of tactical

proficiency continue to increase. They've expanded a great deal since I had command of a submarine. What can we do in terms of shipboard training efficiency to give our submarine crews more time? We're working on that as well.

Status of the Force – Operations

In the area of operations—we provide the best anti-submarine warfare (ASW) capability our Navy has today and we're making good progress in being able to handle our responsibilities in the ASW challenge of tomorrow, which is principally the Air Independent Propulsion diesel submarine. The Commander, Submarine Development Squadron 12 led ASW Tactics Improvement Program (TIP) is working and will get us where we need to go if we stick with it.

Our ability to detect and avoid mines, particularly bottom and buried mines, remains inadequate. Our mainstreaming of mine warfare in the Submarine Force and the work of our Submarine Mine Action Team are producing measurable results. They are improving performance and can help us meet this difficult, extremely difficult, but not insurmountable challenge. Again, we need to stay focused and to stick to it.

Information operations today are, in my opinion, where communications intelligence was in the 1930's and 1940's. There are major policy issues yet to be addressed and the technologists are well ahead of where the operators and policy makers are. With superb support from the Navy Information Warfare Activity (NIWA), we've done extensive experimentation in this area. We've developed and tested a unique antenna, and we've deployed our first IO equipped submarine

We are making progress in demonstrating that tracking and identifying the 1,000 or so merchant ships that are approaching the East, West, and Gulf coasts of the United States is a lesser included case of ASW and that our Integrated Undersea Surveillance Systems (IUSS), both fixed and mobile, along with our existing ASW organizations are well suited to make a substantial contribution to homeland security and homeland defense.

We've made great strides in employing our boats to help find and eliminate terrorists. We've gone places we've never been before and we're interactive with other forces, our bosses, and technical

experts in our actions and reporting. These are not like Cold War submarine operations. They're not like them at all. We're poised to take the next steps, some of which were illustrated in Giant Shadow.

Today our submarines operate in the littorals like never before, yet the submarine role with other Naval forces in littoral combat is largely undefined in terms of doctrine, tactics, technology, techniques, and procedures. The use of submarine stealth, not to hide our presence, but solely as a defensive shield that makes us immune to threats such as cruise missile attack is a different mindset within our Navy and one that needs promotion, discussion and thorough consideration.

The principal challenges to our continued progress in these operational areas are discipline in the case of ASW and MINE WARFARE, acceptance and practical demonstration for Information Operations, the use of IUSS in homeland security and homeland defense and submarine employment in the Global War on Terrorism, and submarine employment in littoral combat deserves broadened discussion within our Navy.

Status of the Force – Maintenance

When it comes to maintenance, changes in the plan for major submarine depot availabilities, delays in overhauls and overhaul cancellations and buybacks all driven by funding instability are causing us considerable inefficient churn. This churn reduces our buying power. Delaying overhauls, for example, requires operating cycle extension by performing an interim drydock maintenance period. These drydocking periods are stopgap measures, useful in the short term because they keep our submarines operating, but ultimately they're not the most efficient way to deliver lifecycle maintenance and increase our lifecycle maintenance costs. Moreover, submarine depot level maintenance is a business where advanced planning and learning curve efficiencies are important, very important, to cost and schedule control. We want, we absolutely need, to keep every attack submarine we can overhaul and refuel, but the current cycle we're in that takes them out of the plan at one level of authority and puts them back in at the ultimate point of decision is not helping us succeed in these complex

industrial enterprises.

As I said earlier, for about the next five years we will have six to ten submarines in depot maintenance each year. This effort is stretching the capacity of our public shipyards and we need to better coordinate with our private sector capacity to maximize our potential for success and get these submarines back to sea where we need them and need them desperately.

Finally, already completed and proposed reductions in Naval Sea Systems Command (NAVSEA) manning raise the question of the adequacy of the technical authority that oversees submarine modernization and repair. This is a serious issue. The near loss of USS DOLPHIN in 2002, in large measure was due to inadequate technical oversight of work done on that submarine. That should be an alarm bell to all of us. We need to watch this issue very carefully and we have a responsibility to ensure we have adequate numbers of competent engineers to oversee and provide discipline in submarine maintenance and modernization work.

Status of the Force – Resources

In terms of resourcing the Submarine Force these are our current and future priorities:

In the short term, operational safety and security measures, and survivability, escape, and rescue are, by and large, not big consumers of resources, but they demand our highest attention and they need our best program management. Paying for what I call the "Cost of Doing Business" and sustaining a "Minimum Rate of Modernization" are today resource limited. For example today we shoot about six exercise torpedoes per crew per year to maintain proficiency, about six. In my judgment we need to be shooting twelve, but it will still take us several years with our current resource limitations until we have the wherewithal to get there. I think it's taking too long. Additionally, modernization that today is frequently delayed and dragged out presents significant configuration control and training challenges to us.

For the long term, attack submarine **force structure** is key. As I said before, we need about 70 and we won't be on a path to satisfy that need until we get to a build rate of two VIRGINIA class per year.

Status of the Force – Technology

Technology. Thanks to the Submarine League, John Padgett and I had ample opportunity to address our technology needs at the Submarine Technology Symposium last month. I do want to bring attention to two issues that we discussed.

First is the answer to "What limits our ability to operationally employ submarines?" It's the ability to communicate with the submarine at any time, in any regime of speed and depth. The issue here is not only the obvious operational advantages it presents, but we have to remember the unique issues of submarine waterspace management (WSM) and prevention of mutual interference (PMI). Not being able to talk to the submarine whenever you want to makes those issues harder.

The second question, "How do we more closely connect the operators with the Tactical Systems developers to deliver capability we want and need faster and more efficiently?", has resulted in the Type Commanders establishing Tactical Systems Development and Installation Teams. These organizations are part of our Tactical Readiness Evaluation (TRE) teams so they are closely connected to today's real world performance and as well with what we judge to be satisfactory operational performance standards. It is crystal clear to us that we cannot achieve the full potential of the Acoustic Rapid COTS Insertion (ARCI) program, and ARCI Engineered Measurement Program (EMP) concept as applied to Combat Systems, Communications, Navigation, all our Tactical Systems, without an effort like this. We need the operators to be more closely coupled with the developers than they've ever been before.

Status of the Force – Organization

Organizationally, I think the Naval Submarine Force organization is working well. To a great extent, quite frankly, it formalizes what existed previously and informally. We've done a lot of work. We've rationalized our paperwork so that there aren't individual Commander, Submarine Force Atlantic Fleet and Commander, Submarine Force U.S. Pacific Fleet instructions any more. They're Commander, Naval Submarine Forces (COMNAVSUBFOR)

instructions unless there is a reason to have unique and different instructions in an area. We've also made the TYCOM staffs look the same way, no small task, with the exception of where there are functional differences.

We still have things to do. Rationalize unique staffs like our development squadrons and deployed squadrons and groups. Technology has created an opportunity for us in the command, control and communications area and we're off to take advantage of it and eliminate some unnecessary redundancy in terms of where we have 24/7 watch floors and how we handle communications.

In all of this, let me say this now, I can't say enough about John Padgett. Through John's leadership we've shown that COMNAVSUBFOR is not a dictatorship from Norfolk, it really is a team and a team effort. The truth is that sometimes I lead and sometimes I follow John and that's the best way for the Submarine Force to work. It works that way today. I would like to take this time to recognize John's efforts in improving the coordination and cooperation of the force. Quite frankly the role is easier when you're the 3-star. John will be leaving the Submarine Force and the Navy this year about a week after I do and I'd just like to take a second to acknowledge John's great career and what he's given to our Submarine Force. Thanks, John.

Organizationally, we still need to benchmark the efficiency of some of our Submarine Force functional units against like civilian operations where appropriate, and compete some of our functional units against one another so we have metrics to ensure we've maximized efficiency and effectiveness.

N77 of course works for N7 in the OPNAV chain of command. N7 signs his Fitness Report. But N77 is also the banker, investment broker, and the executive agent in Washington for the Submarine Force. It's a big job. I rely on *[Rear Admiral]* Mike *[Tracy]* to scrub our programs with a wire brush, every single one of them, and ensure we are spending every dollar wisely. I have to say that I am concerned that OPNAV process changes will result in N77 being fully occupied with numerous high level integration processes that deal with aggregation, conglomeration and homogenization of issues to an extent that the basic jobs of program oversight and ensuring that we submariners remain smart buyers are being squeezed out. There are only 24 hours in a day. I am also concerned that removal of resources, some resources, from N77's control reduces his

authority and his ability to execute those banker/broker responsibilities that have been critical, absolutely critical, to the success of the Submarine Force in the past. You know I'm sometimes asked within the Navy "What is the Submarine Force secret? Why do you guys seem to do this more effectively?". What I think it comes down to is that we're usually pretty good at assigning responsibility, figuring out what authority is necessary to execute those responsibilities, and making a reasonable attempt to ensure that the guy with the responsibility gets those kind of authorities. Make no mistake, control over resources is one of the most powerful authorities you can have. Then we hold him accountable. It seems to work.

I'm also concerned with our representation. I'm concerned that before the end of this year the Submarine Force will lose 7 Unrestricted Line (URL) Flag Officers to retirement. That will reduce Submarine Flag representation from 37 URLs to 30. Additionally, while we are fortunate to have the submarine perspective injected at the Deputy Commander level in the Pacific Fleet and at Fleet Forces Command, the absence of a submariner at the 3-star level on the Washington Navy Staff for several years now is not healthy for the Submarine Force and not healthy for our Navy.

Status of the Force – Transformation

The Submarine Force is well on the road to transformation, and remember that transformation is not about keeping up with others. It is exploiting our competitive advantage in Undersea Warfare, one where few countries can deal with the price of entry and barriers to competition with us. Transformation is using that competitive advantage to confuse, confound, disrupt, disarm, discourage and, if that's not enough, defeat our adversaries. That's what it means. The ARCI – EMP concept, as I said, expanded to all Tactical Systems offers the opportunity for significant performance improvement and a real understanding of the difference between the limitations of the machines and the limitations of the operators. It will also help bring us much more discipline in the development cycle.

The SSGN payload revolution, SSN–like concepts of operations, as well as those demonstrated in Giant Shadow and continuous

experimentation, particularly with unmanned vehicles of all kinds, are going to bring us significant transformational change.

USS JIMMY CARTER and USS VIRGINIA are amazing new submarines, absolutely amazing, and will soon be operational.

We are well poised to exploit the advantage we have in Undersea Warfare and all we need is additional support inside and outside the Navy to provide our country with the added flexibility, responsiveness and ultimately, the security this unique competitive advantage can provide.

Conclusion

Ladies and Gentlemen, in going through my files I found that three years ago I told you that "Today — America's Submariners and Submarines are the Best in the World." I told you then I believed it's true. I believe it's true today.

I also told you that "Challenges have *always* faced our Submarine Force. We got to be the Best by recognizing, attacking and overcoming challenges with talented people, technical discipline, innovation, smart risk taking and experimentation, hard work and tenacity. To remain the Best, we must continue to do so." And I'll tell you that looking around at the wonderful people we have on those ships, looking at their accomplishments in many operations including Iraqi Freedom; my judgment is that it's more true than it was three years ago.

It's a great pleasure to talk to you. It's always a pleasure to be here. Thank you very much.■

THE OHIO CLASS SSGN

Captain Brian Wegner
OHIO Class SSGN Program Manager
Presentation to the Naval Submarine League
June 12, 2003

Admiral Reynolds, admirals, distinguished guests, ladies and gentlemen. It's my pleasure to be here today to provide you an update on the OHIO Class SSGN Conversion Program.

A century ago, the battleship was the capital ship of the world's navies, and the Royal Navy's DREADNOUGHT ushered in a revolution in naval warfare. Between 1900 and 1912, the United States commissioned 29 battleships. Four of those ships were named in honor of the states Ohio, Michigan, Florida, and Georgia. Eight decades later, a new class of capital ship, the OHIO Class SSBN, assumed a key role in providing strategic deterrence for the United States. The first four ships of the class were named OHIO, MICHIGAN, FLORIDA, and GEORGIA, and they have performed magnificently in their nuclear deterrent role. Over the next four years, these ships will be converted into OHIO Class SSGNs — ships with the potential to revolutionize naval warfare at the start of the 21st century, just as DREADNOUGHT did a century ago.

The concept of strategic deterrence is broadening to include non-nuclear strike capabilities, and these four submarines will constitute a potent deterrent — fielded quickly and affordably. They will provide conventional strike and special operations capability from stealthy platforms with unequaled payload, endurance, and connectivity. The OHIO Class SSGN program leverages a substantial investment already made in these submarines and their infrastructure. SSGNs can carry out commitments that now require

multiple platforms in theater, freeing up these assets for other assignments. Finally, these ships will have the payload volume to serve as test beds for new weapons and sensors that will be used throughout the Submarine Force

The OHIO Class SSGN Program will transform the existing SSBNs into SSGNs by installing systems that can be classed into three groups. The first group consists of the equipment for a sustained SOF campaign. As depicted on the slide, this includes Dual Lockout Chambers, systems needed to host Dual Dry Deck Shelters or Dual Advanced SEAL Delivery Systems, internal and external stowage, and dedicated berthing and fitness facilities. The second group comprises the Attack Weapons System, which provides fire control and launch for up to 154 Block III or Tactical Tomahawk missiles housed in up to 22 Multiple All-Up-Round Canisters or MACs. The third group provides a major upgrade in mission planning capability and connectivity through the installation of the Common Submarine Radio Room, new masts and antennas, including the Submarine High Data Rate Antenna, and a complete rearrangement of the existing Nav Center into a Battle Management Center hosting Command and Control and Mission Planning spaces.

There's a lot of activity that goes on behind the scenes to get a new acquisition program going. The good news is the rapid pace of progression from concept exploration to a formal decision to initiate the SSGN program. The initial review of the SSGN program occurred in October 2001, where the Office of the Secretary of Defense concurred with Navy plans for a single acquisition milestone. In January 2002, the Acquisition Strategy was approved, allowing preliminary design activities and refueling overhaul planning to proceed. Over the next several months, a formal program cost estimate was developed. Once this and other statutory requirements were met, the Defense Acquisition Board or DAB reviewed the program, and Secretary Aldridge authorized detail design, long lead time material procurement, and the two Fiscal Year 2003 refueling overhauls. This authorization was crucial to beginning detail design in time to support an aggressive conversion schedule. Finally, the complete package of required acquisition documentation was reviewed by the DAB in November 2002. Electric Boat was designated as the prime contractor for conversion execution, and Secretary Aldridge approved Program Initiation and

all four conversions in December 2002. Over a period of less than 14 months, the SSGN Program covered ground that requires 3 to 5 years for a typical acquisition program.

This chart shows the current SSGN program schedule. While it is a bit busy, the main message to carry away is the very short time from today to the Initial Operational Capability or IOC in 2007. To meet the desired IOC date, design, manufacturing, and conversion are being conducted concurrently, using many of the same design tools and processes pioneered by the VIRGINIA Class Attack Submarine program and refined for the Multi–Mission Platform upgrade to (SSN 23), JIMMY CARTER. The schedule was revised for the November 2002 Milestone C DAB to achieve several benefits. The schedule risk for SSGNs drydocked at Norfolk Naval Shipyard was reduced. By adjusting the schedules for refueling overhauls and conversions, we were able to optimize the timeline by staggering successive conversions at 6-month intervals. We accelerated delivery of FLORIDA and GEORGIA by six months each. Finally, the overall time that each ship spends in the shipyard was reduced to three years or less. USS OHIO, (SSGN 726), will reach IOC four years from today, with all four ships delivered. This is remarkable considering that the program did not receive its first SCN funding until January 2002.

Overall program execution risk is being reduced by using the key players critical to the success of the OHIO Class SSBN program. Electric Boat is producing the design, and will provide labor and manage the overall effort for conversion manufacturing and for installation work performed at Puget Sound Naval Shipyard and Norfolk Naval Shipyard. For development and procurement of the Attack Weapons System, we are taking advantage of the experience embodied in the government–contractor team led by Strategic Systems Programs, with their proven track record of developing highly reliable missile launch and fire control systems using a disciplined system engineering process.

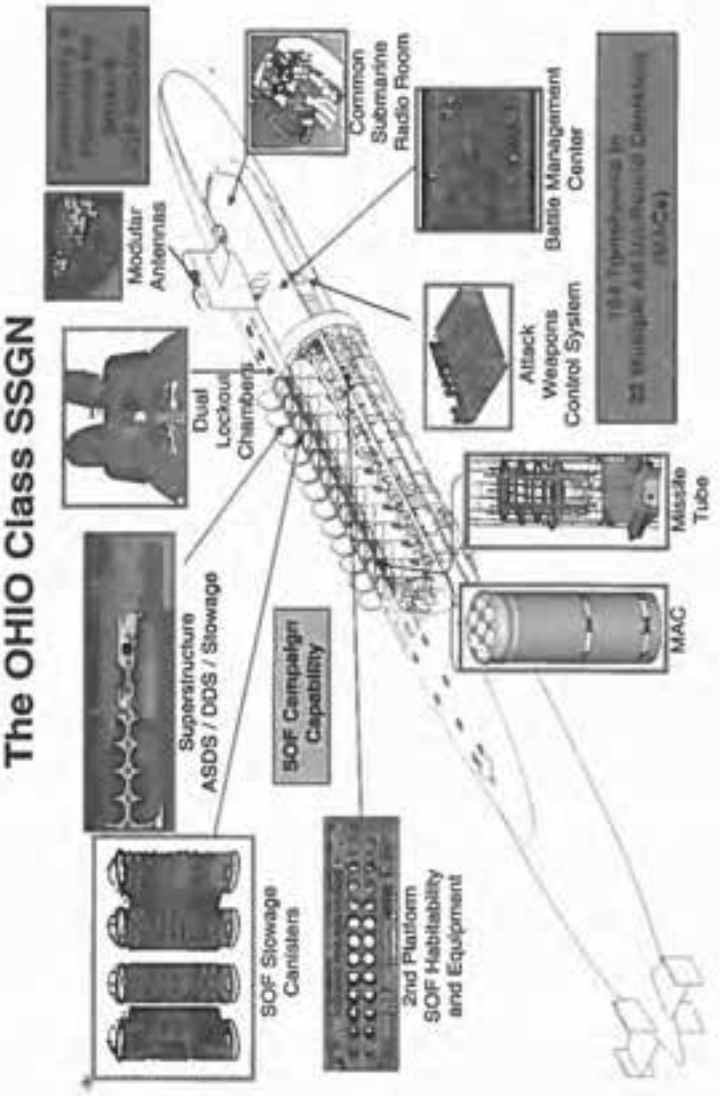


Figure 1—SSGN Conversion Overview

SSGN Program Schedule

Figure 2 —SSGN Program Schedule

Very briefly, I'd like to discuss the major contracts for the SSGN program. Strategic Systems Programs is managing the development and procurement of the Attack Weapons System. Northrop Grumman Marine Systems conducted the MAC Demonstration and Validation, which included the two successful Tomahawk firings off of USS FLORIDA this January, and is developing and producing the MAC. General Dynamics Advanced Information Systems is developing and producing the Attack Weapons Control System, essentially modifying the existing strategic fire control system to incorporate a Tomahawk fire control system.

General Dynamics Electric Boat is producing the design under a contract awarded last September, and is under contract for portions of the manufacturing, Long Lead Time Material, and installation planning via options and contract mods awarded since September. Contracts for additional effort required for the conversions of SSGN 726 and 728 must be in place in time to start the OHIO conversion in November. Puget Sound Naval Shipyard and Norfolk Naval Shipyard are conducting the refueling overhauls and providing

services, conversion ripout, installation labor, and support for the EB–led conversion effort. Puget Sound is already performing the USS OHIO's refueling overhaul and the conversion ripout. I was just on the ship Monday — 3 days ago — and the work is going very well. A lot of contracting activity in a short time, supported by decisions in the acquisition arena, has been required to support our aggressive program schedule.

The SSGN design has proceeded quickly since last year's DAB Program Review gave the go–ahead to start detail design. The goal of the effort is to have the design 80% complete by the time OHIO's conversion begins in November. Some areas of the design, namely those needed to support other design work and ripout conducted in advance of the conversion, are nearing completion. Electric Boat is keeping pace with a very ambitious plan for the remaining design products.

Now that I have given you a picture of the acquisition, key participants, and design status of the program, I'd like to spend a few minutes discussing some of the features of the converted submarine.

Dual 5–man lockout chambers are being installed in Missile Tubes 1 and 2, allowing SEALs to exit the submarine while submerged. The existing 88–inch diameter missile tubes are being cut off at the pressure hull, and 135-inch diameter cylinders are being added to form the transfer trunks. The chamber design also allows access to either the Advanced SEAL Delivery System or the Dry Deck Shelter on the missile deck.

The superstructure is being widened and strengthened to support side–by–side hosting of any dual combination of the ASDS and DDS, and to provide external stowage for combat rubber raiding craft, gasoline bladders, and other SOF gear. Modifications lower in tubes one and two provide for diver rinse–off showers, wet suit drying, equipment storage, and ordnance stowage when the ordnance SOF stowage canisters are not loaded into tubes 5 and 6. With the addition of 66 bunks for SOF personnel — giving SSGN a total of 220 racks, these modifications will provide exceptional capabilities that can be maintained undetected in forward areas and exercised at a time and place of our choosing, contributing to the Sea Basing and Sea Strike components of Sea Power 21.

The remaining missile tubes are being modified to support

modular payloads, while flexibility is designed into the system to allow for future payloads. When the conversion is complete, Tubes 3 through 24 will be able to host MACs holding 7 Tomahawk All-Up-Rounds. Tubes 3 through 10 will also be able to host 8 modular SOF stowage canisters, which contribute just less than half of the ship's overall SOF stowage capacity of 8,000 cubic feet. Two of these canisters are dedicated to SOF ordnance — essentially magazines in tubes 5 and 6. With this kind of firepower, this will be the first submarine to be equipped with automatic ordnance sprinkler systems. The design of the modified missile tube provides flexibility needed for longer, heavier, and more flexible weapons and sensors that are sure to follow the Tomahawks supported at delivery. C4 length payloads can be accommodated in all 22 strike tubes, and several will be capable of accepting payloads up to the size of a D5 missile. The flexibility, connectivity, and strike payload of SSGN will immediately make it a key player in the Sea Strike arena.

Figure 3 - Modifications to Missile Tubes 1 and 2

Connectivity to the battle group, local special operations forces, other forces in theater, and a wide range of shore activities is essential to the SSGN's strike and SOF missions. A variant of the Common Submarine Radio Room is being developed for the SSGN. The SSGN will be part of a robust network of forces, exchanging large amounts of data that allow rapid retargeting, battle damage assessment, and support of operations ashore. Submarine communications is evolving to the point that the communications satellite infrastructure, not the submarine antennas and radio equipment, is controlling throughput. Dual Submarine High Data Rate antennas, an EHF capable periscope, and dual EHF Follow–On Terminals on the SSGN provide the bandwidth needed for SSGN to be a key player in the networked forces that will operate over the next decades. Four Universal Modular Masts or UMMs will be installed in the sail to host the High Data Rate Antennas and two Multi-Function Antennas. The UMMs provide the flexibility to readily incorporate future antennas or to temporarily fit mission specific antennas, such as the Integrated ESM Mast.

