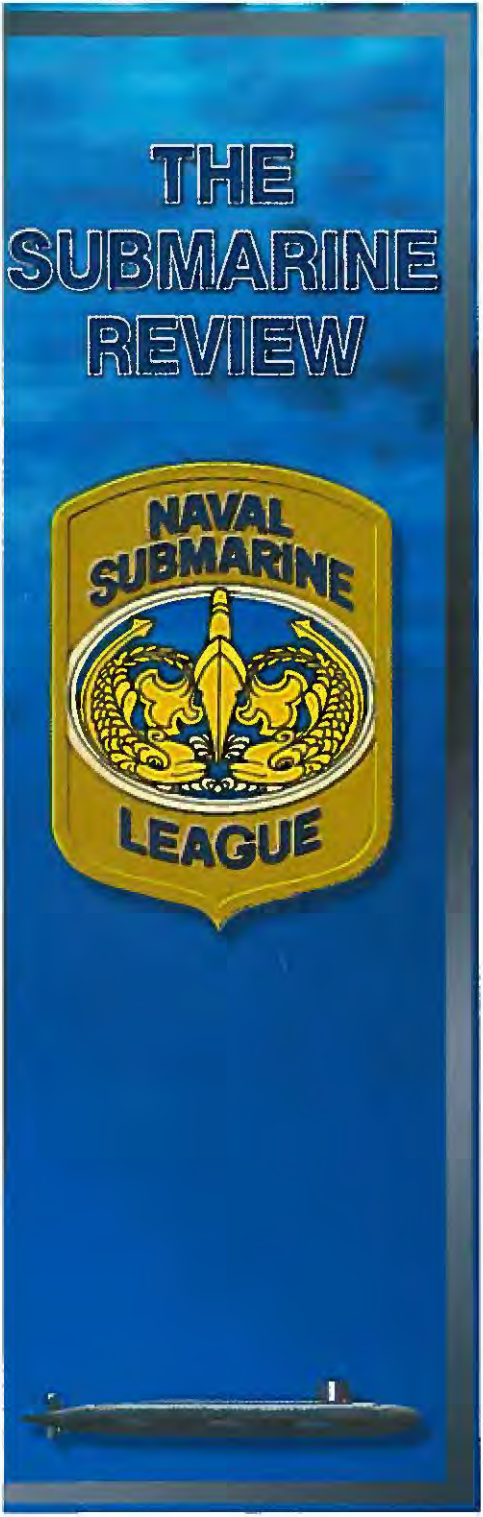


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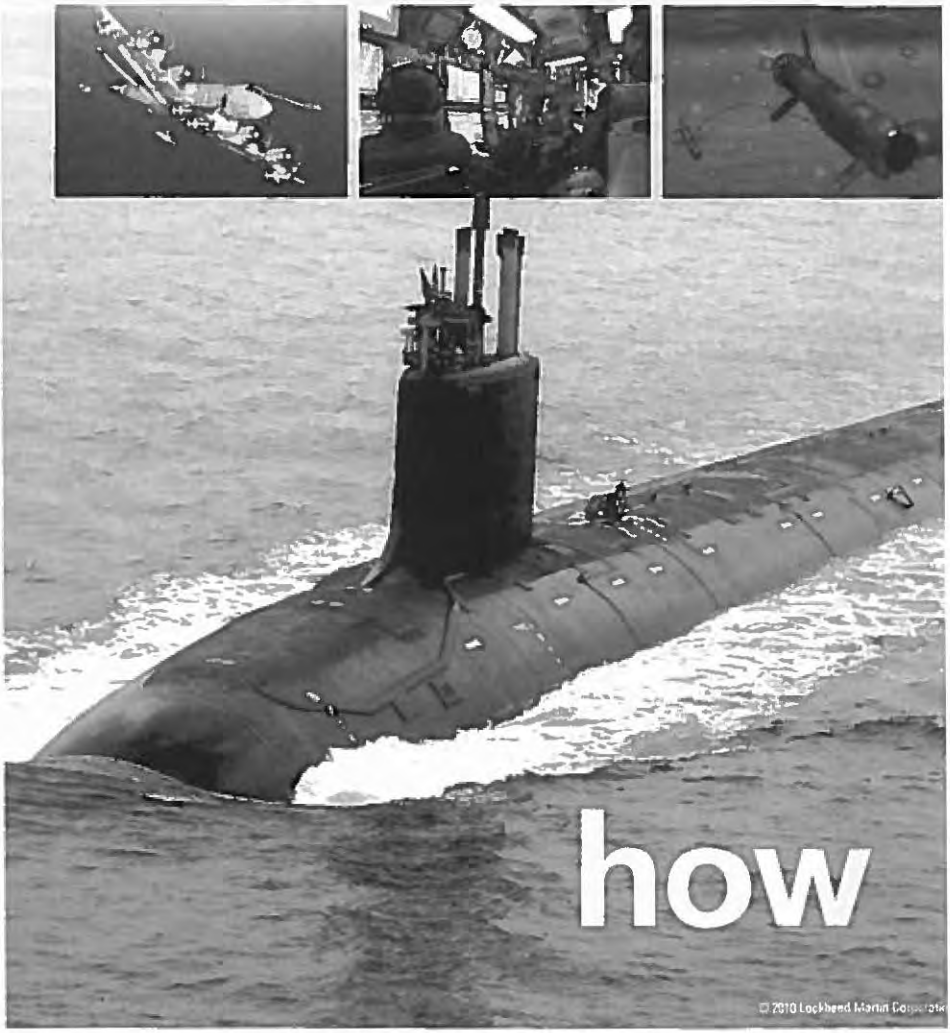


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## *EDITOR'S COMMENTS*

Our Autumn issue this year features highlight speeches from two recent events which effectively articulate for the submarine community both our current successes and future challenges. Congressman Ike Skelton, Chairman of the powerful House Armed Services Committee, spoke at the Commissioning of USS MISSOURI (SSN 780) in glowing terms of the Virginia class production team. He gave his opinion, from his premier knowledge vantage point, that **"In fact, this Virginia class program is currently the *gold standard* when compared to other major defense acquisition programs. There is none better."** High praise indeed from the one person who knows that subject the best.

On the challenges side of the ledger, Mr. Ron O'Rourke, speaking at the NSL Capital Chapter luncheon on September 17th outlined the defense funding situation which he foresees springing from the current national fiscal situation and its potential effect on both SSN and SSBN submarine building programs. In building on his talk to the submarine community at the SubTech Symposium in May (see THE SUBMARINE REVIEW issue of July 2010, page 17), he also suggested several ways the Navy and its submarine industrial base can approach those potential problems.

It is apparent the submarine community cannot afford to rest on current laurels but must build on the innovation and teamwork praised by Congressman Skelton in order to be ready for the challenges foreseen by Mr. O'Rourke. Once again, it seems the American undersea warfare world needs to adapt to a new environment with all the energy and ability it has used in meeting past *sea-changes* .

Heading the list of ARTICLES for this issue is Vice Admiral Sagerholm's recounting of the very innovative way in which the nuclear submarine officer shortage was solved in the time of very rapid force expansion due to the change from an SS force to a force of both SSNs and SSBNs. For those already doing the SSN/SSBN business, as well as those being introduced to the force in mid-career, it was a time of adaptation and accommodation which went remarkably well. It proved once again what can be done with the right folks on the job. A past example of the recent re-emphasis on civil control of the military is offered by RADM Callo in his recounting of the Admiral Byng affair from 1757. It might also be said that the recent White House-Army re-emphasis was also presaged by the words of another RN flag officer when ADM Hopwood wrote "Take heed what ye say of your seniors, Be

your words spoken softly or plain, Lest a bird of the air tell the matter, And so ye shall hear it again."

Two interesting opinions are also offered in these articles. Dr. Sviatov, a retired Russian naval officer and submarine designer has changed his opinion of the armament of Russia's newest SSN from his original analysis to one paralleling the US SSGN conversions. As interesting as the projected increase in firepower is his logic in reaching his new conclusion. LT Haney Hong, a young submariner on duty in the Pentagon, was asked for his suggestions for Force improvement and offers them here for wider distribution and further comment.

Not to be missed among the other very interesting articles, speeches, commentaries and reviews is CAPT Bill Clautice's review of Don Keith's War Beneath the Waves. Bill uses his personal experiences with the hero of this real-life World War II submarine tale to recount the *rest-of-the-story* behind Charlie Rush's late (very late) award of the Navy Cross.

*Jim Hay*
Editor

## *FROM THE CHAIRMAN*

I hope you all had a wonderful summer. During this period the Submarine Force continued to perform with distinction and meet key challenges and milestones. The commissioning of USS MISSOURI (SSN 780) following that of USS NEW MEXICO (SSN 779) marked the first time in over 10 years that the Navy has commissioned two submarines in one year. The proposed 2011 DoD budget has funding for two VIRGINIA Class Submarines, a major milestone for the Submarine Force. This is also a time of great transition for our Submarine Force leadership. John Richardson will relieve Jay Donnelly next month as Commander, Submarine Forces, and Frank Caldwell will succeed Doug McAneny as COMSUBPAC.

The Naval Submarine League (NSL) remains strong and on solid financial footing. They are also in a period of great transition. RADM John Padgett, USN (Ret) has been elected to succeed VADM J. Guy Reynolds as our NSL President. While J. Guy was "one of a kind" and in

many respects irreplaceable, I can think of no one better qualified to build on J Guy's initiatives and legacy than John. In addition to John we also welcome four new members to the Board of Directors; ADM Skip Bowman, RADM David Gove, Ms. Denise Saiki, and RADM Bruce Engelhardt (for his first full term). We also enjoy the additional benefit of having three new liaison Board members in RADM Mike Connor, CAPT (Sel) Craig Blakely, and FORCM (SS) Kirk Saunders.

A Dolphin Scholarship in J. Guy and Jan Reynolds' names has been established and thanks to the generosity of many individuals and corporate benefactors, has been endowed in perpetuity. I sincerely appreciate the responsive and generous support of members and friends of J. Guy and Jan who helped NSL meet the endowment goal. The list of donors to this fund is in the *Review*. If you have not responded to this initiative, it is not too late. Additional funds to the endowment will be used to award additional scholarships in the Reynolds' name. The link to the dolphin Scholarship Foundation is still on the NSL page, **www.navalsubleague.com** .

Our Annual Symposium was held on October 20-21. The theme of the symposium – ***Undersea Dominance in 2040*** – was particularly relevant. The highlights of the symposium included a luncheon honoring the 2010 Fleet Awardees and a banquet honoring Mr. Walt Kitonis as the Distinguished Civilian and Vice Admiral Joe Williams, Jr., USN (Ret) as the Distinguished Submariner. In addition to a distinguished group of speakers representing the officer and enlisted Submarine Force leadership from the operational, acquisition, resource sponsor, and technical communities, the Honorable Frank Miller, a past Distinguished Civilian selectee and the Honorable Chuck Hagel, former Senator from Nebraska and present Chairman of the Atlantic Council were our luncheon and banquet speakers respectively.

The NSL FY 2010 Annual Report was distributed in our annual Symposium mailing. It reported a modest gain for the year because of your support. Increasing costs were offset by the generosity of the Corporate Benefactors sponsoring the Annual Symposium and Corporate Benefactor Recognition Days. The audit results are contained in this issue of the *Review*. The auditor noted strong measures in place to ensure the accountability of our resources. The Annual Report also summarized our programs for fiscal year 2010. All were uniformly outstanding and well attended events. We have an equally outstanding series of events scheduled for 2011. I encourage you to put all of the below event dates on your calendar and participate in as many as feasible.

- Corporate Benefactor Days is scheduled for 2-3 February 2011. Corporate Benefactors continue to be the strong foundation of League support. Seventy-three corporations actively support League initiatives and activities.

- The Submarine History Seminar is planned for early April 2011 at a venue to be determined. RADM Jerry Holland continues to bring fascinating and distinctive submarine history programs to this event.

- Preparations are underway for the 2011 classified Submarine Technology Symposium (STS) which will be held at The Johns Hopkins University Applied Physics Laboratory on 17-19 May 2011. The theme is ***"Maximizing Capability – Technologies to Enhance Submarine Effectiveness and Availability"***. VADM George Emery has identified all the session chairs and many of the plenary speakers. The Call for Papers and Exhibits has been released. Additional information about STS is on the NSL web-page www.navalsubleague.com.

- The 2011 Annual Symposium and Submarine Fall Cocktail Party will be held 19-20 October 2011, at the Hilton McLean Tysons Corner.

I welcome your comments and suggestions on what the League can do to better fulfill its mission of educating the public on the importance of submarines to our national defense. I urge you to submit your ideas in the form of an article for *THE SUMBARINE REVIEW*. League members are uniquely qualified to contribute papers in support of the Submarine Force. The *Review* is widely read outside the Submarine Force by Congressional members and staff and Defense Department leadership.

Finally, Sheila and I wish you and yours a wonderful Holiday Season and ask you to continue to pray for the safety of our troops deployed all over the world. I am honored and humbled to represent you in the leadership of the League and encourage you to recommend membership to your shipmates and friends.

*Richard W. Mies*
Chairman

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Dedicated shipbuilders of the *Virginia*-class submarine program (pictured left to right): Jerome Stokes (shipfitter), Harriet Towns (foreman), and Brian Stockunas (construction supervisor)

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*FEATURES*

## REMARKS OF CONGRESSMAN IKE SKELTON (D-Mo.) CHAIRMAN, HOUSE ARMED SERVICES COMMITTEE COMMISSIONING OF THE USS MISSOURI (SSN-780) GROTON, CONNECTICUT – SATURDAY, JULY 31, 2010

Secretary Mabus, thank you for that kind introduction. Governor Nixon, Secretary Gates, Members of Congress, Distinguished Flag Officers, all our friends from the USS Missouri Commissioning Committee and citizens of the great state of Missouri, the crew of MISSOURI, shipbuilders, family and friends, I am truly honored to be with you.

This is a great day – for the Navy, for Missouri, and for America. Today we complete the first stage in the life of this vessel and commission into the battle force fleet of the United States Navy the 5th USS MISSOURI, a 7,800 ton attack submarine of the Virginia class. Her first crew is with us today, and in just a few minutes they will man this vessel and set the first watch. At the direction of the ship's sponsor, they will *bring the ship to life* and begin the next chapter of service to the nation from a vessel named MISSOURI.

Since today marks the end of the construction process, I want to thank the dedicated workers who constructed this vessel, those great Americans who have taken raw plate and pipe, cable and valves, and crafted this magnificent warship. They, along with their Navy teammates, should be justifiably proud.

I want to particularly thank this ship's sponsor, Mrs. Rebecca Gates, and the USS MISSOURI Commissioning Committee, ably led by Sam Bushman, for all their hard work and dedication on behalf of this ship and her crew. We are certainly blessed to have Mrs. Gates serving as sponsor.

The role of the ship's sponsor is steeped in tradition, including taking part in the keel laying, the christening, and the commissioning ceremonies. But more importantly, the sponsor maintains close contact with her ship and her crews, follows their professional development, and shares in their joys and sorrows. I am very familiar with this role since my late wife Susie was the

sponsor of the USS Jefferson City, a submarine of the Los Angeles class. I can tell you it fulfilled her life.

Captain Rexrode, I charge you to frequently inform your sponsor about the activities of your ship and crew. I also urge you to pass that charge on to your relief, and he to his.

Mrs. Gates, I am so happy for you. Today you truly begin the most rewarding phase of being a sponsor, watching your ship fulfill her operational missions and following the progress of her crew. I know they will make you, and all of us, very proud.

As you know, there have been other USS MISSOURI's in our country's history:

- The first USS MISSOURI was a ten-gun side wheel frigate commissioned in 1842 and was the first American Naval vessel to cross the Atlantic under steam power. Unfortunately, she burned to the water line in the port of Gibraltar and was lost.
- The second MISSOURI was a Confederate side-wheel steamer used to ferry supplies on the Mississippi during the Civil War. She was made of green timber, leaked excessively, and was scrapped by Union forces at the end of hostilities.
- The third USS MISSOURI, a battleship commissioned in 1903, was part of the famous *Great White Fleet* that sailed around the world from December 1907 to February 1909, a voyage that marked America's arrival as a global power. In 1918, my father, Seaman Ike Skelton, served as a coal shoveling fireman onboard that historic vessel.
- The last USS MISSOURI, and the most famous, was commissioned in 1944 and earned the nickname *Mighty Mo* for continuous combat action from her arrival in the Pacific theater until hosting the Japanese surrender ceremony in Tokyo Bay that ended World War II. The *Mighty Mo* also saw action during the Korean conflict and the Persian Gulf War. Today that proud ship serves as a floating museum in Pearl Harbor, Hawaii.

These are trying times for our country. We face the uncertainty of serious economic challenges, a transforming world power structure, and the resurgence of tactics such as piracy and terrorism. Truly, these issues are matters of great concern to each of us.

However, on occasions such as today's commissioning, we owe it to ourselves to take stock as to where we are as a nation in the march of history. We have difficulties, this is true, but our country has climbed troubling mountains before. I remember the words of the song from World War II, "We Did It Before, And We Can Do It Again." This is the time for optimism, because the American *can-do* spirit has not, and will not, be broken.

There is always, in every generation, a chorus of naysayers who sound the negative drums in the background. We should not heed these cynics. Rather, we should reflect on the greatness of our history and strive to achieve in our generation a legacy worthy of those who have gone before us.

When our country declared independence on July 4, 1776, the thirteen American colonies faced the uncertain outcome of picking a fight with King George the Third and Great Britain, the greatest military power in the world at the time. Fast forward more than 200 years, and we find that those same colonies have grown to be the bastion of freedom on the globe.

Our history and our heritage call for us to shoulder the tasks ahead with the typical American optimism that conquered the wilderness, helped defeat totalitarianism, built the most powerful economy in history, and preserved freedom as no other nation has done.

This ship is a prime example of that American can-do spirit: delivered to the Navy under budget and ahead of schedule. In fact, this Virginia class program is currently the *gold standard* when compared to other major defense acquisition programs. There is none better.

The can-do spirit adopted by this program met the challenge placed by then-Chief of Naval Operations Admiral Mike Mullen. He wanted to build two of these vessels a year, but was frustrated because the cost prevented him from doing so. He challenged the

acquisition community and the shipbuilders to reduce the costs of these ships. The Navy and the shipbuilders made it happen. Together, they improved process and design to meet Admiral Mullen's goal. They worked as a team, and they did it in the finest tradition of the American *can-do* attitude.

Congress also accepted this challenge. Led by Congressman Gene Taylor of Mississippi and Congressman Roscoe Bartlett of Maryland, the Subcommittee on Seapower and Expeditionary Forces of the House Armed Services Committee crafted the necessary legislation to fund long lead material, provide authority for multiple procurements, and most importantly, begin the construction of two submarines per year for fiscal year 2011 and every year thereafter.

Of course, Gene Taylor had significant help in this effort. Congressman Joe Courtney has been invaluable due to his expertise in the needs of the shipbuilders. Joe Courtney, whom we affectionately call *Two Sub Joe*, along with Norfolk, Virginia area Congressmen Rob Wittman, Glenn Nye, and Randy Forbes, ensured that other Members of Congress fully understood the importance of these vessels to our national security.

Let me tell you a story about the turnaround of the submarine program. Four years ago, the program was struggling. The Navy had not commissioned a fast attack submarine in over 10 years. The program, at both shipyards, was over budget and struggling to meet schedules. What happened next should be in every acquisition textbook under the heading of "This is the Way to Manage a Program", because this is true acquisition reform.

The Navy appointed Rear Admiral William Hilarides as the Program Executive Officer for Submarine Construction. Admiral Hilarides accepted the CNO's challenge. He sat down with his shipyard partners and formed a coalition of professionals with a common goal. The team, both Navy and shipbuilders, worked together to identify ways to construct these ships more efficiently.

These are amazingly complex machines, and some of the ideas led to redesigning parts of the ship to literally make them easier to build, thus saving time and money. Some of the ideas were about finding better ways to get the job done. In the end, Admiral

Hilarides and his shipyard partners John Casey and Matt Mulherin accomplished the impossible. They reduced the cost of these ships by $500 million dollars.

This amazing submarine and the other submarines of this class are vital to our national security. The simple reason is contained in one word: stealth. You see, technology is increasing in all areas of science and engineering faster than most of our military systems can keep pace. Any student of military history can point to key technologies that shaped the face of warfare: steel weapons over bronze; black powder; rifled barrels; modern artillery; the tank; aircraft; the battleship; and the aircraft carrier. The newest technology to reshape the face of high intensity warfare is the advanced conventional missile. At this time in history, we have entered the Age of the Conventional Missile.

In the 1950s, many military thinkers declared the Age of the Missile – that is, the nuclear missile – and declared conventional weapon systems obsolete. And the Age of the Missile did come, but a funny thing happened. Missiles became essential to all of the military services, but tanks and planes and ships didn't go away. They didn't go away primarily because nuclear weapons did not end all conflict. The need for conventional weapon systems remained.

Indeed, as the missile age continued, more and more strategic systems, like the Tomahawk missile, were converted to include conventional variants. And as missiles have been increasingly utilized as conventional weapons, the technological improvements in conventional missile systems have significantly challenged the ability to defend against them.

This change in warfare means different problems for each of our armed services. For the Navy, it means that major capital ships, such as aircraft carriers, may soon be vulnerable to very long range precision attack. While we are working closely with the Department of Defense to speed up development of defenses to counter this emerging threat, one ship remains untroubled by this threat. Because of her stealth and the inherent protection of the ocean around her, this submarine is the only platform being built by the United States Navy that is immune to this new threat. As

yet, no technological advancement has made the oceans transparent, or allowed for the targeting of our submarines by missiles.

That is why this submarine, and her sister ships, are so valuable to the nation's security. They will remain free of the threat from the increasing accuracy and availability of advanced conventional missiles and will patrol in areas where quick and precise retaliation will give any potential adversary pause.

The stealth of the submarine is still unchallenged. This amazingly modern warship need fear no missile, for beneath the waves she patrols unseen and unheard. MISSOURI and her sister ships can strike, with pinpoint precision, targets far inland, or engage an enemy's fleet directly. She can provide real-time reconnaissance and she can provide direct support to special operations forces. Although her main goal is to prevent war, this vessel can in fact win a high intensity conflict once started.

As I stand here today on this magnificent ship, USS MISSOURI, my hopes are simple – may she sail the oceans of the world for decades, keeping her sailors safe from the awesome forces of the sea, may she provide power to our commanders, comfort to our allies, and sleepless nights to our foes.

As a boy, my father taught me the naval saying he learned aboard the USS MISSOURI of his day: "Red sunrise in morning, sailor's warning; red sunset at night, sailor's delight". At the end of every day this ship sails the seas, may she have delightful red sunsets.

It is my fervent hope that this USS MISSOURI is never called upon to unleash her powerful arsenal, but if she is, may her strike be swift and true. In the words of Henry Wadsworth Longfellow,

"Our hearts, our hopes, are all with thee.
Our hearts, our hopes, our prayers, our tears,
Our faith triumphant o'er our fears,
Are all with thee, -are all with thee!"

Thank you and God bless this crew and the future crews of USS MISSOURI.

## USS MISSOURI COMMISSIONING
## VICE ADMIRAL JOHN J. DONNELLY, U.S. NAVY
## COMMANDER, SUBMARINE FORCE
## 31 JULY 2010

Mrs. Gates, aforementioned Distinguished Guests, members of the Submarine Force Family, ladies and gentlemen, it is truly an honor to be with you today as we celebrate this key milestone in bringing additional capability to our Submarine Force, and our Nation.