The existing SSBN Nav Center is being completely remodeled to support SOF operations and planning for both strike and SOF. The strategic navigation system is being removed and replaced with the Ring Laser Gyro Navigator used on many ships and submarines. The smaller navigation footprint frees up the space needed for equipment and operating stations to monitor and control operations of the Lockout Chambers, Advanced SEAL Delivery System, or Drydeck Shelters, and for displays, storage, LAN drops, and communications equipment needed to plan and supervise both strike and SOF operations. The capability is here to conduct the SSGN's own operations, and to embark command elements that will enable the SSGN to serve as the Launch Area Coordinator, or to provide robust command and control for special forces operations. The commanders of future Joint Task Forces may operate from this space.

SSGNs will be in demand as soon as they are fielded. An operating cycle has been developed to maximize their availability to the war fighter, while maintaining the ships and providing adequate time for crew training and rest. Like the SSBNs, the SSGNs will have two crews. Unlike the SSBNs, the SSGNs will routinely conduct most of their crew turnovers at forward sites,

minimizing transit time and maximizing time in–theater. With the planned cycle, two SSGNs can be maintained in theater at all times, with three SSGNs in theater up to 60 per cent of the time.

This Figure 4 – Notional SSGN Operating Cycle

represents a tremendous return on the investment we are making now for these conversions. With its unprecedented strike and SOF payload, the SSGN represents a great opportunity for the Submarine Force. It also has the volume and infrastructure to support experimentation with new sensors, weapons, and other payloads. Earlier this year USS FLORIDA participated in the Giant Shadow Exercise, demonstrating the potential for SSGN support of SOF operations. Future experiments are already being planned.

The SSGN provides more than an order–of–magnitude increase in payload volume over existing attack submarines, and its large diameter missile tubes constitute an unequalled "ocean interface" for future weapons and sensors. Equipments that exist today, are already in development, or are still only a concept will benefit from the unrivalled features of the OHIO Class SSGN.

I appreciate this opportunity to discuss the history, capabilities, and potential of the OHIO Class SSGN. It will provide exceptional capability at an affordable cost. It is no longer just a concept — the design is maturing, testing has already been conducted, and USS OHIO is already in overhaul, with conversion scheduled to start this November. A lot of effort, with exceptional support inside and outside of the Navy have allowed for rapid progress on acquisition and contracting front. The available volume and ocean interface on SSGN will be leveraged as future payloads are developed and tested for use throughout the Submarine Force. The bottom line is: SSGN will make the Submarine Force even more crucial to the nation's defense — and it's just around the corner.■

ARTICLES

ABOARD A SUB TENDER DURING THE WAR IN IRAQ

by Robert A. Hamilton

Mr. Hamilton is a reporter for The New London Day covering defense issues. Bob, and his photographer, Tim Cook, were embedded newsmen for the recent war in Iraq. His adventures aboard USS PROVIDENCE appeared in July 2003 issue of THE SUBMARINE REVIEW (p70). The January 2004 issue will contain the third in this series with his accounts of some other submarines in that action.

It had been a difficult couple of months for the sailors of USS EMORY S. LAND. They had been working seven-day weeks in Souda Bay, Crete, to prepare for the arrival of attack submarines returning from the war in early April. The boats would need to be resupplied with food and weapons, pick up their mail, and head back to sea.

Captain David M. Volonino had a predicament. There were just three buses available to transfer people to the nearby Naval Security Activity compound where they could make phone calls, go bowling, or have a few burgers and a beer. He could either send his Sailors, or the submariners. So he called together his first-class petty officers and put the question to them.

"It was unanimous," Volonino recalled. "They said, to a Sailor, that it was more important that the submariners get a few hours off and they could wait until things lightened up a little bit. When you have one young person do something that selfless, you feel pretty good. When you have a tender full of young people, you feel 1,300 times as proud."

The attitude on LAND can be summed up in six words: Nothing's too good for the customer. When the LAND's galley crew learned that one of the boats alongside in April had run out of pancake syrup, they gathered up every drop on the ship and sent it over. The LAND sailors knew they could restock in a couple of days, but the submarine would have to go without for weeks.

At one point LAND had four submarines along its starboard side in Souda Bay during the war, the first time that has ever happened with nuclear submarines. It required some special rigging, because the LAND is built to accommodate only three.

But four boats needed to be serviced, and LAND wasn't going to turn anybody away. Within minutes of their arrival, the ships all were connected to LAND by booms that ran electrical power, data services, cable television, water and phones out to the boat. The LAND's security force and Coast Guard cutters patrolled the water nearby. For a time, at least, the submarine crews were in a protected haven.

Most of the boats are in contact with LAND for days before they arrive, providing a list of needed repairs. As soon as each boat was secured, hordes of technicians poured onto the ship and began doing the work, to keep the submarines on their tight schedule.

Normally LAND is anchored in Italy, but the ship got underway just before the war to be closer to the action. It ran right through a storm with 60-knot sustained winds and gusts to 75-knots. The round-bottomed tender made about five knots and handled like a brick. At one point it was taking 25-degree rolls.

"Still, not one thing on the decks budged," Volonino said. "That is a reflection of how well our deck department personnel do their jobs."

And the move saved weeks of steaming time for submarines that were just going to stay in the eastern Mediterranean.

"I would make the argument that our mission is more important than any individual warship because we make the whole fleet look bigger," Volonino said. "We're a true force multiplier, because when we're doing our job the ships can stay out longer, and be ready to meet any tasking."

Some submariners are worried about the dwindling number of tenders. The Navy made a decision in the 1990s to decommission many of the ships in favor of land-based maintenance facilities at submarine homeports.

Starting with the World War II-era FULTON in 1991, the Navy decommissioned nine tenders during that decade, leaving it with just two in commission—LAND and USS FRANK CABLE, homeported in Guam. Both were built in the 1970s.

No one disputes that repair work is more efficient and effective

when done in a shoreside shop, as long as the submarine is home. The problem is that the Navy's pace of operations has picked up in forward areas, and there is likely to be even more demand for services of the tenders in years to come, but there is no plan at present to build a replacement class.

Taking care of the submarines is a job that the LAND sailors take very seriously. Volonino said he's fortunate to have a crew of bright, energetic young men and women who joined the service out of a sense of national duty.

"It sounds corny, I know, but it's true. They are not here because of money and they are not here because of glory, because there is precious little of either," Volonino said. "They are here because they have skills to do a job that has to be done, skills that few people have today."

"Fixing a leaky valve on a submarine is not like fixing a leaky valve in your sink," Volonino said. "Everything that we do on a submarine is very technical, very controlled. All that stuff is ready when the submarine arrives and *Zam*, we spring on board and get to work. Anything the sub crew needs, we provide them."

LAND is loaded with many of the spare parts that a submarine might need in mid-deployment, such as towed arrays, take-up reels and periscopes. And, of course, there are the weapons, mostly Tomahawk missiles on this trip, to resupply ships that have been in combat. Work continues through the night to pull all the empty weapons canisters from the vertical launch system tubes and the torpedo room.

The VLS tubes are pumped out and tested before the new missiles are loaded in by crane, a job that moves slowly and methodically. Volonino remembers from his own tour as Commanding Officer of USS NEBRASKA that the longer one of those dangerous industrial processes went on, the more people tended to do it automatically.

"After about the 10th one, it becomes repetitive," Volonino said. "That's when the accident grabs you. That's when you walk around making sure everyone is at their peak."

While the reloading takes place, other LAND Sailors are scrambling to make any repairs the submarine needs. Chief Machinery Repairman Rob Randall oversees 30 technicians who run the 42 manufacturing machines on LAND—lathes, milling machines

and so forth.

Racks of Dell servers in the bowels of the ship store much of the technical information they need to make repairs, and the location of spare parts they will need. If it's not in stock, he puts his crew to work to make one from scratch, working at tolerances about one-tenth the diameter of a human hair.

"There is no other ship in the Navy that has the capability we have," Randall said. "I don't say no, even if it's something we've never done before."

He said even something as simple as a leaking hydraulic system can make a submarine crewman's life difficult because it means frequent cleanups and refilling of the system. Keeping those systems operating as they are designed, he said, improves the quality of life on the boat.

He pointed out one young fireman who just graduated from machinist mate "A" school, and has been working 12-hour days for the last week.

"I have to tell him to get out of here and go to bed, or he'd be on that machine 24 hours a day," Randall said.

Technical representatives from the Fleet Technical Support Center Atlantic and the Naval Undersea Warfare Center are also on board LAND, ready to lend a hand on an ornery system.

Lieutenant Andre T. Sadowski, a supply officer on LAND, said normally it can take two to three weeks to get something from the States, even something as simple as a tape recorder from Radio Shack that USS PROVIDENCE supply officer requested.

Before raising anchor in Italy LAND set up a special detachment in Sigonella, Italy, that meets all the planes coming in from Norfolk, Va., then puts it on a plane heading for Souda Bay. Turnaround time at the height of the war was cut to about three days.

"This has done wonders for us in terms of supporting the submarines," Sadowski said. "We have a direct pipeline now."

Meanwhile, the submarine crews often fan out through LAND, availing themselves of the services they normally do without while on deployment. There is a medical clinic and a five-chair dental suite, a legal office, and a ship's store where they can pick up everything from anti-perspirant to DVD players.

LAND boasts three gyms, one that has free weights, another with aerobic systems such as bikes and treadmills, and one with a

combination of the two. The Learning Multi-Media Resource Center has 3,000 volumes, but also 15 laptops that allow Sailors to surf the Internet, a wide assortment of music and movie disks, and a section devoted to DANTES, the Defense Activity for Non-Traditional Education Support, said Chaplain Michael Tomlinson.

"We've had several people who've managed to get an associates degree while on board," Tomlinson said. "That saves them time and a lot of money when they go home and go back to school."

Command Master Chief Terry Miles said an aircraft carrier deploys 5,000 sailors for six months at a time, and then they get to go home for 18 months. But tenders are based overseas, and people are away from home three years or more for each tour.

"Our young people, early on, get an enormous amount of responsibility, and accountability, and with that comes a sense of maturity," Miles said. "You don't see that in the civilian world, not at 19 or 20 years old."

One example of the kind of young person on LAND is Signalman 1st Class Dorothy J. Averhart, the 2002 Sublant Sailor of the Year. Born and raised in Gary, Ind., she joined the Navy March 1, 1995.

"I used to watch The Love Boat, every Saturday night at 8 o'clock, and wondered what it would be like to have a job, and an adventure, and be on a boat, all at the same time, and the Navy gave me a chance to try it," she said with a grin. Though she's a likely candidate to make chief, she said she's applying for the Limited Duty Officer program in August.

"I feel that I have a lot more to give the Navy," Averhart said. "That door is open now, and I'm going to go through it, full speed ahead."■

SO WHAT IF THE SEAS WERE TRANSPARENT?
Part II

by Joe Buff

Joe Buff is a novelist with several submarine-related books to his credit. He is a frequent contributor to these pages. His first article in THE SUBMARINE REVIEW was a look at submarine warfare in the foreseeable future using a novelist's method of forecasting from unclassified sources.
Part I of his discussion of modern submarine vulnerability appeared in the July 2003 issue of THE SUBMARINE REVIEW (page 91).

Part I of this article began to consider solutions for the Undersea Warfare community if some hypothetical future technology somehow rendered the oceans genuinely transparent for purposes of anti-submarine warfare. For brevity, that unknown technological breakthrough was given the label MAGIC.

Part II will consider active means to neutralize MAGIC, should something that robs submarines of their stealth, in the conventional sense, ever in fact emerge. And since information on a submarine's exact whereabouts is not necessarily useful if that submarine possesses superior weaponry for attack and defense, we will show that existing trends and plans in naval submarine development are consistent with coping fully in a world where MAGIC exists.

Hull-Forms and Weapons: Present and Future Directions

The discussion now leads to considering the actual field of battle at sea. Some general but relevant points will be made which apply as much in a future with MAGIC as they do apply today, or

historically. Cumulatively, these points will demonstrate how to assure water superiority, come what may.

- *Speed and precision are decisive*: The detection of an enemy vessel, including a submarine, is never enough by itself to guarantee victory, either in the immediate tactical-combat sense or in the broader strategic sense of an entire war. To win a naval battle, destructive warheads must be delivered quickly and accurately onto high-value targets, which themselves will take strong measures in real time to defend themselves. One of the most effective forms of defense is to attack and destroy one's attacker.

- *The atmosphere versus the sea*: War at sea in modern times occurs in three dimensions, each with their own physical characteristics: the atmosphere, the surface of the sea, and underwater within the sea. Crucial to future employment of submarines in a conjectural world with MAGIC are key differences in the properties of water and air, and also certain asymmetric properties of their interface.

- *Hull (or fuselage) forms*: Because air provides less flow resistance than water, in general the fastest moving platforms are airborne ones. Submarines, faced with much greater flow resistance, cannot move at the same high speeds. However, by adopting a streamlined teardrop hull shape, the submarine can optimize its speed for a given amount of propulsion power. Furthermore, by diving deeper, increased water pressure can reduce or eliminate propulsor cavitation, enhancing efficient use of power to gain speed. Surface ships, floating on the air/ocean interface, are at a disadvantage compared both to aircraft and to submarines: They waste propulsion power through unavoidable wave-making, and their screws cavitate heavily because they turn at shallow depth. (Solutions such as hovercraft, hydrofoils, and water-jet propulsion cannot yet accommodate major warships weighing many thousands or tens of thousands of tons.) Thus, a nuclear powered fast-attack submarine might be by a significant margin the fastest type of big hull in any navy. This remains true completely apart from the question of stealth. Indeed, were

acoustic stealth rendered irrelevant by MAGIC, submariners would be much more free to use flank speed.

- *Modern blue-water amphibians*: As has been discussed extensively in the open submarine literature, great advances are being made or planned for bridging the communication barrier presented by the air/ocean interface. Gradually, communications —including covert and high-baud-rate data links—between submerged submarines and surface ships, aircraft, satellites, or land bases, will become greatly enhanced. This will aid the full participation of submarines in total network-centric warfare; in the language of cyberspace, submarines become virtual amphibians. This, in turn, will be crucial to defense against any MAGIC that might emerge.

- *The true all-weather warship*: One factor that remains significant and yet uncontrollable during combat is weather. Weather at sea can affect a naval battle in several ways. Clouds, fog, mist, icebergs, and rain impair many sensors, including visual, radar, lidar, and infrared. In addition, surface storms create added background noise that degrades the performance of passive sonars—wind, rain, grinding ice cap edges, and breaking waves all make underwater sound. Perhaps most importantly, major surface storms can impede both the routing and speed of advance of fleets and convoys, and can badly impair the performance of their aircraft (both fixed wing and rotary wing), their sensors, and their weapons systems. A severe sea-state, especially if wind and waves come from an unfavorable direction, can present major problems. Only a submarine is able to maneuver with complete freedom under the most extreme surface storm, with no reduction in speed or physical discomfort for the crew. (In contrast, even a supercarrier weighing 100,000 tons and over 1000 feet long can find flight operations impossible and the ship herself barely habitable.) In the future, therefore, surface weather and ice caps may become a more significant factor in undersea warfare—and undersea warfare more valuable in extreme-weather or under-ice operations—if submarines do somehow become much more easily detectable.

- *Submarine adjuvant vehicles*: Submarine-carried ancillary vehicles, including ASDS SEAL-delivery minisubs, unmanned undersea vehicles with mission-reconfigurable sensors, armed unmanned undersea vehicles such as Manta, and unmanned aerial vehicles launched from submarines, add greatly to the all-weather advantage of a submarine in both attack and defense, and also significantly enhance that host sub's safety in a wide spectrum of warlike scenarios. The Ocean Interface hull module of USS JIMMY CARTER sets yet another precedent for greater vehicle and weapon capacity and variety, as does the modification of USS OHIO and some of her sisters into SSGNs.

- *Undersea anti-aircraft weapons*: Anti-aircraft weapons launchable from a torpedo tube, such as the Polyphem missile, enable a submarine to destroy enemy aircraft seeking to detect or attack the submarine. This makes the submarine substantially more survivable—and thus potential loss of stealth is less dangerous to the submarine and her crew.

- *Other active close-in defenses*: Several devices are under development to intercept and destroy inbound enemy torpedoes. One such device is an anti-torpedo underwater rocket. Another is an ultra-high-speed dart: A U.S. Navy weapons lab recently announced that it succeeded in firing such a dart underwater at a speed greater than that of sound in water. (The speed of sound in water is approximately five times what it is in air.) One advantage of such a dart is that, by being supersonic in the medium in which the engagement occurs, it cannot be detected acoustically by an inbound torpedo until too late! Yet another means of active defense against torpedoes is a pressure-wave pulse generator array, mounted on the submarine's hull. Such an array would presumably require a large amount of electricity to smash an inbound torpedo with a focused pressure wave; having this power available is one advantage of an all-electric submarine. In the future submarines will be able to actively engage and pulverize a type of weapon—the ASW torpedo—which up to now has required more passive defense combined with emergency escape-and-evasion techniques.

To pull together the points established so far, protection of submarines against MAGIC involves a layered defense enabled by network-centric warfare. MAGIC is less threatening if its sensor platforms can be identified and destroyed—this applies even to space based platforms, for which anti-satellite weapons would be essential. MAGIC is also useless if its data, though accurate, cannot be disseminated to command nodes or to survivable anti-submarine attack platforms with viable weapons. Information warfare assets can be used to target MAGIC's download links. Joint war fighting formations, including active defenses by the submarines themselves and by armed escort, adjuvant vehicles, can help guarantee that detection does not spell doom.

Advantage Submarine; the Ocean as Armor

In future naval combat, special properties of the air/sea interface demand full exploitation.

- *Hybrid propulsion, hybrid weapons*: Supposing that the seas truly became completely transparent, submarines could restore parity or superiority against surface and airborne platforms if equipped with the proper weapons. Versions of such weapons exist today, or have existed in the recent past but were pulled from operational status because they appeared unneeded in world conditions prevailing at the time. The issue comes down to the speed with which an object can move through the water as opposed to through the atmosphere. Adaptations of SubRoc, and employment of super cavitating underwater weapons, level the playing field between platforms operating in the different mediums of air and seawater. An aircraft (or fixed or mobile littoral land site) can launch a missile armed with a plunging warhead that serves as a depth charge against a submarine, from far away. An aircraft can also cover a large distance rapidly to drop an ASW torpedo—a self-propelled weapon that attempts to home on the submarine. A surface ship can similarly fire a missile, such as an Updated AsRoc, which delivers an ASW torpedo very rapidly to a distant submarine target. But a super cavitating undersea weapon might move as fast or faster than an ASW helicopter or maritime patrol aircraft. If equipped somehow with a terminal

stage *bouncing betty* anti-aircraft warhead, that plane or helo would be in for a nasty surprise. And a missile launched from a submarine can quickly leave the sea and make great speed through the air—which was one point of developing SubRoc. The future contest then becomes one of good fire control, adequate weapons capacity, and teamwork and data-sharing with friendly platforms. But with the proper weapons loadout, a submarine and its consorts might even defeat incoming supersonic ASW cruise missiles, or ballistic missile barrages. R&D on submarine-launched supersonic anti-aircraft and anti-missile missiles, and theater ballistic missile defense, become even more potent force multipliers in a world containing MAGIC.

- *The sea/air boundary is asymmetric*: It is important to note that for purposes of engineering and design, there is much less stress on a weapon making a high-speed transition from the ocean to the atmosphere, than on one going the other way to make a hard, high-G-force impact with the water's surface tension. In any head-to-head battle with surface or air opposition forces, this gives an advantage to a submarine equipped with the proper weapons. In addition, as mentioned above, the speed of sound in water is approximately the equivalent of Mach 5 in air. Any weapon or weapons platform approaching the submarine at less that Mach 5 will give advance warning of its approach, as its engine sounds pierce the water and then propagate on ahead to be detected by the submarine's passive sonars. Furthermore, the viscosity of water is significantly greater than that of air; resistance (friction) to a moving body is much less in air than in water. This presents another asymmetry in a battle between a submarine firing a cruise missile, and a surface ship or aircraft firing a missile-weapon at the submarine. In the terminal targeting and impact stage, a missile attacking a surface ship will smash home with tremendous velocity. Last minute close-in defenses have notoriously short periods during which to react effectively. In contrast, the terminal target homing and impact stage of an ASW weapon faces a sudden drop in speed once it enters the water; even if the ASW warhead is itself supercavitating, its speed will drop to some 200 knots after an airborne transit speed of possibly 2000 knots. This gives the

submarine a substantially longer reaction time during which to take active measures to defeat the incoming warhead; once again, advantage submarine. This line of reasoning also suggests that greater diving depth can give a submarine important extra protection, by increasing the distance an inbound air-deployed warhead needs to traverse. Thus, we may conclude that the ocean is much more than just a cloak of invisibility for a submersible ship deprived of large reserve buoyancy. *For a submarine the ocean is armor.* What's more, that armor comes free of any weight or space penalty! Equipped with the proper offensive and defensive weapons, a submarine robbed of its stealth by MAGIC would nevertheless be able to stand and fight against opposition forces, with every expectation of winning.

- *Going nuclear*: Limited tactical nuclear war at sea is one type of potential conflict recognized by the Pentagon. Although all platforms, including submarines, are vulnerable to nearby nuclear blasts, submarines by being submerged gain considerable protection from air bursts such as might result from nuclear-armed cruise missiles. A nuclear air burst does not transfer much of its energy into the sea. That same air burst can be devastating to surface ships and aircraft at the same distance from the epicenter. Furthermore, the seawater surrounding a submarine gives it protection from electro-magnetic pulse (EMP)—a secondary effect of nuclear detonations that can wreak havoc with surface and airborne platforms. The same advantage to submarines would apply in the case of non-nuclear EMP weapons now in existence or under development, and also would apply to chemical and biological weapons. (Again, *for a submarine the ocean is armor.*) In addition, even hydrogen bombs exploding underwater have only limited range against a submarine; the lethal radius of a one-megaton underwater blast, against a robust nuclear submarine, is approximately ten miles.

The Special Case of SSBNs

Up until now, and for the foreseeable future, the deterrent power of America's SSBN boomers is founded in large part on their stealth. They cannot be detected, generally speaking, until they launch their

salvo of ballistic missiles—each one armed with multiple thermonuclear warheads. This is a very powerful deterrent indeed. What would happen to this deterrent in a world where MAGIC existed?

Were the boomers easy to locate, they could be attacked, and their weaponry neutralized at its source. The counterargument to MAGIC rendering our FBM subs useless is a combination of points made above, and points made in the open literature about strategic anti-submarine warfare. First, we have sought to establish in this two-part article that even if easily found, future American submarines would be by no means helpless. Potential countermeasures to MAGIC might assure that it would be impossible to locate—let alone destroy—all at-sea SSBNs with enough rapidity and assurance to preclude a devastating counterstrike at the enemy. Even *one* surviving Trident sub would carry 24 missiles, each MIRVed with several warheads, each with a yield of hundreds of kilotons. This would seem to quite effectively discourage any sane individual or group, with the imagined capacity to drive home fatal attacks on multiple boomers, from ever actually doing so.

The same reasoning appears to urge keeping as many boomers as possible in commission and at sea. If an enemy can obtain MAGIC, before the long-standing program that studies methods to assure the security of our boomer fleet can find effective counters, there will definitely be safety in numbers. This is something to think about for anyone considering reducing the now-planned Fourteen for Freedom, or anyone participating in arms-control discussions regarding the number of warheads allowed on each sub-launched ballistic missile.

High Speed, and Conventional Stealth, Remain Essential

Enemy MAGIC's effectiveness could be limited and of short duration if the proper steps were taken by friendly forces. This suggests that, consistent as always with budgets and other national policy, a high tactical speed and high flank speed, and superb conventional (as opposed to anti-MAGIC) acoustic and non-acoustic stealth remain as important as ever, or perhaps become even more important, in a scenario in which MAGIC exists.

If MAGIC at first, or intermittently, reveals the positions of friendly submarines, those submarines need excellent speed and

stealth to make the best use of timeframes during which MAGIC has been jammed, decoyed, or disabled. In other words, it is vital to be able to restore the mystery as to a submarine's whereabouts as quickly and as thoroughly as possible, once MAGIC has been blinded or neutralized.

Even if MAGIC is working, speed and stealth are key to helping evade fire-and-forget weapons, whose original firing solution was accurate based on MAGIC data but which grew stale during the weapon's transit time. (If the weapons are designed for mid-course targeting updates via radio or guidance wire, priority should be given to breaking those links; the weapons then revert to fire-and-forget.) Conventional stealth would also help defeat the terminal homing of warheads originally dispatched by MAGIC, but reliant on conventional sensors to precisely strike the defending submarine. These two needs, *speed* and *stealth*, appear entirely consistent with present undersea warfare development and acquisition plans.

Conclusion

The actual fielding of an effective MAGIC technology would present a revolution in military affairs. But evolving joint network-centric warfare paradigms, improving connectivity between submarines and other platforms, and emerging extra-capable submarine-launched weaponry and probes, represent a non-hypothetical revolution in military affairs probably more than powerful enough to counter any hypothesized MAGIC.■

DEPTH CHARGE: AN EARLY ANTISUBMARINE WARFARE WEAPON
PART II
WORLD WAR I

by Mr. John Merrill

Mr. Merrill is a retired engineer from the New London Division of the Naval Undersea Warfare Center. Old timers remember that lab as USN/USL. John is a frequent contributor to THE SUBMARINE REVIEW.
Part I of this essay appeared in the July issue (p.100).

Depth Charge Effectiveness

With the depth charge, the intention is to use the incompressibility of water to set off an explosion at depth in the vicinity of the enemy submarine and to create a substantial force to damage or destroy the submarine. A significant consideration is that during World War I once the enemy submarine submerged it was lost to the pursuer as underwater detection using sound was still in an embryo stage of development. Even as World War I ended, underwater detection of a U-boat was a low probability.

Dropping the charge where the enemy submarine was thought to be was certainly a step in the right direction for antisubmarine warfare. However the ability to achieve the goal of destroying the U-boat depended upon a number of variables. The amount of explosive in the depth charge, the depth setting for the explosive and the actual proximity of the submarine target to the event were significant factors. Success always required multiple depth charges and prior to 1918, depth charges were a scarce weapon. Nonethe-

less, even an exploding depth charge, even without damage to the submarine, could be sufficient to rid the area of an enemy submarine.

A variety of distances have been given regarding the separation required for the depth charge explosion to do damage to the target submarine. Admiral Sir John Jellicoe in 1920 recalled a 300 pound depth charge within 14 feet of a submarine hull created serious damage or sinking, and at 28 feet the submarine was disabled sufficiently to force the submarine to surface and be exposed to other weapons.[1] Precise distance requirements are difficult to define as the variables are not easily assessed. However, it is interesting that a distance for serious damage to a submarine of 25 feet was identified regarding World War I while a World War II distance of within 23 feet has been cited. Confirming these numbers, a 1993 comment regarding depth charge effectiveness in World War I stated "An underwater explosion twenty-five feet from a U-boat could destroy it and one as near as fifty feet could seriously damage it."[2] Even with an explosion not sinking the submarine, shock waves from the depth charge impacted the submarine's hull and instrumentation requiring some submarines to immediately surface. On the surface ramming or gunfire could be effective. Admiral Jellicoe referring to the impact of the depth charge noted "...at distances up to sixty feet the moral effect on the crew would be considerable and might force the submarine to surface."[3]

Lieutenant Hersing of U-21 told of a German submarine commander's depth-charge remembrance, "...when depth-charged after firing two torpedoes at a convoy off the south-west coast of Ireland. He was forty meters under water, and every ten seconds charges detonated at depths of ten, twenty-five, and fifty meters in all directions...for five hours the Germans in their steel hull could hear the explosions...all round them, and the hollow roaring sound of the destroyers' propellers overhead."[4] The moral and psychological impact on the crew could be significant.

Long-term Depth Charge Problem

Success with the depth charge hinges on the length of time between awareness of the enemy submarine and the arrival of the weapon in the proximity of the target, as the depth charge is a

proximity weapon, not contact. This time is sometimes referred to as blind time. With the early depth charges and their sink rate of the order of 6 feet per second a target at 150 feet requires 26 seconds after launch for the depth charge to be at the point of explosion. With submarines having underwater speeds of the order of 10 knots, one minute provides about 100 feet of travel. This factor plus other response times by the pursuing vessel did not make for success. Submarine operating depths and speed on the surface and below increased throughout the 20th century. Deeper submarine operations also lessened the depth charge's effectiveness. Increased sea pressure reduces explosive force. The time required for a surfaced submarine to submerge decreased. Early underwater sound detection devices lost contact with the enemy submarine when close and required increased speed by the targeting vessel to minimize blind time. Some early detection systems required the ASW vessel to be dead in the water. Charges could be in the water after the contact was lost. Mired in these changes, depth charge design and tactics demanded serious attention.

Depth Charge at Sea

Early use of the depth charge did not always insure success as in the case of an action in July 1916 when the patrol craft HMS SALMON attacked the UC-7 with depth charges and the UC-7 escaped. It became clear that large numbers of depth charges were required to raise the probability of damage to a U-boat to better than luck. During World War I, both sides were limited in their antisubmarine efforts by the lack of depth charges in adequate numbers.

The 1915 successful intrusion into the Sea of Marmora via the Dardenelles by a number of British submarines was not marred by the use of depth charges. It is interesting that the Turkish Navy then under the guidance of Germany did[5] not use depth charges that were introduced by Germany early in 1915

However, by 1916 the depth charge was in broad use by Germany, Great Britain with France and Italy introducing the weapon at about the same time. The British submarines operating in the Baltic Sea in the fall of 1917 had to think carefully about

German depth charges when challenging German convoys. Throughout World War I, Germany used the float and lanyard triggering type depth charge designated C15. Failure to explode was about 50% of the time. With a 110-pound charge, a thirty-five-foot destructive radius was expected.[6]

The first depth charge sinking occurred March 22, 1916. The U-68 attacked HMS FARNBOROUGH a "Q-ship" off the southwest coast of Ireland.[7] The submarine's torpedo missed the surface ship which retaliated with deck gunfire and depth charges sinking the submarine with all hands.

The German submarine UB-26 was sunk near Le Havre from a depth charge fired from the French destroyer TROMBE on April 5, 1916. The same month unsuccessful depth charge attacks on two U-boats operating in the British Isles alerted Germany to the introduction of the new weapon.

Two U-boat losses by depth charge occurred later on December 4, 1916, UC-19 in the Dover Straits and on December 6, UB-29 in the English Channel, by HMS destroyers LLEWELLYN and ARIEL. On December 13, 1916 two depth charges from HMS LANDRAIL operating in the Straits of Dover sank the UB-29.

On 8 February 1917, destroyer HMS THRASHER operating off Flamborough Head, at 53.56 N 00.05 E, observed the minelayer UC-39 sinking a ship. As the submarine dived, a depth charge from the destroyer burst in the UC-39's conning tower, flooding it and the control room. Forced to the surface, the submarine was sunk by the destroyer's gunfire.[8] In 1918, seventeen of the U-boat depth charge sinkings occurred around the British Coast.

According to Messimer,[9] in October 1916, the Austrian U-16 sank the Allies' Italian destroyer NEMBO. As the depth of the sinking destroyer increased, its depth charges exploded and sank the U-16. Both the Italians and the Japanese operating in the Mediterranean in the later years of war made effective use of depth charges in defeating U-boats.

Although in short supply by 1915, Allied ships began using depth charges. These waterproof bombs exploded at a chosen depth. At first, these were not very effective and between 1915 and the end of 1917, depth charges accounted for only nine U-boats. By 1918, they were improved. With more depth charges available, twenty-two U-boats were destroyed. Improvement included a

hydrostatic trigger with a dial for depth providing settings between 50 and 200 feet.

WWI Monthly Depth Charge Use[10]

Year	Number
1916	100
1917	200
1918	500

Orders for improved depth charges were 10,000 in July 1917, with 20,000 ordered January 1918.[11] It has been estimated that as many as 1,745 per month were expended during the later part of 1918.[12] The total number of depth charges expended during WWI has been estimated at 16,500. Significantly higher numbers have been reported.

United States and the Depth Charge WW I

Frequently, details about submarines and associated systems are under the heading of secret. Depth charges were no exception. Countries using depth charges placed the construction and methods of exploding them in the secret realm. It follows that United States, a neutral nation, was not fully aware of depth charge developments and progress until the declaration of war in April 1917. Prior to that time, some initiatives were taken.

Before United States entered the War and recognizing the need for the new weapon, the United States Bureau of Ordnance (February 1917) selected a depth charge design with 50 pounds of explosive that used the float and line trigger mechanism and a depth capability of 25 to 100 feet. Designated as MK I, an order for 10,000 was placed and they were available upon entry into the War in April 1917 at a time when the U-boats chose unrestricted warfare.

With the MK1, a speed of 5 knots or greater was specified for the depth charging vessel.

The limitations of the float and line trigger mechanism brought attention to the British hydrostatic technique that replaced that method. The United States Navy was not comfortable with the British designed depth charge hydrostatic trigger. Their method was found to detonate prematurely in the water and the exposed external firing device that protruded several inches beyond the head of the cylindrical depth charge container could fire while handling. Detonation during transportation was another consideration.

Critical of the safety and effectiveness of the British hydrostatic depth charge trigger, a careful examination of the British depth charge was undertaken. With safety and reliability a priority, the Bureau of Ordnance tested different ways to detonate. "Various means of effecting this explosion were tested, including slow-burning time trains, buoys paying out wire, and hydrostatic pressure devices."[13] This effort led to a new development.

Chester T. Minkler

One of the investigators working at the Naval Torpedo Station in Newport, Rhode Island, developed a new device to detonate the charges. The investigator was Chester T. Minkler, a young and experienced Bureau of Ordnance engineer of mines and explosives at the Naval Torpedo Station. He devised a new hydrostatic trigger that corrected the shortcomings. The new device also allowed greater depth settings and included an external control for setting the desired depth for explosion.[14] Minkler received his patent in August 1917 and turned it over to the United States Government. It should be noted that in October 1929 the British unsuccessfully challenged Minkler's patent rights.

When the United States entered the war, an exchange of information with the British made it clear that 50 pounds of explosive was not effective. The 300 pound charge being used by the British was adopted. New and stronger submarines mandated a larger charge. In 1940, the U. S. Navy ran depth charge tests against an operational submarine (for most of the test, moored underwater without crew), and determined that 300 pounds of TNT was not very effective; the explosive charge was doubled to 600

pounds.

The American version of the Newport designed depth charge with the newly patented detonator was designated Mark II. An initial contract was placed in July 1917 for the manufacture of 10,000 with first deliveries in the fall of that year. The British government adopted the MKII in 1918 and placed a request to the Bureau of Ordnance to contract 15,000 depth charges.[15] With some modifications, an additional U.S. Navy order for 20,000 Mark II depth charges was placed in the spring of 1918. The United States during World War I let contracts for a total of 72,000 depth charges. With the end of the war, unfulfilled contracts were closed where feasible.

A submarine chaser dropping MKI charges with 50 pounds of explosive specified at least a 25-foot depth setting and ship's speed of 7 knots. The MKII with the 300 pounds of explosive making a total weight of 420 pounds and a dropping rate of 6 feet per second had a 50-foot depth limitation for detonation and a required speed of 15 knots. A 200-foot maximum depth was another parameter.

An order for 20,000 MKIII with a 300-foot depth setting capability was placed in July 1917. At about the same time,1000 MK IV with a 600 pound charge and a weight of 745 pounds were ordered and available overseas in September 1918.[16]

New Convoying Initiatives

By May 8, 1917 (about a month after United States entered World War I), the first six of 36 US destroyers arrived and were ported at Queenstown in southern Ireland for duty. At the same time as the arrival of the destroyers, the Allies began a significant push to convoy merchant ships with naval escorts as a means of countering the U-boats. Successful convoying required a multitude of escort ships, and the destroyers were available to escort convoys and to aid merchant ships shelled or damaged by U-boats.

U-58

The first German submarine sunk by the U.S. Navy in World War I was the U-58. Commissioned in 1916, U-58 was 219.8 feet long with a submerged speed of 8 knots and 14 on the surface and a maximum operating depth of 164 feet. It was the first U-boat kill

of the war by American destroyers. On November 17, 1917, as the USS FANNING (DD 37) patrolled in the eastern Atlantic in the company of other destroyers, Fanning's lookouts sighted a periscope.

FANNING attacked and the first depth charge pattern scored a hit. NICHOLSON (DD 52 accompanying the FANNING made a depth charge pass. The U-58 broke the surface. It has been inferred that the explosions jammed the submarine's diving gear and the U-boat plunged towards the bottom and that at about 300 feet, the submarine blew ballast and shot toward the surface. When the U-boat broke the surface the destroyers shelled. The submarine crew came out on deck with hands raised in surrender. FANNING maneuvered to pick up survivors as the submarine sunk. Forty survivors were taken prisoner. Two different locations are mentioned regarding the location of the engagement. One site is near the Hebrides, the other some distance away from the Hebrides off Milford Haven, Wales at 5132N 0521W.[17] in the Bristol Channel. This was the first of two U-boats sunk by US Navy destroyers in World War I.[18]

World War I Ends

By mid-1918 and during the closing months of the War, improving success of merchant ship convoying and the enhanced performance of depth charges on the destroyers with stern racks, K-guns, and Y-guns, the life expectancy of a U-boat was six combat patrols. Further, U-boat attacks were beginning to be limited to nighttime.

October 21, 1918 three weeks before the Armistice, the British ex-cargo vessel PRIVET operating as a "Q" ship encountered the U-34 in the Straits of Gibraltar, attempting to leave the Mediterranean. PRIVET's depth charges and gunfire sinking the submarine made the U-34 the last U-boat casualty of the War.

The U-34 was observed leaving a trail of light in the water as it was exiting the Mediterranean. PRIVET tracked down and destroyed the submarine. Later it was suggested that a possible source of the aforementioned light was the bioluminescent glow resulting from the disturbance of the plankton by the motion of the submarine.

Even closer to the Armistice on November 10, 1918, (the eve of the Armistice), the minelayer HMS ASCOT was torpedoed on the

northeast coast of England. The central role of the U-boats during the entire five years of World War I persisted until the end.

A mid-1960s appraisal of the depth charge as the War closed is appropriate. "The weapon with the greatest future was the depth charge independent of geography wherever and whenever U-boats made attack on shipping."[19]

World War II Comment

"At the start of the Second World War the stern-released depth charge was the only viable A/S weapon"[20]

Entering World War II, the available depth charge capability heavily reflected the status at the end of World War I. Five years of the new World War saw significant changes in the depth charges and their tactical use. Early depth charges were still primarily rolled over the stern of antisubmarine craft or flung out to the side of the pursuing craft using the K-gun or the Y-gun.

Features of the wartime depth charge developments included the ability to fire ahead of the vessel pursuing the submarine and deliver a wide semicircular pattern of charges. This capability, associated with much-improved underwater detection reduced the blind time between enemy submarine detection and weapon delivery. In some instances, wartime systems were implemented that coordinated depth charge firing with the sonar system's enemy submarine detection. During the entire World War II, the generic depth charge, ("ashcan"), underwent improvement and refinement. In a timely fashion, United States and Great Britain through research and speedy development produced various new antisubmarine warfare weapon systems of the firing ahead type augmenting the basic depth charge. At the same time, improving sonar systems enhanced the effectiveness of depth charges systems with their ability to locate and track the enemy submarines. The significant changes came in the firing ahead capability.

Reviewing U-boat losses for the period August 1942 to May 1943 cited by Tarrant, demonstrates the extensive use and effectiveness of the depth charge.

During that 10-month period, 150 U-boats were sunk with 127 or about 85% of the sinking a result of depth charging.[21]

ENDNOTE

1. Jellico, *op., cit.*, p. 61.
2. G. A. Stackhouse Jr., *The Anglo-American Atlantic Convoy System in World War I*, 1917-18. (Volumes I and II), University of Michigan, Ann Arbor, MI, 1983, p. 350.
3. Jellico, *op. cit.*, p. 61.
4. Dorling, *op. cit.*, p. 268.
5. Sims, *op. cit.*, p. 94.
6. Messimer, *op. cit.*, p. 221.
7. Gilbert, op. cit., p. 236.
8. Dorling, *op. cit.*, p. 269.
9. Messimer, *op. cit.*, p. 206.
10. www.ku.edu/-kansite/ww_one/naval/br 1669.htm, p. 2.
11. Jellico, op. Cit., p. 81.
12. Tarrant, op. Cit., p. 42.
13. US Navy Ordnance Activities, op. Cit., p. 98.
14. US Navy Ordnance Activities, op. Cit., p. 99.
15. Evelyn M. Cherpak, "Chester T. Minkler and The Development of Naval Underwater Ordnance", Newport History: Bulletin of the Newport Historical Society, Vol. 59, Part 4.
16. US Navy Ordnance Activities, op. Cit., p. 101.
17. Http:/ /uboat.net/wwi/boats/index.html?boat=58
18. Dictionary of American Naval Fighting Ships, Navy Historical Society, 1981.
19. Grant, op. Cit., p. 169.
20. Willem Hackman, Seek and Strike, Her Majesty's Stationery Office, London, 1964, p. 303.
21. Tarrant, op. Cit., p. 117-119.


The sea dominates the Earth.
This dominates the sea.
It runs silent, it runs deep. The Virginia-class attack submarine is the most advanced undersea weapons system in the world. This nuclear-powered submarine comprises an innovative mix of technology to stealth and combat effectiveness. Designed to meet changing missions and threats, it is at the forefront of the Navy's push to maintain 21st century sea superiority. Northrop Grumman Newport News is proud to be a partner on the Navy's next-generation submarine. It's one reason there will always be something in the water that keeps America strong.
NORTHROP GRUMMAN
Defining the future
Newport News

"SET CONDITION 2SC"

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

CAPT Jim Patton is a retired submarine officer. He commanded PARGO (SSN 650). He currently lives in Connecticut and is a frequent contributor to THE SUBMARINE REVIEW.

Although I consider myself to have been an SSN sailor, numbers two and four of the seven submarines served on were SSBNs, and the slightly different operational spin I was exposed to there has proven to be personally valuable ever since.

For example, I remember that there were a set of pre-defined weapon system readiness conditions that included, in addition to the weapons system hardware and software lineup as such, navigational accuracy specifications and requirements for specific external connectivity stances. These 4SQ through 1SQ conditions were set as appropriate during different phases of the patrol cycle as a function of the degree of readiness required.

With the wide range of missions and tasking now existing for SSNs (plus soon to be SSGNs) and the vastly different types of connectivity required or appropriate for each, it would seem that some consideration be given to devising similar pre-defined states easily understood by submarines, Battle/Joint Force commanders and all others concerned. In a mission/ship-specific OPORD, the time/geographic/tactical triggers for establishing one or another condition would be clearly set down.

Similar to the SSBN case, these communications/connectivity requirements could be broken down into four "SC" (submerged connectivity) conditions, namely:

- Condition 4SC
- Condition 3SC
- Condition 2SC
- Condition 1SC

Although none of these conditions would normally refer to the alongside, in home port situation, given other established routine

connectivities and reduced readiness status, there is no reason one couldn't be imposed if a crisis existed (or when in a foreign port).

Condition 4SC would generally refer to all but the very last part of a transit phase, would impose no restrictions on depth or speed and could consist of something like:

- Passively (receive only) check the VLF/SATCOM submarine broadcast for traffic at least every (8/12/24 as directed) hours. Conduct active (transmit) communications only as directed or as tactical situation or other documentation demands (i.e. MEDIVAC request et. al.).
- No state of land-attack weapons readiness would be directed.
- Commanders accept that in return for potentially high SOA, submarine is entirely incommunicado for up to as long a period as his assigned schedule period (i.e. 8/12/24 hours).

Condition 3SC could be set for those portions of a transit where some improved level of alertness is appropriate. For example, if during the last 1000 miles of a transit phase when embarked land attack missiles are within range of potential targets, condition 3SC would impose minimal restrictions on depth or speed while allowing the Regional Commander to target those missiles in less than an hour. To still reach station expeditiously but have its weapons so targetable, the submarine would:

- Operate within a speed/depth envelope that would allow continuous passive receipt of ELF *bellringer* signal on streamed buoyant cable antenna.
- If such a bellringer is received, proceed to periscope depth, or stream a buoy with MDR/HDR passive/active connectivity capability or launch an expendable two-way MDR/HDR buoy to establish connectivity within 30 minutes.
- In the absence of such a bellringer, passively (receive only) check the VLF/SATCOM submarine broadcast for traffic at least every (8/12/24) hours. Conduct active (transmit) communications only as directed or as tactical situation or other documentation demands (i.e.MEDIVAC request et.al.). Commanders accept that in return for a slightly lower SOA, submarine is available for tasking within 30 minutes.

- Land attack weapons readiness would be such as to be capable of receiving aim and waypoint data upon commencement of passive connectivity (<30 minutes).
- Commanders accept that in return for being able to literally call it up, submarine SOA can be somewhat slowed to ensure ELF reception, and that excessive employment of this bellringer option will dramatically impact the submarine's transit.