Becky, we are so proud that you are the sponsor for this fine ship named MISSOURI. With your proven commitment to our military men and women, and their families, I believe that it was especially fitting that you were chosen to sponsor this ship. On behalf of the Submarine Force, I thank you for accepting this important role.

Our Submarine Force has built upon a strong legacy of selecting and training the best people, building and maintaining the very best ships, and equipping those ships with the latest technology and advanced equipment.

Today, MISSOURI will complete a significant milestone toward adding to that legacy. One hundred and ten years ago, in these very waters of the Thames River, our Submarine Force was born with the commissioning of USS HOLLAND. Fifty years ago USS GEORGE WASHINGTON also left these waters as the first fleet ballistic missile submarine, initiating a new era of Strategic Deterrence.

And today, history is once again being made in these waters as the most advanced war fighting machine built in America is commissioned into service to defend our nation's freedoms.

She will join her sister ships of the Virginia class, to provide a huge leap forward in undersea capabilities to accomplish new missions – in this new century.

MISSOURI is a tremendous investment by the American taxpayers, yet she and her crew have already begun to prove her worth.

She is being delivered to us today only two years after her initial crew manning. Recently, her crew performed propulsion plant power range testing, crew certification and her fast cruise milestones without pause and completed each test with flying colors.

Despite 4 months of shift work in difficult shipyard conditions, the crew of the MISSOURI leads all 88 of our submarine crews in the reenlistment rate of her outstanding Sailors. Commander Rexrode, I personally thank you and your leadership team for setting MISSOURI on the right course to a future of success.

Soon MISSOURI will be in the far waters of the world delivering the stealth, persistence and flexibility in high demand by our Combatant Commanders and in support of our national maritime strategy. Commander Rexrode, that day will come soon and under your leadership, I'm confident your crew will be ready.

To the crew of USS MISSOURI, and General Dynamics Electric Boat and Northrop Grumman Shipbuilding Teams, thank you for your commitment to building the best submarines in the world so that our Navy can ensure continual freedom of the seas.

# LUNCHEON ADDRESS AT NAVAL SUBMARINE LEAGUE CAPITAL CHAPTER FALL MEETING REMARKS BY RONALD O'ROURKE SEPTEMBER 17, 2010

Thank you for the introduction, and also for the invitation to speak today. The submarine community has long welcomed outside perspectives, which is something that I think benefits the community.

I should mention at the outset that these views are my own and do not necessarily reflect those of my employer.

I've been told that I have 25 to 30 minutes, so I've designed my remarks to leave some of that time for Q&A.

As some of you know, I gave a talk on submarine issues this past May at the annual Sub Tech Symposium at Johns Hopkins APL. Some of you may have heard that address, or read it in the July issue of THE SUBMARINE REVIEW, so I'm not going to repeat in detail what I said at Sub Tech. Instead, I'm going to quickly review some of the points I made in that address, and then extend the discussion to some follow-on issues.

**Review of points made in May**

In my talk last May, I noted that this year's 30-year shipbuilding plan eliminated about 1 of every 6 attack boats that were in the previous 30-year plan. As a result, the attack submarine shortfall that has been projected for many years is now expected to be a little deeper at its minimum, and somewhat more open-ended, than previously projected. This change has not received very much attention in discussions this year of the 30-year plan.

I also noted that there were some reasons to believe that the impact of the SSBN(X) program on the Navy's ability to afford other kinds of ships might be greater than shown in the 30-year plan, in part because there's no explanation in the plan as to how the Navy will achieve the $2 billion- per-year hump in the shipbuilding budget that is assumed in the middle years of the plan, which is intended to help pay for the SSBN(X)s, and in part

because the federal budget situation that has developed since late-08 may put downward pressure on the DOD top line. I then provided some comments as to why the burden of paying for the SSBN(X) – if it turns out to be greater than shown in the 30-year plan – might be more likely to fall on the attack submarine procurement program than the destroyer program.

Looking at that situation, I concluded in May that at least some—if not most or all—of the Virginia-class boats that are shown in the shipbuilding plan during the years of SSBN(X) procurement were at risk of disappearing from the plan due to funding constraints—that as many as 12 Virginia-class boats might drop out of the plan, which would reduce the attack boat force to levels well below those shown in the 30-year plan—to figures that are below 40 boats for a number of years.

Given that possibility, I said, the submarine community might want to consider exploring various potential options, including additional forward homeporting of attack submarines, dual-crewing of attack submarines, and extending the lives of the 23 Improved 688s and the 3 Seawolf-class boats by something like 10 years, which would require refueling those boats. I noted that the technical feasibility of the service-life-extension option was questionable, given limits on pressure hull life and other considerations, but that the Navy should still consider exploring it, if only to confirm general beliefs about its feasibility, and to be ready to show the analysis to others.

**Changes Since May**

So with that as a starting point, the question becomes: What has changed since last May?

Well, for one thing, as I think you're all aware, Secretary Gates and Under Secretary Carter earlier this week announced that cost-reduction efforts on the SSBN(X) have brought, or are expected to bring, the ship's estimated unit procurement cost down to $5 billion, compared to the Navy's preliminary estimate, in the 30-year plan, of $6 to $7 billion. That's welcome news for those concerned about the pressure that the SSBN(X) program may place on the rest of the shipbuilding budget. Other things held

equal, it could help buy back some of the Virginia-class boats that I said were at risk of disappearing from the plan.

But you'll notice I said "other things held equal," which may not be the case. Since last May, pressures to reduce federal spending so as to reduce projected deficits and the projected growth in the debt-to-GDP ratio have, if anything, intensified, and there is now more open and direct talk than there was in May about this effort including reductions in defense spending. So the chance that the DOD top line will go down might now be greater than it was in May—a growing number of observers believe it is very likely or even certain—and the potential rate of decline might also be higher than some might have projected earlier.

How these changes might alter the situation I described in May is hard to calculate, but it's not clear to me that reducing the cost of the SSBN(X), combined with a stronger downward pull on the DOD top line, would necessarily result in a net substantial improvement in the Navy's potential ability to procure attack submarines in coming years at currently planned rates. On the one hand, the Navy might be able to procure some of the Virginias that are scheduled for procurement in the same years as SSBN(X)s. On the other hand, the Navy might lose some of the Virginias that are scheduled for procurement during the period FY14 to 18, which is the period between the current multiyear and the procurement of the lead SSBN(X).

I'm not saying that most or all of these at-risk Virginias are certainly going to disappear from the 30-year plan. I'm saying that there's a distinct possibility they could disappear, and that in light of this possibility, the submarine community might want to begin thinking through the implications of this scenario, so the community would be ready for it, should it transpire. I want to spend the rest of my address discussing six specific questions for the submarine community that might arise from this scenario, and then conclude with a comment about a final, broader issue.

**Bridging a period of reduced or suspended Virginia-class procurement**

One specific question that might arise from this scenario is

what a suspension or near-suspension of Virginia-class procurement during the years of SSBN(X) procurement would mean for preserving hard-won efficiencies in the production of Virginia-class boats. What, in other words, would be the best strategy for getting through a potentially decade-long period of little or no Virginia-class procurement, so that Virginia-class procurement could be resumed or ramped back up following the completion of the SSBN(X) program with minimal loss of learning or other restart costs?

For example, how should Virginia-specific shipyard tooling and construction skills be preserved? And how should Virginia-specific suppliers be supported or otherwise managed during this period? Should the Navy stockpile components made by these suppliers prior to the start of the suspension, continue purchasing them, in at least limited quantities, during the suspension, or do something else? These are potential questions for both industry and the Navy.

**Operating a force of 30-something boats**

A second question arising from this scenario is what the operational and force-management implications might be of having an attack Submarine Force that, for some number of years, consisted of 30-something boats. If service-life extensions of the Improved 688s and the Seawolfs are not feasible, then what would be the best way to operate an attack boat force of this size? What role would forward homeporting and dual-crewing play in maximizing day-to-day forward presence? What might be done to further maximize the percentage of the force that could be surged on short notice to meet wartime needs? What would a force of this size mean for ship maintenance practices, command opportunities, and career paths? And most of all, what current attack submarine missions might need to be reduced or dropped, with what potential implications for U.S. security?

Some of these are potential questions not just for the submarine community, but for the Navy as a whole, for DOD, and for the nation. The submarine community may wish to be prepared to

describe to others the implications of this scenario from its own perspective, so as to help inform the general discussion.

**Additional capabilities for in-service attack submarines**

A third question arising from this scenario concerns measures that might be taken to augment the capabilities of existing attack submarines, so as to get the most out of a force of 30-something boats. This could lead to an even stronger emphasis than at present on how things like UUVs, clip-on weapon modules, and other backfittable new technologies might extend the capabilities of in-service attack boats.

**Additional capabilities for new-construction attack submarines**

In a related vein, a fourth question arising from this scenario is whether new-construction Virginia-class boats should be built to a more-capable configuration, such as a lengthened configuration that offers increased volume for equipping the ship with additional things. If only so many Virginia-class boats are going to be built during these years, and if the attack boat force is going to number in the 30s for some period of time, should new Virginia-class boats be constructed with things such as additional built-in payload launchers and a greater amount of internal payload storage space? The logic would that if you're only going to build and operate so many boats, you might want to make the most of the ones you build.

Right now, the idea of building Virginias with augmented strike capabilities is being explored in part as a way to compensate for the eventual retirement of the SSGNs and the loss of their strike capability. The idea here would be to build a larger number of Virginias with augmented capabilities to offset not only the retirement of the SSGNs, but also the reduction in the total number of attack boats. Building Virginias to an augmented configuration would increase their procurement costs, which in turn might further reduce the numbers procured, but the net result might be a force that is better able to perform its assigned missions.

The Navy and industry might consider studying the potential tradeoffs involved in this option. As part of this, the Navy and industry might consider exploring the feasibility, design implications, and construction implications of putting into the Virginia-class design features that would make it easier for the Navy to defer, until the last possible moment, the decision of whether to build a Virginia-class boat to a standard configuration or an augmented configuration.

**Non-nuclear-powered submarines**

A fifth question concerns the option of acquiring and operating non-nuclear-powered submarines. The question of whether the U.S. Navy should acquire and operate non-nuclear- powered submarines as supplements to the nuclear-powered boats, largely as a means of increasing total numbers of attack submarines, emerges a matter of discussion every once in a while, and the potential force-level scenario I have outlined here is one that might prompt another round of discussion on the matter.

The general Navy position on the question has been that since non-nuclear-powered submarines have limited submerged endurance, particularly at higher speeds, they are generally inappropriate for performing many U.S. submarine missions, most of which call for stealthy transits to distant operating areas, extended stealthy operations on station, and stealthy transits back home.

The disadvantages of non-nuclear-powered submarines for performing missions with these profiles might be mitigated somewhat by forward homeporting the boats near their intended overseas operating areas, but the resulting mitigation of disadvantages would be only partial, and a forward homeported non-nuclear-powered boat would generate less planning uncertainty for potential adversaries than a nuclear-powered boat in terms of what ocean region that boat is likely to be operating in after it leaves port.

Even so, the submarine community might consider reviewing the option of acquiring and operating non-nuclear-powered submarines, if only to confirm, in the context of a force of 30-

something nuclear-powered boats, that the Navy's past position on the issue still applies, and to be ready to shows its analysis to others.

**Allied submarines**

And a sixth follow-on question arising from this scenario is whether there are any actions, beyond those already implemented, that could be taken to increase the capabilities of allied attack submarine fleets, so that those fleets could help more in the performance of submarine missions of common interest. The United States decades ago provided technical assistance to the UK to jump start that country's nuclear-powered submarine program, and more recently helped Australia fix problems with its Collins-class boats. Assistance can also come in the form of things like joint training and exercises. Of particular importance in this context might be forms of assistance that, in one way or another, might give allied countries the additional incentive or support needed for them to each procure and operate one or two more attack submarines than they otherwise might.

It should also be noted, however, that there are risks in depending on allies to perform missions for you, because the interests of allies do not always coincide completely with U.S. interests, and because an ally's interest in performing certain missions could change abruptly due to changes in policy that can occur, for example, as a consequence of a change in government.

**A Navy for a frugal superpower**

So that's six specific questions that arise from a scenario where Virginia-class procurement was limited or suspended for several years, and the attack boat force as a result is reduced, for some number of years, to a total of 30-something boats. These are by no means the only specific questions that would arise from such a scenario, but they're a start.

As a final and broader point, I'd like to return to the budget situation that gives rise to this potential scenario, and talk for a moment about the place of the submarine force in U.S. national security strategy in the context of this budget situation.

The projected budget deficits and the projected growth in the debt-to-GDP ratio are leading not only to increased discussion about reducing defense spending, but also, as a consequence, to initial discussion, at least in certain quarters, about whether the nation might need to reconsider its role in the world, including which national goals and objectives might be more important to pursue than others.

It's not clear how far this incipient discussion of U.S. goals and objectives might go. It's entirely possible that the nation will decide to address the resources-vs.-national strategy situation simply by muddling through, without making crisp or explicit decisions about pursuing some goals rather than others. But either way, our fiscal situation may be taking us in the direction of becoming, in the words of one writer, a more frugal superpower[1], meaning a superpower that will face increased limits in the future on the resources it can apply to accomplishing its security objectives.

In that situation, various parts of the defense establishment will likely be eager to show how they can help a frugal U.S. superpower accomplish the most within more-limited resources. This could be the new Zeitgeist that many will attempt to plug into.

If that's the case, then submarine supporters might want to consider thinking about how the Navy in general, and the submarine force in particular, would plug into that Zeitgeist. There are some potential lines of argumentation that submarine supporters could consider pursuing.

For example, it might be argued that a frugal superpower should, among other things, maintain and leverage capabilities that generate high payoffs and enable a lot of options for policymakers, particularly when those capabilities depend on investments in technology that the United States has already made, and which potential adversaries might find too expensive to replicate.

An example of such a capability, supporters of naval forces, including submarines, might argue, is the ability to achieve sea control, and consequently to use the world's broad stretches of international waters – the maritime global commons – in a highly

leveraged manner, as a medium of maneuver, and for gaining access to and affecting events ashore in various parts of the world. Naval forces, including submarines, are central to achieving sea control and denying it to others, and the country's force of nuclear-powered submarines reflects an investment in technologies dating back decades, and which will be very difficult for any potential adversary to match anytime soon.

The argument would be that nuclear-powered submarines are worthy of continued support not *in spite of* new limits on national resources, but precisely *because of* new limits on national resources, on the grounds that maintaining and leveraging this investment could help a frugal superpower get the most out of the resources it has. The argument, in other words, would be that as the country's resources become more limited, the submarine force would be an ace in the hole that would become more important, not less.

That's just one possible argument, offered as a notional example. Other arguments, including opposing arguments, are certainly possible. And other parts of the defense establishment will likely be making arguments in favor of their own contributions to national security in a scenario of more-limited resources.

**Conclusion**

In my talk at the Sub Tech symposium in May, I said that while we're all aware of the federal budget situation, I wasn't sure that the system had fully internalized what this situation could mean for the defense establishment. That process of internalization is now underway, but it's still in the early stages. Exploring the six specific questions and the broader final point that I've outlined here might help the submarine community, and the Navy as a whole, in that process.

Thank you again for the invitation to speak today, and I'll be happy to respond to your questions.

## ENDNOTES

1. Michael Mandelbaum, "The Frugal Superpower," Guernica, August 2010 (accessed online at http://www.guernicamag.com/features/1934/mandelbaum_8_1_10/).

***ARTICLES***

## THE GREAT DRAFT OF 1963

***by VADM James A. Sagerholm, USN (Ret)***

*VADM Sagerholm is a retired submarine officer who commanded USS KAMEHAMEHA (SSBN642) (Gold). As a flag officer he served as Commander South Atlantic Force, Executive Director of the President's Foreign Intelligence Advisory Board, and Chief of Naval Education and Training.*

On a Wednesday morning in September, 1963, upwards of 800 officers gathered in the auditorium at the Bureau of Naval Personnel in Arlington, Virginia, where they were to be briefed by Vice Admiral Smedberg, the Chief of Naval Personnel, on a singular event that I call "The Great Draft of 1963," an event that would change their lives and their naval careers.

The previous Monday morning, I had received a call from the Washington area detailer, an old acquaintance with whom I had served in destroyers. I was a Lieutenant Commander beginning a tour in Washington.

"Are you sitting down?" he asked. When I replied that I was he continued: "You are to report to the BuPers auditorium this Wednesday at 0745 for a briefing by Vice Admiral Smedberg, the Chief of Naval Personnel, concerning possible nuclear power training for duty in ballistic missile submarines."

"Milt," I objected, "you have the wrong guy. This is Jim Sagerholm you're talking to, and I haven't requested duty in submarines. I have astigmatism in my right eye, so I can't qualify for subs."

"Jim, let me explain. First, I have the right guy, so listen carefully. As you know, the Navy is building ballistic missile subs at the rate of 10 to 12 per year. That means finding officers for 20 to 24 crews per year, a figure roughly of 300 officers per year. Admiral Rickover feels he has exhausted the supply from the

diesel boats, so he has received permission from President Kennedy to draft around 600 officers from the surface Navy. Those he selected will be asked if they will volunteer for duty in submarines, but hear this, even if an officer refuses to volunteer for subs, he will still have to go through nuclear power training. About 800 officers will be interviewed, ranging in seniority from lieutenant commander to ensign. You have no choice in this, so be at the auditorium on time Wednesday in service dress khaki."

So there we were in the auditorium, and at 0800, the entrance doors were shut, the room quieted, and Vice Admiral Smedberg appeared. He told us essentially the same story that I had been told by Milt, and he emphasized the critical need for officers to man the SSBNs that were being added to the fleet. After asking if there were any questions, and getting none, he informed us that the schedule of interviews was posted in the rear of the auditorium, and added that the lieutenant commanders were at the top of the list, since they would commence their interviews at Admiral Rickover's office in Main Navy at 1000.

We lieutenant commanders were told that a bus was ready to take us to Main Navy, so off we went to meet whatever fate had in store for us. I think there were five of us from the Naval Academy class of 1952 in the group of about fifteen lieutenant commanders, with Year Group 1952 being the most senior.

After first being screened by several members of Admiral Rickover's staff, we were lined up for the final interview with Vice Admiral Rickover. We all had heard stories of the interviews with the *kindly old gentleman*, so there was certainly a fair amount of apprehension among us.

Every prospective commanding officer was required to spend three months in Rickover's headquarters, learning the nuclear power plant on the ship he would command. It was the custom to assign these officers as escorts for officers being interviewed by the admiral. We were no exception. My escort was Captain James L. Holloway, III, waiting to go to the carrier ENTERPRISE, and who later was Chief of Naval Operations. Captain Holloway emphasized the importance of listening carefully to each question, and the need to answer a question directly and completely.

Without going into the details suffice it to say that I got wrapped around the axle of those directions, and my interview ended with my being required to write an official memorandum to the admiral, which I did. I then proceeded to BuPers via the shuttle provided, in order to be debriefed by Captain *Sunshine* Aubrey, the head submariner officer detailer. While I was telling Captain Aubrey that I considered that I had not been selected, the phone rang, and I was informed by the admiral's executive assistant that my memo had been accepted and I was in the program! I think all the other lieutenant commanders were accepted as well.

Captain Aubrey then asked me if I wished to volunteer for submarines, to which I replied in the affirmative, my right eye's condition being waivered. Within two weeks, we were on the way to Submarine School, except for a 1952 classmate who refused submarine duty. His orders were to Nuclear Power School.

We were in Class 125, together with a large number of lieutenants, lieutenants (junior grade), and ensigns. We lieutenant commanders were probably the most senior officers ever to go through the basic officer course at the school. From there, we attended the Nuclear Power School at Bainbridge, Maryland, followed by prototype training at the several sites then available. I finally received orders to USS SEADRAGON (SSN-584) in the summer of 1965, and spent the next ten months or so qualifying in submarines. Although I was senior to all on board except the skipper, CDR Ray Eagle, the welcoming and helpful attitude of all my SEADRAGON shipmates prevented any problems, no doubt due to CDR Eagle's leadership and example. The day I had my dolphins pinned on, I was promoted to commander, which may also be a record of some sort for seniority when qualifying.

Once qualified, we old guys went on to executive officer tours, and then command tours. I can say without any reservation that my XO tour in the commissioning Blue crew of M.G. VALLEJO (SSBN 658), under CDR Doug Guthe, and my command of KAMEHAMEHA (SSBN-642) Gold crew from 1968 to 1971, were the best tours I had in the Navy. Both crews were absolutely superb. In the three years of my command, I had no-repeat no-disciplinary cases, no captain's masts. As an aside,

Kam's medical officer was a young lieutenant named Robin Cook, who later gained fame for his series of medical mysteries, beginning with the *Coma* in 1974, and continuing to the present. The Weapons Officer was LT George Sterner, who retired from the ComNavSea billet in the rank of vice admiral.

Of the 600 or so officers who were drafted in 1963, I understand that over 90% volunteered for submarine duty, and many went on to highly successful careers in the Navy, including as high as the Deputy Chairman of the Joint Chiefs. The excellent training we received, the exceptional morale and esprit we found in the submarine service, and the outstanding quality of the submariners with whom we were privileged to serve, more than compensated for the abrupt and arbitrary change we experienced in our service careers.

The great draft of 1963 was a unique and unprecedented event that has never been repeated. To my knowledge, its story has never been told, so I now offer this brief account, such as it is, for the benefit of history. Consider this: given the importance to national security of the fleet of ballistic missile submarines, the 41 for Freedom, during that long struggle known as the Cold War, it would appear that the gap filled in the manning of those submarines by those officers who were drafted merits at least a footnote in the history of the Cold war.

*(Author's Note: the inspiration for this article came from the comments of Dan Curran in the July 2010 issue of THE SUBMARINE REVIEW. Dan was one of the 600 and a member of Class 125; this article is dedicated to his memory).*

# TRAGEDY AT SEA
# MILITARY TRIBUNALS, 18TH-CENTURY STYLE

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

*RADM Callo is a retired Naval Reserve Public Affairs officer who was a highly respected television executive in civilian life. In response to a Submarine Force request for senior professional Public Affairs assistance, then Captain Callo spent one of his activity duty—for-training tours with SubGruTWO at Subase New London. He arrived as a potentially serious problem was developing involving a weapons mishap at State Pier. He took charge of the public affairs matters, held press conferences and issued statements keeping the public fully informed of the incident, its implications and the immediate resolution efforts. It became obvious to all concerned that Joe Callo's professional approach to the problem turned what could have been a difficult Navy-Town affair into a positive illustration of a Navy timely solution with a full appreciation for public concerns.*

*In retirement he is an active author, with an interest in both John Paul Jones and Horatio Nelson. He is also a frequent contributor to these pages. He makes his home in New York City.*

*Reprinted with permission from the August 2, 2010 issue of The Weekly Standard.*

In 1757 Admiral John Byng of the Royal Navy was executed by firing squad on the quarterdeck of HMS MONARQUE. He wasn't shot because he lost a battle, betrayed his country, or committed an act of cowardice under fire. He was shot because he failed to achieve a victory in a naval action against the French, and particularly because he was indecisive and passive in the battle's aftermath.