Condition 2SC could be set for those portions of a mission where continuous MDR/HDR passive (and immediate readiness for active) connectivity is essential. When 2SC is set, the submarine is immediately taskable, and would:

- From within the equipment's operational envelope (up to15 kts and down to 400 feet desirable characteristics) stream a deployable floating wire or buoy capable of continuous two-way MDR/HDR operations and establish continuous passive connectivity.
- If a system such as the above is not available, than employ a mast-mounted HDR antenna, accepting the limitations of periscope depth and relatively slow speeds (<8 knots).
- Be prepared to immediately conduct active connectivity evolutions as directed or as appropriate.
- Land attack weapons would be in their maximum sustainable readiness condition, with aim and way point data entered if available.
- Commanders accept that in return for much better connectivity, submarine mobility and covertness can be somewhat affected – particularly those with none other than a mast-mounted MDR/HDR capability.

Condition 1SC could be set for those portions of a mission where continuous MDR/HDR passive/active connectivity is essential, and direction to launch land attack weapons is imminent. It is a Battle Stations equivalent as regards total ship readiness, detracts from the submarine's covert stance to a degree, and is not intended to be sustainable for more than several hours at a time. When 1SC is set, the submarine is immediately taskable, and would:

- Establish continuous MDR/HDR passive/active connectivity from periscope depth, contributing to the Common Operational Picture (COP) as appropriate in real time.
- Land attack weapons would be in their maximum readiness condition, with aim and way point data entered if available.
- Commanders accept that in return for the highest possible level of connectivity, loss of submarine mobility and discretionary covertness is also at its greatest. Also, prolonged and/or excessive implementation of this condition could actually result in *decreased* personnel/weapon readiness due to fatigue and weapon system wear and tear.

The above SC conditions are entirely hypothetical and are meant only as an example. The important issue is that it be understood by *all* Joint Forces that (unlike most other forces) there are **situationally specific** optimum submarine connectivity stances, and that directing increased levels generally does adversely impact other desired platform characteristics such as mobility and covertness of operation. Exceptional judgement by operational commanders is appropriate if the goal is to realize a net *aggregate* benefit from conflicting cause and effect syndromes.■

THE FLEET THAT WASN'T SIGHTED AT VIGNA[1]

by Captain Nils Bruzelius

Captain Nils Bruzelius had a long and successful career within the Swedish Submarine Fleet. He retired from active duty in December 2001 and spends part of his time on academic studies. This is a somewhat shortened translation of his B-level essay in history which has been presented to the Swedish National Defence College. The essay is based on non-classified literature, reports written by Swedish defence attachés in Washington, Oslo and Copenhagen between the years of 1956-1961, released documents from the National Security Council and protocols from the interrogation of the Swedish spy Stig Wennerström in 1963.

Background

On November 15 in 1960, the Nuclear Powered Fleet Ballistic Submarine GEORGE WASHINGTON sailed from Charleston, S.C. Hereby; the first deterrent patrol with a ballistic missile submarine was under way. GEORGE WASHINGTON was armed with sixteen ballistic missiles, which could be launched from a submerged position. The missiles were named Polaris A-1 and each missile had a nuclear warhead of 600kT explosive force (30 times more powerful than the Hiroshima bomb).

The Polaris project had been initiated on January 1, 1957. Originally the aim was that the system should have been operative in 1963, but on 4 October 1957, the Soviet Union sent the first *Sputnik* around the Earth. Thereby, the Soviet Union had shown that

it was capable of destroying targets in U.S.A. using ballistic missiles. The Polaris project now became a top-priority issue and the project was brought forward three years in order to counter the Soviet threat as quickly as possible. The gain in time was primarily realised with two measures: the range of the missiles was shortened from 1500 to 1200 nautical miles and the Attack Submarine SCORPION, which keel had already been laid, was cut in two and provided with a missile section amidships. In total, U.S.A. was to build 41 submarines with ballistic missiles in less than ten years. These were, over time, provided with missiles of greater range and accuracy, Polaris 1-3 and ultimately the Poseidon. During the early 1960s, the five GEORGE WASHINGTON class submarines, equipped with Polaris-1 missiles, formed the operative core in this fleet.

Questions at issue

In this essay I aim to:

- Explain the governing factors for choosing the area of operation for the strategic missile submarines.
- Describe measures taken by U.S.A. in order to protect the missile submarines' areas of operation and how this affected the Nordic countries.
- Investigate the criteria to be fulfilled in order to launch a missile successfully. If one or more of these criteria indicate that the submarines had a reason to be in Swedish territorial waters, this is of course of particular interest.

The Area of Operation for the Missile Submarines

When choosing an area of operation for the strategic missile submarines, there are four factors that have to be taken into consideration, namely:

1. The missiles' targets

The targets one intended to engage with the missiles from the Polaris submarines were cities in the Soviet Union. By means of constantly maintaining an ability to destroy a great number of Soviet cities, the communist leaders would be deterred to attack cities in the U.S.A. This doctrine, called *Assured Destruction* replaced, after the establishment of the Kennedy administration, the doctrine on *Massive Retaliation*, which no longer was considered credible.

The range for the Polaris-1 missiles was 1200 nautical miles. The distance between Moscow and Vinga is 880 nautical miles. In order to reach Moscow, one can be positioned quite far out in the North Sea or in the Norwegian Sea, but to reach the cities beyond Moscow, one has to get closer to the Scandinavian Peninsula. The big city of Gorky, where a great deal of the Russian weapon industry was concentrated, is situated 400 km east of Moscow. To reach Gorky, the submarines had to be positioned in the Skagerrak.

2. The accuracy of the missiles

Notwithstanding the powerful charge, there was a need for hitting the selected targets as accurately as possible. Without getting into details about all the factors that affect the accuracy of a ballistic missile, we can clarify that the accuracy increases when the firing range is short. There was also a minimum firing range, inside which it was not possible to get the warhead down. This is due to the fact that the Polaris missiles had engines with solid fuel. A solid fuel rocket engine cannot be turned off. The engine will run until there is no more fuel. A reasonable assumption would be that the minimum firing range was half of the maximum range. Hence, the Polaris missiles would be able to destroy targets located 600 to 1200 nautical miles from where they were launched. To position the submarines close to the Scandinavian Peninsula was, in other words, desirable from an accuracy point of view.

3. The distance from the submarine base

On her first patrol, GEORGE WASHINGTON sailed from the east coast of U.S.A. and returned there after her patrol. This was,

however, an exception. As early as in February 1961, a forward submarine base was established for the 14th Submarine Division, to which GEORGE WASHINGTON as well as the other four submarines of the same class belonged. The base was located at Holy Loch in Scotland. Logistics consisted of the submarine tender, Proteus, and a floating dock. Onboard the tender and in the floating dock, one could carry out maintenance and repairs of both submarines and missiles.

4. The distance to enemy bases

After World War II, the Soviet Union built a naval base of impressive size in Murmansk. For the U.S. Navy to choose the position of its missile submarines in the Barents Sea in the immediate vicinity of this base, appears improbable for obvious reasons. Partly because it was easier for the Soviet Fleet to carry out anti-submarine operations close to its own base, rather than further away, and partly because it would be more difficult for the U.S. Navy to defend its missile submarines. It is true that the missile submarines carried effective self-defence weapons, but to use them was probably considered a last resort. The safety of the submarines was momentous for the survival of the American society in the event of a nuclear war.

Skagerrak

Based on the statements above, it is reasonable to suggest that Skagerrak was the primary area of operation for the U.S. missile submarines, during the early years of the 1960s. From this area, the planned targets were within a good enough range. The distance to the submarine base was short. The submarines had the best possible protection: the whole of the Norwegian Sea could, as it were, be assigned for anti-submarine operations against any Soviet submarines trying to get down to the area. An efficient defence of the Baltic Sea outlets would prevent the ships from the Soviet Baltic Navy to enter the area from the south. The strategic importance of the Skagerrak had changed all at once. From being an anonymous

area of the sea it became, in November 1960, the *submarine bastion* from which the American retaliation would be guaranteed. In other words, an area of utmost importance to the United States' security.

The National Security Council and the protection of the submarine bastion

The National Security Council (NSC) was established in 1947 and its task was "to advise the President on all matters relating to national security." The policy, which the United States intended to use in a certain situation, for example towards an individual country or group of countries, was established by the President in a policy document when required. These documents were written by the NSC Planning Board, with the co-operation of the most important departments, the intelligence organisations and the Joint Chiefs of Staff and were discussed before being established in the National Security Council. After a policy had been established, the documents were given to the departments and authorities concerned for implementation.

In the spring of 1960, there was a need of a new American policy regarding the three Scandinavian countries. A new policy document was prepared and was read on Friday, April 1, 1960, at the 439th meeting with the National Security Council with President Eisenhower in the chair.

When this meeting took place, the Polaris submarines were about to become operational and the first deterrent patrol to be set up six months later. The U.S. Navy would, most likely, have expressed a strong wish about the reinforcement of the submarine bastion's security. The CNO, Admiral Arleigh Burke, also participated in the meeting as the representative of the defence forces. It could have been a coincidence, Burke was of Swedish stock, was a great friend of Sweden and was surely the most informed of the Joint Chiefs regarding the Scandinavian countries. Furthermore, as CNO, he was responsible for the strategic submarines.

The result of U.S. new policy towards the Nordic countries

Sweden

Sweden received, without its knowledge, a very strong security guarantee. In the event of a Soviet attack against Sweden, the U.S. would provide Sweden with military help. Sweden received the same security guarantees as the NATO countries, without having to perform any of their commitments. As the only non-aligned nation, the country also got the opportunity to buy the most modern defence material from the U.S. Naturally; this gave rise to certain commotion from persons within the American administration, that were not aware of the strictly classified motives behind the decisions.

Norway and Denmark

The military assistance to Norway and Denmark was almost doubled at once between the years of 1959 and 1960; despite the fact that, at the same time, the whole budget for military assistance was cut down with 25 percent. It is also evident that the U.S. had clear guidelines on how the money should be used.

Norway received a new fleet plan consisting of 5 frigates and 15 submarines. The number of armed ships in the Norwegian Fleet was doubled. In May 1960, the Norwegian Commander-in-Chief of the Navy, Vice Admiral Hostvedt, informs the Swedish defence attaché in Oslo that the plan that now had been sent in were approved by, CNO Admiral Burke, SACEUR, SACLANT as well as the commanders of the NATO Standing Group.

"Admiral Hostvedt seemed to be very pleased with the state of things."

There was naval re-armament with minelayers and frigates in Denmark too. The most considerable difference, however, was the establishment of a joint combined command for the defence of the Baltic Sea outlets, called BALTAP. This command was set up in 1961 and was established on the initiative of the American NATO commander in Europe, General Norstad.

The knowledge about the submarine bastion's existence

It is possible to determine that nobody within Sweden's military command was aware of, or reflected on, the areas of operation of the Polaris submarines, even though a lot of the information about the missiles' range and targets consisted of open source information and was available as early as in the beginning of the 1960s. If anyone in the military command had started to wonder about the positions of the submarines, this would immediately have resulted in questions to the attaché office in Washington. No such queries have been found. The only geographical information that the Navy attaché spontaneously mentions is that the Polaris submarines *"carry out patrol missions in the Atlantic."*

The Soviet Union was, however, well aware of the Polaris submarines and their operations. This is natural since it was its cities which were the targets of the missiles. According to the interrogation protocols from 1963, Wennerström, the Swedish spy, says: "On a number of occasions, the Soviets expressed that they were significantly anxious about the American Polaris submarines, that is, the nuclear-powered submarines which are armed with long-distance rockets. They took into account that these submarines would strive to be close to the Russian coastlines in order to reach certain targets. They thought it possible they would find their ways towards the Swedish west coast or even into the Baltic.

How the submarines operated in the area of operation

In order to understand how the submarines operated when they eventually had reached their allotted area of operation, one needs a rather comprehensive description of what requirements there are to be met for a successful missile launch.

The submarine has to survive until the launch

The submarine was chosen as platform thanks to its invulnerability. A running submarine can be detected with passive sonar by, e.g., an enemy anti-submarine submarine, as its engines and propellers emit sounds in the water. A submarine that is hovering or just lies on the bottom of the sea is considerably quieter and should, in

practice be impossible to detect with passive reconnaissance.

Maximum depth for launching

To fire a ballistic missile from beneath the sea is an awkward but technically solvable problem. The Polaris missile was exposed to the pressure of the surrounding water from the point of launching until the missile broke the surface. The greater the depth the missile had to take, the heavier and stronger the shell of the missile, resulting in a decreased range. Therefore, it is reasonable to assume that the missile only could be launched from a relatively shallow depth. Exact figures are classified, but a probable presumption is that the missile only could be launched from a maximum keel depth of 30 meters or 100 feet.

The submarine's speed when launching

The missile is launched vertically to the surface. During the short instance when the missile is leaving the tube, the part that has reached above the deck is exposed to a horizontal power if the submarine is making headway through the water. The magnitude of the horizontal power is exponentially dependent of the submarine's speed. To launch the missiles when the submarine is running fast is therefore out of the question. There must have been a speed limit for launching the missiles. The optimal speed when launching is of course zero knots, as the missile is not subjected to any hindering powers when being launched. On the pictures that exist showing launches from Polaris submarines in submerged conditions, one can notice that the submarine is not making headway.

The submarine's ability to retain its depth after launching

A submerged submarine is weightless and could therefore remain still and *hover* without floating to the surface or sinking to the bottom. When launched, the missile is given a substantial impulse upwards. The submarine will hereby be given an equally big impulse downwards. This impulse has two effects on the submarine: it starts to sink as well as to oscillate or *swing* in the longitudinal direction.

When the missile leaves its tube, this is completely filled with water. The missile in itself is heavier than the water volume that is

displaces, wherefore the submarine ought to become lighter after launch. But as the launch tube itself is kept dry before the launch, the result is the opposite.

If only one missile is launched, it is possible to increase the speed after the launch and keep the submarine up with the help of diving planes until it is again correctly balanced. If one would like to launch all the sixteen missiles, however, in a rapid succession, the only way of maintaining the submarine as a stable platform during the whole launch sequence should be to position the submarine on the sea-bottom.

The accuracy of the missiles

Earlier in the text, I pointed out that the accuracy of the missiles was dependent of the distance from which they are launched. How the submarine performed before the launch also matters. Every misinterpretation concerning the submarines position when launching the missile, results in an equally big miss in the missile's point of impact. Between each position fix, the submarine calculates its position with so-called dead calculation. The miscalculation of the position will therefore slowly increase until a new position fix is made. If one chooses, on the other hand, to position the submarine on the bottom of the sea immediately after a position fix, no dead calculation is necessary and there will not be any time-related error.

The submarine's understanding of North

The missile has no ability of its own to determine the north, but has to receive this information from the submarine. After the launch, the missile will make a turn according to the calculated angle in relation to north that is required to hit the target. If the submarine's understanding of north is incorrect, the missile will miss the target. An angular incorrectness of 1 milliradian (or 0.057 degrees) gives a miss of 2,000 meters over a distance of 1,200 nautical miles. To accurately determine the north, the submarines were equipped with an enormous gyro. The Gyro wheel held a diameter of 8 feet and weighed 22 tons. With such a large installation, north could be determined with great accuracy. As the gyro wheel, despite its size, is affected by the submarine's movements, its precision is increased if the submarine is still on the sea-bottom.

Conclusion

In the area of operation, the submarines were lying still on the bottom of the sea, waiting for the missiles to be launched.

There is proof that the above conclusion is correct. The device, with which a ship calculates its speed through the water, is called *log*. The log is always placed in the bottom of the ship. In February 1960, the Swedish Navy attaché in Washington reports that the Polaris submarines will be equipped with two logs of a completely new type: *"One in the bottom of the ship and one above the deck, the latter for calculating speed, and current, when launching the Polaris missiles."*

The attaché does not reflect any further on this peculiarity, but it proves that the Polaris missiles were intended to be launched with the submarine positioned on the sea-bottom. For it is only when the submarine is on the sea-bottom that the upper log is needed. The lower log is stuck out approximately 30 inches from the hull and must therefore be taken in before the submarine is positioned on the sea-bottom. Normally, there is no need for a log at all when the submarine is on the sea-bottom, but the Polaris submarines needed one, as they had to be sure, before the launch, that the currents were not powerful enough to jeopardise the missile when it was launche d. The fact that this was considered necessary also shows how easily affected the missiles were, as the currents seldom reach more than one or two knots.

Locations for sea bottoms positions on the west coast of Sweden

In principal, a submarine can position itself on the bottom of the sea anywhere. Uneven and rocky sea bottoms should be avoided, due to the risk of damaging the rudder and the propeller. The requirements for locations on the bottom of the sea having appropriate depth, imply that these submarines had the motivation to operate within the territorial waters of Sweden. Range-wise, it would be fully possible to stay outside the territorial border that, before 1979, only reached 4 nautical miles from the base line. However, the depths out there are too big.

Anti-submarine operations on the Swedish West coast in 1966

On the 24th of October in 1966, a remarkable anti-submarine

operation was carried out outside the Swedish fishing village Lysekil. After a conscript soldier had spotted a fin above the surface, the minesweepers BLACKAN and DÄMNAN established sonar contact with a stationary object two nautical miles west of the Gäven lighthouse. The depth at the location is 29 meters; the bottom of the sea is flat. The contact was maintained for more than two hours and the object remained still throughout that time. The minesweepers successfully maneuver to a position right above the object and drop two 50-kilo iron balls in a wire. The wire slackens after about ten meters. It is obvious that the balls are resting on a solid object. After a minute or two, the balls are dragged off the object and the wire is stretched again. Immediately after that, the water becomes very upset. It is, on this occasion, dark, so the phenomenon can only be seen in the light of the searchlights. A few moments later, the minesweeper HASSLÖ, which has arrived to the area, receives radar contact with something that is thought to be a submarine periscope. A depth charge is dropped and after that there is no more contact.

In the briefings afterwards one always presupposed that is was a small conventional submarine hovering 10 meters above the bottom of the sea.

That the submarine could have been that large that it, in fact, was lying on the bottom of the sea and had the roof of the fin 10 meters beneath the surface, never seemed to have occurred to the participants at all. But if it were a submarine of GEORGE WASHINGTON class, the dimensions would fit very well. The motive why such a submarine would be right there, in Swedish territorial waters, is also evident.

Even if it is impossible to prove before one can have access to the submarine's log books, there is a lot that indicates there was a missile submarine , which, by chance was discovered on Swedish territorial waters this October day in 1966.■

ENDNOTE

1. Vinga is the lighthouse to Gothenburg, Sweden's biggest seaport. The title is a travesty of the popular hit song *The Royal Navy has been sighted at Vinga*. A hit song that was written in connection to the first English naval visit in Gothenburg after the Second World War.

TRANSFORMING TACTICAL TRAINING— PART 2

by Capt. David Marquet, USN

In the April 2003 edition of this magazine, I reported on the submarine force's new approach to tactical training. Since then, Sailors have been asking, OK – What's in it for me?

To recap the April article, the essence of this new approach is that the submarine Type Commander staffs define what is important and what the expected performance is for each evolution and task. This is accomplished through the use of published attribute sheets. The Tactical Readiness Evaluation teams (during Tactical Readiness Evaluations) and Squadron staffs (during Basic Submarining Assessments and Pre-Overseas Movement Certifications) use these published sheets to measure performance.[1] As a result, for those appropriate evolutions, operational effectiveness is determined by a combination of performance (time for fire hose, off-track error, etc.) and the degree of procedural compliance. This contrasts with previous methods that did not quantitatively define performance expectations and relied almost solely on measuring the degree of procedural compliance.

The benefit to the Sailors is a dramatic improvement in training efficiency. All ships have essentially the same amount of time to dedicate to training. Yet, given this constraint, some ships demonstrate significantly higher levels of operational effectiveness than others. Those ships utilize their training hours more efficiently. Another benefit to the Sailor is standardization among boats, squadrons, and forces. Now, when a Sailor transfers among ships, his emphasis and focus should be easily transferable, making the transition more smooth for both Sailor and ship.

Based on our observations during Tactical Readiness Evaluations, training is most efficient when it is operationally oriented and clearly focused on specific objectives. This is the vision espoused by the Submarine Readiness Manual.

[1] At the same time, operationally effective boats are learning how to use the attribute sheets in order to make their training more efficient.

"Operational" refers to practical performance. Typically, this means a drill, evolution, or walk-through. However, operational could also mean that a seminar has an output or product -- for example, the Temporary Standing Order, or naval message that would be appropriate for a certain scenario.

"Focused" means the team understands what is important and what the standards of expected performance are. This is where the attribute sheets, along with the standards, can be of tremendous value. They define what is important (as defined by the Type Commanders) and what the performance standards are. These can be directly useful for any training session.

Ships that tell their teams ahead of time what to focus on (the critical attributes) and what the standards are will evoke better performance from their teams. Beyond (or instead of) tracking overall attribute sheet scores, ships may choose to focus on one or more of the critical attributes. The benefit to quantitatively defined attributes is that they can be tracked, graphed, and analyzed. Performance can be analyzed by watch section, initial condition, or any number of other parameters.

Since the mechanics of recording and displaying the performance data can become an administrative burden, it is important to select only the most critical attributes to measure.

The key at this point is what the ship does with this data. When performance falls short of the standard, the ships that do well will gain an intimate knowledge of their process and figure out how to change that process for sustained and permanent improvement. Exhortations and repeated training will lead to short-term gains only. Performance will quickly return to the mean for that team unless the process is changed. This is the net result of "That was bad, do it again."

The requirement for sustained improvement is to modify the process. Consider the initial fire hose response for a fire. Gaining an intimate knowledge of that process may require standing next to the fire hose and following its deployment, or alternatively, standing next to the ship's assigned responders and closely monitoring their behavior.

One side note while on this issue: having watched many ships respond to fires, it seems to me that a fragile system results when the fire hose response is the responsibility of the "rapid response

team." Unexpected events can result in significant degradation of performance. On the other hand, a robust system results when the crew, as a whole, considers it their responsibility to respond with the fire hoses. Then, if an assigned responder becomes unavailable, there is little degradation in performance.

By following the responders and the hose, the ship's leadership understands where the bottlenecks are, and where the most time is lost. The result is assignment of different personnel, reapportionment of equipment or responsibilities, or training on the optimal sequencing of events (hose to adjacent compartment, breathing protection on while pressurizing, test hose and advance into the affected compartment).

The benefits of this type of focused, operational training are apparent on chart 1. Chart 1 shows the time to get a pressurized fire hose to a fire during Tactical Readiness Evaluations. Over the past 18 months an improving trend is evident.