Following the execution, Voltaire remarked sardonically that the British "shoot an admiral from time to time to encourage the others." But there was much more to the event than that, and in Admiral Byng Chris Ware illuminates the complicated military and political circumstances of this story of an otherwise unremarkable officer whose career ended in a seemingly bizarre act.

Ware sets up some of the incongruities of the narrative at the end of his prologue:

> It was not treason that brought Byng to his execution.... It was both devastatingly simple and, at the same time, far more complex than that. What brought him down was the one thing which could destroy any British admiral; failure to defeat the enemy in battle.

It occurs to the reader, however, that even in the eighteenth century, failure in battle might lead to being relieved of command and even cashiered from the service—but not to a ceremonial death by firing squad. Ware tells the story in detail—how the peculiar execution came to pass—and he tells it with the insights of a lecturer, author, and former curator of Britain's National Maritime Museum.

John Byng was born in 1704, the son of Admiral Viscount George Byng, who became an admiral of the fleet and was first lord of the admiralty from 1727 to 1733. There was little doubt that John Byng was headed for a career in the Royal Navy, and he entered that service in 1718. After an undistinguished early career, he advanced to rear admiral in 1745, vice admiral in 1747, and admiral in 1756. He was not a brilliant naval leader, but neither were there serious blemishes on his record. He managed generally to avoid the least attractive assignments during his career, and he had no more than his expected share of brushes with higher authority, both political and naval. He was in many ways typical of the numerous well-connected officers who achieved the rank of post captain, and then advanced inexorably to flag rank in the Royal Navy of the day.

Byng's career took an ominous turn in March 1756, however, when he was appointed to command a 10-ship squadron with

troops embarked and ordered to the Mediterranean. It was clear, in Byng's orders, that a crucial element of his deployment was the protection of Minorca, a linchpin of British naval power in the Mediterranean. A key phrase in his orders was this: "If you find any attack made upon that island (Minorca) by the French you are to use all possible means in your power for its relief."

After considerable delay, including significant problems in manning his ships, Byng arrived in Gibraltar at the beginning of May. There he learned that the French had already invaded Minorca and were in control of the island, with the exception of Fort St. Philip at the port of Mahon. Byng was faced with a situation that he had not anticipated. Instead of reinforcing the British defense of Minorca against a potential attack, a mostly tactical challenge, he was faced with a question with broad strategic implications. Should he support the garrison at Mahon, even if that support was likely to fail, or should he write off Minorca and use his squadron in other ways against the French? It was a question of broad strategy, the likes of which he had not confronted previously.

Even beyond his shortage of experience, Byng had a personality that was no match for the challenge. Ware describes those inadequacies candidly: "Byng was fussy, which might come across as dithering, and he also wrote in an orotund style." In addition, Ware quotes an evaluation by Julian Corbett, the British maritime strategist: "He was not a man for doubtful enterprise where so much must turn on a capacity for prompt resolution and fearlessness of responsibility."

On May 20, Byng's moment in history arrived. After sighting a French squadron off the coat of Minorca, a battle was joined. The opposing forces were equal, and once engaged, neither side was able to gain a clear advantage. During the action Byng demonstrated neither exceptional tactical skill nor aggressiveness, and it was clear that his captains had not been briefed about their commander's intentions prior to the action. Confounding the issue were the Navy's "Sailing and Fighting Instructions," which provided little help in the basic command-and-control challenges of combat at sea during the Age of Sail. The instructions were not

conducive and tentativeness marked the British squadron's performance. As darkness approached, the French force bore away. There was some damage inflicted by both sides, but there was no decisive result: Byng did not pursue the French squadron—and for that he would pay, not with censure or ignominy, but with his life.

Confronted with a challenging tactical situation and serious strategic implications, which Byng appeared to be overlooking, he called for a council of war among his captains and a number of the senior army officers involved. It was a common reaction for the time; but nearly 50 years later Admiral Nelson would be instructive on the subject of war councils when he wrote to his prime minister: "For if a man consults whether he is to fight, when he has the power in his own hands, it is certain that his opinion is against fighting."

As it turned out, Byng's war council voted unanimously that there was no prospect of relieving the garrison at Fort St. Philip, and that Gibraltar would be endangered if Byng's squadron was to suffer further damage. Byng returned to Gibraltar. When word of the eventual surrender of the British force holding the last British bastion on Minorca, and Byng's return to Gibraltar, reached Britain, a political and press firestorm was ignited. As Ware explains, "Gibraltar was important, but Minorca was vital.... Lose Minorca and the law of unintended consequences came into play." It was a circumstance that threatened the government, as well as the Royal Navy's leaders at the Admiralty—and for good reason. It was their planning and policies, more than Byng's lack of aggressiveness, that had led to strategic disaster, and it is on this aspect of the story that Ware's knowledge of British political history is particularly important.

A squadron was quickly formed and sent out to reinforce the Navy in the Mediterranean. Byng and many of the officers in his squadron were relieved and returned to England, where Byng was immediately placed under arrest, and preparations for his court martial began.

Byng's position was extremely dangerous. While imprisoned initially in the Tower of London, and subsequently at the

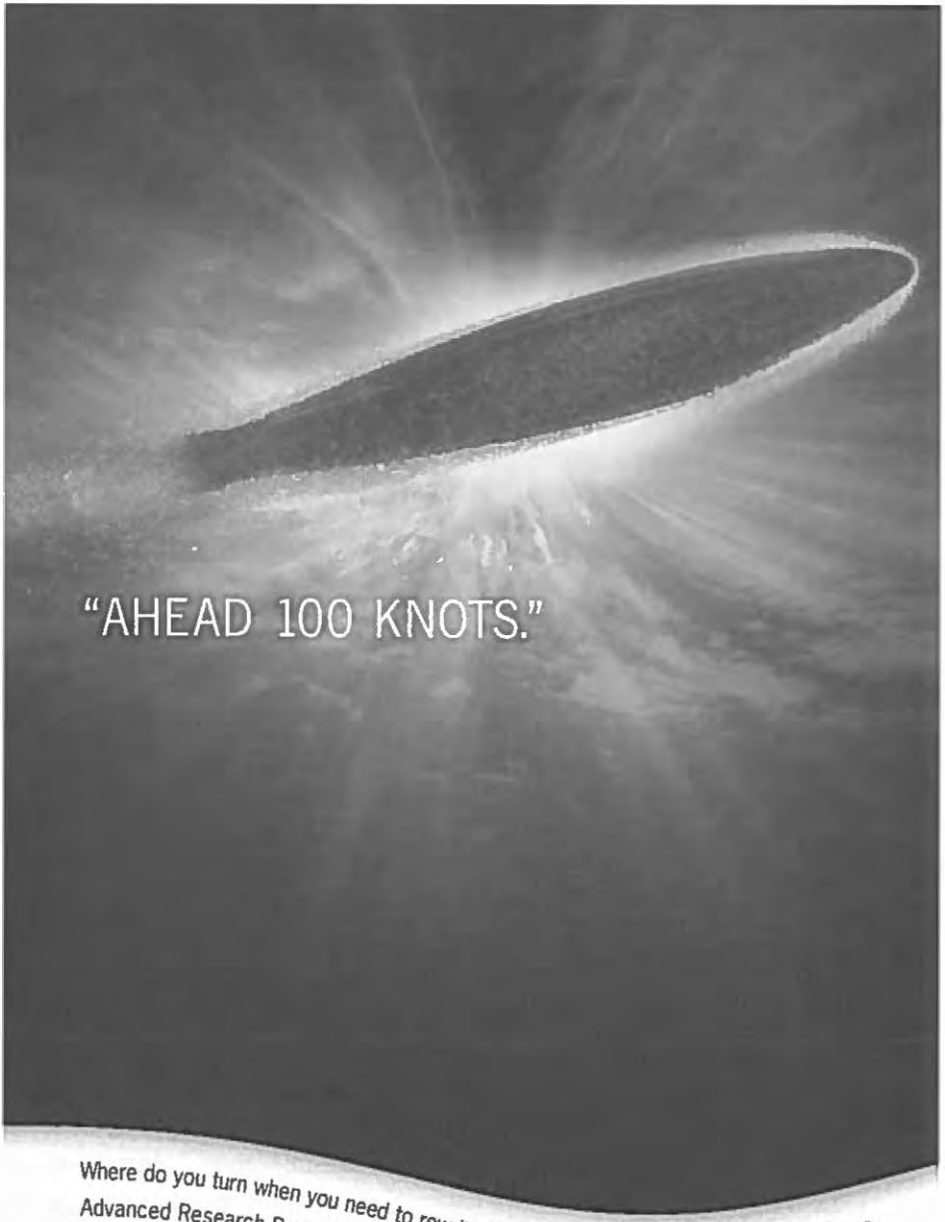
Seamen's Hospital at Greenwich, it was difficult for him to mount a legal defense, and no one in the government or the Admiralty facilitated matters for him. He was, after all, the lightning rod for blame that could easily have fallen upon them. The forces arrayed against Byng were overwhelming, ranging from George II to the king's ministers to the Admiralty to the press. And unfortunately for him, he had no anchor to windward in any of those places.

What resulted was a trial conducted in strict accordance with Britain's Articles of War of 1749 but moved inexorably towards a conviction. Ware describes the proceedings bluntly: "Whatever the circumstances it was obvious that this was a show trial... and a show trial in the sense that the ministry of whatever composition had to be seen to be doing something." When the court martial ended, Byng stood convicted of violating a critical article: "Every person who through cowardice or negligence or disaffection shall in action withdraw or keep back or not come into the fight or engagement or shall not do his utmost to take or destroy every ship which be his duty to engage...shall suffer death."

It was the requirement to *do his utmost* that led to his doom.

Byng's legal defense failed, as his action against the French fleet at Minorca had failed; but he pursued it with resolution and a sense that his impending sacrifice was inevitable. He clearly believed that he was innocent of misconduct, and notwithstanding the odds stacked against him, he never wavered from that position. Nor did he question the prerogatives of his civilian masters to sit in judgment of his actions or, in his case, his thought processes.

When the smoke from the Royal Marines' muskets drifted off MONARQUE's quarterdeck, and the corpse of John Byng was removed, there were doubtless sighs of relief from George II and in Whitehall and at the Admiralty. But there was something else as well, something more permanent: the realization that Admiral John Byng was clearly more than a mediocre flag officer. He was someone who, by the quality of his response to his accusers, endorsed a concept that is a given in those societies based on representative governments: civilian control of the military.

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# ONCE MORE ABOUT RUSSIAN SEVERODVINSK NUCLEAR ATTACK SUBMARINE

***by Dr. George Sviatov***

*Dr. Sviatov is a frequent contributor to THE SUBMARINE REVIEW and has been a knowledgeable observer of submarine characteristics across the world.*

My article *Severodvinsk Class Russian Nuclear Attack Subs* was published in the January 1999 issue of THE SUBMARINE REVIEW.

In that article I presented my then current information and reasoning about that submarine. I used Russian publications and my knowledge of a former Russian builder and preliminary designer of Soviet nuclear submarines in Severodvinsk city's huge shipyard and in the First Research Institute of the Soviet Navy in Leningrad.

In those days my net assessment of that SSN's tactical-technological characteristics were as follows:

| | |
|---|---|
| Surface displacement | 9,500 t |
| Submerged displacement | 14,000 t |
| Length | 120 m |
| Beam | 13,6 m |
| Draft | 9.7 m |
| Reserve of buoyancy | 23% - 25% |
| Surface unsinkability | with one flooded compartment |
| Test depth | 600 m |
| Hull material | AK-32 steel with yield point 100 kg/sq mm |
| Torpedo tubes | 8-533 mm, amidships |
| 533 mm torpedoes and cruise missiles | 40 |
| 1,600-mm vertical launchers and big cruise missiles | 8 |
| Sonar | Irtish-Amphora with spherical bow array |
| Underwater speed | 32-33 knots |
| Reactor | 1, some 200 mgwt |
| Turbine | 1, some 50,000 shp |
| Manning | 85 officers and men |

The conclusion of my 1999 article I wrote that in designing the fourth generation of their SSN's the Russians did not go by the American way. They did not reduce displacement, diving depth, speed and the number of torpedo tubes and weapons. They eliminated the 650 mm torpedo tubes and torpedoes because they did not have significant advantages in comparison with the 533 mm torpedo tubes and missiles, but they added 8-1,600mm vertical cruise missiles launchers inside of the pressure hull.

It seems that I was wrong about not going the American way, because it is the inheritance of old Soviet design philosophy to put cruise missiles with more than 533 mm diameter on submarines. Now the Russians have anti-land 533 mm cruise missiles with a range of 3,000 km and supersonic anti-ship 533 mm cruise missiles with a range up to 200 km, and very effective anti-submarine and anti-ship 533-mm torpedoes (by the way, Russian 533-mm torpedoes are 2 meters longer than American torpedoes).

I presented my opinion that the future of SSNs is not connected with the increasing number of missile launchers but with keeping six to eight 533-mm torpedo-missile tubes and increasing the number of their weapons up to 80-100 with fast reloadable firing systems. Such a fast firing tempo is difficult to accomplish with wire-guided torpedoes, but much easier with conventional torpedoes and cruise missiles.

But now it is reasonable to move from history to our time.

On June 10, 2010, at the huge shipyard Sevmash Severodvinsk, the RS SEVERODVINSK (newest Russian SSN) was rolled out from the Building Assembly Shop.

SSN SEVERODVINSK is the first ship of Project 885 *Yasen* (*Ash-tree*). She was designed in the Saint-Petersburg's Design Bureau *Malachit* under the leadership of her General Designer Vladimir Pyalov.

In that celebration the Honorable speaker was President of Russian Federation Dmitry Medvedev. He said at that ceremony that the introduction of such submarines into the Russian Navy will increase its potential by several times. According to his words, in contrast to the new Russian ballistic missiles underwater strategic cruiser YURY DOLGORUKY her weapons passed all

the tests. They are cruise missiles of long range, which can hit the targets at sea and on the land.

SEVERODVINSK will be the first sub of the newest fourth generation. She can solve all the tasks which the State is putting to the Naval General Purpose Forces: striking the targets underwater, on the surface and on the land. It is a double hull one propeller SSN with a reduced level of noise.

The missile complex has eight vertical launchers. Vladimir Pyalov borrowed the idea of such kind of unusual launchers from American naval architects. It was implemented a dozen years ago in retrofitting of the 4 Ohio class ballistic missiles submarines. On those submarines, which had 24 huge silos, 22 of them were used to house 154 torpedo sized Tomahawk cruise missiles with range of some 300 kilometers (by putting 7 missiles in a tube of 2.4 meter diameter).

So, if you are talking about increasing a combat ability by several times, you must accept that this notion is put to better use in the converted American Ohio-class SSBNs. Although, any such multiplication is effective, and in such an approach Vladimir Paylov is correct.

By my present net assessment the Severodvinsk class Russian SSN has the following tactical-technological characteristics:

| | |
|---|---|
| Surface displacement | 9500 t |
| Submerged displacement | 13800t |
| Length, beam, draft | 306x41, 3x30 feet |
| Reactor | 1 PWR OK-650V, 200 mgwt |
| Turbine (one shaft), | 50000 hp |
| Underwater maximum speed | 32 knots |
| Maximum test depth | 800m |
| Missiles weapons | 8x3=24 |
| Bow side torpedo tubes-weapons | 8-32 |
| Total weapons | 56 |
| Complement | 85 |

Now I would like to present my net assessment of the new Russian attack submarine and her chief designer.

First of all, about Vladimir Pyalov's statement about increasing the military value of his new sub *Y RAZI* (in several or may be

many times). The previous Russian nuclear attack submarine Acula class, the characteristic of which had been presented in my article *Acula Class Russian Nuclear Attack Submarines*, published in 1977 October issue of THE SUBMARINE REVIEW, had 4-650mm and 4-533mm torpedo tubes and 12 and 28 weapons or in sum – 40 weapons or 80 mines.

As a result, Vladimir Pyalov increased the number of torpedoes and missiles weapons from 40 to 56 and that is a significant achievement.

But he lost a possibility to surpass the American achievement on the 4 Ohio class converted strategic missiles submarines in which, 22 silos of converted Trident ballistic missiles submarines the USA naval architects installed 154 Tomahawk class cruise missiles and in 2 silos put some equipment for special service marines. In that case the Americans had the absolute right to say they increased the weapon power of their submarine by many times.

In conclusion, I would like to present the longitudinal cut of SEVERODVINSK Russian SSN, which I took from the Internet. Unfortunately, I do not know the name of it author, but I have to give him the highest credit for his professional level. Probably this cut belongs to a US intelligence officer, for security reasons he blackened the torpedo area of the picture. On that black rectangle should be seen only four 533mm torpedo tubes and four 533 mm torpedoes from 32 total torpedoes number.

# OPERATIONS RESEARCH: EVOLUTION

***by Mr. John Merrill***

*Mr. Merrill is a frequent contributor to THE SUBMARINE REVIEW and is a published author of several books on the history of undersea technology. He is a retired engineer with lengthy experience at the New London lab of the Naval Undersea Warfare Center. He currently lives in Waterford, CT.*

Not many persons in the general public think about or are even aware of operations research, but the U. S. Navy began its support for OR in early 1942 and never stopped. The *United States Occupational Handbook 2010-2011*, a nationally recognized source of career information, pointed out that for the year 2008, there were about 63,000 OR analyst positions in the United States.

Further it commented "Employment of operations research analysts is expected to grow 22 percent over the 2008-2018 period, much faster than the average for all occupations." With these positive remarks about the OR profession, a sampling of the milestones and early history of the evolving field including contributors seems appropriate. The initial part of this essay recalls the early origins of OR, questions raised at the end of WWII regarding how the Navy should address continuing OR at the end of WWII, the movement of OR to industry and satisfying the academic needs for the new OR profession.

Under the aegis of DOD(I) during 2008, the Defense Sciences Board (DSB) Advisory Group on Defense Intelligence Task Force on Operations Research Applications for Intelligence, Surveillance and Reconnaissance (ISR) assessed current OR sponsored by DOD and issued a final report. The closing section of the essay brings to notice some of the DSB findings about contemporary DOD use of OR.

At the end of World War II, the release of information about OR to the public after the war years of necessary secrecy and confidentiality brought some of the high drama and effectiveness of the physicist's and engineer's wartime technologies to a new audience.

With the successful OR introduction to the military of both England and United States by probably less than 300 people total in both countries, it is remarkable that a half-century later there would be 63,000 analysts pursuing this new and growing field of expertise applicable to the management of business and industry as clients as well as the original users, the military. Added to these users, a highly interested academic participation became available to meet student needs in the new field of OR. It was soon noticed that OR methodology for solution of military problems could be applied directly to business or industrial problems.

In the United States, the basis for the decades of OR after 1950 focused heavily on the work accomplished by MIT acoustic physicist Philip Morse and his associates during the years 1942-45. Morse's interest in OR never waned. The careful documentation of his teams' work and results and its availability in book form in the early 1950s pointed the way to the extensive theoretical and practical growth of OR. Morse's insight and guidance for this professional field earned him on occasion the title *Father of OR.*

*Operations research* (OR) and its other image *operations analysis* (newly brought to fruition in the late 1930s) was

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None of the wartime OR practitioners was trained in that field. It did not exist.

Operations research, also known as operational research, is an interdisciplinary branch of applied mathematics and formal science that uses advanced analytical methods such as mathematical modeling, statistical analysis, and mathematical optimization to arrive at optimal or near-optimal solutions to complex decision-making problems.

somewhat obscured with a continuing classified status. Awareness of its capabilities and wartime uses was in the purview of possibly several hundred wartime scientists, technical and military personnel who observed OR utility and effectiveness. Certainly, with OR improvements in solving various wartime naval operational needs by factors of 3 or 10, a continuing post-War military interest in the methodology would follow. Brief definitions of OR include Tidman's[1], "analysis conducted on the basis of operational data." And from the Industrial Engineering Handbook, The essence of OR "...O.R. may be viewed as a scientific approach to solving problems."[2]

The end of the War did not imply a public awaiting the OR methodology. It was well understood by the wartime OR leadership and others that there was an immediate need to document the OR-developed techniques to prevent their possible loss. This end was achieved.

In the period after WWII, questions were raised as to how the U.S. Army, Navy, and Air Force should adopt and implement OR. At this time, OR was generally unknown to industry and academia. The first decades after 1945 witnessed OR growth and acceptance, and it was the cadre of WWII OR scientists and others who provided the guidance.

The intention of this essay is to bring brief renewed attention to some historical aspects of OR and to briefly highlight more than fifty plus years of Navy and OR. Esoteric aspects and intricacies of OR are not of consideration. Detailed attention is given to pre-war development of OR in Great Britain, because OR was one of the cornerstones of the U.S. effort when attention was directed to the U.S. Navy's applying OR to solving ASW problems in early 1942.

Today after more than seventy years, the pre-WWII work by British scientist A. P. Rowe, cited below, adapted scientific techniques soon to be called operations research to success in solving problems related to implementing the newly developed British secret early warning radar system.

In the United States, it was the Antisubmarine Warfare Operations Research Group (ASWORG) formed in May 1942 under the initiative of Admiral King and the leadership of Philip Morse from MIT that fostered OR as a significant tool to remove the German U-boat from the Atlantic Ocean scene. At this point in Morse's career, he was a successful physicist who was both an experimenter and a theoretician.

OR's immense progress in ultimately winning the constantly-changing debates on submarine technology measures vs. counter measures saw evidence of success by May 1943. During the next two years of the War, OR also grew and broadened into other operational areas while meeting with success in the Atlantic and Pacific in the multitude of air and sea challenges presented.

Even now, more than a half century later and into the 21st Century, OR techniques and methodologies of the skill are with us; that are widely followed in industry and business as well as the military. Colleges and universities offer OR study opportunities. The Navy became connected to operations research and benefits from it. This essay offers some thoughts and glimpses of OR.

**Starting point: a need**

In 1934 at the British Air Ministry, H. Wimperis (a scientific research director) and A.P. Rowe (on Wimperis's staff), on studying the records at the British Air Ministry were astounded to find that there were less than fifty documents out of thousands that related to the subject of air defence. Because of the increasing importance of air defence, Wimperis suggested to the Air Ministry that an Air Defense Committee be formed. This was approved and the Committee was placed under the chairmanship of a well-known physicist, Henry Tizard, with both Rowe and Wimperis on the committee. The Committee lasted until the beginning of the War in 1939. The first meeting took place January 28, 1935. The Committee, all scientists, included P. M. S. Blackett, A. V. Hill, A. P. Rowe, and Sir Henry Tizard, and. H. E. Wimperis.[3]

As a result of immediate action in radio direction finding by the Committee, the following month (February 1935) the BBC short-wave transmitter at Daventry was successfully used to identify the approach of a Heyford bomber eight miles away. In April, funding of £13,200 was appropriated to continue the research. By April 1937 aircraft were being detected at a distance of 100 miles and in September 1939 a fully- operational air defense system was in place along the southeast coast of England.

**Operations Research Begins**

Effort to apply science to management of organized systems and to their understanding was a precursor of operations research. It began as a separate discipline in 1937 in Britain as a result of the initiative of A. V. Rowe, then superintendent of the experimental radar station at Bawdsey Research Station's center for radar development. In teaching military leaders how to use the then newly-developed radar to locate enemy aircraft, Rowe organized teams to do *operational researches* on the communications system and control room at the new British radar station to improve the operational efficiency of the system. This pre-war scientific effort invoking OR efforts at Bawdsey became the seminal force behind modern operations research.[4]

In July 1938, a second major air-defensive exercise was carried out at Bawdsey including four additional radar stations installed along the coast. Post-exercise analysis indicated failure to meet expected results. Rowe proposed and immediately implemented a crash program of research into the operational as opposed to the technical aspects of the system should begin immediately. Operational Research was coined as a suitable description of this new branch of applied science.

The Committee (known as the Tizard Committee during its five years before dissolving during the first years of the War) made four primary accomplishments. First, Radar and its development was supported by senior airmen and introduced secretly into the Air Force. When war came in 1939, the whole

east and southeast coast of England had operational radar chains. This was a decisive factor in the winning of the Battle of Britain in 1940.

### The Human Element

A final reason for the high quality of wartime operations research must be noted: the employment of geniuses. (The British Operational Research Section included two Nobel Prize winners and five Fellows of the British Royal Society) The war effort plucked these individuals from their natural habitats and set them to work "seven days a week, 52 weeks a year" Today's peacetime efforts—many of which are in fact window dressing or rococo computer make-work—cannot hope to engage such talent with such intensity. [5]

Second, senior officers of the Armed Services were brought into much closer intimacy with the research and development scientists in the government establishments. The third achievement was the creation of mutual confidence and understanding between serving officers and university scientists.

Fourth, it was the recognition that scientifically trained research workers had a vital role to play, not only as of course was traditional in the development of the increasingly more technical weapons of war but also in the actual study of operations.[6]

**Summarizing**

Outnumbered in fighting planes, England's success in combating the initial heavy German bombing and strafing during the summer and early fall of 1940 was in part due to the beginning in 1936 of scientific operational investigations before the radar chain was constructed. Preparations for enemy fighter interception addressed problems in fighter direction and

control, experiments using simulated radar data, and input from the Observer Corp personnel.

### Scientists, Engineers, Military Officers

**In 1920, George Ellery Hale, worldwide known astrophysicist, commented: "...it is impossible to distinguish between science as needed for national defense and science as the basis for industrial progress."[7] WWI experience observed the beginning of Scientists, Engineers and Military Officers in England and the United States coming together to meet operational needs of the modern weaponry. WWII witnessed significant increased participation and contributions by scientists including the introduction of operations research.**

With a limited number of fighter planes, Britain used the tactic of holding planes on the ground until the right moment. Then control directed the plane to location within visual sighting of the enemy aircraft. Radar range capability at the time was 120 miles out to sea with 50-mile detection of low-flying aircraft. These experiments integrated the radar into the early warning systems, the Observer Corps, and fighter direction and control. The June 1940 successful introduction of early warning radar in England in a comparatively short time was followed by formal OR research groups being established in all three of Great Britain's military services.

**P. M. S. Blackett**

Blackett, physicist, protégé of Nobel Laureate Ernest Rutherford, and active participant in the early warning radar development during 1940-1942, later successfully with his assistants applied OR methods to resolving antiaircraft-radar operational challenges. In March 1941 he moved from the Anti-aircraft Command to the Coastal Command to advise on

problems arising from the air-war against U-boats. The Coastal command's assignment included antisubmarine operations, convoy protection and attacks on enemy shipping primarily, an offensive role. Blackett established his new operations team as part of the British Command's senior staff. The team members included physiologists, mathematicians, astrophysicists, and a surveyor. "Blackett's biggest contribution was in convincing the authorities of the need for a scientific approach to manage complex operations, and indeed he is regarded in many circles as the original operations research analyst."[8]

**Antisubmarine Warfare Operations Research Group (ASWORG)**

The U.S. Navy was aware of British success with ASW due in part to their civilian scientists' OR efforts. After the first few months of the war, it became apparent that the Navy needed detailed ASW data analysis for tactical decisions. The requisite analytical skill including statistics and probability were not within the ken of the U. S. military. In March 1942, the Navy requested Vannevar Bush's National Defense Research Committee (NDRC) to provide civilian scientific support in the U-boat campaign to the Boston ASW unit. The NDRC appointed MIT acoustic research physicist Philip Morse, then at the Harvard Underwater Sound Laboratory, to form the group.

**Operations Research Countering the U-boat 1941-1943**

**Recommending an optimum depth for air dropped depth charges**
**Securing additional Liberator night bombers for convoy cover**
**Painting bombers sky color to reduce U-boat sighting**
**Expediting the night use of Leigh Lights on ASW aircraft**
**Discerning the use of radar listening devices by U-boats**
**Promoting the use of large convoys (1944 186-ship convoy)**
**Implementing High Frequency Direction Finding (HF/DF)**

**Philip M. Morse**

Morse, a mathematical physicist, received his PhD from Princeton in 1929. This was followed by a year's work study sponsored by the International Fellowship—fall and winter study at the University of Munich and at Cambridge University the following spring and summer.

Prior to Morse's departure to Europe, Carl T. Compton, then at Princeton, was about to become the new president of MIT. Compton asked Morse to join the physics faculty when he returned from Europe. Morse agreed. Now ten years later in 1941, Morse's broad spectrum of capabilities and interests included acoustics. Morse directed a successful U.S. Navy project on sound measurement and control for defense against acoustically actuated mines. He wanted to contribute further to the ongoing defense efforts.

In early 1942, considering the then out-of-control problems with German U-boats in the Atlantic, Morse felt that the key to success in combating the submarines lay not just in the hardware but also in understanding the Navy's operational problems and interactions among hardware, people, and tactics.[9]

A new Atlantic fleet ASW unit was established in Boston March 2, 1942. Morse met with USN Captain Wilder Baker at the ASW unit late in March 1942. Baker had recently returned from several months in Europe where he had discussions with Blackett and understood the value of scientists assisting with the operational enhancement of military equipment. Baker asked Morse if he would organize a scientific task force to help Baker's unit analyze the U. S. antisubmarine effort.

By April 1, Morse, as director, immediately became involved in recruiting top scientists for the ASWORG at Columbia, California Institute of Technology, Harvard, MIT,

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In 1946, Blackett and Morse received the Medal for Merit, the highest award the United States can make to a civilian, Blackett for his application of scientific method concerning the anti-U-boat campaign during the War and Morse for his work with the Anti-Submarine Warfare Research Group in the Atlantic.

Princeton, and Stanford. Dr. William B. Shockley (future Nobel Physics Laureate for the transistor) on loan from Bell Telephone Laboratories had recently designed a submarine radar prototype. Shockley was made Research Director of the ASWORG and Morse's assistant supervisor. "In two weeks three of us were at work and by the first of May there were seven...By September we had seventeen."[10] On May 1, 1942, "Preliminary Report on the Submarine Search Problem" ASWORG'S first memorandum was published. The recommendations of the report were immediately put into effect and improved the tactics of convoy protection and the search for U-boats.[11]

It is interesting that Morse looked for people with a more theoretical outlook than experimentalists. He needed mathematicians, insurance actuaries, and theoretical geneticists, as well as quantum theorists. Half of the first group were mathematicians, most of the remainder physicists.

By the end of 1942, the first seven scientists were joined by 21 additional team members and by mid-1943 the number increased to forty-four [12] and by the end of the war there was a staff of 80 scientists and an annual budget of $800,000.

Morse and Shockley in the remaining months of 1942 established contact and relations with the US Army Air Force and assigned scientists to naval commands. By then, having a grasp of Navy's submarine warfare, they visited England to meet with Blackett and other members of the British OR organizations to have knowledge of the British view of ASW.

The May 20, 1943 establishment of Admiral King's Tenth Fleet, an administrative arrangement for the consolidated and centralized command of all Atlantic ASW, provided the broadest possible support to defeat the U-boat challenge. ASWORG became part of the Tenth Fleet in August and moved from Boston to Washington, DC. The OR group evolved into a center for the entire American ASW effort. An IBM state-of-the-art data processing system provided help in analyzing and tracking the expanding U-boat data. A large percentage of the OR team was

eventually widely scattered at various Navy and Army commands in both the Atlantic and Pacific.

Morse and his scientists, in search of unbiased operational data pushed to be permitted to directly observe field operations themselves. This was unusual but authorized. These six-month field assignments ensured accuracy of data being gathered, direct knowledge about ASW operations and opportunity to observe the status of OR- implemented recommendations. On another issue, the scientists pressed for access to senior Navy decision makers to promulgate results and obtain consensus on the OR findings.[13]

Scientists' recommendations on tactics and even strategy were included in the decision processes. As Admiral King pointed out later, "...Operations research, bringing scientists in to analyze the technical import of the fluctuations between measure and counter measure, made it possible to speed up our reaction rate in several critical areas."

**Post WWII: Military-Academia, 1945**

How to continue the work of the Operations Research Group as advisor to the Navy during peacetime was a challenge. The wartime success of OR was evident in the methodology in the group's wartime files and the minds of the wartime scientists but what type of arrangement would be best suited during a non-war time environment? OR was well established in all three branches of the British military and its usefulness was understood by the U.S. Navy and Army Air Forces.

Admiral King, a strong OR advocate reported the need to Secretary of Defense James V. Forrestal. Emphasis was on the continuation of not only a scientific approach to advice for the Navy but an academic viewpoint needed to assure the independence and integrity of the participating activity's findings.

To meet the academic requirement as the institution sponsored to perform OR, the Navy up until 1962 contracted with several universities and not for profit organizations to carry out the OR effort. The first contract for continuation of OR with

MIT was signed November 1, 1945. The staffing was reduced to 25. Operation Research Group was changed to Operations Evaluation Group (OEG) and Navy OR continued. In the years ahead, Navy contracted for OR support with universities and nonprofit organizations that included among others the Franklin Institute in Philadelphia, University of Rochester, and Hudson Institute.

The respite at the end of the WWII allowed the Navy to come to grips with the contracting needed for the OEG to continue its studies and analyses covering past operations, operational capabilities of new equipment, strategic alternatives, etc. This was quickly upset with the unleashing of North Korean troops across the 38th Parallel on 25 June 1950.

OEG mobilized to meet the contingencies of the Korean War period (June 1950 to January 1953) growing from forty to sixty by the end of the war with emphasis again on OR team members in the field. OEG's Korean War participation is detailed in Tidman's *The Operations Evaluation Group* published in 1984.

Significantly, 1946 saw the consolidation of the OR learning of the war years with the writing of *Antisubmarine Warfare in World War II, Methods of Operations Research,* and *Search and Screening.* Motivation to urgently document the basic methodology texts on operations research details of the WWII OR work by ASWORG was fear of loss of information as the OR WWII team was returning to their peacetime vocations. Eventually, the documents were issued for public release and proved valuable for the generations of OR analysts that followed. In 1951 MIT Press published a declassified version of *Methods*. The book was well received and later translated into Russian and Japanese. In the post-war period with OR still in a nascent stage, a broad number of non-military potential OR users and academics benefited from the availability of the documents created from the extensive wartime efforts of the ASWORG.

In the *Methods* book, Morse and co-author George E. Kimball point out, "...while a general scientific background and training in

the operation being studied will be important in performing OR, "**above all**" an operation researcher must have "a personality that will permit him to talk successfully to all kinds from the bottom to the top, as the measure of his achievement may depend on this basic ability to adapt himself to all grades of personnel."[14]

In addition to the military's ongoing OR involvement, there were three significant activities promoting OR toward professionalism and growth. The formation of the American Operation Research Society in 1952, the academic community's specific OR interest and in the establishment of OR education ultimately through the PhD level, and the application of OR techniques to problems in business management, industry and society. In addition to government, industries using OR included airlines, finance, logistics, petrochemicals and among others. Interest and growth in application of OR is reflected in the three professional organizations cited below.

**Operations Research Society of America (ORSA)**

Seventy-three individuals from academia, the military and corporate America mapped out plans May 26, 1952 for a professional organization for OR in America. Morse led the group and was the obvious choice to serve as first president. Morse's post war years were heavily concerned with OR research, academic, industrial, national and international. A Society journal was started the same year, *Operations Research*. As late as 1955, some analysts still viewed OR with skepticism. By 1964, the ORSA membership was at 5,000.

**Institute for Operations Research and Management Sciences (INFORMS)**

With strong growth in the application of OR to management, in 1956 the Institute of Management Science (TIMS) was formed and thrived. By 1995, TIMS and ORSA common interests brought the two organizations together as The Institute for Operations Research and the Management Sciences (INFORMS) which is the largest professional society

in the world for professionals in the field of operations research, management science, and business analytics.

**Military Operations Research Society (MORS)**

In support of the Operations Research Community of Southern California, the Office of Naval Research sponsored the first Military Operations Research Symposia at the Corona Naval Laboratory Corona, California in August 1957. In the following years, in addition to meetings for local needs on the west coast, the first national meeting was held at Fort Monroe, Virginia in April 1962. On occasion, the meetings have attendance of 1,000. The Society was incorporated in 1966 with a further change in 1989 to become the Military Operations Research Society Symposia (MORSS).

During the Cold War and since 1962 a civilian organization (Center for Naval Analyses (CNA) a Federal Funded Research and Development Center sponsored by the Department of Defense, the only one sponsored by the Navy) was established to handle the contracting with the various private contractors who do the defense studies including OEG. Collectively the established Federal Centers continued OR's utility to military operations.

**Real Cases of using Operations Research**

Between the years, 1985-1998, a number of countries, national cities, and a wide variety of industrial organizations as diverse as airlines, police departments, petroleum corporations, oil companies and others applied OR to an equally wide variety of applications. The purposes included development, production operations, optimization, addressing airline customers' needs, gasoline products optimization, and the U.S. Military Airlift Command for evacuation in "Desert Storm." The yearly savings from using OR for some of the organizations involved were from a few millions of dollars to slightly more than a trillion dollars in one instance.[15]

**OR Academic Programs**

In 1948, MIT offered a summer course in non-military OR. In June 1952, a two week OR program was given at the Case Institute of Technology in Cleveland, Ohio. In 1955, interest in OR brought about the creation of MIT's Operations Research Center to accommodate student demand for OR courses. The same year MIT and Johns Hopkins conferred their first OR degrees. Case's first OR degree was conferred in 1957. By 1962, these three schools had granted thirty-one doctoral degrees and seventy-six master's degrees in OR.

To meet the OR demand, by 1959, thirty universities instituted studies offering 24 degree programs, 19 offered a doctoral programs, and 5 offered a master's program.[16]

The Chief of Naval Operations (CNO) directed in January 1950 that a program of study in operations research be established at the Navy Postgraduate School in Monterey, California. The School granted the first anywhere masters degree in OR. The program grew and a doctoral program was inaugurated in 1971. By 2001, 3,300 School OR alumni included members the United States Coast Guard, Marine Corps, Air Force, Army and representatives from 31 other nations.

In addition today, the Navy has a subspecialty coding system for officers based on their undergraduate education. Chief of Naval Operations, N81, initiated the program. The first code is the 3211E code to support the navy's need for officer analysts. The code identifies junior officers who have analytical skills and training that qualify them to fill designated shore billets that involve analytical studies important to the future of the U.S. Navy. Officers with a 3211E code will be given special consideration for assignment to Naval Postgraduate (NPG) School in Monterey to earn a master's degree.

**DSB 21st Century assessment of OR for broader use within DoD**

January 29, 2008, the Defense Science Board (DSB) Advisory Group on Defense Intelligence was tasked by the Under Secretary of Defense for Intelligence (USD(I)) to examine the manner and extent to which OR is employed by the DoD; how OR can be used to support Intelligence, Surveillance and Reconnaissance (ISR) decision making, and the manner in which OR can be institutionalized in DoD. The final report was submitted January 13, 2009.

Initial guidance to the DSB advisory group suggested:

- Consideration of OR throughout DOD and the services
- Examination of resources available to conduct OR
  Commitment of decision makers to the use of OR
- Private sector OR application models
- Recent and historical uses of OR in support of national security requirements.

The OR findings mentioned below by the DSB sixty years after the initial 1942 establishment of the Antisubmarine Warfare Operations Research Group (ASWORG) provide historical background and an update of OR and its role in DOD as of January 13, 2009.

Currently, the Navy uses operations research in modeling and simulation, warfare capability assessments, requirements determinations, investment balancing, manpower modeling, recruiting, cost analysis and inventory management. In the Fleet, operations research is used in exercise reconstruction, battle

This report is UNCLASSIFIED and releasable to the public (http://www.acq.osd.mil/dsb/reports/ADA493773.pdf

experiments, and campaign analysis, war gaming; strike planning, logistics support planning, readiness and tactical analysis.

**Final DSB Report Executive Summary Comment**
Four aspects of inquiry stand out:

1. Operations Research represents a powerful tool to help improve the quality of investment decision making by illuminating key issues, suppositions, and sources of information.

2. Operations Research is applied inconsistently throughout the Defense and ISR Communities. These communities do not posses standard OR processes and practices, a consistent organizational model, or a consistent commitment to the use of OR.

3. OR – and its use – can be strengthened in the Defense and ISR communities through effective institutionalization. The Task Force commends to the USD(I) for further consideration models employed by the private sector (of which FedEx appears to be a strong example) and the Army (TRAC and CAA). The Military Operations Research Society (MORS) is a domain expert resource that should be used in building a plan for institutionalization.

4. The utility of OR can be more firmly established through appropriate test cases. The Task Force points out two cases for USD(I) consideration: Biometrics and Investment in a Balanced Intelligence Cycle, with specific emphasis on Unmanned Aerial Systems (UASs).

Initial perusal of the DSB final report reinforces what has been known from long experience, OR works and needs highest level consistent top down interest, free from bias, in the OR effort. Natural long-term support and funding and the strongest possible commitment from all involved especially the decision makers is essential.

**Decision Makers (DM)**

In the event of institutionalizing OR, significant and strong emphasis is placed by the Board on the criticality of the DM in achieving success. Likewise, the professionalism of the analytical support must meet similar standards. Relevance to the needs of ISR is not lost sight of by the Board's findings. Advocacy for the OR at hand by all involved is an absolute requirement.

**OR's Standing in the U.S. Workforce Today**

Imbedded may best describe OR's growing place among the occupations.

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# DEGAUSSING POLICY DURING WWII: KEY TO SUBMARINE ACTION AND VICTORY IN THE ATLANTIC AND THE PACIFIC, PART I OF II

*by Victor S. Alpher, Ph.D.*[1]

*Dedicated in Memory of Ralph A. Alpher, Ph.D. (1921-2007), Naval Ordinance Laboratory (1940-1944), Johns Hopkins APL (1944-1955)*

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**Abstract**

*Degaussing* is a term derived from the term *gauss*--measuring the strength of a magnetic field.[2] Early during WWII (1939), Germany dropped hundreds of magnetic and contact mines every month into major British harbors and estuaries. Magnetic mines were also dropped that anchored themselves to the ocean floor; U-boats dropped mines from their torpedo tubes. The Empire of Japan also placed hundreds of mines monthly throughout the Pacific. Countermeasures to these hazards became an immediate high priority for the Allies. Part I of this two-part series describes the fundamentals of degaussing, and documents how *Degaussing Policy* (DP) was developed and implemented. Part II examines consideration of modification of DP at the height of its effectiveness in 1943. Resolution of this question led to an important final decision by the Chief of Naval Operations in December, 1943, and thus contributed to ultimate victory in all war theatres.

Statement of the Problem: Why is Degaussing Important?

As Germany dropped hundreds of mines in the waters around Great Britain, one mine dropped in the Thames estuary and was recovered at Shoeburyness, enabling the British to begin research aimed at developing countermeasures. Nonetheless, during the early period of the war, before the United States entered the conflict, a great deal of gross tonnage was lost at sea to magnetic mines. German mines initially detonated with a sensitivity of 15 milligauss change in the surrounding magnetic field.[3] However, some mines were equipped with counters, and would detonate *only* after the $n^{th}$ detection, such as the $n^{th}$ pass of a vessel nearby. By early 1942, *4 milligauss* magnetic and magnetic-acoustic mines had been discovered—and this was an effective increase in sensitivity by about a factor of two. Mines anchored to the seabed were of particular danger to submarines. By this time, degaussing, deperming (of submarines), and minesweeping had been implemented as the main countermeasures.

Ships, Submarines, Magnetism and Degaussing Policy.

All ships made primarily of metal are subject to acquired magnetization once the keel is laid. The source of initial acquired magnetism is the Earth's own magnetic field. All vessels with metal components, even wooden minesweepers, provide *low reluctance*, or opposition to acquiring magnetic fields. Components of the Earth's magnetic field are illustrated in Figure 1. This one explanatory figure was used in naval manuals for decades.

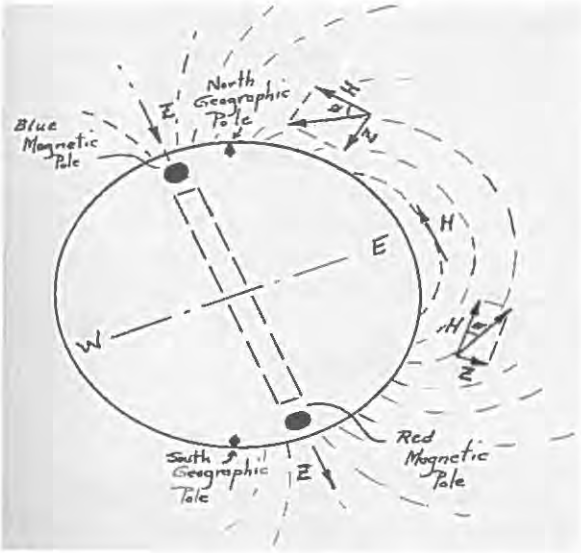


**Figure 1.** Sketch depicting components of the earth's magnetic field. From the Handbook of Magnetic Compass Adjustment and Compensation, by Nye S. Spencer (Associate Electrical Engineer) and George F. Kucera (Lieutenant J.G. U.S.N.R.), Bureau of Ships, Hydrographic Office, H.O. No. 226, 1944. Degaussing of initial acquired magnetization and continual re-magnetization was intended to counter one or more of these sources.

A ship is basically a bar magnet with a North and South Pole. A vessel begins to acquire a magnetic signature as soon as the keel is laid. Whether or not perfectly aligned with the Earth's magnetic field at any given location (reversed south of the equator), the ship acquires a *unique magnetic signature*. Then, the vessel is detectable by magnetic-induction torpedo or by the magnetic portion of magnetic-induction mines. The presence of properly degaussed ships also helped to provide safe haven for submarines. Before the war, installation of coils in submarines was considered. An alternative method, *flashing*, became standard because of the delay required for installation of degaussing coils, and is described below. The complex series of countermeasures became functional as a component of overarching *Degaussing Policy* (DP), controlled by the Chief of Naval Operations (CNO).

Including components of the Earth's magnetic field, other factors will contribute to *induced magnetic fields* of surface vessels, and where applicable, submarines, which require countermeasures to their magnetic signatures. These include the firing of a ship's guns (for example, the 16 inch guns on a battleship), firing torpedoes, the pounding of the ocean waves upon the vessel, changing barometric pressure, variations in the salinity of the water, firing of antiaircraft guns, depth charges near submarines, and the flow of current in various electric circuits and machinery aboard. Ambient air and water temperature also affected the magnetic signature.