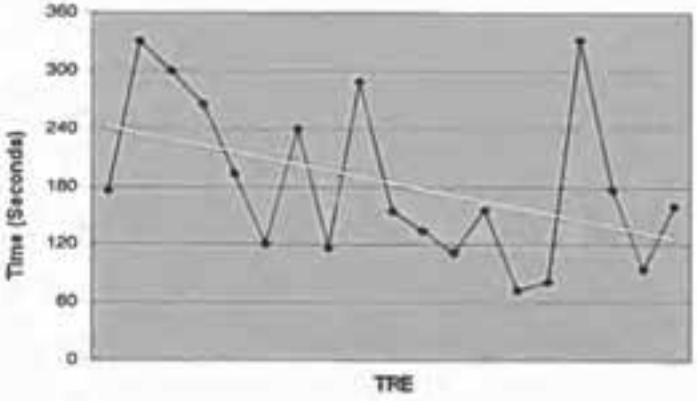


Chart 1. Fire hose response times for TREs

The long-term objective of this transformation is to make the ships significantly more efficient at training. This is accomplished by the force leadership publishing what they think is important for each task and what they think the standards will be. The benefit is

that the Sailor on the deckplate should know what to focus on for a particular evolution and what is expected of him. For trainers, once the expected performance is attained, effort can be shifted to other areas where performance comes short of expectations. This will result in more effective training at the Sailor level, as Sailors learn to focus on the operationally significant attributes. It will also result in more effective training at the unit level, as trainers allocate training time to the evolutions that most require improvement.■

"FAST ATTACKS AND BOOMERS"
The Centennial Exhibit Moves On

by CAPT C. Michael Garverick, USN (Ret.)
Executive Director

After a most successful run of over three years and over ten million visitors, the Smithsonian's National Museum of American History closed "Fast Attacks and Boomers-Submarines in the Cold War" on June 1 and dismantled it. For the past nine months the Naval Submarine League (NSL) has been working with the Naval Historical Center (NHC) and the Naval Historical Foundation (NHF) to preserve and move the exhibit from the Smithsonian to the Washington Navy Yard Museum. A Memorandum of Understanding (MOU) between these organizations has been executed and implemented.

During the planning for the Submarine Centennial Celebration the Committee wanted to prepare an exhibit that would fulfill the League's Charter to "...to stimulate and promote an awareness, by all elements of American society, of the need for a strong submarine arm of the U.-S. Navy." By all accounts, the Centennial Celebration succeeded in bringing the submarine message to the forefront of the American people. By far the most impressive piece of the Centennial was the 3000 square foot exhibit that was placed in the Smithsonian through the combined efforts of our planning committee and was successfully launched with a grand opening reception during the April 2000 Centennial celebrations.

Several NSL members served as docents and guided the millions of visitors through our exhibit for the past three years. An informative brochure was prepared for our visitors and provided a historical perspective of the Submarine Force and our missions. Two exploded view pictures are included to show the interior views of "fast attacks and boomers" to demonstrate the complexity and functionality of

these magnificent machines. NSL recognized the performance of nine of our docents during our Annual Symposium in June.

With the closing of the exhibit in June, the three parties of the MOU agreed to work with the Smithsonian to preserve as many of the artifacts and displays as possible with the intention to reestablish the exhibit in the newly renovated Navy Museum at the Washington Navy Yard. Navy funding renovated the original towing basin building used by David Taylor and NHC has set aside over 7000 square feet to redisplay our exhibit, with additional items that they have accumulated. For example, a TRIDENT I (C-4) missile was recently acquired by NHC from Strategic Systems Programs (SSP) for this purpose.

NSL and NHF have jointly funded $44K needed for the dismantling and transfer of the exhibit from the Smithsonian to a secure Navy facility pending the completion of the renovations of the new museum facility and the design of the new exhibit. NHF sponsored a video tour of the exhibit prior to its closing with one of our docents providing the narrative to preserve the exhibit "as displayed". NSL will also contribute $25K to help fund the design of the new exhibit and ensure that the integrity of our "Fast Attacks and Boomers" exhibit is preserved while incorporating the lessons learned during our stewardship of the exhibit in the Smithsonian. Two NSL members have been assigned to the Exhibit Design contract review team at NHF to provide the oversight desired to preserve our exhibit.

The Terrorist Attacks on September 11, 2001 have also impacted the planning to display the exhibit at the Washington Navy Yard. The Navy recognizes that the increased security required to protect our government assets also impacts the access of visitors to our government facilities. Several proposals have been made to move the Navy Museum to locations outside the Navy Yard and are under evaluation. NSL will have representation in these deliberations and will work to ensure that our exhibit is available to the public in the best forum available within the Navy Museum venue.

Completion of the new exhibit will take at least three years with substantial additional funding required to recreate the new presentation. NHF has the responsibility for raising the funds for the new exhibit and will be initiating a fund drive shortly.■

THE FIRST AND THE LAST

By Dr. Robert P. Beynon

Dr. Beynon served in USS BOWFIN (SS287) and subsequently earned his doctorate at OHIO STATE University. He is a retired university professor having served at Bowling Green State University and the University of Maine at Farmington. He presentlly resides in DeLand, Florida. He is the author of
The Pearl Harbor Avenger — USS BOWFIN.

There is a port of no return, where ships
May ride at anchor for a little space
And then, some starless night, the cable slips,
Leaving an eddy at the mooring place . . .
Gulls, veer no longer. Sailor, rest your oar.
No tangled wreckage will be washed a ashore.

Leslie Nelson Jennings
"Lost Harbor"

The attack of the naval fleet at Pearl Harbor was a tragic event. It was described as a "Day of Infamy" by President Franklin Delano Roosevelt. The anchored ships were devastated by the

Japanese naval aircraft. Such an event will live in the memories of those who were there and also on the pages of naval history.

A little known event occurred two days later after Pearl Harbor in the Phillipine Archipelgo. Once again enemy bombers assaulted the Asiatic Fleet at Manila and Cavite Naval Yard. This second incident was reported as more damaging than at Pearl. A total of 22 vessels and 1800 men were lost. Because of occurring just two days after Pearl Harbor, a presidential decision was made to keep the event secret. It was felt the loss at Pearl plus the losses at Cavite were too much for the American public to absorb.

Although the news of the December 10th attack was not relayed to the general public, those at the scene were eye-witnesses. Among those giving testimony was Carl L. D'Alessio, a submarine sailor aboard the USS SEADRAGON.

Seaman D'Alessio recalls hearing air raid sirens about high noon and seeing the enemy planes make reconnaissance runs over the Cavite Naval Yard. The return runs produced a barrage of bombs aimed at destroying the submarines moored at the piers. USS SEALION was a prime target and a direct hit resulted in extreme damage to the boat. The submarine, commanded by Richard G. Voge, was unable to avoid the destruction inflicted upon her. She was without her main engines which were due for major overhaul. The inability to get underway made her a sitting duck. The indefensible boat took two bombs. One was a direct hit on the cigarette deck and the other near the after engine room hatch. The two hits resulted in an immediate flooding of the compartments and SEALION settled by the stern. Damage to the bulkheads resulted in further flooding and the boat listed to starboard. She finally settled on the bottom with half of the main deck under water. Shortly after the bombing a damage survey team reported the boat was totally incapacitated. All motor controls were gone; thereby, rendering the boat not fit for salvage. In addition, Cavite was not able to do any repair work and the only facility was 5000 miles away at Pearl Harbor. A decision was made to strip her of all vital instruments and on Chritmas Day three depth charges were exploded. This ended the voyage of USS SEALION . . . THE FIRST SUBMARINE LOST IN WWII.

USS SEADRAGON was moored along side SEALION. This proximity caused damage to her also. Fragments of the bombing and

pieces of SEALION damaged the conning tower of SEADRAGON. Along side SEADRAGON was the minesweeper, BITTERN, which was burning furiously. As the SEADRAGON was in the process of being re-painted, the paint cans exploded and caused further damage. As the two vessels continued to burn, and not knowing the cargo of the minesweeper, Captain Pete Ferrell made preparations for his boat to be removed from the area. He summoned the rescue vessel. PIGEON, which hauled the submarine from harm's way into clear waters. Later on, the tender CANOPUS made minor repairs to the boat after which she sailed for Surabaya, Java for further repair work. Finally she was made sea worthy and returned to retaliate for the attack at Cavite.

SEADRAGON continued her war patrols. She delivered code-breakers to Java, she escorted the tender HOLLAND to Darwin, Australia. And was assigned to guard the sea lane approaches to Darwin. Shortly thereafter, the invasion threat to Australia was lifted and she was assigned regular patrol runs. During the fourth patrol, seaman first class Rector was diagnosed with appendicitis. The boat's *doctor* W. B. Lipes, decided an operation was in order. Captain Ferrell was undecided. In order to solve the impasse, the question was put to the patient. "I can do it," said Lipes, "but it is a chance. If you don't want me to go ahead. . . ." "Lets do it" said Rector. With the patient's concurrence, the Captain took the boat to 120 feet to provide a smooth, flat operating table in the officers' quarters. Lipes operating with make shift instruments—dining silverware—and a tea strainer for a mask, proceeded to perform a two and one-half hour appendectomy. All went well. The SEADRAGON finished with a war record of 10 vessels sunk–43,450 tons of enemy material on the Pacific Floor.

USS BULLHEAD was the last of the 52 submarines lost during the war. Her early patrols were under the command of Walter Griffith (ex BOWFIN Captain). While aboard BOWFIN, Griffith earned two Navy crosses, the Silver Star, the Bronze Star, a letter of Commendation and a Presidential Unit Citation. This fearless skipper was assigned to new construction and commissioned BULLHEAD.

Griffith served the BULLHEAD for the first and second patrols. Few targets were found as the boat patrolled the South China Sea. On board was a war correspondent, Martin Sheridan, a reporter for

the Boston Globe. He was the only correspondent awarded the privilege during WWII. Sheridan reported on one incident during the second patrol.

> A B-24 Liberator popped out of the clouds.
> Three bombs were dropped about 75 feet astern of the boat. Though the boat dove rapidly, it didn't seem half fast enough. Men in the maneuvering and the after torpedo room were shaken up a bit by the under water blasts. One serious case of constipation was known to be cured by the attack."

BULLHEAD's second patrol was the last for Captain Griffin. He was relieved of command and joined Admiral Lockwood's staff. His successor was E. R. Holt Jr. Who sailed the boat from Fremantle on the last day of July. Her orders were to patrol the Java Sea until September 5 and then head for Subic Bay in the Phillipines. In order to follow such orders, Holt had to traverse the Lombok Strait. This narrow passage-way lay between Lombok Island and the Island of Bali. It was heavily guarded by Japanese A/S vessels and a shore battery of 6 inch guns on the cliffs overlooking the Strait waters. It was here that Commander Holt reported the boat through the Strait. Between August 6 and August 15 several submarine attacks were made on American and British boats. CAPTAINE, enroute to the Java Sea, ordered the BULLHEAD to position herself in a scouting line. Receiving no response, the CAPTAINE reported the following:

> "Have been unable to contact BULLHEAD by any means since arriving in area."

No message meant no BULLHEAD. She was lost. Confirmation came on August 6th, as a Japanese Army Plane depth charged a submarine off the Bali Coast. Near the Northern mouth of the Lombok Strait. The pilot claimed direct hits and a gush of oil and

air bubbles. With that information and with no response from BULLHEAD, it was reported the boat was down in action. . .ALL HANDS LOST. She was the last US submarine lost in the war.

The Silent Service will record the history of USS SEALION and USS BULLHEAD. The submariners who served aboard the boats were truly memorialized by the following:

> "For those to whom much is given, much is required And when at some future date the high court of history sits in judgment on each of us, recording whether in our brief span of service we fulfilled our responsibilities to the state, our success or failure, in whatever office we hold, will be measured by the answers to four questions:
>
> First, were we men of courage. . .
>
> Second, were we truly men of judgment
>
> Third, were we men of integrity. . .
>
> Fourth, were we truly men of dedication?
>
> John Fitzgerald Kennedy
> Inaugural Address
> January 20, 1961

WORLD WAR II SEA STORIES

WWII Memories in *Flying Fish*

By Captain Charles W. Styer, USN (Ret.)

Captain Charlie Styer graduated early from the Naval Academy with the class of 1941. He had a distinguished career in submarines commanding MACKEREL (SS 204) in 1945 and CUTLASS (SS 478) in 1955. He was Chief Staff Officer to COMSUBRON 14 in 1960 and commanded HOLLAND (AS 32) in 1964. He took command of SUBRON 10 in 1965. Charlie is part of a long line of submarine sailors. His father was COMSUBLANT and his brother, Bob, commanded PLUNGER (SSN 595)

My first submarine duty was as a Naval Reserve apprentice seaman in *USS Cuttlefish on* a San Diego to Pearl Harbor cruise in 1936. That experience, plus a year before the war as a commissioned officer in the destroyer *USS Rowan,* confirmed my preference for sea duty aboard small ships rather than the major combatant types to which the majority of my Naval Academy classmates had been detailed upon graduation. I liked the early assignment of responsibilities that accompanied small ship duty. Thus, I applied for submarine school in early 1942 and began my wartime submarine experiences. They were typical for most young officers of my time—adventure and adrenaline, plenty of responsibility, and many cat and mouse encounters and other experiences shared as only a submarine crew does. The periods when time dragged were few. Although my nine World War II patrols were not as action-filled as many about which we have read, they accounted for a respectable share of Japanese shipping sent to the bottom. As happened to those who entered submarines before or early in the war, I made patrols in more than one boat, with responsibilities increasing steadily throughout the war. This is the story of my first four war patrols.

My first assignment after Sub School was *USS Flying Fish*. About three quarters of her crew had participated in her first two patrols, action-filled in both torpedo attacks and depth charging. Our skipper, Lieutenant Commander "Donc" Donaho, ranked among the top skippers of the war. He ran a taut ship and was known as being aggressive in making torpedo attacks. When I joined the *Flying Fish* wardroom, she was just completing a three-week refit in Pearl Harbor. I was assigned as communications officer and was introduced to the tedious duties of strip and machine message decoding. My roommate and mentor for submarine qualification was third officer Lieutenant Walter Small, who later became our "exec" and then went on to his own early successful wartime command.

We headed from Pearl to the Solomon Islands, where the struggle for Guadalcanal was in full swing in the fall of 1942. En route to the patrol area, we new hands were thoroughly drilled as officers of the deck and diving watch officers. There were frequent surprise exercises in diving the boat. How agile we were in our youthful days! Clearing the bridge of personnel, shutting the topside hatch on the way down the ladder to the bridge, and sliding further down the control room ladder to take over as diving officer to complete the dive gave us plenty of exercise. The last man down, generally the officer of the deck, often found himself riding the shoulders of anyone ahead of him who might be a mite slow in dropping down the vertical ladder from the bridge to the conning tower compartment. We were also thoroughly trained as lookouts. Captain Donaho always assigned two officers to the lookout stations high in the periscope shears whenever the boat was close to friendly entry or exit ports.

En route to the Solomons, we patrolled off the entrance to the big Japanese base at Truk in the Caroline Island group. There, we made submerged attacks on a formation of five cruisers and five destroyers and another against a formation of several warships. Both attacks were unsuccessful, believed to be due to the infamous defective Mark 14 torpedoes of the time. A depth charging followed each of these torpedo attacks. This was my first encounter with this disagreeable aspect of submarine life. Listening through the hull to the swishing of our attackers' screws and to short scale sonar pings, followed by the "click" of a detonator, then the loud explosion itself, convinced me that the Japanese were serious about finding and

sinking us.

In the Solomon Islands area, we made our first use of the new SJ surface search radar, running submerged just enough (about 40' depth) to expose its antenna. We made successful night attacks this way on two occasions, sinking two destroyers. These were heavily loaded with troops and running at high speeds down the "slot," as Lengo Channel, the narrow body of water north of Guadalcanal, was called. The Japanese were attempting to reinforce their forces on Guadalcanal. Interdicting their supply and warships and dodging our own surface forces kept us busy. Torpedoes expended, we headed for Brisbane and a welcome refit.

On my second run in 1943, we sank two merchantmen in Marianas waters, proceeding afterwards to Midway for a short refit. There were quonset hut quarters ashore here for resting submarine crew members while a relief crew stationed on the tender took over the refit work. The officers stayed in a BOQ, named the "Gooneyvil le Lodge." My membership card to the bar therein stated that I was "a raider of the deep and an experienced submariner and that, as a member in good standing, I could return again at any time to carouse and sleep with the gooneybirds." We took our rest periods seriously.

We were off again for my third patrol, this time to Japanese home waters. Captain Donaho had been promoted to commander and Walt Small had fleeted up to exec. Our assigned area included the northern east coast of Honshu, the main home island, and the southern east coast of Hokkaido. We spent two weeks just off Tokyo Bay where the enemy shipping traffic was known to be heavy. We had high hopes there and they were fulfilled with several successful submerged attacks on coastal shipping. After one of these, we were slammed around for hours under an intensive and close depth charging by several destroyers. With depth keeping particularly difficult, I felt I had earned my keep as diving officer. I remember receiving the approving comments of our grizzled old Chief of the Boat who was manning the diving manifold in the Control Room. During that patrol we made six periscope attacks and sank three ships.

My fourth and last run in *Flying Fish* was in Formosan (now Taiwan) waters. Our division commander, Commander Frank Watkins, had volunteered for this run while Captain Donaho was on stateside leave. Captain Watkins, 45, was obviously delighted

at the chance to make a patrol. He was the first division commander to take a boat to sea as skipper. After departing from Pearl Harbor, we stopped at Midway for refueling on our way west. One of our enginemen had purloined a small motor scooter at the Pearl Harbor Sub Base, cutting off the handlebars in order to fit it down a hatch. However, a Marine awaited us on the dock at Midway to recover the scooter. Too many submariners had pulled off this same stunt before!

This patrol was conducted mostly off the entrance to Takao, principal port of Formosa (now Taiwan). We experienced miserable weather much of the time, including one typhoon with mountainous seas. Running on the surface in such seas usually meant that men on the open bridge were ducked under water much of the time. Whenever a huge wave came over the bridge, the bridge hatch to the conning tower compartment below had to be quickly closed. Running with the main induction valve closed in these high seas required taking air from the bridge hatch through the ship, causing a veritable continuous high wind throughout the after part of the boat. Periodic shutting of the conning tower hatch meant, of course, shutting down main engines to avoid pulling an increasing vacuum inside the boat. Our knowledge about running engines in a vacuum was hazy in those days. At the best, taking engine air through the conning tower in high seas was a pain in the neck; it was noisy and made sleeping difficult. At worst the interruptions made battery charging virtually impossible. If there was sufficient "can," sometimes the best solution was to submerge and ride out the storm at depths of one or two hundred feet. Even then, things could get uncomfortable. I recall once rolling 20 degrees at 200 feet. Coming up for occasional periscope looks in this weather to search for targets meant both difficult depth keeping and poor visibility. This was a disappointing patrol, although adjudged successful with one ship sunk.

Flying Fish was refitted between my patrols in Brisbane, Pearl Harbor (twice), and Midway. Crews were moved ashore for two weeks of relaxation during these three-week refits. The Royal Hawaiian Hotel in Honolulu had been taken over shortly after outbreak of the war by the Navy for submariners. It was not too shabby as a submarine rest camp! In Brisbane, I had the pleasure of making a few liberties with my dad, who was also *Flying Fish's*

squadron commander, embarked in the submarine tender *Sperry* that was refitting us. It was just like old times, when he gave me the keys to his car! The Australians were most hospitable and we enjoyed the rest camp beaches, some night life, and horse races.

In contrast, Midway was a quite dull rest camp. Feeding beer to the gooney birds and qualifying as drivers in bulldozers and other earth moving machinery was about as interesting as the place got. Of course, the best part about any refit was getting mail from home and to taste the fresh fruits and milk brought in from Hawaii.

While on patrol in 1943 in Japanese waters, we usually operated in areas devoid of U.S. surface or air forces. Our assigned patrol areas generally contained an extensive coastline and significant ports. The areas were geographically separated from those of other U.S. submarines so as to avoid possible "friendly fire" situations. Even so, we were kept well informed of movements of other boats. We maintained radio silence except to report movements of out-of-range or damaged shipping which might provide target opportunities for other boats. When in close-in coastal patrol areas, we usually submerged at dawn. Morning star sights were taken just prior to diving to fix a position so we could keep as close to known Japanese traffic lanes as possible. While submerged, we established our position by taking periscope bearings on known structures (few) or mountain peaks (many). Most of our charts gave the British Admiralty credit for the survey work upon which they were based.

We kept a constant periscope watch for targets, conserving battery power needed to close a target for attack. After dusk, we ran on the surface all night to charge batteries, run air compressors to refill air banks, and run distillers for fresh water. In my last *Flying Fish* patrol, we ran on the surface quite often in daylight, using a high periscope watch for telltale masts or smoke on the horizon.

We were in heart-pounding action many times on each patrol, attacking shipping while submerged in daylight or on the surface at nigh. If submerged, we usually received our expected ration of depth charges after each attack. In daylight, a spread of steam-driven torpedoes left a very visible "V" pointer to our firing position. Close depth charges were loud and bone rattling, with insulation cork and cracked glass flying around the compartments, and or with vital equipment becoming damaged. Silent running and evasive maneuvers after attacks usually meant many hours of creeping

speeds. It also meant shutting down most auxiliary equipment to minimize noises for which Japanese sonars were listening, as well as to conserve battery power. Silent running meant heavy sweating (both men and ship) with no air conditioning and cold food.

Speaking of food, we had the best. Submarine chefs were well trained, occasionally at leading stateside hotels. We were issued as much in the way of fresh vegetables and frozen foods as our freezer and refrigerator could hold. Before each patrol, we stuffed canned and boxed goods in every nook and cranny on the ship. Still, we ran out of some foodstuffs and had to rely on powdered milk, eggs, and other ersatz foods occasionally. The extra ration allowance given submariners helped. Without much exercise, keeping off weight was a problem. One solution was having only "C" ration chocolate bars for lunch. Never my favorite! But it did keep down air contamination and electricity consumption. Like many boats, we reversed day and night hours, eating lunch at midnight. I was impartial to that procedure, but then I don't remember having a vote!

Flying Fish sank five and a half ships (one shared with another boat), totaling 10,000 tons during eleven attacks over the 10 months I was aboard. Those four patrols averaged 52 days in length and were all adjudged successful, entitling all participating crew members to wear the Submarine Combat Insignia. I left *Flying Fish* for new construction in the summer of 1943. I looked forward to a stateside rest and the opportunity to bring to bear the experience I had gained in *Flying Fish* to another boat.■

GOLDEN GATE IN '48

by Floyd W. Erickson

Mr. Erickson served in the Navy from 1940, just after graduating from high school in Kentucky, until his enlistment was up in July of 1946. He made five war patrols and, as a Chief Pharmacist Mate, was an independent duty corpsman in WHALE. After the war he went to college and worked in the aerospace industry for 40 years. He is now retired and lives in New Jersey.