Development of Degaussing Policy

Degaussing Policy in place when the US declared war on the Empire of Japan was a work in progress. In October, 1940, a conference was held at the Puget Sound Navy Yard concerning the installation of degaussing coils on many naval vessels, over a year before Pearl Harbor. This report not only describes problems with designing retrofitting at the Navy Yard, but also problems disseminating information to private shipyards and contractors in the Seattle area.[4] Admiral W. H. P. Blandy noted strongly in a BuOrd CONFIDENTIAL memorandum received 23 December 1941 to the Chief of Naval Operations, that

> "the Bureaus (BuShips and BuOrd) recommend that degaussing coil installations be regarded as a matter of *vital military necessity* and that such installations be made as rapidly as circumstances permit. It is further recommended that if necessary on new construction vessels, reasonable delays in completion be permitted where such delay will result in satisfactory completion of the coiling installation prior to delivery of the vessel."[5]

At this early point in the war, vessels without degaussing coils were being retrofitted, and new vessels were being fitted with coils integral to the design. Installation of coils on submarines caused

delays in production, and was eventually abandoned in favor of a different method, described below.

Atlantic Fleet Confidential Memorandum 7 CM-42

Dated 20 January 1942 refers to a BuOrd Conference Letter dated 7 January 1942, which tends to support minesweepers in view of the initial threat of the new 4 milligauss mines, concluding that "The situation of other ships [other than minesweepers themselves] *is not particularly happy* [emphasis added] and there is nothing to warrant the hope they will be protected in depths much less than twice the beam in the near future.... We must, perforce, rely largely on sweeping for protection against magnetic mines."[6] As we shall see, the view of CINCLANT, fortunately, did not prevail throughout the Fleet. As we shall see, the diverging attitudes towards the value of minesweeping versus degaussing would persist.

Fundamentals of Degaussing

Rendering a vessel magnetically *invisible* requires production of electromagnetic currents and is more complex than simply running one cable around the ship at the water line—although for many ships this was the *lone* countermeasure (and significantly, the only one employed by Germany and Japan). This is normally referred to as the M-coil; this coil is the foundation of all degaussing systems; when a coil is placed temporarily at the waterline as the flashing (demagnetizing) of a submarine, it is referred to as a Z-loop. Depending on the size of the vessel, additional coils might be installed.

Degaussing during WWII required three-watch (24 hour) monitoring of all currents and gauges by at least one Lieutenant and several electrician's mates once installed (usually in the Engine Room). Many vessels whose keels were laid before 1941 in the United States that needed *retrofitting* can be seen in photographs of the decks of many WWII warships, with large bundles of degaussing cables laid around the perimeter of the deck to effect an approximation of a properly installed M-coil.[7]

Prior to any installation, extensive testing would occur, supervised by the Naval Ordnance Laboratory. Then, as stated by Rear Admiral H.N. Wallin, there are three activities that are critical to the degaussing of naval and merchant vessels:

1. Operation of maintenance of deperming [demagnetizing] ranges at strategic locations.
2. Design, installation, testing, and periodic inspection and repair of degaussing systems.
3. Operation and maintenance of degaussing systems on operating vessels.[8]

Degaussing of Submarines by Flashing

Degaussing of submarines was one of the tasks of the Bureau of Ordnance. Rather than using installed degaussing coils, the solution developed was an external process, variously referred to as *Flash-D, Deperming, or Flashing.* Figure 2 shows a drawing of a generic submarine set up for flashing. Flash-D provides elimination of essentially all substantial permanent, induced, and acquired magnetization of the submarine, and was to be done every 6 months of operation.

Flash-D is usually done when the submarine is at a North-South magnetic heading. Following a Flash-D treatment, attention is given to potential effects on the magnetic compass. In this process, the submarine is *swung* for adjustment (degaussing) of the magnetic compasses before sailing, in no case prior to five hours following Flash-D.[9,10,11,12] Figures 2, 3 and 4 illustrate some of the further aspects of flashing submarines. Figure 5 shows USS PORPOISE with an installed degaussing coil *outside* the pressure hull. As previously mentioned such coils on submarines were not standard, because of the extensive need for submarines in operation immediately at the beginning of U.S. involvement in the war. Some submarines, nonetheless, had degaussing coils fitted if this did not delay construction. The advantage was that these were continually adjusted.

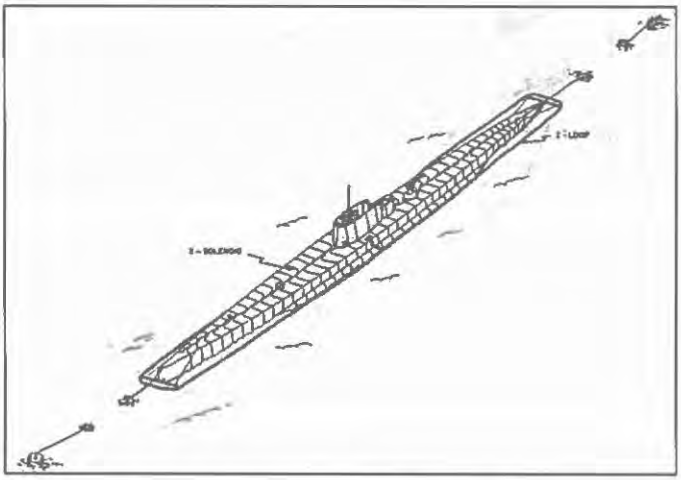

**Figure 2.** Schematic showing submarine prepared for Flash-D deperming. From OP-536: Degaussing Station instructions: degaussing of Submarines.

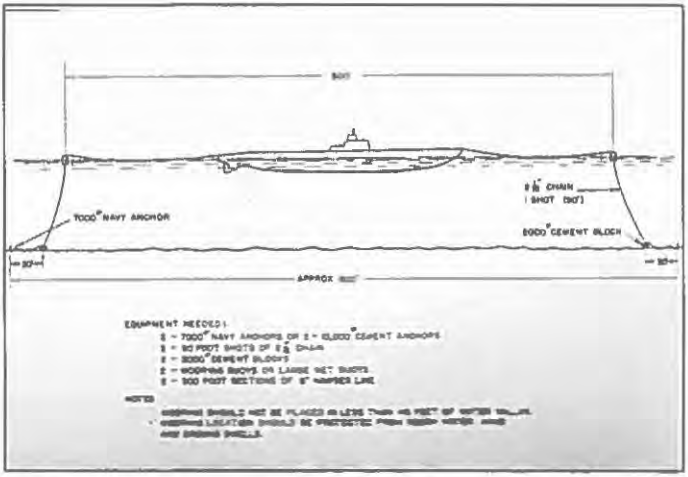


**Figure 3.** Schematic drawing showing anchoring of submarine for flashing. OP-1536.

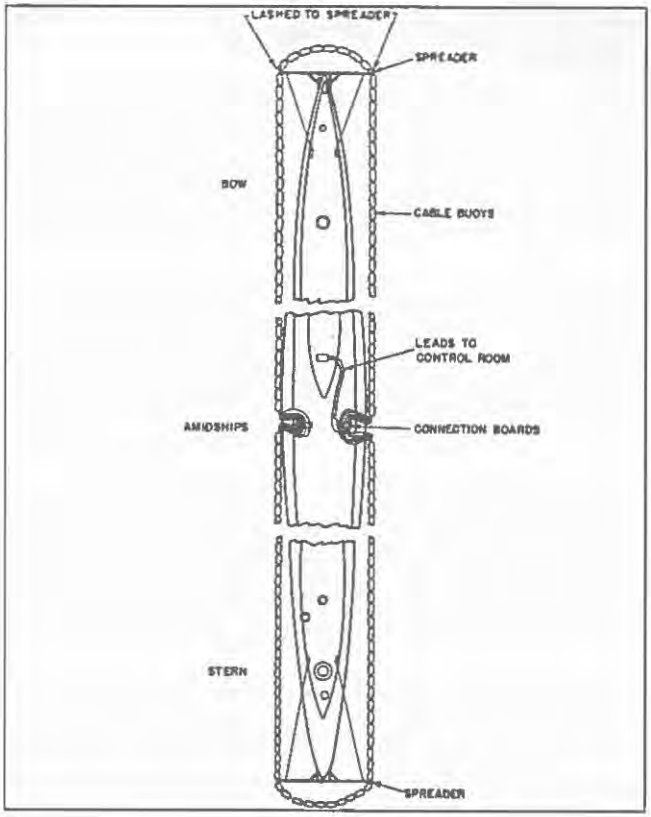


**Figure 4.** Schematic drawing showing location of the Z-loop at surface level around the submarine in preparation for Flash-D deperming. OP-1536.


**Figure 5.** Photograph of the USS PORPOISE at the Mare Island Navy Yard, 13 October 1942. Note the outline of an external degaussing coil.[20] Official U.S. Navy Photograph #19-N-35999, from the National Archives and Records Administration, College Park, Maryland.

In Flash-D, ever-increasing surges of power are hot-shot through the circuit, beginning at about 550 amperes, and sometimes reaching 2,000 or 3,000 amperes. For comparison, the typical output in DC transformer to power a portable laptop computer or DVD player is 1 – 2 amperes or less. During the two minutes between Flash-D *shots* at high amperage, magnetometer measurements are taken around the ship while the coils *cool*.

Degaussing Surface Vessels

While the M-coil is the mainstay of a degaussing installation, some coils are split (e.g., F and Q coils) to provide reverse polarity in critical locations (designated as FI-QI and FP-QP coils, respectively). These splits (in series) are difficult to install but provide better neutralization of acquired permanent magnetization.

Further complicating the entire enterprise, any ship's compass required a completely different set of compensating degaussing coils (until 1957, when it was directed that compasses be removed prior to flashing[13]). Submarine tenders also were fully degaussed, as they were critical to the operation of submarines in any forward areas.

The basic layout of degaussing coils for any naval, army, or merchant vessel consisted of the following:[14]

1. *M-coil* (main coil): The M-coil compensated for the ship's vertical magnetization and countering the Earth's vertical magnetization, which is its strongest field. The M-coil (or girdle) consists of one or more horizontal loops running from bow to stern, either around the entire ship, or around the perimeter of the upper deck. This is comparable to the Z-loop used for flashing.

2. *F and Q coils*: Many installations also included *F and Q coils* (forecastle and quarterdeck coils); the F-coil covers the forward one-third to one-fourth of the ship just below the forecastle or other uppermost forward deck. The Q-coil consists of one or more horizontal loops in the after one-third to one-fourth of the ship, just beneath the quarterdeck or uppermost after deck. These F and Q coils neutralize the longitudinal (as opposed to the vertical) component of acquired magnetization. The most effective F and Q coil installations would be at different levels than the M coil.

In some cases the individual coils, not including insulation, had a diameter of over 1 inch, and might be part of a large multi-coil cable. Applied current could at some times melt the copper cable, and if there was a break or pinhole in the insulation and sailor or merchantman in the vicinity ran a risk of severe burns (Ralph A. Alpher, personal communication, 15 February 2005). Typical location of control equipment—rheostats, resistors, ammeters, reversing and disconnect switches were usually

grouped together in the Engine Room. Indicator lamps and switches were placed at various locations on the ship for the benefit of crew assigned to monitor that the equipment was operating, polarity and other basic functions. I have heard of the entire operation as looking like a "Rube Goldberg" apparatus. This is significant, because, as these wires ran throughout the vessel, all personnel were aware of their protection by degaussing.

By 1943 the overall advantage was definitely with the U.S. Navy, and the submarines were well protected from mines and torpedoes detonated by magnetic influence. Deperming ranges were also built around the world for the purpose of demagnetizing submarines. By 1943, *mobile* ranges (barges) were also in operation.[15]

Copper, Sailors, Accounting and Cost of War

*Liberty ships alone* were using .1% of the nation's copper, using only M coils.[16] Pennies minted with a 1943 date were made of steel. Copper was an increasingly valuable commodity; the use of copper depleted existing reserves and put pressure on copper mining. Evaluation of the magnetic condition of each seagoing vessel was required at a *minimum* of 6-month intervals, with results to be sent immediately to the Bureau of Ordnance.

This paper has given the reader a fundamental introduction and insight to the unheralded topic of degaussing. In the following paper in this series of two, we will examine the Navy's serious consideration of reducing the breadth of what was clearly one of the most successful documented countermeasures in the purview of the Chief of Naval Operations. This would potentially affect the intricate network of defense provided to submarines and all seagoing vessels of the Navy, Army, and Merchant Marine.[17,18,19]

**Acknowledgements**

Acknowledgements will follow in Part 2 of the series, to be published in the January 2011 issue of THE SUBMARINE REVIEW.

## References

Note: In the case that a document was declassified in the conduct of my research, this is indicated in the footnote. Absent such designation, I have obtained original documents or copies of known provenance.

1. Contact Dr. Victor S. Alpher through http://www.ralphalpher.com

2. Richardson, F.D. Biographical Memoirs of the Fellows of the Royal Society: Charles Frederick Goodeve. Volume 27, 1981 (www.goodeveca.net/CFGoodeve/cfg_bio.html; retrieved 17 February 2010).

3. Williamson, Gordon. (2007). U-Boats vs Destroyer Escorts. The Battle of the Atlantic. Great Britain: Osprey. See "Technical Specifications" chapter.

4. MEMORANDUM of Conference held at Navy Yard, Puget Sound, 1100, 10 October 1940. Subject: Degaussing Installation on various Naval Vessels. Declassified Authority NARA NND 755028, 12 October 2004.

A significant purpose of surface attacks and air attacks on submarines was psychological (see Chapter 11, Report No. 51 of the Operations Evaluation Group (OEG), "Antisubmarine Warfare in World War II" by Charles E. Sternhill & Alan M. Thorndike, Office of the Chief of Naval Operations, Navy Department, Washington, D.C., 1946. Downgraded to UNCLASSIFIED Authority OEG, January 1962, Log. No. S-91573. German U-Boats were particularly sensitive to sinking at detonations of 60 feet, regardless of actual depth setting, probably an additional effect of hydrostatic pressure at that depth.

5. CONFIDENTIAL memorandum, declassified NARA Authority NND 803073 14 October 2004.

An early directive from the CNO to the Chiefs of the Bureau of Ships and Bureau of Ordnance directed that submarines receive degaussing coils, only if no delay in construction would occur, in which case new and existing submarines would be degaussed by flashing. The actual number of submarines receiving degaussing coils is beyond the scope of the present study, but correspondence from BuOrd and BuShips reviewed would indicated this number to be relatively small in relation to the total number of submarines serving during the conflict. CONFIDENTIAL Memorandum, Subject: Degaussing-Protection of Submarines from Magnetic Mines, 10 January 1942, signed by F.J. Horne, Acting CNO, declassified NARA NND 803073 14 October 2004.

6. United States Atlantic Fleet, CINCLANTFILE A2-11/S81-6/FF13(1) (0111), Naval Operating Base, U.S.S. Constellation (Flagship), 20 January 1942, over signature of O.M. Hustvedt, Chief of Staff.
Distribution Atlantic List and Pacific List. Declassified Authority NARA NND 803073 14 October 2004.

7. The Bureau of Ordnance CONFIDENTIAL memorandum directing the experimental run on the U.S.S. Massachusetts to measure sources of acquired magnetism, and requesting that a Naval Ordnance Laboratory representative be permitted aboard ship to conduct the experimental measurements on board, is dated 27 March 1942 (From: The Chief of the Bureau of Ordnance; To: The

Chief of Naval Operations; Subject: U.S.S. MASSACHUSETTS, BB59; Magnetic Measurements Desired – During Gunfire Tests (Declassified Authority NND 803073 NARA 14 October 2004). Ralph A. Alpher reported to me being one of the scientific personnel on such scientific voyages.

8. Bureau of Ships, NAVSHIPS 250-660-34. Degaussing Manual. My personal copy is updated 10 October 1951. However, this is essentially the same information as used during the war. It included figures dated 1942, such as the figure for "Dimensions for Degaussing Control Rheostats & Resistors."

See also Bureau of Ordnance publication OP 1536, Degaussing Station Instructions: Degaussing of Submarines (First Revision, 5 November 1945; Declassified by NARA 6/30/09, Authority NND 24869). Early instructions for degaussing and deperming (Flash-D) were published with the designation DGSI (Degaussing Station Instructions). My father Ralph A. Alpher authored and co-authored many of these publications and left in his personal papers a list with the original (DGSI) designations.

9. Degaussing Station Instructions. Navy Department, Bureau of Ordnance, DGSI No. 22, which was later renumbered OP-1522, 5 October 1943. See p. 24. Reference is made to the original, Declassified 6/30/09, NARA Authority NND34869. Although intended for line use, this CONFIDENTIAL document states on the cover: "THESE INSTRUCTIONS MAY BE ISSUED TO PHYSICISTS CONCERNED WITH DEGAUSSING UNDER THE SAME RESTRICTIONS THAT PERTAIN TO COMMISSIONED OFFICERS. SUBJECT TO THESE RESTRICTIONS, THE RAPID DISSEMINATION OF THE INFORMATION THEREIN IS STRONGLY URGED." The document is signed by D.W. VerPlanck (an engineer at Naval Ordnance Lab) for Admiral W.H.P. Blandy.

10. Degaussing Compass Compensating Coils Installation and Adjustment. Part 1. Electrical Section, Bureau of Ships, 1 March 1942.

11. Handbook of Magnetic Compass Adjustment and Compensation. First Edition. Nye S. Spencer & George F. Kucera, (Lt.j.g., U.S.N.R.). Approved by the United States Navy Department Bureau of Ships, Hydrographic Office, H. O. No. 226. Washington, D.C.: Government Printing Office, 1944.

12. Degaussing Compass Compensating Coils (Type "B Modified"). Electrical Section, Bureau of Ships, 1 November 1942. Magnetic mines continued to threaten all seagoing vessels long after the war ("30,000 Japanese Units Loose," New York Times, 8/25/46; "Clearing job to end next year, British Report," New York Times, 3/3/46).

13. During WWII, rather than removing compasses from vessels during deperming, they were demagnetized *after* deperming. It was apparently not until 1957 that the Bureau of Ordnance ordered compasses removed during deperming. OP 1536, *op.cit.* (First Revision, Change 1, insert change; on cover 'Change 1 inserted' approved by the Chief of the Bureau of Ordnance, *2 August 1957.*

14. Degaussing Manual. NAVSHIPS 250-660-34. Bureau of Ships, Navy Department. 10 October 1951. Earlier manuals were produced by BuShips in 1943 and revised in 1944. The essentials are the same.

15. Mobile Deperming Station, San Francisco, California. Installation Report. April, 1943. RESTRICTED. Declassified Authority NARA NND 755028 12 October 2004.
16. This estimate appeared in a rough draft of a memorandum dated 14 April 1943, Record Group 38, NHC 39, Box 3, Declassified Authority NARA NND 907050, 14 October 2004. Memoranda concerning consideration of curtailing degaussing in favor of minesweeping during the 1943 period are marked SECRET and MOST SECRET.
17. The U.S. Navy supplied seagoing craft for such operations as Operation Overlord (the invasion of Normandy on June 6, 1944). However, the U.S. Army maintained its own fleet of seagoing vessels. See *U.S. Army Ships and Watercraft of World War II* by David H. Grover, U.S. Naval Institute Press, 1987.
18. Confidential Memorandum from the Office of the Quartermaster General (U.S. Army) to the Chief of Naval Operations, 4 November 1940. Subject: Degaussing Equipment on Army Vessels. The Quartermaster General was referred to the Bureau of Ordnance, for coordination with the Marine Design and Construction Section of the Office of the Quartermaster General. Declassified NARA Authority NND 755028, 12 October 2004.
19. Separate CONFIDENTIAL directives from the Commanders in Chief, Atlantic Fleet (13 April 1943), and Pacific Fleet (30 June 1943) put these requirements into effect.
20. Refer to footnote 5 for further explanation.

# A BRIEF HISTORY OF SUBMARINE RADIO COMMUNICATION– PART TWO

*by Edward Monroe-Jones, LCDR, USNR (Ret.), Ph.D.*
*CAPT Robert Baker, USN (Ret.)*

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*Captain Baker served as a Radioman in four submarines making RMC(SS) in THEODORE ROOSEVELT before being commissioned as an LDO. He continued in submarine communications billets along with a seven-year tour at the White House. As a Captain he commanded NAVCOMSTA Puget Sound and NAVCAMSEASTPAC. He retired after forty years of service.*

Submarine radio communication had come a long way since its inception near the turn of the 20th Century. The Navy had tackled the technical and organizational problems with the dedication founded in its unique role as protector of maritime safety. By the end of the 1920s improvements in equipment and training were running at high speed.

It was difficult for submarine radiomen to keep up with the ever-changing frequency assignments and the use of non-authorized frequencies was common. Commanding officers were blamed and they, in turn, saw the problem as stemming from inadequately trained personnel. Each submarine was expected to guard two frequencies whenever the submarine's operating schedule allowed. Surface ships could maintain circuit discipline on a twenty-four hour basis, but the submarines faced many

problems peculiar to their mission. These included antenna immersion and grounding of antennas because of defective water seals.[1]

By the 1930s the Navy had established radioman schools with standardized curriculum. Morse Code had to be error free at a speed of 12 words per minute both in terms of sending and receiving. The standard key was used in sending and a manual typewriter (Royal and Underwood) was used in receiving five letter code groups.[2]

Of importance to the Navy communication system was the Federal Communication Commission and the allocation of frequencies to commercial and military use. Commercial broadcast stations became a problem for the Navy when the number of them increased into the thousands. They were concentrated along the coasts and their frequencies overlapped those of the Navy's shore stations. The Federal Communication Commission sorted out the problem and by the mid 1930s the Navy had the most reliable radio communication network in America.[3]

Immediately prior to the Second World War there were 122,000 personnel in the Navy. Of these 10,500 were engaged in Navy communications including 1,500 officers. On the civilian side, there were 743 licensed commercial radio stations broadcasting to 45,300,000 receivers. By 1944 there were 22,000 officers and 225.000 enlisted men engaged in Naval communications.[4]

As America entered the Second World War, radioman graduates were expected to know the Fleet Communication System which involved the CW nets, teletype and voice communication procedures, the bulk of the three letter Q Codes, internal message routing, communication log maintenance, manual encrypting techniques, teletype machines with tape distributors for further transmission in code, operation of transmitters, and receivers using frequency bands from VLF for submarines, through the middle frequencies to VHF and UHF equipment for aircraft.[5]

Training of war-time radio operators accelerated beyond the limits of Navy schools. Classes were established in certain universities. One such volunteer told of his training, "I went to boot camp at Farragut, Idaho in 1943 during which time I took a

battery of mental tests. I scored high and so was admitted to Class A Radioman School, which at the time had a new, experimental program of teaching the Morse Code. The school was at the University of Wisconsin, in Madison. With two men to a dormitory room, life was good. The program taught typing in conjunction with code receipt. The concept was to translate a tone cue into a finger touch without the brain trying to register a particular letter. This worked well with copying five letter word groups in coded material. Since I had known how to type, the training was easier. The school lasted six months. While the minimum code rate was 13 words per minute, the real objective was to copy at a rate of 18 words per minute so that normal Fox and Whiskey schedules could be copied with ease. I was able to pass these tests. After Class A school I was assigned to submarine school at New London and this too was six months. I then was assigned to the USS Atule (SS-403) at New London. Fox came in four times a day. The radio shack was always manned by two men. The radio crew was a chief, a 1st class, a 2nd class and two or three 3rd class petty officers. We had to know the fundamentals of the equipment in addition to all the communication skills."[6]

*Figure 1. Seaman First Class Arnold Hornsby practices Morse Code receipt at Class A Radioman's School in San Diego, California. Circa 1926. Courtesy: Lloyd Jones collection.*

*Figure 2. Radioman First Class Robert Baker in radio space aboard USS THEODORE ROOSEVELT, (SSBN-600) in 1962. Equipment includes: extreme upper left – teletype converters, above Radioman Baker are the Low Frequency receivers and in the lower right is the BRR3 VLF receiver and the R390 high frequency receiver. Courtesy: Robert Baker collection.*

Prior to the United States entering the Second World War the submarine force became dependent on higher frequencies for reliable long range communication. The use of the higher range frequencies using modified submarine antennas was an improvement over previous frequency use. Accordingly, the Naval Communication Frequency Plan was approved and ship allocation of frequencies according to the original plan changed little through the Second World War.[7]

The TBL became the standard submarine transmitter toward the end of the Second World War. During the latter 1940s and 50s the TBL occupied the forward-starboard corner of the radio space and reached from the deck to the height of a man. The TBL had its motor-generator power supply in the pump room and its massive tubes glowed and hummed when CW was being transmitted. It was actually two transmitters in one. The high frequency power amplifier was located in the upper part of the left hand frame while the medium frequency antenna coupling and tuning system occupied the top portion of the right hand frame.[8] The TBL's components were huge by today's comparison. For example, it housed coils consisting of evenly-spaced, wound, copper wire over a phenolic tube of about 6 inches diameter. It occurred to more than one radioman of the time that the a few of the seldom-used coils would make fine wine racks, except that bourbon bottles would be more functional. The beauty of such a discovery was the tamper-proof sign on the TBL's front panel, "Danger – High Voltage."

By 1943 American submarines were equipped with mast antennaes which could receive and transmit while remaining submerged. During the Second World War, Radio Pearl (ComSubPac) received information from American code breakers on the location of Japanese convoys. It then transmitted this information to its submarines for possible interception.[9] Wolf pack tactics, in which several submarines attacked together, required pack submarines to communicate via radio signals emitted on the surface. These signals, which could be detected by Japanese surface ships, could reveal the position of the submarines. American submarine tactics gave wolf pack operational control to

the wolf pack commander. This divestiture of a centralized control meant that submarines need not transmit over long distance and so preserved the secrecy of the submarines' location. A VHF stub antenna mounted on the search periscope provided short-range communication with limited detection potential.[10]

In 1941 the Navy conducted extensive tests of loop antenna underwater reception. By 1944 a submarine with her loop antenna 15 to 20 feet below the surface could expect good low-frequency reception at range of 2,000 to 3,000 nm. It was found that very low frequency waves of from 3 to 30 kiloHertz could penetrate sea water up to about 50 feet. Although submerged reception reliability had not been proven, many US submarines during the Second World War continued to use the flat and square loop antennas for periscope depth reception. CW was able to be copied and the smaller loop antennas mounted in the shears were often preferable to long centerline antennas.[11]

During the early 1950s the Submarine Force considered three options for prolonged submergence; the closed cycle engine (Swedish Stirling), the Fuel Cell (German Siemens) or Nuclear Power (American Westinghouse). It chose the latter despite the much larger initial design and development period. In the interim, the Submarine Force would utilize its Fleet Type submarines with modifications stemming from advanced German World War II designs. These modifications included a snorkel, doubling of battery size (from 126 cells to 252 cells), streamlining of the superstructure and fairwater and accommodation of an advanced chin-mounted sonar array. These converted boats were called GUPPIES for Greater Underwater Propulsive Power and would represent the backbone of the submarine fleet for two decades.

Improvements in sonar were not paced by communication and fire control, which lagged behind by several years. Certain improvements in radio procedures and equipment did appear in the interim. Accelerated speed transmission was developed after the close of the Second World War and further refined in the decades that followed. Taped messages could "spurt" Morse Code at rates of up to 80 words (five letter code groups) per minute.[12] This reduced the time that a mast antenna had to be exposed when

copying Fox and Whiskey broadcasts. Submarines were required to guard the submarine component of the Whiskey Fleet broadcast, which for submarines, was broadcast every six hours on the odd hours. Submarines also guarded the 0430 Zulu hydrographic broadcast and the distress frequencies of 500 kilocycles and 8364 kilocycles.

Tactical transmission from submarines became a serious problem when the GUPPIES were assigned sonar platforms ahead of Hunter-Killer groups. These units of ships and submarines operated as ASW forces in response to the growing Soviet submarine threat. While the submarine was the best platform in which to detect a hostile submarine, its difficulty was transmitting information. A surface ship was normally stationed close by the submarine so that short-range, underwater, UQC telephone communication could be used. A partial solution for Hunter-Killer submarine-to-battle group communication was the radio buoy, which transmitted a pretaped message, after having been released from the submarine. Another partial solution was for the submarine to raise its mast and transmit on a pre-arranged two hour schedule. This necessitated the submarine to keep a significant distance ahead of the Hunter-Killer Group and to compromise its location on a regular basis.[13]

The standard submarine communications radio transmitters and receivers found on USS SIRAGO (SS-485) in 1959 were: the TBL transmitter operating on frequencies from 175 to 18,100 kilocycles with a 220 volt DC power supply emitting 200 watts with CW or 50 watts voice, the TCZ transmitter operating on frequencies from 300 to 600/ 2000 to 18,100 kilocycles with a 120 volt AC power supply emitting 90 watts, and the TED transmitter operating on frequencies of 225 to 400 megacycles with a 120 volt 60 cycle AC power supply emitting 40 watts on CW or 20 watts on voice. Receivers included the RAK which covered 15 to 600 kilocycles, the RBS which covered 2 to 20 megacycles, and the RAL which covered .3 to 23 megacycles, all using 120 volts 60 cycle AC. These were the major components of a GUPPY submarine during the 1950s; however, other transmitters and receivers were also used. The TBL transmitter was remarkable in

that its tenure of service was from about 1944 to the end of the 1960s. It consisted of two frames bolted together and mounted in a single base.

**Figure 3.** The TBL transmitter, which served American submarines for almost two decades, stood 72 inches high, 32 inches wide and 24 inches deep. Permission of Naval Historical Foundation.

The SIRAGO, a GUPPY II, had several whip antennas, which could be raised on masts while running at periscope depth. The snorkel also had a small whip antenna. Most submarines of the time had a VLF loop antenna, the AT-317/BRR. This was normally used with the RAK receiver while running at periscope

depth. The UHF AS-468/B antenna on a retractable mast was used with the AN/URR-13A receiver and the TED transmitter.[14] As antennas were added to GUPPY sails, the number of grounds increased from leaks. A spring-loaded, side-mounted whip antenna was designed to fold backwards and lie horizontally when the submarine dove. It performed as designed, but the pivot point necessitated flexing of the lead. Seals and packing glands failed with depressing regularity. Electronics technicians and radiomen climbed the sail to make repairs, but despite their best efforts the antenna was often inoperable. Once seawater entered the stainless steel webbing imbedded in the neoprene insulating sheath no amount of alcohol could remedy the problem. In addition, leaks were often encountered as violations of the pressure hull. Submarine radio equipment was often subjected to seawater incursion. This chronic problem was a result of failing antenna lead connections, antenna trunk leaks and leaking pipes that ran through the overhead of the radio spaces.

One potentially disastrous event occurred during the 1950s when the USS CARBONARO (SS-337) got underway after a yard overhaul. On the boat's first trim dive a sudden jet of sea water blasted into the boat's radio room from the overhead. At sixty feet the one-inch hole hosed seawater on equipment and radiomen. Located in the rear quadrant of the control room the radiomen's cry of, "Flooding in radio!" resulted in an immediate surfacing. It didn't take long to discover that the hole had been drilled by a yard worker for an intended antenna lead. It had been taped over and painted by unknown parties in the shipyard. The amazed radiomen wondered how tape and paint could have held back sea pressure down to 60 feet. The story didn't end there. The chief radioman removed the soaked TCZ transceiver and carried it back to the crew's head. He placed it on the shower floor and immersed the receiver in fresh water. He then carried the receiver back to the engine room and placed it under the engine air induction. After two days of surface operation the receiver was judged to be dry. Tests found no grounds, no shorts and no opens. The chief claimed the receiver worked better after having been so thoroughly cleaned.

The German Type XXI submarine was a revelation to American investigators at the end of the Second World War. A new design moved from the drawing boards to the shipyards. It was the Fast Attack or Tang Class boat. Closely resembling the Type XXI design, it proved to be the test bed for many submarine innovations. While the radio room in GUPPY occupied the space between the periscope wells and the control room's after bulkhead, the Fast Attack submarine had its radio space in the attack center. This type submarine, lacking a conning tower, had its periscope at the center of the control room which split it into the depth keeping space, on the port side and the attack center on the starboard side. The Tang class boats used a ferrite-core loop antenna AT-274/BRR.

After the Second World War, NRL developed the much smaller loops, which could be wrapped in a small streamlined body. It was omni directional with two loops wrapped at right angles. Tang class boats had a variety of whip antennas such as the MF/HF retractable whip, NT66053 and the fixed VHF/IFF AS-524/BPX.[15]

Submarines were required to guard the submarine component of the Whiskey Fleet broadcast, which for submarines was broadcast every six hours on the odd hours. Submarines also guarded the 0430 Zulu hydrographic broadcast and the distress frequencies of 500 kilocycles and 8364 kilocycles.[16]

Navy shore radio installations kept pace with submarine improvements during the Second World War and Cold War. For example, by 1922 San Diego was already an active Navy location with several facilities stretching from Point Loma to Coronado Island and the eastern coastline of San Diego Bay. The Eleventh Naval District was housed at the foot of Broadway and the Naval Training Center was built on the tidelands adjacent to Old Town. On this same site the Navy had built the Fleet Radio School. In 1943 the Navy built a new radio receiving station on its property at Imperial Beach. In 1947 this receiver station became the Naval Communications Station, Eleventh Naval District and in 1953 became the Naval Communications Station, San Diego, (NAVCOMSTA).[17]

Retired Chief Warrant Officer and former radioman Tommy Robinson recalled his shore-based billet as an RM3, "I was a Radioman at Naval Communications Station, San Francisco, CA (NPG). I stood a split phone watch at the Naval Receiver Site, Skaggs Island, Sonoma, CA, which was shared with the Naval Security Group. We RMs were in a square block building located in the middle of an antenna farm. The building housed receiver banks and operating stations and a teletype link to headquarters in downtown San Francisco. In 1958 Navy primary ship to shore communication was regulated to four frequencies: 4289 KCS, 8578 KCS, 12867 KCS, 17156 KCS, all harmonics. My watch station was a chair, two Royal typewriters, a Morse code key, a set of headphones, note pad and pencil. The object of a split phone watch was to have one CW operator monitoring and receiving messages on two different frequencies, one in each ear. I listened to 4289 KCS in left ear and 8578 KCS in right ear. A knife switch on the Morse code key allowed me to switch between transmitters, one tuned to 4289 KCS and the other to 8578 KCS. An incoming message sequence might have been as follows: Submarine A calls NPG on 4289KCS in left ear. I type the incoming call on my Radio Log, which was inserted into Royal #1, I then insure my CW key is on the correct frequency, and I answer Submarine A's call. I slip a blank message form in Royal #2 and begin typing Submarine A's message. But, in the middle of receiving Submarine A's message a call comes in from Submarine B on 8578KCS in my right ear. I tell Submarine A to wait (AS), switch my key to 8578KCS and ask the precedence of Submarine B's traffic. If Submarine B's message is of equal or lesser precedence than that of Submarine A, I tell him, his turn is two (QRY2). If Submarine B's traffic is higher precedence than that of Submarine A, then Submarine A's turn becomes two, even though I have part of that message. QRY lists can get rather lengthy so the job demanded speed and accuracy in sending and receiving."[18]

Navy schools for radiomen were slow to modify curriculum as equipment and procedural changes were made in the fleet. In 1970, Radioman A School was essentially the same as it had been during the Second World War. Equipment had become more

varied, band use had expanded and fleet communication procedures had become more complicated. Radioman Class A School consisted of learning the Morse Code, gaining a familiarity with radio transmission/receiving equipment, learning the Fleet Communication System and learning the basics of encryption/decryption of messages. Radioman Class C School was the advanced portion of radioman training during the 1970s. It was referred to as 2304 School and restricted its students to only those who had demonstrated a high degree of aptitude. Code had to be keyed at not less that 18 words per minute and received at not less that 24 words per minute.[19]

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## SUBMARINE NEWS FROM AROUND THE WORLD

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*From the June 2010 Issue*

**SWEDEN – Submarine Programs Update**

In mid-June 2010, AMI received additional information concerning the new construction A26 submarine program and the mid-life upgrade (MLU) on two Gotland class submarines now in service with the royal Swedish Navy (RSN).

For the A26 program, the Swedish Parliament on 16 June approved moving forward with the acquisition. This will allow award of a construction contract by the fourth quarter of 2012. The June Parliamentary decision follows the 26 February 2010 award by the Swedish Defence Materiel Administration (FMV) to Kockums AB (part of ThyssenKrupp Marine Systems) for the overall design phase for the program.

Kockums is the designated prime contractor for the program and Saab is designated as the supplier of the combat management systems (CMS) and the information technology (IT) infrastructure. All subsystems will be procured by Kockums through open competition. The timeline for subsystems is as follows:

- 2010 Q2-Q4 Issue requests for information (RfI)
- 2010 Q2-Q4 Supplier evaluation
- 2010 Q4 – 2011 Q2 Request for tenders (RfT) issued
- 2011 Q1-Q4 RfT submissions required
- 2011 Q1 – 2012 Q1 Tender evaluations
- 2012 Supplier decisions

AMI's source indicated that the first of two A26 units is scheduled to be commissioned in the first quarter of 2019 and the second in the first quarter of 2020. Although only two A26 units are being ordered at this time, two additional units could be ordered after 2020 in order to replace the two active Gotland class

submarines (commissioned in 1997) that will start a MLU in 2012. The forecasted order for the additional two hulls assumes that the RSN will continue operating a four-unit Submarine Force with no further force reductions.

The source also indicated that the A26 will have the following capabilities:

- High transit speed of 12+ knots
- Broad temperature operating range
- Long endurance
- Flexible payload concept with four torpedo tubes and one flexible payload dock
- Payload dock will be able to launch and receive a swimmer delivery vehicle (SDV) and unmanned underwater vehicles (UUVs).

And the following subsystems:

- Towed/bow/flank sonars
- Floating wire antenna (ELF)
- Optronic sensor mast (no periscope)
- Electronic support measures (ESM) radar
- Communications antenna in mast
- Possible mast mounted cannon for support of special forces
- Two 500 kW diesel engines
- New generation Air Independent Propulsion (AIP) Stirling system with a permanent magnet motor
- Network will be gigabite fiber optic with plug and play for future modernizations

For the MLU of the two Gotland class, the Swedish government will reportedly award a contract by 2012 and both hulls are scheduled to complete refit by 2014. The MLU will include the following:

- Hull, mechanical and electrical (H, M & E) work
- Upgrade of the Air Independent Propulsion (AIP) system
- The addition of an AUV/ROV capability
- The addition of a diving lock built into the sail
- Upgrade of the combat management system (CMS)

Some of the Gotland MLU upgrades may include new technologies that will also equip the new construction A26 submarines.

## BRAZIL

### Submarine and OPV Program Details Emerging

**A. Scorpene Submarine Program:** In mid-June 2010, an AMI source received information concerning the Brazilian Scorpene submarine program. The new construction program for four boats began on 27 May when DCNS officially started construction of the first unit. The front section of the pressure hull will be built at DCNS' Cherbourg Shipyard and transferred to Brazil. There the forward hull section will be joined with the stern hull section that will be built at Itaguai Construcoes Navais (ICN), a joint venture established by DCNS and Brazil's Construtora Borberto Odebrecht (Odebrecht 59%, DCNS 41%).

The remaining three units will be built entirely at ICN. The first unit will be delivered to the Brazilian Navy (BN) in 2017 and the remaining three on 18-month intervals in 2018, 2019 and 2020; if the program remains on schedule.

The HLES 80 steel for the hulls is being provided by Industeel France. Major French subcontractors include: Jeumont Electric, Schneider Electric, Thales Underwater Systems (TUS), MBDA and Sagem Defense Securite. The Brazilian Scorpene submarines will be larger than their Chilean, Malaysian and Indian counterparts due to the longer 80 day endurance requirement established by Brazil. The submarines will be 75 meters (246ft) in length with a displacement of around 2000 tons and a crew of 30-45.

Major subsystems include: DCNS SUBTICS generation 3 combat management system (CMS), TUS S-Cube sonar suite, Sagem Series 30 SMS search mast system, Series 20 attack periscope, Series 10 compact submarine radar (CSR) and SIGMA 40XP inertial navigation system (INS). Armaments include 18 WASS Blackshark heavyweight torpedoes and MBDA Exocet SM 39 anti-ship missiles (ASMs) fired from six torpedo tubes. Countermeasures will be provided by the CONTRALTO-S anti-torpedo system.

The €6.7B (US$9.5B) September 2009 contract includes the construction of four submarines, construction of a modern naval base and support facility, modernization of the ICN shipyard, training of Brazilian engineers, transfer of technology, supply of spare parts, torpedoes and the anti-torpedo system. The contract also cover the DCNS technical support to develop and build the hull of Brazil's first nuclear powered submarine that is scheduled to be delivered to the sea service in 2025.

## EUROPEAN UNION

### EUROPE – Defense Austerity Measures

As of late June 2010, AMI continues to receive information concerning the defense budget environment throughout Europe. It appears that *Austerity* is the word of the day and is beginning to effect force levels as well as procurement programs, current and future. Listed are some of the latest proposals that are being discussed (although some not yet finalized) by various governments in order to reduce defense funding in the near term:

**A. UNITED KINGDOM:**

- Preparatory work on the Future SSBN Program (tied to the US Program) is being delayed and will be discussed under a new Strategic Defense Review (SDR) announced by the new government
- Possible cancellation of units five and six of the Astute class submarine, which will also be reviewed as part of the SDR
- Reassessment on the need for two aircraft carriers (both under construction)
- 12% budget reduction 2012 through 2017
- 20% cut in personnel, 27% cut in active aircraft and 21% cut in active ships

**B. SPAIN:**

- Decommission 17 (not yet identified) ships through 2011, three Anaga class patrol boats already decommissioned on 17 June

- Defense budget cutbacks across the board, percentage and number of years not yet finalized

**C. GREECE:**

- Cutback of Kosovo peacekeeping mission, anti-piracy mission in Somalia
- Probable delay in FREMM and other procurement programs past 2011

**D. ITALY:**

- Budget reduction of 10% for 2011, follow-on years uncertain
- FREMMs funded through 2011 (first six units), final four units will be decided after 2013 with delay or total cancellation being discussed as options

**E. GERMANY:**

- Budget reduction of US$742M for 2011, US$1.36B for 2012 and US$1.6B for 2013 and 2014
- Decommissioned the remaining six Type 206A submarines
- Troops strength reduction of 100,000 bringing the total to 150,000 (40% from current levels).

**F. FRANCE:**

- Possible US$5B defense budget reduction 2011 through 2013 (1.8% annually)

**G. DENMARK:**

- US$231M defense budget cut for 2011 (around 5% reduction from current budget)

As noted above, many of these proposals are in review—but AMI assesses that the fiscal crisis in the Euro zone will force implementation of these and further cuts in defense programs.

The fiscal reality is that defense budgets will be cut and force levels reduced for much of this decade and possibly beyond. These actions will obviously have a domino effect within the defense industry, requiring possible cutbacks and further consolidation. Modernization programs will become a much higher priority over the next decade as sea services attempt to keep their fleets operational while waiting for new construction ships to arrive.

## GERMANY

### New Export Submarine Design

In mid-June 2010, AMI received additional details on Howaldtswerke Deutshe Werft's (ThyssenKrupp Marine) latest submarine design for export—the 210 Mod. The new submarine design is intended to provide a small, modern submarine at an attractive cost in line with the earlier generation of widely exported type 209—with procurement price per hull estimated to range between US$250M-US$400M.

The 210 Mod—together with the type 206As coming out of German Naval Service, would be targeted at markets which do not currently operate Submarine Forces. These *new entrant* markets could include Bangladesh, Thailand, Philippines, Saudi Arabi and the United Arab Emirates. Additionally, the 210 Mod and 206A are smaller submarines (1000-1100t displacement), making them attractive to navies that operate in restricted or constrained bodies of water such as the Baltic, Black and Mediterranean Seas.

The 210 Mod design combines the best of the Type 210/212/214 and Type 209/1400 designs. It has the size and crew of the 210, the automation, sail design and hydroplane systems of the 214, propulsion and electrical concepts as the 212 and acoustics of the 209-1400. Specifications of the 210 Mod design are as follows:

- Length of 58.4 meters (191.5ft), displacement of 1150 tons
- Dive to a depth of 240 meters (787.3ft)
- Max speed of 18 knots submerged
- Range of 9000nm at 04 knots
- X-rudder configuration, sail is made of FRP

- SERO 1400 periscope (hull penetrating)
- Composite propeller and shaft
- 4 torpedo tubes for a total of 10 weapons
- Optional ESM mast
- Two MTU 12V396 diesel engines, two Pillar NRB 50.50-8 generators
- Electric rudder actuators
- Permasyn propulsion motor
- Li-ION batteries (manufactured by GAIA)
- Crew of 15 (2 watches) or 21 (3 watches)

The 210 Mod is the latest in a series of small submarine designs offered to the market by European builders. Those recent small submarine designs include the DCNS SMX-23 Andrasta and the Rubin/Fincantieri S1000. As of this writing, there are no reported sales of these designs. However, if any of the prospective new entrant navies do go forward with plans to field a submarine capability; one of these three designs are the most likely to be chosen for new construction. Additionally, fiscal constraints and force reductions in Euro zone navies (see above) will create opportunities in the used submarine market, such as recently decommissioned German Navy Type 206A.

**VARIOUS DID YOU KNOW?**

**UNITED STATES**: On 09 June 2010, the keel for the ninth Virginia class submarine, USS MISSISSIPPI (SSN 782), was laid at Electric Boat's Quonset Point Facility in Rhode Island.

**RUSSIA**: On 15 June 2010, the first Yasen (Project 885) class nuclear-powered attack submarine (SSN), RS SEVERODVINSK, was launched from the Sevmash Shipyard in Severodvinski, Russia.

*FROM THE JULY 2010 ISSUE*

## ARGENTINA

### Nuclear Submarine Plans

In mid-July 2010, the Argentine Minister of Defense, Nilda Garre, announce an initiative to develop nuclear propulsion for its Navy submarines. This statement apparently marks the first formal Government of Argentina confirmation of a nuclear submarine development program in the country, which could see the first unit in service as early as 2015. The Minister acknowledged that the program is already underway and has the support of the President and Ministry of Foreign Affairs. He added that the announcement was intended to make the program publicly known.

The defense minister also acknowledged that the project would be based on a reactor developed by INVAP and that it would be installed in a TR1700 Submarine for testing by 2013 and completed by 2015. INVAP is an Argentine high technology company that designs and builds nuclear research reactors, radiosotope production plants, nuclear fuel manufacturing plants, uranium enrichment facilities, neutron beam transport systems radiation protection instrumentation and reactor protection systems. It has built nuclear reactors for Argentina, Algeria, Egypt, Peru and Australia. Currently there are two Santa Cruz class (TR1700) class submarines in service. Both were built by HDW and commissioned in 1984 and 1985.

Four additional TR1700 units have been in various stages of construction at Argentina's Astilleros Domecq Garcia shipyard in Buenos Aires. Construction of the locally-built submarines halted in 2004 due to funding issues. At the time, two of the four units under construction at Astilleros Domecq Garcia were 70% complete.