Happy the man who like Ulysses made a wonderful journey
or like the one who carried off the Fleece and then
returned home, full of experience and good sense,
to live his remaining years among his family.
Joachim Du Bellay (1522-1560)

On January 4, 1945 I had been overseas for over two years. Now on this date I was aboard USS WHALE (SS239) and we were steaming towards the beautiful Golden Gate and San Francisco Bay. Throughout my time overseas it seemed to everybody that the tenacity of the people of Japan would make it a long war. The most optimistic said that at least three more years might be needed to defeat the Japanese, assuming that the Allies had to invade the homeland, the Islands of the Empire of Japan. Based on that assumption most of the people that I knew came up with the motto "Golden Gate in '48", meaning that we were all pretty well convinced that we would steam under the Golden Gate in 1948 when we all predicted the War would be over. Our ship, USS WHALE had to undergo a major shipyard overhaul, so we were lucky enough to be coming back to the States before 1948. But even those of us who had five or more patrol runs on WHALE would get a new

construction boat and steam back out of the Golden Gate to resume our war with the Empire of Japan. That was a dreary thought to most of us, because on the last two patrol runs we had made, we did believe that the Japanese Merchant Fleet was pretty well decimated. We in the US Submarine Force figured that we would probably spend the rest of the War doing life guard duty. The Air Corps was so successful that seemed now to be the main thrust of the war. Well, I figured at least on life guard duty we were doing a good service and it was relatively safe, so we would probably survive the war. Today, three years before 1948, we were steaming towards the most beautiful city in the world — San Francisco. We fortunate few intended to enjoy this sojourn as long as we could.

[Today] as we approached the Golden Gate Bridge, I was at my docking station on the bridge phones. We had just been cleared by the Coast Guard to enter San Francisco Bay. Commander J. B. Grady, our Captain, said to the Duty Officer, "Mr. Alford, as soon as we get to the entrance to the Bay, just before we go under the Bridge please announce that all hands not on landing watch may come topside as we enter the Bay. Please open all deck hatches and proceed at your will." "Aye, Aye, Sir" answered Mr. Alford. He then proceeded to make the Captain's announcement over the intercom. Almost immediately the two aft and one forward deck hatches opened and all hands not on duty streamed up on the deck, eager to see the beautiful panarama of the city of San Francisco unfold as we went under the great Golden Gate Bridge. As we approached the Golden Gate Bridge, a loud cheer went up from the members of the crew who were topside. It was the thrill of a lifetime for most of us. As we proceeded under the bridge, we could see the beautiful white buildings of San Francisco on the starboard side of the ship and the lovely greenery of Marin County on the port side. Then Alcatraz Island came into view and further down the Bay the beautiful Bay Bridges came into sight. There was much shipping on the Bay that morning. As we passed each ship, the deck crews came to attention and saluted us. It was a thrilling feeling to experience this once in a lifetime happening. We were to dock at Pier 42 in the Hunters Point Shipyard. We were to stay there overnite and then proceed to Mare Island Naval Shipyard at Vallejo, California, a distance of about 30 miles to Upper San Francisco Bay.

We steamed past Alcatraz Island, proceeded on under the Bay

Bridges, past the Embarcadero and China Basin and into Hunters Point and Pier 42. Captain Grady made a good docking in one pass. As the Skipper eased alongside the Pier a great cheer went up from all the workers on the Pier. There were many vendors on the Pier to greet us. I have always treasured that moment. It was a hero's welcome. None of us felt much like a hero, but it was a moment to savor for all of us aboard WHALE.

We tied up to Pier 42 and Mr. Alford announced there would be liberty for all hands, except the few needed to stand watch aboard the ship for security reasons. All hands were allowed to go out on the pier and sample the vendors wares. We all went out on the pier and got a drink of the Nectar of the Gods. Something that none of us had had for months — fresh milk! That is all that the vendors had and it sold out in an hour or so. What a treat! I was on the liberty list so I got dressed up to go ashore in the beautiful City of San Francisco.

I went with a group of my shipmates. We took a taxi to China Town. One of the well known restaurants in China town was noted for its floor shows — featuring beautiful Chinese Maids. We had a great Chinese Dinner and enjoyed a magnificent floor show. The Chinese Dancers were indeed beautiful — it was the most beauty that many of us had seen for several years. After the show we all headed for the Mark Hopkins Hotel to enjoy a cocktail or two at the Top of the Mark, a world famous watering hole in San Francisco. Most of our Officers were at the Top of the Mark when we got there. We enjoyed the cocktail hour together.

We all finally left the Top of the Mark a bit after midnight. We were back on board our boat shortly thereafter. Bob Beavers, a Chief Motor Mechanic (ChMoMM), was the watch Chief that night. He greeted us at the top of the gangplank as we came aboard. As I saluted the colors Bob said to me, "Doc, am I glad to see you. We have had the wildest scene here that you can imagine." I said, "What do you mean 'wildest scene?'" Beavers said, "Well, as you know the Skipper stayed aboard tonight. At about 2200 he came out of his cabin, went into the Control Room and summoned me. When I got to the Control Room I could see right away that the Skipper was crocked to the gills. He ordered me to take all of the bunks out of the Aft Battery crews quarters, and to lay all of the mattresses on the Aft Battery deck. I said, "Captain, if we do this where will the

crew sleep tonight?" He answered, "On the deck." I asked, "Why are we doing this, Sir?" The Skipper laughed and said, "I'm going to give everybody who can handle it a lesson in Greco-Roman, or is it Roman-Greco wrestling? At any rate it will be wrestling." He was pretty well gone and did not know what he was saying," said Bob. I knew that he had been an Intercollegiate Varsity Wrestler at the Naval Academy, at that point though, I thought I should call the Officer of the Day (OOD) Mr. Tarbox. Mr. Tarbox came to the Control Room at Bob Beavers request and tried to talk the Skipper out of this wrestling idea. It was to no avail. We did as the Captain asked and cleared the Aft Battery of all the bunks and put the mattresses on the deck. Mr. Tarbox was only a Lt.(jg) and he was thoroughly intimidated by the Captain. Then Bob added, "Me too!" I said, "Sounds like you guys had a good time tonight. So what happened?" Beavers said, "The Skipper set up shop in the Aft Battery and challenged every man left on the boat to come and wrestle him. He challenged Mr. Tarbox right away. He pinned Tarbox in about 10 seconds! Then he came after me. I thought I could just push him off, but it didn't work out that way. He tossed me aside like a sack of flour. He was having a great time and as more of the crew came back aboard from liberty they all joined in. They tried to gang up on the Skipper, but there was not two or three guys who could handle him. But they were all having fun. He didn't do Greco–Roman wrestling — it was free style! Bodies were flying all over the Aft Battery. Mr. Tarbox and I could do nothing so we just hoped that the Skipper would pass out or something."

I couldn't help laughing. "Well, apparently everything is under control now. What can I do?" Just then Mr. Tarbox came up and said, "Doc, I think we have it under control. The Captain finally passed out and we got him to his bunk. I'm worried that he may have hurt himself or that he may wake up and go on another wrestling rampage. Can you check him out and maybe give him a shot or something. Something so that he sleeps the rest of the night." I said, "I'll check him out. He will probably be out till morning, but I will give him a mild sedative to be sure." We went below to the Forward Battery where the Captain's Cabin was. The Skipper was on his bunk and out cold. I looked at him and blurted out, "My God, what happened to his face?" Mr. Tarbox said, "When he was tossing everyone around the Aft Battery, he took several falls and he got a

lot of floor burns on his face. I didn't know what to do, but I thought we should put something on his floor burns. I went into the Medical Locker and got out a bottle of Mercurochrome, and I swabbed his floor burns with that, was that okay?" I said, "Yes, but it leaves this terrible yellow color on everything it touches, didn't you know that? Mr. Tarbox hung his head and said, "Well, I do now." We all had a good laugh at that. I was still laughing as I examined the Skipper. Tarbox had done a job! The skipper's face was a sight to behold. His face was yellow all over except for his nose and around his eyes, and a clear spot on his chin. I said to Lt. Tarbox. "This stuff takes awhile to wear off. You are going to have to confess to the skipper what happened. It is my recommendation that you sleep in here with him, and when he awakens and looks in the mirror you will be right here to explain things. And please sir, don't mention my name, I don't want any credit for the facial that he got. Blame it on gremlins or what not."

We all had a good laugh at Mr. Tarbox's expense, but he said, "Okay, I'll stay here and watch him. The next time you see me though I may be a Seaman." He then shook his head and said to no-one in particular, "What a strong man he is! He is one tough SOB. I have never faced such a strong man! One thing I know is that he is the unchallenged wrestling champ of the SS239!" I kept laughing as I retired to my bunk in the Chief's wardroom in the Forward Battery. I had a great nite's sleep.

We were all up at the crack of dawn. The order was given to man our cruising stations for our departure from Hunters Point to Mare Island Shipyard. I took my station on the phones on the Bridge. Mr. Alford, our Executive Officer, was the OOD. We were at our stations waiting for the Captain who would con the ship to Mare Island. Finally Captain Grady came up the ladder from the conning tower. He was in his best Khaki uniform and he looked sharp. His yellow Mercurochromed face was very solemn. He gave the orders to get underway and to cast off all lines and he eased the old SS239 out into San Francisco Bay. We were clear of Pier 42 and underway to Mare Island. The Skipper was all business. Not a hint of what had happened last night. He gave the final orders to the engine room to proceed "All ahead full" and he gave a heading to the Helmsman. He then turned the Con over to a smiling Mr. Alford. As he turned to leave the bridge he looked at me. Our eyes met. His

Irish eyes were twinkling. A bit of a sheepish grin came on his beautiful yellow face. And as he went down the ladder he looked at me and gave me a big wink! It was a perfect ending to a great homecoming.

I knew at that moment that I had been honored to serve with Captain J. B. Grady, Class of 1933 at the Naval Academy, Intercollegiate Wrestling Champion; Officer and Gentleman; a great Submarine skipper; and unsung hero; and, of course a Great Irishman!■

IN MEMORIAM

James T. Allen
CAPT. John F. Fagan, Jr., USN(Ret.)
CAPT Arthur 'Speed' Graubart, USN(Ret.)
RADM Frederick Emery Janney
Dr. Richard Rosenblatt
VADM Arnold F. Schade
CDR Thom Warburton, USN(Ret.)
MOMM 1/C (SS) Robert J. Weley, USN(Ret.)
CDR William B. Young

COLD WAR SEA STORIES

WHICHAWAY SUBROC

by CAPT. Larry G. Valade, USN (Ret.)

This story is about how the first SubRoc missile fired in the Atlantic came very near reversing course after launch, and proceeding in the opposite direction away from the intended target. That this did not happen was due to a fortunate event occurring in the hours before the launch, and a disciplined and inspired performance by the submarine's fire control technicians led by Chief Fire Controlman William A. Seimer.

USS DACE (SSN 607) was designated in 1965 to be the lead SubRoc boat in the Atlantic Fleet. USS PLUNGER (SSN 595) a Pacific Fleet SSN, had completed the operational evaluation firings earlier. In 1966, shipboard preparations for the SubRoc capability were completed, and a test missile was loaded aboard. DACE, commanded by Commander William J. Cowhill, sailed out of New London for Fort Lauderdale, enroute to the AUTEC firing range for the launch.

At Fort Lauderdale, mail call brought a package from the Naval Ordnance Laboratory White Oak, with a request for the submarine to install the enclosed instrumentation. While somewhat dismayed at the absence of a NOL engineer or technician to assist in the hook up, the package was opened up by the fire controlmen. The instrumentation consisted of a bearing circle synchro receiver about the size of a dinner plate, with five attached leads. The instructions were straight forward, calling for the standard synchro transmission line-up, S1 to S1, S2 to S2, S3 to S3, R1 to R1, and R2 to R2. The leads were attached to the submarine fire control system, across the wiring that sends the firing bearing to the SubRoc missile. The bearing circle worked perfectly, except that the displayed bearing was 180° different from the bearing indicated on the SubRoc simulator (this was a small suitcase that plugged into the launch panel in the Torpedo Room) that had been used for all fire control system testing involving SubRoc to date!

While not obvious at first, it became apparent that there was a wiring reversal in the fire control system, and probably in the

SubRoc simulator as well. As this point, Chief Siemer and his men, aided by a Librascope field engineer, started through the fire control system lead-by-lead, trying to find the reversal. One of the immediate trouble-shooting challenges was how to determine whether the signals on the circuits were in, or out of phase. Through sheer genius, one of the trouble-shooters came up with the idea of comparing Lissajous figures on an oscilloscope, perhaps as taught at FT "A" or "B" school?

DACE, with VADM V. L. Lowrance, COMSUBLANT, embarked, along with an observer from one of the New Mexico AEC laboratories, got underway for the AUTEC range. Within a few hours of launch, Chief Siemer and his people had located and made the necessary wiring changes, and were satisfied that everything worked.

The test missile was made ready and loaded for launch. The missile was fired at the prescribed time, with Admiral Lowrance watching on Number One periscope. He said something like "Look at that son-of-a-b. . . . go!"

The missile proceeded down range as intended. There is no doubt that Chief Siemer and company deserved all the credit for this shot being a success. Thanks are also due to the unknown person at NOL White Oak, who thought that reading and recording the firing bearing on a NOL bearing circle, would be useful for post flight analysis!■

FISH DON'T VOTE

by CAPT John F. O'Connell USN(Ret.)

According to a frequently told story, Admiral Rickover was asked why the Navy had changed its practice of naming submarines after fish, and he reportedly replied "fish don't vote," indicating that politics had something to do with the change. When I was serving in the Submarine Warfare Division(OP-31) way back in 1969–1970 before OP-02, etc., etc., I had occasion to gain some insight about Admiral Rickover's political acumen in a rather interesting fashion.

I was OP-313 and the only non-nuclear branch head and only Commander-rank branch head in the Division. For some strange reason a lot of little tasks seemed to fall my way. One of them dealt with coordinating congressional correspondence dealing with submarines. Probably that dumped the specific letter of which I am reminded, into my in-basket. The letter in question was from a retired submariner Vice Admiral to Admiral "Chic" Clarey, then VCNO. Clarey and the writer were contemporaries, had served as submarine COs in the Pacific, and collected numerous awards for their respective war patrols. The personal letter reminded Admiral Clarey of this and noted that only one thing was lacking to make his life full and complete. That was to have his wife named as a sponsor for a new submarine. Of course by this time that meant a nuclear submarine, either an SSN or SSBN.

It sounded like a natural fit to me in my naivete, but the cover sheet from Admiral Clarey's office indicated that the answer was "No", to be expressed in a pleasantly regretful tone. I puzzled over the instructions but finally put together a reply that made it through the 03-chop chain and was signed out by Admiral Clarey.

The issue bothered me because as I said earlier the lady in question seemed a most appropriate choice. Her husband had made many successful war patrols as a CO, he had gone on to flag rank, had served as a Vice Admiral and what more could you want? So I inquired. I quickly learned that Admiral Rickover controlled the choice of commissioning sponsors for all nuclear-powered ships. That got my attention.

My next step was to consult the Electric Boat Company Data

Sheet. It listed every submarine ever built for the United States Navy, their sequential number beginning with USS Holland as number 1, their length, breadth, etc., their commissioning commanding officer and their sponsor. I drew a line on top of USS Nautilus (SSN-571) and started scanning all the sponsor's names for SSNs and SSBNs. I seemed to see some familiar sounding names. I got out my Congressional Directory and cross-checked the sponsor's names against a listing of senators and representatives. There appeared to be a high correlation. I went even further and checked Committee assignments for those members whose mothers, wives or daughters had somehow wound up as sponsors of nuclear submarines. Here again the correlation was very high. Members of authorization committees, appropriation committees and the nuclear energy committee seemed to have done particularly well. It has been a long time now and I don't remember the exact number but it seems to me that the correlation between sponsor and member of Congress–relative was at least 90 percent. It became clear to me that while Admiral Rickover knew that fish didn't vote he was well aware that Senators and Representatives did.■

"MONK"

by CDR T. A. Curtin, USN (Ret.)

USS CUBERA (SS 347) lazed along on the surface in the Gulf Stream that late afternoon in summer of 1959, far out to the east of the Virginia Capes Operating Area, waiting for a visit of our Division Commander, Captain C.N.G. "Monk" Hendrix. We were one of two modernized *Guppy* submarines attached to Task Group Alpha, a special group of ships, planes and subs assigned to research and develop the best possible anti-submarine warfare tactics for use against the world-wide spread of the rapidly expanding and modern Soviet submarine force. In that Cold War era of reduced defense budgets, we were using any and all kinds of available, *off the shelf* equipment, plus any *in house* inventions that could be built and tested inexpensively on the units of our group. The task group was formed around an ESSEX class carrier with its squadron of ASW planes and helicopters, a division of destroyers, all specially equipped with the latest sonar gear, a squadron of long-range ASW patrol planes, and ourselves, two World War II submarines refitted with higher capacity batteries, snorkels and the latest in submarine sonars. Our boats were called *Guppies* from the designation, "Greater Underwater Propulsive Power."

Monk Hendrix was the ideal man to be in command of submarines engaged in such an endeavor. He was a prophet of undersea warfare, the first Academy grad to take a P.G. course in Oceanography at Scripps Institute, and a tireless advocate of increased U.S. efforts in that field, in order to counter the Soviet effort underway through its far-flung fleet of *fishing* trawlers, which were busily charting the sea floor and the nature of the waters above it, which he knew were the battle ground of the Navy's future. Though already something of a legend in the Submarine Force, Monk was down to earth, friendly and encouraging to his juniors. Our skipper, Hank Wilson, had served with him before, and was quick to invite him to join us in our Wardroom, where we soon became acquainted with his intense, impassioned and inspiring discourses on the ways and means of overcoming the incursions of the Russian subs, which he always referred to as *U-boats*.

We knew that Monk had a distinguished record in submarines, both during and since the war; part of it in recent years stemming from his having stepped on a few senior toes in his drive for greater efforts in undersea warfare research. We'd get him to tell *sea stories*, including the tale of his shipwreck in an old S-boat, early in the war, on a reef near Australia. Unable to get the boat off the submerged coral, and wanting to get the crew clear of what would become a prime target for Japanese planes once dawn came, the skipper decided to abandon ship and move the crew to a nearby reef that rose above the water. A torpedo was disarmed and fired into the second reef to make a mooring for a safety line for the crew's passage. Monk, a good swimmer, volunteered to take the first light line through the several hundred yards of fairly turbulent water. This he did, and hauled over the heavier lifeline by which the crew got to safety. Fortunately, they were not sighted by the enemy, and all were soon rescued. Seventeen years later, Monk was still a rugged, feisty little guy, and that story, to us, personified one of his favorite expressions, "there's one way to go".

At last, we got the word that the helicopter bringing Monk and his assistant, LT Roy Battles, was on its way, and we called away the Helicopter Receiving Party. The skipper was on the bridge, and, as Exec. I went out on deck to meet and greet the "Commodore". Our party consisted of about 8 men, of various rates, as was common in submarines, as we had no Boatswain's Mates, who handled such duties on surface ships. One of the party was our Hospital Corpsman. Two more were designated swimmers, ready to dive in and rescue people in the water, and each had his line tender, ready to haul him back alongside. They wore inflatable lifejackets, but were not in wet suits — just their dungarees. The rest stood ready to gather in beneath the 'copter, to guide and steady the descent of our visitors being lowered some 15 or 20 feet by the cable of its winch. This was a drill we'd carried out many times during our time with the task group.

As the helicopter hove in sight over the horizon, we turned the boat up so that the wind was on our starboard bow, in accordance with standard procedures, and notified the pilot of our course and speed, to facilitate his approach. He should then fly up into the wind, which would give him the best control, and hover over our bow while he delivered his passengers. The 'copter approached, a stubby

little model with twin rotors tilted at angles from her centerline. The pilot circled us, then, surprisingly, began his approach downwind. We stood watching and waiting, as he descended toward us, and as he swept over the deck — and into the sea! One of his wheels caught in a wave top, and the plane lurched forward, hit the surface and rolled over. As the rotors struck the water, they seemed to explode, and the air was filled with long spinning bits and pieces as the 'copter, its doors open, immediately filled and sank, it seemed without a trace.

We were stunned, transfixed as we watched to see that the spinning debris fell clear, then turned our attention back to the still-roiling spot where the helicopter had disappeared, searching for survivors. Suddenly a head bobbed to the surface, still covered by an officer's cap bedecked with "scrambled eggs" – the Commodore! He swam toward the boat, as three more heads surfaced – all safe! Waving off the swimmers, Monk reached the side ladder cut into our superstructure, and climbed aboard. I greeted him, and he assured me he was OK, as he turned his attention to the rescue efforts, where Roy Battles was coming alongside. "I don't think that pilot's doing too well", he said, and as I followed his gaze, he turned to a swimmer tender, grabbed a spare tending line, made a bowline around his waist, and dove back in to assist the pilot! He quickly reached his side, spoke to him and started back to the boat, this time assisted by the admiring line tender. With the pilot and copilot at the ladder, Monk shouted up, "I saw my files, I'm going to get them." and off he went again to recover his bulging brief case, which had somehow floated free of the sunken 'copter. It was not until he returned again and clambered back aboard that the *Doc* got a look at him, and found a long gash down his leg, which was now bleeding profusely.

We bound his leg and hustled him below, where the corpsman took quite a few stitches to close up what had been cut by a torn edge of the sinking fuselage. Monk was as chipper as ever, and at supper that evening he gave all hands a thank you "attaboy", regaled the wardroom with sea stories and the latest info on ASW, and gave us one of his inimitable pep talks on professional development for submariners. Looking at his bandaged leg, I couldn't help thinking that we had recently caught sharks in these same waters! He too knew these waters and their denizens, and only he had known he was

cut and bleeding, yet he unhesitatingly dove back in to help someone else. That was just the way Monk was.

I don't know what happened to that pilot for what I considered an improper approach leading to the loss of his aircraft; but I know I never heard Monk Hendrix utter a single word in public or private about the man who nearly got him killed, and whose life Monk risked his own to save! We felt even closer to Monk after that incident, and had a special mounting made for our ship's plaque, beneath which we mounted a little copper figure of a helicopter and a statement of appreciation for our *shipmate*, Captain C.N.G. Hendrix, USN, Commander, Submarine Division 61, an all around outstanding Navy man and friend.■

NAVAL SUBMARINE LEAGUE
HONOR ROLL

BENEFACTORS FOR MORE THAN FIFTEEN YEARS

AMERICAN SYSTEMS CORPORATION
BAE SYSTEMS (ROCKVILLE MD)
BWX TECHNOLOGIES, INC.
EG&G TECHNICAL SERVICES , INC.
ELECTRIC BOAT CORPORATION
ELIZABETH S. HOOPER FOUNDATION
GNB INDUSTRIAL POWER
KOLLMORGEN CORPORATION/E-O
LOCKHEED CORPORATION
LOCKHEED CORPORATION NE&SS
LOCKHEED MARTIN NE&SS-AKRON
LOCKHEED MARTIN NE&SS-MANASSAS
NORTHROP GRUMMAN (DMS)
NORTHROP GRUMMAN NEWPORT NEWS
NORTHROP GRUMMAN CORPORATION-OCEANIC & NAVAL SYSTEMS
PLANNING SYSTEMS INC.
PRESEARCH, INCORPORATED
RAYTHEON, NAVAL AND MARITIME INTEGRATED SYSTEMS
SAIC
SIPPICAN, INC.
SPERRY MARINE
THE BOEING COMPANY
TREADWELL CORPORATION

BENEFACTORS FOR MORE THAN TEN YEARS

APPLIED MATHEMATICS, INC.
BAE SYSTEMS (BRAINTREE, MA)
CAE USA INC. MARINE SYSTEMS
CORTANA CORPORATION
DRS TECHNOLOGIES, INC.
DYNAMICS RESEARCH CORPORATION
GENERAL DYNAMICS-AIS
HYDROACOUSTICS, INC.
L-3 COMMUNICATIONS OCEAN SYSTEMS
MARINE MECHANICAL CORPORATION
NORTHROP GRUMMAN CORPORATION-MARINE SYSTEMS
NORTHROP GRUMMAN INFORMATION TECHNOLOGY-TASC
PEROT SYSTEMS GOVERNMENT SERVICES
RIX INDUSTRIES
ROLLS ROYCE NAVAL MARINE INC.
SARGENT CONTROLS AND AEROSPACE
SONALYSTS, INC.
SYPRIS DATA SYSTEMS
SYSTEMS PLANNING AND ANALYSIS, INC.