If the Argentine nuclear propulsion program continues to move forward, one of these incomplete TR1700 units will likely be modified to handle a medium-sized reactor. This would be a less costly alternative to ordering a new hull from either a local or foreign builder.

For the reactor design, the defense ministry has indicated that a Central Argentina Modular Elements (CAREM) reactor

prototype would be built and modified as a naval reactor. The CAREM is a modular 100MW simplified pressurized water reactor with integral steam generators designed to be used for electricity generation. It can be used for electricity, generating 27 MW, or as a research reactor at up to 100 MW. It can also be used for water desalination with 8 MW in power cogeneration.

Recent studies have explored scaling the design up to 300 MW. The CAREM reactor has its entire primary coolant system within the reactor pressure vessel, self-pressurized and relying entirely on convection. Fuel is standard 3.4% enriched PWR fuel, with burnable poison, and required refueling annually.

The Defense Minister's recent statement appears to be a clear reaction to Brazil's recent moves to establish a indigenous nuclear submarine program. Argentina's nuclear infrastructure is more than sufficient to support a naval nuclear program, although the schedule is highly aggressive and optimistic considering the funding constraints that have plagued the Argentine armed forces for the past decade. The engineering and integration challenges of adapting a nuclear power plant to an existing conventional submarine design are also formidable.

AMI believes that this program will be executable only if it is funded as the highest priority program within the entire armed forces over the next several years. Even with adequate funding, a nuclear submarine program would still probably be delayed well past 2015 due to the complexities of building, testing and integrating a reactor into a submarine, even if a nearly complete TR1700 is used as the initial hull for the program, or an existing Santa Cruz class hull already in commission is used as the lead hull in the class.

## INDIA

### Vertical Launch Missile Submarine (SS/SSG) (Project 76/Project 75I) Still in Holding Pattern

In mid-July 2010, AMI received information that the Indian Navy (IN) still intends to move forward with plans to pursue a second submarine acquisition program in addition to the current Scorpene program with France. Available information states the

second sub program has been funded at about US$10.7B (including technology transfer).

No Request for Proposals (RfP) has been released for this program and given the ambitious scope of other Indian Navy acquisitions—both foreign source and the local construction—plus continued reporting of delays in current Navy programs, yet another new construction program could see significant schedule slippage.

Current program issues notwithstanding, AMI believes that India is entering a crucial period for its aging Submarine Force and will have to move forward as soon as possible with new acquisitions. An RfP could come as early as 2011 in order for these six units to begin entering service in six or seven years. The six hulls in this new program added to the six hulls in the Scorpene program (currently being built at Mazagon Dock ltd (MDL but 3-five-years behind schedule) will form the core of India's future conventional Submarine Force. Half of India's current fore of 10 Kilo class and four Type 209s are expected to begin decommissioning by 2015.

Companies that responded to India's earlier 26 September 2008 Request for Information (Rfl) on submarines will be issued the RfP and vie for the construction contract. Companies that responded to the 2008 Rfl include:

- DCNS with the Super Scorpene design.
- Navantia with the S-80 design.
- Rubin with the Amur.
- Fincantieri/rubin with the S-1000.
- ThyssenKrupp Marine with the Type 214.

One of the major reasons for the delay of this program was indecision on whether to add additional Indian yards as well as foreign construction sites in order to get the submarines built and in service faster than would be possible with construction only in Indi. The delay of the Scorpene program at MDL and the looming decommissioning schedule of the Kilos and Type 209s has forced the Defense Minister into a decision to expand the program to

include foreign construction, limiting MDL to building only half of the six hulls in the program.

AMI believes that choosing MDL to build three units will still risk substantial delays, as MDL is still struggling with executing construction of the six hulls in the Scorpene program. Further, MDL has a full order book, and has little capacity to spare for yet another submarine construction program, which signals trouble ahead for this newest program in India's growing naval investment plan.

## GREECE

### Future Programs Update and Hellenic Shipyard Details Emerging

In early July 2010, AMI received updated information regarding the potential sale of Hellenic Shipyards as well as details of programs that are to take place in the coming years.

AMI reported in the March Edition of Hot News that Abu Dhabi Mar (ADM) offered to purchase Hellenic Shipyards (HSY) from ThyssenKrupp with some conditions. It appears that the offer is now subject to additional conditions, as well as possible concessions ADM has offered to the Greek Government to make the deal more attractive.

The initial terms of the sale include:

- The acceptance of the first Type 214 class submarine that was initially refused by the Hellenic Navy (HN). Although the HN would accept the submarine, AMI's source indicated that it would likely then be sold for €300M (US$388.8M) to a client known to the owner of CMN. The French yard CMN is a 30% stakeholder in ADM.
- The Greek Government would waive the penalty for the delay in delivery of the type 214s, amounting to €100M (US$129.6M).
- The Greek Government would negotiate with the European Union (EU) to cancel the fine to HSY for what was called *illegal competition*.

Other new concessions have been discussed in regards to the sale of HSY, including:

- €2B (US$2.59B) in new orders for HSY for the new construction of two additional type 214s as well as 5 new construction corvettes.
- Possible shift of construction of an optional Commandante class corvette in a current UAE Navy program to HSY from Abu Dhabi Shipbuilding (ADSB) in order to increase the order book of the Greek shipyard.

Recognizing the pending sale of HSY, and the need to sustain the shipbuilding infrastructure and competence of Greece despite recession and new fiscal constraints, the HN stood up an Admirals board in June 2010 to review and recommend new Navy force levels required to keep the HN operationally effective in the future.

The Board recommended that the future HN force structure include:

- Twelve frigates
  - 6 FREMM (actually destroyers) frigates
  - 4 upgraded Hydra (Meko 200) class frigates
  - 2 upgraded Elli (S) class frigates
  - Five 1,800-ton corvettes (new program)
- Fourteen Fast Attack Craft (FAC)
  - 10 Super Vita class
  - 4 upgraded Commandante II class

Request for Proposals (RfP) were issued in 2009 and AMI anticipates a construction contract for the FREMM class destroyers to occur by the end of 2011, with construction beginning in 2012. The load-out of the six vessels will likely be similar to the French multipurpose FREMMs including the Aster 15 anti-air missile system, Herakles multi-function radar, Exocet MM40 Surface-to-Surface Missiles, and the OTO Melara 127mm gun. AMI's source has indicated that all six units will be built at Elefsis Shipyards near Piraeus with French assistance.

The request for five 1,800 ton corvettes will likely occur around the time that the second Type 214 is launched in order to maintain a steady workload at HSY. It is likely that these units will be financed through ADM as part of the shipyard buyout plan and RfPs could be issued after 2019.

With regard to the FAC programs, AMI expects that plans for an eight-unit class of Super Vita FAC may be modified to build ten hulls. The additional two FACs would likely be built at Elefsis Shipyards, where the first eight were built.

The HN Flag Board also reviewed requirements for replacing or upgrading the maritime patrol aircraft (MPA), Greece currently has six P-3B Orions in very poor condition.

The HN issued a tender for four new MPA in 2009, as reported by AMI. However, the two responses to the tender came in at prices well above the available budget for the program, and the tender was subsequently cancelled. The US also offered Greece four used P-3C aircraft that would be retired from US service and upgraded with new payload capabilities as well as a new combat and avionics systems. Those upgrades would extend the life of the P-3Cs aircraft another 17-20 years after delivery.

The HN continues to review the offer of used P-3Cs to meet its MPA requirements. A decision, which could be made as early as 2011 if financing becomes available.

In addition to the ambitious new construction requirements detailed above, the HN continues to save resources in their current fleet. This includes the decommissioning of two of four Pomornik (Zubr) class ACVs, L181 ITHAKI and L183 ZAKYNTHOS.

Should a stimulus plan be put into action regarding HSY, new construction submarines and ships and MPA, the HN seems poised to be on track to recapitalize their forces while at the same time maintaining a viable shipbuilding infrastructure.

## INTERNATIONAL NAVAL MARKET TRENDS

### Asian Naval Spending and Naval Industry Outlook 2010-2029

Key Points

- The Asia-Pacific region has now moved into second place behind the United States as the No. 2 naval market for

new construction ships over the next 20 years. The non-US NATO market has fallen to third place.

- The IMF predicts strong economic growth in Asian countries in the near-term (next 2-3 years). Positive Gross Domestic Product (GDP) growth has a strong correlation with naval spending, which bodes well for naval procurements in the region
- India outpaced China as AMI's forecasted top spender on new construction naval ships and systems, with a predicted expenditure of US$39.35B (forecasted China new build naval spending is US$24.93B). However, open source information on Chinese naval spending remains limited, so real Chinese naval new construction spending may well be higher than India's.
- The third top naval buyer in the Asia Pacific region is South Korea. Japan and Taiwan round out the top 5 forecasted naval shipbuilding budgets in the region.
- Asian navies are investing in a broad range of capabilities. Growth is particularly strong in patrol craft for maritime security, multi-mission frigates, and larger amphibious ships (10,000-20,000 tons full load displacement) for a broad range of support and disaster relief missions.
- Submarine spending in the region will also be substantial over the next 2 decades, with AMI projecting 111 new hulls worth a total of US$53B to be built.
- Given the strong prospects for continued naval market growth in the Asia-Pacific region, European shipbuilders will look to the region to boost growth amidst declining domestic markets. The current decline in the Euro's value will help make Euro naval products more price competitive for export in the coming one to two-years.

## MISSILE DEVELOPMENTS

In an ongoing effort to update AMI International's World Missile Systems Online, the following information is provided regarding world missile developments that occurred during June and July 2010.

**RUSSIA:** on 30 June 2010, a Russian state investigation commission has given the recommendation to the Defense Ministry that the troubled Bulava submarine launched ballistic missile (SLBM) should continue testing.

Since testing on the Bulava began in December 2003, only five of twelve tests have been successful, with the latest failed launch occurring in December 2009. Although critics state that it would be much more cost effective to continue fielding the time-tested and more reliable Sineva SLBM, the new Borey class ballistic missile submarines have been designed around the new missile, basically forcing the continued development of Bulava.

Bulava has a reported range of 8,000 km (4,960 mi) utilizing a three-stage combination liquid/solid propellant system. It can carry up to 10 multiple independent re-entry vehicles (MIRV) or a combination of MIRV warheads and decoys.

If testing resumes as planned, redesigned missiles could begin testing again as soon as November 2010.

*From the August Issue*

**ISRAEL**

**German Funding for Corvettes and Submarines Cut**

In early August 2010, AMI received information that the German Government will no longer provide any monetary support to the two naval modernization programs for the Israeli Navy (IN), the two MEKO A-100 class corvettes and a sixth Dolphin II class submarine. The German Government was expected to pay 50% of the cost of the sixth submarine (a discount of US$200M of the total US$400M price tag) and 33% discount for each of the two MEKO corvettes (a discount of US$132M per unit of the total US$396M per unit price tag) or a total discounted price of US$464M for all three vessels.

The decision to withdraw these funds is obviously attributed to the economic woes in Germany, still struggling to get its own budget under control and in the process of reducing its own defense expenditures. The earlier offer of assistance to Israel was aimed at assisting ThyssenKrupp Marine Systems (TKMS) to maintain its workforce stability as domestic and export orders

have been falling over the past several years. Historically, Israel has been able to get funding assistance from the German Government in order to increase TKMS's order book. The first five (3 Dolphin/2 Dolphin II) submarines sold to Israel were heavily discounted.

Now, more pressing domestic economic issues seem to have forced a reconsideration of this policy, making them a higher priority than helping fund Israel's naval programs to assist TKMS.

The question now is: where does Israel go from here? Israel has three Dolphin submarines in service with two Dolphin IIs under construction at TKMS. However, Israel does have a requirement for up to four additional submarines. Israel has also been attempting to move forward with its long delayed acquisition of two additional surface combatants. Once considering the Lockheed Martin variant of LCS, known as LCS-I, and the Northrop Grumman Modified SAAR class; Israel decided to move forward with the MEKO A-100 design on cost grounds – with the German supplied hulls coming in at a considerably lower cost than US offers due to funding assistance from Germany.

With German assistance in these two programs now off the table, Israel's choices for the surface combatant seem to be limited to indigenous construction at Haifa Shipyard or a revisit of higher price foreign platform options. Israel will have to find other funding streams if it intends to go either route, and if opting for domestic construction, will face the additional risks involved in building its first major surface combatant locally.

At the end of the day, Israel may very well have to reconsider foreign designs if it intends on getting new surface combatants in service on a reasonable schedule. In regards to additional submarines, Israel really has no other options other than to pay full price to TKMS when and if it orders any additional submarines.

## JAPAN

### Increase in Submarine Force Levels

On 25 July 2010, AMI received information that the Japanese Government will be releasing its new *Defense Program Guidelines* (DPG) by the end of 2010. The new *DPG* will contain the

mandate to increase the Japan Maritime Self Defense Force (JMSDF) Submarine Force from its current level of eighteen units to *more than twenty*.

Since the JMSDF established its current guidelines in 1976, the sea service has maintained a Submarine Force of eighteen active vessels. These guidelines have allowed for the JMSDF to strengthen its overall submarine capability in a predictable program of one-for-one hull replacements that bring newer, more capable vessels into the force and while sustaining the nation's capability for advanced conventional submarine construction.

AMI sources have stated that the *DPG's* increasing of the submarine fleet is specifically in reaction to the growing quantity and quality of China's Submarine Force, which now numbers over 60 hulls. Another factor in mandating an increased JMSDF Sub Force is to be ready to offset the reduced number of United States Navy (USN) submarines anticipated to be in the Pacific in the future.

Traditionally, the JMSDF has decommissioned its submarines at or near twenty years of operational service. However, recent improvements in construction and increased capabilities, including air independent propulsion (AIP) are expected to allow the newer units of the Oyashio and Soryu classes to remain in service much longer than 20 years.

Extending the service life of newer submarines will allow the JMSDF to build fewer units while still maintaining a force of *more than twenty* to conform with the 2010 *DPG*. How many is more than twenty remains unstated, but AMI anticipates that the JMSDF submarine order of battle will reach at least 24 units. This will require six additional units, likely to be modified Soryu class hulls, to meet the new force structure requirement. The modified Soryu hulls will also be AIP capable but we could begin seeing the next generation of weapon and sensor systems integrated in the later units of the class as well as additional capabilities such as unmanned underwater vehicles (UUVs).

The final two planned units of the Soryu class are being funded in 2010 and 2011 and will bring the total number in the class to eight. Should an additional six units be ordered, funding

will probably be approved from 2012 through 2014 and the new units will deliver from 2017 through 2022.

Additionally, by 2022, the older units of the Harushio class will need replacement, creating the need for a follow on program to the Soryu lass. This will likely include up to eight units that will also replace the older units of the Oyashio class as well, keeping the Japanese submarine building industry well booked for the foreseeable future.

## TURKEY

### A Bright light in the Shadow of Austerity

In August 2010, AMI received information that Turkey continues to increase its defense budget at a time when austerity measures are hitting other parts of the world including Europe and the United States. Turkey will spend US$16B in 2010 (1.8% of GDP up from 1.6% of GDP) with US$4B being for the procurement of new equipment. Sources indicate that the defense budget will continue to grow year over year through 2015 and level out from 2015 through 2020.

Our source indicated that the increased levels through 2015 and remaining constant through 2020 are required in order to fund major programs that have just begun or will begin over the near term. For the Turkish Navy, this equates to the aggressive procurement stance that began several years ago. Programs now underway, which will begin in the next few years, include:

- Type 214 Submarine: Contract for six submarines signed in late 2009. First submarine should enter service in 2015. Joint construction at Golcuk and TKMS.
- TF 2000 Frigate: Program for four units. Responses to Rfls in March 2010. Rfls being evaluated. All units will be built in Turkey with construction and systems assistance.
- MILGEM Corvette: First unit of 16-unit class launched in October 2008 at Istanbul Naval Shipyard Keel for second unit laid on 27 September 2008. Work will be split between Istanbul and a variety of private yards.

- Coast Guard SAR OPV: First of four-unit class launched from RMK Marine Shipyard. All units will be built at RMK.
- New Type Patrol Boat: Contract for 16 units completed in August 2007. First unit launched from Dearsen Gemi Insaat Sanayii AS in April 2010. All units will be built at Dearsen.
- Landing Platform Dock (LPD): RfP for single unit provided to local companies in early 2010. Prime contractor (Turkish yard) scheduled to be selected by the end of 2010, with a contract in place by 2011.
- Landing Ship Tank (LST): Program for two units to be built at local yard. Responses to RfPs submitted in February 2009. Evaluation of proposals is completed. ADIK and RMK Marine are two finalists. Construction contract could be in placed by 2011.
- Landing Craft Tank (LCT): Program contracted for June 2009. Partnership of ADIK and FURNTRANS being formed, will commence construction of eight units in 2011. BMT awarded design contract in July 2010.
- Landing Craft Air Cushion (LCAC): Responses to RfIs in August 2009. Evaluation of RfIs in progress. RfPs could be issued as early as 2011.
- Submarine Rescue Mother Ship (MOSHIP): RfP for single unit issued in May 2008. Istanbul Denizcilik Gemi Insa Sanayi AS selected as preferred supplier. Contract negotiations underway.
- Rescue and Towing (R & T) Ship: RfP for two units issued in May 2008. Istanbul Denizcilik Gemi Insa Sanayi AS selected as preferred supplier. Contract negotiations underway.
- Seismic Research Ship: Proposal from local shipyards for one unit due 30 September 2010.

As seen in the above listed programs, Turkey is continuing to invest in the modernization of its naval force primarily through local construction with assistance from foreign firms.

*VARIOUS DID YOU KNOW?*

**ALGERIA:** On 27 July 2010, the Algerian Navy took possession of its second Kilo II class submarine from Russia's Admiralty Shipyard.

**PORTUGAL:** On 02 August 2010, the first of two type 209PN submarines for the Portuguese Navy, NRP TRIDENTE, arrived at the Lisbon Naval Base in Portugal.

## ETERNAL PATROL

CAPT Will Mont Adams, Jr., USN (Ret)
CWO (SS) Arthur L. Carter, USN (Ret)
RADM LeRoy Collins, Jr., USN (Ret)
CAPT Robert B. Connelly, USN (Ret)
MMCM (SS) John R. Crouse, USN (Ret)
CAPT Thomas B. Dabney, USN (Ret)
CAPT Edward "Ned" Dietrich, USN (Ret)
CAPT Lewis E. Diley, USN (Ret)
CAPT William C. (Bill) Doizer, Jr., USN (Ret)
Mr. Robert E. Fennell
CAPT Terrance J. "Terry" Garbuzinski, USN (Ret)
LT Nathan S. Henderson, USN (Ret)
Mr. Charles J. Hyman
Mr. James McNaughton
CAPT Hugh D. Murphree, USN (Ret)
CDR Peter D. Nalle, USN (Ret)
LCDR Donald E. Pennington, USN (Ret)
CAPT Arthur L. Rehme, USN (Ret)
Mr. Harry E. "Dusty" Rhoads
Mr. Robert Taylor
ETCM (SS) Francis J. Young, USN (Ret)

***DISCUSSION***

## A JUNIOR OFFICER'S VIEW

*Editor's Note: LT Haney D. Hong, USN, is an analyst and action officer stationed in the Office of the Secretary of the Navy at the Pentagon. He served aboard USS Topeka, SSN 754, and as the Flag Lieutenant/ Executive Assistant for Commander, Navy Recruiting Command. Outside of uniform, he is a Consulting Associate Professor for the Bing Stanford in Washington Program and a member of the Advisory Board for Ashoka U, a division of Ashoka, Innovators for the Public.*

Dear Rear Admiral Haney,

You asked me to consider what we might do to improve ourselves as the Submarine Force. While many might discredit me for my relative inexperience and citation of anecdotal evidence, I am extremely grateful to have this opportunity to voice my thoughts on what the Submarine Force ought to do to remain the credible, self-sufficient, covert, and low-vulnerability force that provides our leaders flexibility in their wielding of the military as an instrument of national power. You clearly value the ideas of all, even those markedly junior to you; otherwise, you would not have solicited my personal thoughts. Your leadership is representative of our finest.

My approach here will be to derive *strategic imperatives* for the Submarine Force by considering our comparative advantages as a credible, self-sufficient, covert, and low-vulnerability force. By determining the root causes for attitudinal trends that prevent maximization of our comparative advantages, we can then develop associated corrective actions that are, in my opinion, the strategic imperatives for shaping our force.

**The Submarine Force provides the National Command Authority, Theater Commanders, and Joint Force Commanders with**

- **Cost-effective operations resulting from self-sufficiency, covertness, low vulnerability to prosecution by an opponent's forces;**
- **Early, accurate and sufficient knowledge of pre-crisis situations as well as the battlefield on which power may be projected from the sea;**
- **Covert and timely strike power against critical targets at sea and ashore;**
- **Capabilities to prepare the battle space and enable the establishment and support of the expeditionary force on land; and**
- **The naval superiority to defeat enemy forces, control sea lines of communication and dominate the undersea battle space.**

The mission of the Submarine Force makes quite clear what comparative advantages we bring to bear on national security challenges:

Simply stated, the Submarine Force is singularly unique because of its ability to be stealthy and self-sufficient. This self-sufficiency comes not only from the flexibility in operations provided by nuclear power, but also from the cadre of highly-qualified and well-trained volunteers who man our submarines. This group of self-selected volunteers is extremely self-motivated and capable of accomplishing tasks that might otherwise be elusive to individuals of lesser talent.

For the Submarine Force to maintain its lofty position as the provider of premier undersea assets anywhere in the world while keeping untarnished the track record of over fifty years of safe nuclear operations, we must maximize our comparative advantages. We can do so through a commitment to training our

volunteers to their strengths; we should fit each Submariner's acuities to need. We can enhance these strengths by tracking closely the time that our volunteers must spend to complete their jobs; we should focus each Submariner's time on their strengths and not on unrelated or unnecessary requirements. We can channel this increased focus by optimizing the self-sufficiency of the individuals who comprise the Submarine Force; we should improve each Submariner's understanding of how his or her individual talents fit into the larger contexts of their units. We are, after all, a "Global Force for Good," because it is the sense of service and duty that draws our volunteers.

**Root Cause Analysis**

During my short tenure as a submariner, numerous submarine commanding officers have been relieved of duty for *loss of confidence* each year. Additionally, it seems that we as a force suffer from an at-least-annual public reprimanding of divisions of nuclear-trained personnel for falsifying logs. While one cannot say for certain that there is an increasing trend in these occurrences, it seems we also cannot disprove the opposite. That is to say, it is difficult to assess whether there is a decreasing trend in these occurrences.

These occurrences reinforce some of the disturbing attitudes that limit how the comparative advantages of the Submarine Force are fully realized. Nearly everyone, including myself, is guilty of continuing these very attitudes, which also makes apparent to me the need for significant leadership in bringing change to our force. Attitudes beget attitudes, and maximizing our comparative advantages may require a shock to our ways of doing business, although my intuition tells me that cultural shock may not be necessary because the *Guiding Principles* of the Submarine Force already align with what we must do.

Submarine Force Guiding Principles

As we conduct our daily business we will be guided by the following principles:

- People, and their safety, are most important.
- Training is necessary for our safety and readiness.
- Quality and daily improvement are a way of life.