BENEFACTORS FOR MORE THAN FIVE YEARS

ADVANCED ACOUSTIC CONCEPTS, INC.
AETC INCORPORATED
AMADIS, INC.
AMERICAN SUPERCONDUCTOR CORPORATION
BURDESHAW ASSOCIATES, LTD.
CUSTOM HYDRAULIC & MACHINE INC.
DIGITAL SYSTEM RESOURCES, INC.
HAMILTON SUNDSTRAND SPACE & SEA SYSTEMS

MATERIALS SYSTEMS, INC.
RAYTHEON COMPANY
SCOT FORGE
VEHICLE CONTROL TECHNOLOGIES, INC.
CURTIS WRIGHT ELECTRO MECHANICAL CORPORATION

ADDITIONAL BENEFACTORS

BURKE CONSORTIUM, INC.
BUSINESS RESOURCES, INC.
DIRECTED TECHNOLOGIES, INC.
DRS POWER & CONTROL TECHNOLOGIES, INC.
E.C. MORRIS CORP.
GENERAL ATOMICS
GOODRICH CORPORATION, EPP DIVISION
KOKES MARINE TECHNOLOGIES, LLC
L-3 COMMUNICATIONS CORPORATION
M/A COM SIGINT PRODUCTS
MARINE SONIC TECHNOLOGY, LTD.
McALEESE & ASSOCIATES, P.C.
OIL STATES INDUSTRIES/AEROSPACE PRODUCTS DIVISION
PACIFIC FLEET SUBMARINE MEMORIAL ASSOCIATION, INC.
PROGENY SYSTEMS CORPORATION
SSS CLUTCH COMPANY, INC.
SUPERBOLT, INC.
SYNTEK TECHNOLOGIES, INC.

NEW SKIPPERS

Mario Bagaglio, Jr.
RADM J. C. Metzel, Jr., USN(Ret.)

NEW ADVISORS

David C. Bailey, Jr.
James McGettigan

NEW ASSOCIATES

CAPT. Roy C. Atkinson, USN(Ret.)
CAPT. Mark R. Kevan, USN(Ret.)
CDR Edward A. Ransom, USN(Ret.)
LT. Brian Rauscher, USN

LETTER

THE DOLPHIN SCHOLARSHIP FOUNDATION

September 7, 2003

The Dolphin Scholarship Foundation has chosen **Lauren R. Maurer** of 12868 Darnick Court, Bristow, VA 20136 as the

2003 PAT LEWIS MEMORIAL SCHOLAR.

Lauren's stepfather, Captain Douglas E. Fremont, has served in the Submarine Force for twenty-four years. He was assigned to the National War College in Washington, DC at the time of Lauren's selection as a Dolphin Scholar. Lauren is attending the University of Georgia, where she plans to double major in International Business and Spanish. Lauren is a very bright young lady who has maintained a 3.6 grade point average throughout her first two years of college.

On behalf of the Foundation, I would like to thank you for your continued generous participation in our program of assistance to sons and daughters of submariners.

Sincerely,
Tomi Roeske
Scholarship Administrator

BOOK REVIEWS

CREATING THE NEW WORLD
Stories & Images from the Dawn of the Atomic Age

by Theodore Rockwell
Foreword by Glenn Seaborg
Nobel Laureate

1st Books library
Bloomington, Indiana 2003
ISBN: 1-4033-9086-X (e-book)
ISBN: 1-4033-9087-8 (Paperback)
ISBN: 1-4107-0333-9 (Dust Jacket)

Reviewed by RADM Donald P. Hall USN (Ret.)

(Reflections on individual life experiences of a pioneer from the early days of nuclear power)

When I started to read Creating a New World, I *knew* personally Ted Rockwell as an incredibly knowledgeable individual on all aspects of nuclear power both from the theoretical and practical aspects. He is comfortable functioning both as a scientist and as an engineer; a rare talent. I *expected* to fill in my own background knowledge (perhaps with a few anecdotes) on all that has occurred in this field in the past 60 odd years. Possibly, some of the mystery behind the paper weights made from one inch lengths of zirconium pigtail that all the *old timers* kept on their desks would be revealed.

What I *found* was an interesting, highly personal and eloquent exploration of the policies which produced the nuclear industry as it now exists; presented in a manner such that even the untutored can understand, absorb and accept the facts, *if* there is a concomitant desire to learn.

His description of experiencing a nuclear bomb test is a vivid and sobering classic that sets the stage for the rest of the book which concentrates on the power production application of this boundless energy source. An energy source presented as it is: misunderstood and under appreciated in the country that led in all stages of the

technology development. The first hand description of development at the Oak Ridge facility was typical of so many efforts of the World War II period with the added element of compartmented security which severely limited individual knowledge of events. Presentation of the actions of the scientists and engineers leading up to the creation of the Atomic Energy Commission establishes the arena in which the myriad organizations have grown up, participated, sometimes flourished, and in many cases then vanished from the nuclear power scene. The background discussion on use of the bomb to end the war adds a personal touch to what seems to be a never ending debate. (As a 17 year old seaman waiting to enter quartermaster school in the spring of 1945 I have never harbored any doubts that the correct course of action was taken.)

The guts of this book rest with Section 6, *Radiation, People, and the Good Earth;* and are expanded on in Section 7, *The Great LNT Scandal*. The coverage on public safety in Section 9 provides the capstone. These sections should be required reading for everyone before they are permitted to either comment or act on any aspect of the use of application of nuclear power. In terms easily understood by any thinking individual, Ted makes the case that the present concept of limiting exposure to radiation to *as low as reasonably achievable* (ALARA) is an anachronism that is long overdue for revision. Regrettably, the roots of this concept, that *any radiation is bad*, probably rests within the nuclear community based on the early bomb tests and resultant management actions.

Ted's coverage of The Three Mile Island reactor *incident* (I use the word deliberately because there was no disaster) is compressed, even handed and factual. Even so, he is charitable to the politicians and regulators that thoroughly botched the affair. The idea that responsible persons watching an incident in a plant designed, constructed, licensed and operated in accordance with established rules cold be so out of touch with reality remains perplexing. In the hydrogen explosion controversy of the incident he points out that naval plants had been and were all riding around with "hydrogen bubbles" while the "incident" events were unfolding.

The section on Norman Cole and water quality seemed out of place even for those of us that knew this very talented individual. However, on reflection it illustrates what might occur if the correct individuals were to be placed in certain key positions with some degree of permanence. On further reading and reflection, recalling

the struggle experienced within the Department of Energy during the Bush administration (first), and how quickly revised quality efforts were allowed to atrophy following that period it is probably irrelevant. In this regard, Ted cites the disastrous tenure of Bill Richardson at the Department of Energy. This individual is now a serving state governor and an influential television talk show performer. The book confirms that supposedly knowledgeable but uninformed individuals have continued to make decisions regarding nuclear power based on what they think people want to hear rather than on what the facts are.

Old *mossbacks* will find this book interesting and entertaining; newcomers to nuclear power in all areas should be required to read it in an attempt to inculcate a basis for future examination of where this industry should go. It is probably futile to hope that politicians and regulators would approach the book with openness. Even with standard designs and some of the innovations that Ted discusses (e.g., The Institute of Nuclear Power, INPO) it is difficult to envision any private utility willing to invest in the tortuous and unrewarding path of constructing a new commercial nuclear power plant. Only the Navy with its totally contained development, construction, training and operation system has been able to make nuclear power work with complete success. In conclusion, the book leaves one with the feeling that nuclear power has survived only because of dedicated individuals such as Ted Rockwell.

A few typographic errors and the degraded printing quality of some figures was disconcerting but easily worked around. Ted did touch briefly on zirconium production, but the metallurgy of nuclear power is probably an entire book of its own.■

ENCYCLOPEDIA OF AMERICAN SUBMARINES

by Wilbur Cross and George W. Feise, Jr.
Facts On File, Inc, New York, 2003
ISBN 0-8160-4460-0 (Hardcover; 304 pages)
Reviewed by CAPT James Ransom, USN (Ret)

Submarines from A to Z—or in this case, from "acoustic warfare" to "Zumwalt". If you are looking for a reference volume that gives a broad overall view of American submarines and submarine warfare from their historic beginnings through today's latest developments, then this book will provide you with a useful complement to other resources.

Fittingly, the first page after the title page is an "In Memoriam" tribute to my classmate, fellow submariner, and friend, Jim Blanchard. "Doc" worked with the authors as a consultant in planning and starting the initial research prior to his untimely death in 2000. Another of my submariner classmates, Joe Talbert, picked up the gauntlet as a technical consultant to ensure a reasonable degree of salt water reality was brought to the text. Vice Admiral Al Konetzni authored the foreword.

This book is the most recent of the Facts on File series, specifically part of the Facts on File Library of American History. A little digging on the internet and at the local library reveals that this publisher has produced encyclopedic volumes on such diverse subjects as Science, History of the American People, World Literature, Navy Seals, Native American Religions, World Mythology and Legend, Health and Living, and, somewhat grandiosely, *Pocket Guide to the World.*

It is not surprising, then, to find this product is indeed in encyclopedia format, with subjects entered alphabetically and indexed for easy reference. As in virtually all reference books using this format, range rather than depth of subject is evident. One will find entries on specific (but not all) US submarines, organizations such as "Department of the Navy" and "Electric Boat Company", battles such as Midway and Vella Gulf, equipment such as "sonar"

and "chronometers", weapons such as "Mk 48 Torpedo" and "TOMAHAWK", tactics and technologies such as "celestial navigation" and "propulsion, advanced", and admirals such as Nimitz and Lockwood. In addition to the main section on alphabetized subjects, appendices are included on "Chronology", "Leading Individual Submarine Scores " (by ships sunk in World War II), a complete list of "United States Navy Submarines, 1900-2000", "Submarine Museums", "Websites", "Acronyms", and a glossary and bibliography. The book is populated with a number of excellent and appropriate photographs, diagrams and maps.

The authors concentrate the densest information on World War II, and acknowledge their emphasis on the "stirring narratives" of this historic period over more current events. Coverage of each of the most successful World War II submarines is much more detailed and informative than those of earlier or later periods. The more productive war patrols provide the drama for excellent, concise synopses. Unlike the venerable Submarine Operations in World War II which puts the submarine campaign in a chronological sequence, this book has the advantage of telling the story boat by boat. If you are interested in FLASHER's exploits, for instance, they are all found under one heading. Summaries of many of the most important World War II battles, some with no submarine involvement, are also included. The only battles outside WW II chronicled are the World War I Battle of the Atlantic and the Inchon Landing in Korea.

The rationale for not including an entry on every United States submarine— "...there is no way we could adequately integrate information on all of the submarines that have been placed in service..." —is acknowledged and understood. This encyclopedia is not, after all, a complete database of our boats, but rather is a readable sampling of the most noteworthy submarines, submariners and submarine-associated subjects. Most of the submarines not singled out for a narrative entry are covered in summary lists of the various classes. The topic on "S-boats" gives a good synopsis of the class characteristics, capabilities, and some of its more noteworthy submarines and their achievements. However, there is some inconsistency in the choices and coverage made. Fewer than half of the SSBNs and 594/637/688-class SSNs merit individual inclusion as an alphabetized topic, and for most of those that are

mentioned little more information is contained than a repetition of the class characteristics (already given under the class summaries) and the dates of service. Why give this perfunctory treatment to some submarines and leave others out completely?

There are a few misstatements, inconsistencies, and omissions that I picked out, most of which only someone personally familiar with the ships or incidents would notice. ALLIGATOR (1862) is described as the "first submarine purchased by the US Navy", whereas HOLLAND (1900) is credited with that honor on the back cover. Electric Boat Company merits a subject entry as a submarine builder, but Portsmouth and Mare Island Naval Shipyards do not. TRITON is described as the "first generation of a new class of nuclear submarines" and TULLIBEE as "the prototype of a new class", and in another entry as a "sister ship" of LIPSCOMB. Each of these three boats was, of course, one of a kind. Although TULLIBEE and LIPSCOMB both incorporated electric drive, they were vastly different ships, hardly "sisters".

There are some imbalances. Under "strategic deterrent submarines", SSBNs are given one sentence, followed by three-quarters of a column on air-breathing missiles and REGULUS boats. Only four admirals outside the World War II era (Burke, Rickover, Sims and Zumwalt) are given topic headings. Since two postwar CNOs (not submariners) are featured, why not some submariners who reached the top of the military leadership ladder, for example Watkins, Trost, Kelso, and Crowe?

I found it curious that the topic "Submarines Lost During Peacetime Operations" includes SARGO ("Explosion - 1960"), RAY ("Grounding - 1977"), NATHANIEL GREENE ("Grounding - 1986"), and BATON ROUGE ("Collision - 1992"). It is true that GREENE was decommissioned after the grounding, but in part to meet SALT requirements. BATON ROUGE remained in commission until 1995 (1994, by one source), although the damage and cost of refueling may have led to her being the first of the 688-Class decommissioned. SARGO and RAY finished normal service lives. A number of other submarines have survived similar accidents. To include these four as peacetime losses is misleading. Under another heading "eternal patrol, US submarines on", the list omits S-27, S-36, S-39, and DARTER, all lost during World War II.

The volume would have profited from a more rigorous

proofreading, obviating such errors as listing both TURTLE and ALVIN as "DSV-2", TRITON as "SSBN/SSN-586", Ned Beach as commanding "USS TILTON", SUBROC detonating at "a present depth" (as opposed to "pre-set"), and a number of SSNs listed in the Index as "SS", for example my old home GUARDFISH as "SS-612". Several hull numbers are incorrect.

Having said all that, I confess to having learned a few things in eye-hopping through this encyclopedia. I was not previously aware, for example, that two submariners were awarded the Congressional Medal of Honor prior to World War II: TM2 Henry Breault for action during the sinking of O-5 in 1923, and Ensign Paul Foster for exploits at Vera Cruz in 1914. Foster later received a Distinguished Service Medal as commanding officer of SS-41 for sinking a German submarine in World War I, and a Navy Cross for heroism during a gun turret explosion on USS TRENTON in 1925.

It is these and similar nuggets that I found worthwhile in the Encyclopedia of American Submarines. This is not a book that you will read cover to cover. Rather you will skip to topics of interest or research, or those that catch your eye as you "surf" the pages. Such is the obvious intent of the authors, whose "hope is that this volume will be a fitting tribute to the achievements of submariners present and the memories of submariners past."■

UNDER PRESSURE
The Final Voyage of Submarine S-Five
by
A. J. Hill
The Free Press, 2002
239 pp - $25.00, ISBN 0-7432-3677-7

ON THE BOTTOM
by
CDR Edward Ellsberg, USN
Flat Hammock Press, 2002
243 pp - $34.95, ISBN 0-9718303-0-4

A TIME TO DIE
The Untold Story of the KURSK Tragedy
by
Robert Moore
Crown Publishers, 2002
273 pp - $25.00, ISBN 0-609-61000-7

Reviewed by CAPT C. Michael Garverick, USN (Ret.)

The Naval Submarine League 2001 Symposium featured a banquet address by Peter Maas, the award winning author of The Terrible Hours, telling the story of the raising of the USS SQUALUS and a presentation by John Smith and John Eidsnes of Brown & Root Services on the KURSK Recovery Operations. I had recently read The Terrible Hours and became acquainted with Admiral Momsen and his role in salvaging the SQUALUS, and was privileged to speak with one of the survivors of SQUALUS at a showing of "SUBMERGED" prior to its showing on national TV. I had also been introduced to the ASR and ARS association and

through their organization made aware of the Master Diver program and the Diving and Salvage School. Herrie ten Cate, producer of the Discovery Channel video Raising the KURSK, spoke to the 2003 Symposium. All of this peaked an interest in the men who have earned the title of Salvage Master, and in particular, the recovery of submarines. If this is your interest, these three books are worth your time.

Under Pressure introduces you to Lieutenant Commander Charles M. *Savvy* Cooke, Jr., Captain of the new submarine, S-5, on her shakedown cruise to Baltimore. During this transit the ship was completing some sea trial test including a full power run followed by a crash dive. Dr. Hill, a former anesthesiologist, Navy physicist, and research biologist, meticulously follows the events that happened during that crash dive giving us a picture of men under stress and an analysis of how men react in a time of crisis.

Savvy Cooke has earned his nickname at the Naval Academy, having completed college in two years, and entering the Academy at age 19, graduating second in his class of 1910. His classmates appreciated his common sense and practicality as well as his academic brilliance. In his 10th year of service, S-5 was his third command and he was well prepared for this assignment. Savvy had been an assistant inspector at a shipyard where he was responsible for the construction of more than twenty submarines. He would take more than a professional interest in the completion of S-5, as the submarine construction yards were in intense competition to produce a quality product. Portsmouth Naval Shipyard was the Navy's effort at demonstrating how a quality submarine ought to be built. There were still a lot of problems to be solved in achieving the desired results and Savvy intended to be a part of the solution.

Savvy Cooke commissioned S-5 in March 1920, completed sea trials, and started her shakedown cruise on August 30, 1920. She had some remaining sea trial deficiencies that were deemed acceptable for going to sea, including a class problem with the main induction valve that was hard to operate. The four-week shakedown cruise was designed to complete some remaining trials and to show off the Navy's newest submarine in multiple east coast ports to attract *ex-servicemen* to the growing Submarine Force. At 1:53 PM

on September 1, Savvy received the reports that the full power run data collection was complete, hatches secured and vents closed. He removed the stopwatch from his pocket and shouted "Dive! Dive!" and started the watch. At full speed, S-5 was submerged in less than a minute. Two and a half minutes later, still traveling at high speed, S-5 plowed into the ocean bottom, 180 feet below, bouncing once, then buried her bow in the bottom.

Dr. Hill continues a narrative that involves the reader as an active participant in determining what happened and the formulation of a corrective action plan. Savvy Cooke displays his genius as he directs the damage control of his ship, and eventually identifies a way to bring the stern of the sub above the surface where the crew can cut a hole in the tiller room to allow fresh air to enter the ship and to attract attention of passing ships. Fighting against the clock, the story tells in dramatic detail how Savvy determines how long they have before running out of air, the assessment of how they crew can cut through the hull with the tools available, and the ultimate rescue of the crew.

At 1445 on September 2nd, the S.S. Alanthus, which had sighted the submarine stern with a white skivvy shirt waving in the breeze, sent a small boat alongside S-5 and through the hole, Captain Earnest A. Johnson asked the classic questions, "What ship are you?", "What nationality?", and "Where are you bound?" Savvy's sense of humor responded with, "S-5!", "United States!", and "To Hell, by compass!" Captain Johnson returned to the Alanthus to organize a rescue effort, but was hampered by the lack of a radio. Nevertheless, he sent his engineers and what tools they had to enlarge the hole from the outside and to provide fresh water and air to the crew. Thus started another saga; getting the proper tools, equipment, and manpower to complete the rescue of the entire S-5 crew.

Help was quick to come with the arrival of S.S. General George W. Goethals about 1700. Captain Johnson briefed Captain E. O. Swinson on the situation and the rescue started in earnest. Additional drills were available as well as manpower to rotate on the drills. Captain Swinson sent medical personnel to set up an infirmary on Alanthus, and sent messages to the Navy informing them of the disaster. Additional assistance would be forthcoming from Norfolk and Philadelphia. The hole was punched in about 0100 on September 3rd and the first man was helped out at 0120. The Executive

Officer, Lieutenant Charles Grisham and Savvy were the last to leave S-5 at 0334.

The Navy arrived about 0400 and started planning on how to rescue the submarine. By 0900, the battleship USS OHIO, five destroyers and a tug, were on station relieving some of the other ships that had stopped to offer assistance. As a first attempt, the Alanthus would use her current moor with a towing cable replacing the wire harness to tow the S-5. However, even under full power, the submarine did not move. It was then decided to transfer the crew and allow Alanthus to proceed on her journey to Newport News. As the news of her role preceded her, she received a grand reception as she steamed by the fleet in Norfolk.

The salvage effort of the Navy team, however, was not successful. Hill discusses most of the meetings and decisions that shifts the tow to OHIO and the subsequent abandonment of the S-5 about ten miles from the nearest shoal water. The towing cable broke and it was decided to mark the submarine with a buoy using the original line left by the Alanthus. The crew was transferred to a destroyer that would take them to Philadelphia. A salvage master arrived on Friday, September 5th and stated nothing further could be done. Continued work by the Navy through the winter and again in the spring when USS FALCON arrived was not successful. On August 29, 1921, the Navy called off the salvage effort and struck the S-5 from the records. USS FALCON, however, started a succession of submarine rescues that are legends in the salvage arena. S-5 remains about 48 miles southeast of Cape May in 160 feet of water. Sport divers visit it regularly. The hole punched out of the S-5 tiller room hull is now in the Navy Museum.

Dr. Hill summarizes the Court of Inquiry and disposition of the crew. Savvy Cooke suffers from personal tragedies, but continues to serve in positions that use his intellect and is Commanding Officer of USS PENNSYLVANIA during the Pearl Harbor attack. Promoted to Rear Admiral in 1942, he is a strategic planner during most of WWII. As a classmate stated, of all those unsung heroes who helped with the war, "his name was at the top." Savvy commanded the Pacific Fleet from 1947-1948 and retired to his home in Sonoma, CA as an Admiral. He died in 1970 and is buried in Arlington National Cemetery. In the words of James Michener's "The Bridges at Toko-Ri", *"Where did we get such men?"*

Commander Edward Ellsberg is another one of these men. In his book, On the Bottom, he describes in detail the trials of salvaging the S-51 that was rammed by the S.S City of Rome shortly after 2200 on September 25, 1925 and sank with 28 of the 36 crew members still on board. Ultimately only three would be rescued. This particular volume is the first of a new venture by Flat Hammock Press of "salvaging the maritime classics of the past". The book contains two additional recordings, a CD of an oral interview with Edward Ellsberg and a DVD of the newsreel clips filmed during the salvage effort with narration by Ellsberg in 1979, four years before his death. Ellsberg's own statement on why he wrote On the Bottom continues my thesis - "...So On the Bottom finally came to life - not the recital of an engineering feat, not a tale of scientific marvels, but the stark battle of a band of men in desperate combat with the overwhelming forces of the sea."

Captain Ned Beach has written a fresh introduction to accompany this new edition of the book that is a great read on its own. He reports his own fascination with the salvage of the S-51 and Ellsberg's style of writing. He reviews much of Ellsberg's career including much of the frustrations between the line and the *Construction Corps*, the prejudice he experienced as a Jewish naval officer, and his personal drive for excellence starting with his graduation as number one in his class of 1914. What follows this introduction proves that Ned's assessment of *Ned* Ellsberg is indeed correct and exciting reading.

The salvage of S-51 started almost immediately. Ellsberg was on board USS FALCON when she got underway on September 26 from New York and steamed to the site of S-51, now located by some other ships out of Newport. S-51 was about 14 miles east of Block Island and 15 miles southeast of Brenton Reef Lightship off Point Judith in 22 fathoms of water. FALCON arrived at 2200 and anchored clear of the assembled ships until morning. S-50 was anchored over S-51 pumping air into the stricken sub while continuously calling the ship on the underwater telephone.

After a brief meeting on USS CAMDEN Ellsberg learned that a wrecking crew had already been hired and was enroute with two large derricks. The plan was to lift the stern of the S-51 and quickly recover any survivors that might be in there. Ellsberg concluded there was nothing left for him to do so he returned to New York. However, further events would prove him wrong.

The wrecking crew was unable to life the S-51 and concluded that the submarine was flooded and therefore all hands on board were dead. The rescue efforts were discontinued and the wrecking crew discharged. The Navy was left with the problem of how to salvage S-51. The original wrecking crew was willing to attempt to do the job only if the Navy provided all the resources, assumed all the risk and paid them whether they were successful or not. This contract was on the verge of being signed when Ellsberg went to Admiral Plunkett, Commandant of the New York Navy Yard, with his proposal on how to raise the S-51. Plunkett was enthusiastic and called the Navy Department recommending that he be charged with the salvage of the submarine. The Navy was not interested but agreed to allow Ellsberg to come to Washington to explain his method. Ultimately, Ellsberg's recommendations prevailed and he was designated the Salvage Officer.

On the Bottom has a detailed first person account of how the submarine was raised and taken to New York Naval Shipyard. The DVD and Oral History provides some insights on how Ellsberg had to make critical decisions on his own to complete his task. He was fortunate to have Captain Ernest J. King, Commandant of the Naval Submarine Base, New London, designated as the Officer in Charge, Salvage Squadron, and John Neidermair, a draftsman at the Navy Yard but ultimately the top civilian engineer in the Bureau of Ships, as an engineer. Lieutenant Harry Hartley, Commanding Officer, USS FALCON, used this experience to support the salvage of S-4 in 1927, established the Navy Deep Sea Diving School in Washington, DC in 1928, and supported the rescue of the SQUALUS in 1939. This team designed a number of innovative solutions to raising sunken submarines including the use of stabilized pontoons, the Ellsberg underwater cutting torch, the Ellsberg (actually Waldren) Jetting Nozzle, and improved underwater lighting to assist divers underwater.

The successful raising of S-51 facilitated the improved training of Navy divers, the development of additional rescue capabilities, and ultimately was responsible for the successful salvage of USS SQUALUS under the direction of *Swede* Momsen. Clearly Ellsberg and Momsen are two more representatives of *these men* who think way outside the box in the salvage of submarines.

The Raising the KURSK video documents the engineering

feats that were proposed by Brown & Root and successfully mastered in salvaging the submarine, but A Time to Die provides the details behind the scenes that allowed this event to occur. Robert Moore, chief U.S. correspondent for Britain's ITN News, was able to access many internal documents and personal interviews about the early days of KURSK tragedy that highlight the internal difficulties of accepting the offers of assistance from the international community and the poor state of Russia's own recovery resources that essentially doomed the 23 sailors known to be alive in the rear compartments of the ship.

The documentation of the cause of the sinking of KURSK has been the subject of much press and video documentaries that are recorded in this book, but the political process that did little to serve the survivors and prevented available recovery resources to even proceed to the scene are important to this sad event. One important fact to understand about KURSK is that her external weapons we still considered to be live rounds, subject to detonation during any recovery operation, and the ship displaced over 23,000 tons, more than twice the size of any U. S. submarine except OHIO class at some 18,000 tons. Salvage masters never had to lift such a large load off the ocean floor before. But there is much that happened before recovery could ever begin.

The Russian Navy summarily rejected initial offerings of support to rescue any remaining submariners in KURSK. Several ships in the Russian fleet heard the explosion but discussed reasons why KURSK would not have fired her torpedoes and discounted its importance. Submarines had routine communications problems and that was considered one of the reasons that KURSK had not informed the fleet that they were having some problems. She was due to report at 2300 at the end of the exercise, and that would be the time they would worry.

At 1700, the Fleet Commander communicated to the Fleet Headquarters ashore to begin a systematic effort to communicate with KURSK, advising them they she may be missing. The duty officer received the report and at 1800 ordered an ASW aircraft to conduct a surface search of the operating area during the last few hours of daylight. The head of the Fleet's search and rescue forces also received the 1700 report and he ordered the Russian submarine rescue ship, RUDNITSKY, with her two submersibles to be ready to go to sea in one hour.

To complicate the matter, US resources on scene at the time of the accident were also confused as to what had happened and were reluctant to report the incident to higher authority. The Norwegian seismologists also studied their data attempting to define what had caused the two explosions in the middle of the Barents Sea about two minutes apart at 1129 that morning. The lack of any immediate Russian response to the explosion further confused the US resources and therefore gave some credence to their decision to delay their initial report.

At 1900 the Fleet Commander issued orders to redeploy the fleet to search for KURSK. The ASW search plane returned at 2000 and reported nothing found. Shortly thereafter, a signal was sent to the submarine KARELIA, which was operating in the proximity of KURSK, to report any contact or communications she may have had with other submarines. The Captain immediately sent back that he had heard the two explosions about 40 minutes before their scheduled missile launch that they now considered related to the Fleet Commander's request. Their response triggered an immediate request to collect all data associated with the explosion and send it in.

At 2330, after KURSK failed to make contact, the Fleet Commander sent the emergency message to all naval facilities - "The submarine KURSK, tactical number K-141, commanded by Captain 1st Rank Gennady Lyachin, is missing. A search-and-rescue operation is being launched." At 0500 on August 13 the Duty Officer at the Navy's Moscow Command Center called the Head of the Russian Navy's Search and Rescue Forces. At 0700 the Defense Minister notified President Putin of the situation but evidently toned down the seriousness of the problem, as later events proved. Moore summarizes the internal political situation as "a sorry one." "The president was on a holiday, the defense minister suspected he was being mislead by the Navy as part of an internal political battle, and the head of the search-and-rescue forces was first notified a full seventeen and a half hours after KURSK was lost."

The RUDNITSKY arrived in the operations area at 0839 Sunday morning, August 13. Their first task was to locate KURSK, which had been tentatively identified as an "acoustic anomaly" by the cruiser PETER THE GREAT. RUDNITSKY confirmed that the anomaly was probably KURSK and makes preparation to launch

her submersibles. Moore postulates that a highly classifies submersible was the first underwater vehicle to be deployed and brought the first information on the destruction of KURSK to the Fleet Command. He surmises that video pictures taken by the DRONOV minisub showed the shattered bow and collapsed bulkhead into the second compartment. It probably reported the reactor compartment and aft parts of the submarine appeared intact and that if there were survivors, their only escape route was through the ninth compartment escape tower. Since the DRONOV had no rescue capability that job was turned over to the RUDNITSKY's submersibles.

The two submersibles were poorly equipped to make the recovery. One was over 20 years old with severely depleted batteries and had not been configured to attach to the escape hatches on the new KURSK. The second was properly equipped but their batteries were also old, limiting its endurance on the bottom. The first dive lasted an hour and ten minutes, never successfully mated with KURSK, and on breaking away ran into the rudder and almost destroyed the only hope of evacuating the crew. The second submersible made descent to further survey the damage to KURSK and spent several hours trying to find the sub. With their batteries nearing exhaustion, they made a cursory pass of KURSK before returning to the surface. While both submersibles were charging batteries, the weather report also turned for the worse.

On Monday, August 14, the international community started reacting to the incident. The Fleet Exercise had been announced, the explosion monitored and reported, but not analyzed. Now the exercise had come to an abrupt halt and many ships were concentrated in a small area. Commander North Norway wondered what was going on. He had not been briefed on the explosions, or any of the other activity that had happened over the weekend. The analysts, on summer vacation, were returning to their offices and recognizing that something had happened. A quickly called staff meeting revealed that they had a lot of indications but no real assessment of what was going on. A P-3 reconnaissance plane was dispatched to the area and directed to survey the area and ensure that it was seen. The real time photos and radar images relayed back to headquarters allowed the staff to realize that either an emergency or a very realistic exercise was in process. The Commander placed a call to the Russian Fleet Commander on a secure dedicated phone. The staff officer answered the phone and reported that the Fleet Commander

was at sea. The Commander requested a report of the situation in the fleet exercise area and stated he was authorized to offer assistance, if required. After a brief pause, the call was transferred to the Fleet Commander and a staff officer responded that the situation was under control and no assistance was needed.

In Northwood, UK, the acting Flag Officer Submarines took an early call from their intelligence resources indicating there was a problem. After listening to the status report of the Russian exercise, he requested another update as soon as additional intelligence was available and noted that it was 0800 in London - 1100 in Moscow. At 1103 the Russians issued press releases to the government and media that KURSK was down, they were in communication with the crew using special tapping signals, and that the Norwegians were inquiring about the incident and offering assistance. The Navy had kept the incident from the media for 48 hours and was actively seeking to hide the first 24 hours. The Russians were discounting the efforts of the Norwegian seismologist who was puzzling over the seismic waves on Saturday morning. Shortly after reading this press release, the seismologist reported his findings and opinions that the Russians were not being entirely honest about the situation to his headquarters. The word was out about the incident and the Russians attempts to cover it up.

In America a different concern was the primary focus. USS MEMPHIS was known to be in the vicinity of the fleet exercise and there was a possibility that she may have been involved in the explosion. Once clear of the area, MEMPHIS reported her status and that concern was relieved, but replaced by another one of how any offer of US assistance might be received. It was decided that after a nominal offer of assistance, the US would defer to the UK and Norway who were in a better position to respond.

The Russian response to these initial offers was anticipated, and expected. However, the Russians also suspected that the cause of the explosion might have been the result of a collision with another submarine. There had been precedents to this suspicion over the years and it was another resource to the Russians to further subvert the reporting of the incident. Monday evening the Commander-in-Chief of the Russian Navy made his first public comments on the accident. His announcement dampened the hopes of a quick recovery reporting that KURSK was buried deep in silt

and listing as much at 30 degrees to port. He also reported that a collision might have been the cause of the incident, without further details.

This *official* report also started KURSK wives incident that was a significant embarrassment to President Putin and the Navy. Moore reports the disinformation given to the wives throughout the early days of the incident based on hopeful thinking, confused analyses of reports of sounds that might have been tapping, and now the weather was taking its toll. RUDNITSKY was unable to launch the submersibles in the high sea state further frustrating the Fleet Commander and the crews.

On Wednesday, August 16, the offers of assistance still laid unanswered on the desk of the Russian Navy's Commander-in-Chief. The US offer was dismissed out of hand, however the Norwegian and British offers split the staff down the middle. The internal political struggles between the Navy and the General staff, and the paralysis in reporting factual information to the President was going to cause further delays and embarrassment. At 1400, the Fleet Commander on scene assessed the situation and finally picked up the dedicated telephone to the Norwegian Commander. In humble recognition that the entire KURSK crew could be lost, he asked for divers to help connect the submersible to KURSK. The Commander said he would respond within a few hours. The Commander recognized that his Navy had no saturation divers and that this capability was totally resident in the commercial industry. A suitable resource was found and the call was returned with a report that in order to effect a rescue the team would need access to the engineering design detail of KURSK hatch. The Russians agreed.

This was not an isolated action on the Fleet Commander's part. Inside the Navy staff, another team was assessing the availability of British rescue assets. A call to the British Naval Attaché was made about the same time and he immediately went to a meeting with the Russian officials. The British LR5 rescue submersible was the first state of the art resource to reach KURSK, but first the attaché needed to know the truth about the state of the submarine. Armed with only the official reports, he was quickly advised that much of the information was wrong and that KURSK was listing no more than eight degrees, with visibility at depth of about 10 meters. He learned that the forward escape hatch was utterly

destroyed along with the whole bow section, and that the escape would have to be through the after hatch. Russian naval officers also made a parallel approach to the British at NATO headquarters during a visit. They were immediately connected to Flag Officer Submarines in Northwood and he advised them of the capabilities of the LR5. He did not tell them that he had ordered its preparation to go to a port in Norway using a Russian cargo plane he chartered on Monday and that NORMAND PIONEER was ready to proceed to the rescue site as soon as the LR5 was loaded. The Russians never asked how the British were able to respond so quickly.

The Norwegian response was also quick and thorough. SEAWAY EAGLE was already at sea servicing oil wells for Stat Oil. She was a vessel specially built for undersea operations and her Captain was well qualified to perform tasks that required quick thinking with the resources on hand. He had heard of the KURSK incident on satellite TV in his cabin on Monday and wondered if there might be a job for his crew there. He recognized that he was the closest diving support vessel to the disaster site and started planning for the additional resources he would need to perform a rescue mission. He would need extra divers and rations and would have to travel about 800 miles to reach the scene. The Captain was prepared when the call arrived from his office asking if he could respond to this emergency. Stat Oil had agreed to release SEAWAY EAGLE for this mission and the Captain placed the necessary calls to marshal his resources that he would pick up on the way. The ship left the Stat Oil field at 2320 on Wednesday. The rescue capability was now identified and enroute after a four day delay.

Russian and British submariners had estimated that any survivors would have no more than seven days air and life support capabilities under the best of circumstances. The Russians had to admit that the incident occurred on Saturday, not Sunday that had been officially released. This news exacerbated the relationship with KURSK wives, but they were heartened that there was still hope. On Thursday, however, the Russian Navy Commander-in-Chief declared that emergency supplies in the submarine were sufficient to keep the sailors alive for at least one more week. The source of the information was never identified, but the families seized it with hope that surely their loved ones would be rescued. It also raised questions about Russian leadership. Where was President Putin in

this time of national disaster? The response that he was still on holiday on the Black Sea coast a full five days after the accident was not received well. In fact, he was scheduled to meet with other heads of Russian states on Thursday in Yalta. The press initiated the attack. The Komsomolskaya Pravda paid $600 to buy a list of the crew from a well-positioned naval source and published it on Friday.

The Russian submersibles made additional dives starting on Thursday after the weather abated but none were successful and the crews were frustrated. MEMPHIS arrived in Norway on Thursday and offloaded her sensitive cargo and crew. Requests by the Russians to examine the hull of the ship were refused. Upon receipt of her data in the US, it became clear that the explosions and the resulting sounds were the death of a submarine.

SEAWAY EAGLE arrived in Tromsø, Norway on Friday to pick up her divers and extra supplies. Three and one half hours later she was underway again. It would take 36 hours to get to KURSK site, arriving Saturday evening. The Captain spent that time gleaning information from the Russian riders, news stories, the Internet and their own estimates of the situation. NORMAND PIONEER with the LR5 was about an hour ahead of SEAWAY EAGLE. The British had sent a delegation ahead to meet with the Russian leadership but had met a roadblock at Bodø when the Russians denied permission to continue on to Murmansk. The delegation then joined NORMAND PIONEER as she rounded the cape and started their coordination. A joint meeting of the two rescue crews was held aboard SEAWAY EAGLE with the Russians and British participants.

This meeting was full of surprises for the Norwegians and the British. Instead of listening to how the international crew could participate in a rescue, the group was frustrated by the Head of the Russian Navy's Search and Rescue Forces who insisted on making a long protocol introduction and then said all the Russians wanted was "...for a diving bell to land on the submarine, and for the divers to gain entry to KURSK to confirm that it is fully flooded." He also stated that the Russian resources would be used for the next 24 hours and only at midday on Sunday would the decision be made regarding the use of the international assets. The Russian Admiral was continuing to stall for time as his nation's leadership including the President struggled with the issue. While the Fleet officers wanted the assistance, the national commanders were concerned

about lose of face and naval secrets. One newspaper reported "an official" stating that even if one sailor was saved from the submarine with international assistance, for the Admirals, this would be a political catastrophe.

The Russian Admiral returned about 2240 Saturday evening and started negotiating what the rescue fleet could do to assist. Graham Mann, SEAWAY EAGLE's Captain, started working on a plan to survey KURSK using Remotely Operated Vehicles (ROV), and then send divers already in saturation down to the submarine to establish the condition of the after hatch. After much discussion and explanation, Mann made a final appeal to the Admiral - "Admiral, we're all trying to achieve the same goal. We're all humans. We all want to try to bring people out of KURSK alive. Let's work together. Let's agree on a way forward right now." After another review, the Admiral leaned toward Mann and said, "OK, let's do it. Let's go ahead." The dive was now on.

At 0810 SEAWAY EAGLE was in position astern of KURSK and lowered a ROV into the water to find KURSK. This was not anticipated to be a problem, but the rubber coating on the submarine was absorbing the ROV's active sonar, finally the propellers reflected a return that resulted in locating the sub. After surveying the ship and recording its precise location, the divers descended to the sub, leaving the diving bell at 1106. A series of four taps, three times were struck against the hatch without response. Their next task was to inspect the hatch for damage and some scratches as well as a bent positioning pin, probably from the Russian submersibles attempting to dock, were noted. Next they would try to determine if the escape hatch was flooded, by opening the equalization valve and noting if there was flow in or out. The Russians had told them that the valve opened counterclockwise, and took 11 turns to be fully open. After no success in opening the valve it was decided to turn it clockwise, and it opened. After four turns, they noted a slight flow inward, indicated that the tower was flooded. Their next attempt would be to open the hatch, but that would be another problem.

Admiral Oleg Burtsev, Commander of the First Submarine Flotilla that included KURSK, arrived on the NORMAND PIONEER to assess the operation of the British submersible LR5. He offered to fly out a KURSK engineer to discuss technical matters with the British team. However, as soon as he left the PIONEER,

was the principal motivation of the internationals. Feeling the frustration, the Russian Admiral in charge of Search and Rescue Forces ordered Captain Mann to rip the hatch off the KURSK using his cranes. Mann refused, knowing that he still had an opportunity to find the ninth compartment dry. He also countermanded an order to leave the equalizing valve open, allowing full sea pressure to remain on the lower hatch.

The Fleet Commander came to the EAGLE later in the day for an assessment of the situation. Taking issue with Captain Mann's performance on accessing the submarine, the Fleet Commander asserted that the divers were ill-suited to recover any corpses that may be found. He also took issue that the divers were not trained in the submarine systems and therefore unable to operate the hatch. Mann took issue with this insult and reported that the Russians had incorrectly told them how the valve operated and provided no diagrams or sketches of the hatch or any related rescue system. The Fleet Commander reflected on what he heard and then offered to take two divers to a sister ship, ORYOL, which was in drydock in Severmorsk 70 miles away. Two divers were dispatched immediately.

Upon arrival at ORYOL the Fleet Commander greeted them and granted the divers access to the hatch, escape trunk, and lower hatch. They were permitted to take pictures of the equipment and sketch the mechanisms and piping systems. The verified the clockwise operation of the equalization valve, the operation of the hatch and the piping systems to flood and drain the hatch. They noted the small space available to the crew on the upper deck under the hatch for the crew to prepare to escape. This meant that the survivors would be forced to stand in the passageways by the machinery, making access to the compartment from above difficult.

However, when the divers were ready to return to the EAGLE, the Engineer of ORYOL quietly passed on one additional piece of information that would change the entire focus of the disaster. The Engineer reported that whenever OSCAR IIs are stationary, water leaks into the ninth compartment through the stern glands around the propeller shafts. The submarine has clamps to stop the leaks in port. However, at 350 feet, the leakage would be excessive. Therefore the crew in the ninth compartment would be subject to increasing pressure as the water flooded into the compartment. If the crew had attempted to escape in their saturated condition, they

the crew had attempted to escape in their saturated condition, they would have suffered the bends and probably death. It made sense, then, for the crew to wait for rescue rather than a free ascent from 350 feet in the cold water.

On Monday morning, the upper hatch on KURSK opened without further assistance as the pressure equalized and the airbags that were left by the divers were able to lift the hatch. The lower hatch was now visible using the cameras left by the divers, and they noted some gas bubbles escaping from the hatch. This effect was due to the wave action crossing over the hatch causing some small differential pressure across the hatch, allowing some air to escape. They concluded the compartment was flooded and that nine days after the disaster, there was no life aboard KURSK. The Russian Admiral in charge of Search and Rescue Forces could also see this effect and all were quiet. There was no reason to not go ahead and open the lower hatch using one of the ROVs. Divers then went down and lowered a camera into the compartment to examine the area. What they found was the effects of a fire - a fire whose cause was not readily defined, but perhaps due to a chemical reaction with the seawater and the CO2 canisters. They also saw at least one body float by and therefore confirmed that there was no life in the compartment.

In the next few months, Haliburton would be tasked to retrieve 12 men from the compartment, as discussed by our speakers at the June 2001 Symposium. President Putin had the extremely unpleasant task of telling the families of the fate of their sailors. The Russian Admirals were fired or reassigned. The Russians agreed to *Raise the KURSK* and ultimately destroy it using funds provided by the United States for demilitarizing nuclear weapons and facilities. On October 8, 2001, GIANT 4 raised KURSK from the bottom after cutting off the bow and took it into drydock. The engineering feats needed to accomplish this task are fascinating and clearly in a class by themselves. However, in Moore's words, the lesson learned by the loss of KURSK was the value of people - "...the assets really worth fighting to protect were not the secret weapons aboard KURSK but the young sailors themselves." *That is where we find such men!*

THE SUBMARINE REVIEW

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

Articles for this magazine will be accepted on any subject closely related to submarine matters. Article length should be no longer than 2500 to 3000 words. Subjects requiring longer treatment should be prepared in parts for sequential publication. Electronic submission is preferred with either MS Word or Word Perfect as acceptable systems. If paper copy is submitted, an accompanying 3.5"diskette will be of significant assistance. Content, timing and originality of thought are of first importance in the selection of articles for the **REVIEW.**

A stipend of up to $200.00 will be paid for each major article published. For shorter Reflections, Sea Stories, etc., $100.00 is usual. Book reviewers are awarded $52.00, which is that special figure to honor the U.S. submarines lost during World War II. Annually, three articles are selected for special recognition and an additional honorarium of up to $400.00 will be awarded to the authors. **Articles accepted for publication in the REVIEW become the property of the Naval Submarine League.** The views expressed by the authors are their own and are not to be construed to be those of the Naval Submarine League. In those instances where the NSL has taken and published an official position or view, specific reference to that fact will accompany the article.

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

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