We:

- Value tradition, but encourage new ideas.
- Protect the environment wherever we go.
- Think about those we serve whenever we make decisions.
- Are good neighbors in the community where we work and live.
- Take pride in team work.
- Encourage open communications.
- Believe in equal opportunity.

These disturbing attitudes will be the pitfalls of the Submarine Force. Though good leaders may be able to negate or ignore the influence of these occurrences on their leadership styles, we as a force cannot ignore what incentives these trends are creating. Namely, the Submarine Force continues to drive further and further to micromanagement that permeates all levels of leadership from the division officer level where I served to captaincies and beyond. We are replacing trust with procedures, and we are becoming increasingly risk averse to avoid the possibilities of mistake. We are reducing the authorities of subordinates to make independent decisions, and we are raising the burden of responsibility for each successive level of leadership. I could cite individual examples to highlight these further, but I contend there are few people who are untouched by these attitudinal trends, and therefore I do not need to do so. These trends are disturbing because they present a direct affront to those comparative advantages that make us a great Submarine Force.

Add on top of these attitudinal trends the myriad competencies for which each member of the Wardroom is held responsible. Every submarine officer must be a nuclear engineer and a tactician. He must be a maintenance supervisor in port or in drydock while also being a watch officer out at sea. He is a scope operator and contact coordinator, Officer of the Deck and Engineering Officer of the Watch, all while training to become a department head, executive officer, and commanding officer. And regardless of position, he is expected to give training, monitor training, verify the adequacy of training for engineering and tactics both while monitoring engineering evolutions and weapons loads. Calculating the amount of time that any one officer can dedicate to any one task is simple: hours in a day are constant while the number of tasks goes up. Therefore time per task goes down.

Our Submarine Force has an amazing record of over fifty years of safe nuclear operations. If we are to keep this record untarnished, we need to take a hard look at what we expect of our officers. The truth of the matter is that in this globalizing world of irregular and hybrid warfare threats, the Submarine Force must continue to adapt and adopt larger mission sets. Using the simple math above as the number of tasks continue to rise, the amount of time each submarine officer has to be good at each task and complete each task well is going down rapidly. We risk becoming decent at everything while being great at nothing because the number of responsibilities each officer has continues to rise. And each Submariner knows that nuclear safety is not satisfied by decent officers; nuclear safety is only ensured with great officers.

As the amount of time per task goes down, it is not unreasonable to conclude that more mistakes will likely be made. As a response, submarine crews increase the level of backup to the point where now, as an example, the training petty officer writes the training exam, which gets reviewed by the division officer, the department head, the executive officer, and the commanding officer. As the time per person continues to go down for reasons explained earlier, the solution to involve more people makes sense; collectively, the process merely splits the time one individual would have spent reviewing amongst several people.

But while this may work in theory, in practice it reinforces an already difficult trend of reduced time to get the job done. One of two things can happen in this scenario: either each individual spends more time reviewing the material than he can afford or does a limited review that adds little value to the process. If each possibility is driven to its asymptotic limit, then it means that either too much time is spent in the aggregate reviewing the material or there is an inadequate review that has gone to the commanding officer for signature. Neither case is optimal: either time is wasted or the commanding officer carries the burden of this petty officer's test review.

The Submarine Force has reached a tipping point. Too many tasks, not enough time. So what is happening now? We increase the amount of time in the day by reducing the amount of sleep individuals get. Captains, executive officers, engineer officers, navigators, everyone gets constantly woken up time and time again because the overall period in which these myriad tasks must be accomplished cannot change. We are increasing the likelihood of mistakes, and therefore increasing the amount of backup that we need. More requirements, less time—the cycle continues, and its momentum is unstoppable. It will only be a shock to the way we do business that we will break this cycle and return to maximizing our comparative advantages.

## Corrective Actions as Strategic Imperatives for the Submarine Force

**To maximize our comparative advantages,**

- **We must train our volunteers to their strengths.**
- **We must focus the time each Submariner spends on maximizing his or her strengths.**

Fundamentally, the root cause of our troubles is that each individual officer has too much to do with not enough time in the day. Since we cannot change the amount of time in the day, we need to change the number of tasks. Given my earlier discussion, these recommendations need to align with the Submarine Force's guiding principles and must continue to maximize our comparative advantages.

**1. Split the engineering and tactical officer career tracks.**

What better way to reduce the number of tasks on each officer's plate than to split it in half by reducing the scope of his or her responsibilities? In general terms, we ought to create a track for those officers who want to focus on engineering, and separate the officers who want to be tacticians. Perhaps grossly oversimplified, the two tracks of officers, engineering duty (EDO) and warfare duty (WDO) track, should be divided as follows:

| | Ship at sea | Ship in availability |
|---|---|---|
| CO/XO | WDO | EDO |
| Engineer Officer | EDO | EDO |
| Navigator/ Weapons Officer | WDO | EDO |
| Division and Watch Officers | WDO for OOD /EDO for EOOW | EDO |

We should train our officer volunteers to their talents, whether technical or tactical. With this division of career tracks, we could develop leadership within these respective areas and build the cultures within each track that reinforces success. For instance, we want our engineers to be focused on safety, an inherently risk-

averse orientation; conversely, we want our tacticians to be innovative and adaptive to new threats and challenges, which requires a more risk-loving orientation. Splitting these two tracks allows the Submarine Force to attract officers of varying technical and psychological predispositions and to let them flourish in their respective areas of talent.

As far as career progression is concerned, splitting these two tracks allows us to free ourselves of the various Wardroom CO/ XO/ Engineer interlocks that make personnel distribution that much more difficult. Engineering duty track personnel can follow a vital career path that includes Fleet maintenance as a core competency, which then allows them to serve as commanding officers of submarines in availability, drydocks, and shipyards and, when they reach flag rank, directors and commanders of acquisition- and engineering-related functions. Similarly, the warfare duty track personnel follow career paths for operational duty, building the skills they need to be operational commanding officers, task force commanders, and ultimately combatant commanders.

This recommendation obviously needs much more analytical review and analysis, but this idea certainly gets validation by the division of submarine officers into different career tracks by our allies in Great Britain and Australia. Along similar lines, Admiral James Stavridis, the current Commander of United States European Command, argues that "[a] reevaluation of the officer assignment, education, and promotion system—from midshipman to admiral—is in order" to deal with the "task saturation apparent in our officer career tracks today."[1] Implemented correctly, this allows the Submarine Force to maximize our comparative advantages by training our officer volunteers to their strengths.

[1] Admiral James Stavridis, USN, and Captain Mark Hagerott, USN. "The Heart of an Officer," *Naval War College Review* (Spring 2009, Vol. 2, No. 2).

**2. Focus where the Submarine Force requires its officers to spend time and energy.**

Now with officers on designated career tracks in their respective areas of specialty, the Submarine Force should focus on two general efforts that will free up the limited time of their officers. This may help us as a force reduce the sleep deprivation or repetitive tasks and reviews that are the result of sub-optimized time usage:

- Standardization of common tasks across the Submarine Force

  Every submariner performs common tasks, like the development of training plans and examinations, and no individual should have to create any product for a common task from scratch. Common templates and computer programs can certainly help to standardize these common tasks across the Submarine Force; some already exist and could easily be distributed. Where larger gains may potentially be made in standardization is in a thorough, open, and non-attribution review of standards of inspection on these common tasks and an assessment of the behaviors that are subsequently incentivized. For example, when an inspector from an Operational Reactor Safeguards Examination reviews a training program, do the inspection criteria review the administration (i.e., the formatting of the reports, the tabulation of test results, etc.) or incentivize the desired outcome of better day-to-day training? While I do not purport an answer here, I recommend that the Submarine Force conduct an open, non-attribution review of these standards to get the most accurate answers.

- Reductions in requirements or investments in assistive technologies for those requirements

> Every submariner spends time satisfying key requirements that are absolutely essential to our performance as a Submarine Force. There are certain requirements, however, that may be remnants of old standards or echoes of outdated procedures. Again, we ought to have a thorough, open, and non-attribution review of the various engineering and tactical requirements that we self-impose and consider whether those requirements contribute to the short- and long-term successes of the ship. For example, we might look at the *mental gymnasium* requirements that we place on our officers. I would personally argue that the calculations of safety sweeps and distance from track are absolutely essential to submarine operations, but I would also pose the question whether the officer on the scope needs to calculate this in his or her head. I do not offer an answer, but I think the Submarine Force would benefit from asking this question across the spectrum of engineering and tactical requirements. If something is required, then the force should ask whether we are investing in assistive technologies so that we minimize the amount of time our officers spend on these requirements so they can focus instead on their respective areas of engineering or tactical growth?

By striving to minimize the limited time of our officers on those tasks spent outside their areas of expertise, we are maximizing our comparative advantages by allowing our volunteers to utilize their limited time most heavily for the development of their areas of talent.

**3. Enhance teamwork and identify weak leadership early through holistic evaluations.**

The Submarine Force, with specialized engineering and warfare duty officers whose time is focused less and less on

requirements deemed unnecessary, should promote teamwork and identify weak leadership early through a holistic evaluation process. Commonly known as *360-degree* evaluations, all of our Sailors, officers and enlisted both, should be evaluated by their seniors, subordinates, and peers. Part of the Submariner's psyche derives from the Submarine Force's sense of self-sufficiency, and holistic evaluations will validate whether he or she is optimizing his or her self-sufficiency. That is to say, peer reviews might reveal that he or she is not contributing to watch standing or maintenance without needing significant assistance, or a subordinate review might reveal that a leader is micromanaging or untrusting. Senior reviews already do what they should, which is to reward strong performers and to identify performers who need improvement. I do not wish to diminish the importance of senior reviews, as I still believe these evaluations should be the primary data used for selection boards; I want to enhance these senior reviews by informing that senior review process with subordinate and peer reviews. This will help the Submarine Force identify poor leadership early and to ensure that the Sailors in whom we invest so much time and money have an opportunity to adapt their leadership styles early. This will also help each individual within the Submarine Force hone his or her sense of self-identity through holistic reviews, which helps us to continue maximizing our comparative advantages.

**A Legacy of Service and Talent**

The Submarine Force is well respected, because we have a legacy of self-sufficient, covert, and low-vulnerability operations that collectively make the *Silent Service*. That legacy is supported by a cadre of extremely capable and talented volunteers who are the bedrock of our stealth and self-sufficiency. We as a force must do whatever we can to maximize the comparative advantages that will continue our legacy, and I believe that our guiding principles allows us to alter how we do business so those comparative advantages continue to work in our favor.

I appreciate the opportunity to voice my thoughts in this forum, and I will gladly be a part of any initiative or pilot on which the Submarine Force may endeavor to reinforce our legacy and those comparative advantages that have built and will continue to keep alive that legacy. From Haney to Haney, I send heartfelt gratitude for the opportunity to serve in the world's finest Navy and Submarine Force.

Very respectfully,

*Haney D. Hong*
Lieutenant, United States Navy

*Editor's Note: In discussions with the author I noted his suggestions are wide-ranging, significant in impact, and have been discussed at length over the years. He indicated that he wished to go forward with wide distribution in the hope of generating discussion. To that end, THE SUBMARINE REVIEW invites all who wish to comment to do so in Letters to the Editor.*

# RE: THE CONVOY SOLUTION—IGNORED UNTIL ALMOST TOO LATE

*By CAPT Bill Riffer, USN (Ret)*

*Captain Riffer is a retired submarine officer and currently teaches a course in the history of submarine warfare for the Christopher Wren Association (the adult continuing education program at William & Mary in Williamsburg, VA).*

Captain O'Connell's review of German submarine operations during the First World War is particularly good in capturing the details of the sinking of ABOUKIR, CRESSY and HOGUE by U-9 in September of 1914. The impact of this event and the Royal Navy's reaction to it cannot be over emphasized. However, he then goes on to say, "The reluctance of the Admiralty to adopt convoy on a wide-scale is very difficult to understand today." No it's not. There were three reasons. He captured one (listed as two); that was the *too many eggs in one basket* issue. The Royal Navy (RN) concluded that convoys would be easier to detect and provide too many targets once detected. Captain O'Connell is correct in his analysis that the RN was wrong on this although it is important to remember that no one was sure just how dangerous submarines could be and the specter of ABOUKIR, CRESSY, and HOGUE hung over all RN decisions involving German submarines.

However, the RN did not convoy for two other very clear and unambiguous reasons. First was concern over shipping through put. When ships sail and arrive independently, they can be off-loaded as they arrive. Put them all in a large convoy of say 80 to 100 ships and when the convoy arrives, most ships have to anchor out or mill about waiting their turn. This greatly reduces the through put at ports in terms of tons per unit time. The RN accurately estimated that convoying would reduce through put by at least 25%. In 1915 when this decision was first visited U-Boats

were not having anything like the effect necessary to make convoying cost effective. The RN's mistake was to not revisit this calculation in light of the serious increase in sinkings later in the war.

The second reason again goes back to ABOUKIR, CRESSY, and HOGUE. After losing these three cruisers, the RN made the decision to provide destroyer escorts for all major warships. However it did not have enough destroyers to escort RN warships and escort convoys. Deciding that the warships were the most important resource, they saw no way to escort convoys and therefore no reason to use them. The US Navy solved this problem by joining the war with a large force of combat ready destroyers. The US Navy had also run a number of tabletop exercises prior to entering the war that demonstrated that the *too many eggs in one basket* analogy was faulty and they made this clear to both RN and British political leadership. It was also obvious by the spring of 1917 that the U-Boats were sinking ships at a rate that made convoying effective and indeed necessary in terms of through put.

To his credit, Captain O'Connell does not make the claim that I have seen in a number of sources that the Americans came over and browbeat the stupid British into convoying against their will thereby saving the day. What the Americans actually did was set up the situation that allowed the British to convoy, something they inherently and historically knew they wanted to do.

## *THE SUBMARINE COMMUNITY*

### USSVI DIESEL BOATS
### FORCM KIRK SAUNDER'S REMARKS
### BANQUET 02SEP10
### FORT MITCHELL, KENTUCKY

*The Force Command Master Chief is the leading enlisted advisor to the Commander, Submarine Forces. His position is a natural progression for the time-honored part played by the Chief of the Boat in every US submarine crew.*

Carl, thanks for that kind introduction.

Fellow submariners, ladies, and distinguished guests:
I certainly realize how important it is to come out and speak with some of the true heroes of the Submarine Force and I am truly honored to be in the presence of such a proud group of submariners tonight. I thank each one of you for your steadfast, distinguished service and continued devotion to the defense of this great nation, and I'm happy to see all of you here.

Before I proceed, I would like to give special thanks to the backbone of all submariners—the ladies here tonight. Just as it was in your day, we could not do what we do without the love and support from the home front. The spouses of today's submariners are carrying on that most important tradition blazed by you. So again ladies, thank you for all that you do and you all look wonderful tonight.

At great personal risk—and no one knows the awesome power of the oceans like sailors—you voluntarily took to the sea, protecting the liberty of future generations, and your deeds are an inspiration to us all.

Each of you contributed to establishing and enhancing our rich submarine culture. We have a long and rich history of espirit de corps and camaraderie. Submariners today exemplify the Navy's

ethos with integrity, effective leadership, discipline, honor, courage, and commitment to mission accomplishment—but those traits were first planted and executed by you!

With that said, I want you to know how your service has made a difference to the submariners of today. Your professionalism, sacrifices, and commitment to each other lives on in the submariners of today.

Not that I need to start you off this evening with a history lesson, but I feel it's appropriate to highlight at every opportunity the accomplishments of those that set the tone for the Submarine Force we are today. I won't bore you by putting you through all the history. However, there are countless impressive accomplishments that submariners contributed to and I think it's worth mentioning and remembering a few of them here tonight.

Employing the extremely reliable boats of GATO, BALAO, and TENCH classes, the Submarine Force scored the most complete victory of any force in any theater of war between 1939 and 1945.

In spite of a hesitant beginning due to the Pearl Harbor surprise and difficulties with defective torpedoes, the Submarine Force destroyed 1,314 enemy ships totaling 5.3 million tons, which translated, into fifty-five percent of all enemy ships lost.

Out of 16,000 submariners, the force lost 375 officers and 3,131 enlisted men in fifty-two submarines. Even though it was a tragic and significant loss to the Force, the numbers equated to the lowest casualty rate of any combatant submarine service on any side during WWII.

Dollar for dollar and man for man, the submarine is the country's most economical weapon. Comprising only 1.6 percent of the Navy's WWII personnel, the submarine service accounted for 55 percent of all enemy shipping destroyed.

Records for enemy shipping sunk by U.S. submarines during WWII are held by two boats built by Electric Boat. USS FLASHER sank 100,231 tons of Japanese shipping, while USS TAUTOG holds the record for the most ships sunk - 26.

In comparison, while the United States lost 52 submarines in WWII, the Germans lost 782 submarines and the Japanese lost

130. Twenty-three of the Japanese subs lost were victims of the American submarine service.

More decorations for valor have been awarded, per man, to the submarine service than any other Navy branch.

So that got me thinking—how are yesterday's submariners the same or different from today's submarine sailors?

First: Submarine sailor's can still fix anything. The Mark I Mod 0 Blue Jacket of today is smart and technically savvy. I've watched them tear down broken gear and save the mission or get the ship underway on time more than I can recall, just like you did when you were serving.

Second: the people do not change! Torpedomen. Auxiliarymen. Sonarmen. Electricians. Chiefs! XO's. Captains. Although our boats today are a little more technologically advanced, they still need the same attention to detail and loving care that you provided to your boats when you were on active service.

Third: the boats are tough.

Submarines require no vulnerable underway logistics chain nor depend on mutual defense from other platforms for survivability.

In fact, on any given day, an average of 30 U.S. submarines are underway. Typically, 10 attack submarines and 3 guided missile submarines are forward deployed and 6 SSBNs are at sea providing strategic deterrence as the most survivable component of our nuclear strategic force.

Today, the Submarine Force provides approximately one-third of our warships but uses only about 7 percent of the people and about 10 percent of the budget to achieve this effect.

These warships provide U.S. combatant commanders highly capable, multi-mission, cost-effective platforms needed to support both the maritime strategy and the U.S. national security objectives around the globe—just like it was when you were serving in them.

So I guess things haven't changed all that much, have they?

I like to think of occasions like this one tonight as a time when we give our dolphins a good emotional polishing. Those of us still wearing the uniform too often get lost in the day to day hoopla:

working on quals, doing preunderways, stores loads for the upcoming patrol or deployment, gathering data for the message the XO needs to send to squadron, removing rust from those brackets under the deck plates in Seawater Bay so they can be painted, giving a checkout to help Fireman Timmy get off the delinquent list. We should remember, and take pride in who we are more often. We should pause to remember that it was good folks like you who sacrificed to make our Submarine Force what it is today. Our predecessors passed down their example of excellence, skill and audacity to us.

Every one of today's submariners owes something of what he is to a sea dad who put his arm around us and helped us to trace those difficult systems, to find those Nash float valves, to properly operate that portable submersible pump, to stay out of trouble while on liberty overseas.

Those sea dads had their own mentors and so on back to the first crew of USS HOLLAND in 1900.

The legacy of excellence that marks submariners continues, passed down from those brave souls of WWII who gave their all, to our Cold War heroes, and finally to today's gifted and dedicated submariners who are skillfully performing their difficult missions around the world, with the same level of tenacity, fortitude, and valor that has always been the hallmark of the Submarine Force.

The circle is unbroken, the brotherhood remains strong. So rest easy, and be comforted in the fact that your legacy lives on.

Since we started this submarine business some 110 years ago, our boats have evolved through a variety of shapes and sizes. The result of this technology and experience has brought us to the newest and most technologically advanced submarines ever to have joined our fleet; the Virginia Class SSN and the SSGN.

The most capable submarine in the world, the Virginia Class performs missions in both littorals and deep water across the spectrum of all submarine warfare mission areas. These submarines are coming on line at a steady pace and about 20% under budget. In July of this year, we commissioned our 7$^{th}$ Virginia Class submarine (USS MISSOURI). The next 5 submarines in this class are CALIFORNIA, MISSISSIPPI, MINNESOTA, NORTH

DAKOTA, and the JOHN WARNER. JOHN WARNER (SSN 785) is expected to be delivered in April 2015. We will start building two of these submarines per year beginning next year.

The SSGN platform is the Navy's premier Irregular Warfare platform and is delivering on its promise of unmatched special operations forces and strike capability and capacity. This year marshaled another chapter in submarine history as all four SSGN's were simultaneously deployed to our combatant commanders with tremendous success. Not just underway—but FULLY deployed! What a weapon for our Combatant Commanders!

For fifty years, strategic ballistic missile submarines have stood ready to defend our nation. Our Ohio Class ballistic missile submarines continue to provide the most survivable component of the U.S. strategic nuclear deterrent force. About half of these submarines are on patrol on any given day, keeping the peace silently throughout the world's oceans. With 134 consecutive successful flight tests, the Trident II (D5) strategic weapons system continues to demonstrate itself as a credible deterrent. Plans are underway for the construction of the Ohio Class replacement. Research and design efforts should allow for construction to begin on the OHIO replacement in 2019.

The workhorse of the force continues to be our 688 class submarines. The demand signal from combatant commanders is high for these submarines, and our submarine crews continually raise to the occasion; meeting those demands.

Speaking of our submarine crews, we continue to build upon a strong foundation of selecting and training the very best people. So let me tell you a bit about what they're doing in your Submarine Force today.

- As of the middle of this August, 104 submarine sailors were *boots on ground* in direct support of the global war on terror. They're operating completely out of rate in areas such as Iraq, Afghanistan, Kuwait, and other hotspots around the globe. Their performance has been outstanding, receiving high praise from Joint Force Combatant Commanders.

- Over the past two years, we've seen a 50% reduction in alcohol related offenses within the Force. This is largely due to the outstanding deck plate leadership being provided by the Chief Petty Officer community. This has resulted in a more positive image within the communities we homeport our ships and has reduced the loss of otherwise outstanding sailors due to behavioral issues.

- Retention has remained consistently on par with the Navy's goal. (The sailors are motivated and staying Navy). Again, this is as a result of the strong leadership being provided in our force today as we continue to apply focus to the people programs that take care of sailors and their families.

- Facing significant changes in our submarine culture with the integration of women to serve aboard submarines and the ban of smoking aboard submarines, your sailors are meeting the challenges head on. We will see the first female officers aboard SSBN and SSGN platforms by the end of next year. As of 31 December of this year, smoking tobacco will no longer be allowed onboard submarines. The crews have identified the positive aspects of each of these changes and realize that a healthier and more diverse force will be created as a result.

Clearly, the best part of my job is getting to interact with our sailors. I have been fortunate as a squadron Command Master Chief and now as the Force Master Chief to see our sailors in action. The hard work and enthusiasm displayed every day along with the technical savvy they possess is why we are a more ready and capable force than ever before.

I am extremely proud of all the sailors in our force. As I visit with our sailors, pride and professionalism runs deep. Everyone in this room has contributed to the pride and professionalism that the Submarine Force depicts today. Your legacy as submarine veterans is alive and well in today's Submarine Force.

Once again, I would like to close tonight by thanking all submariners for your service. You have served honorably and proudly, and have paved the way for those who follow you. God bless you and keep you.

**LIFE MEMBERS**
CAPT Larry C. Johnson, USN (Ret)
LT Curt M. Maier, USN (Ret)

**SPONSOR**
Mr. Guy Stitt
President of AMI International

**COMMODORE**
VADM Dan Cooper, USN (Ret)
CAPT Larry C. Johnson, USN (Ret)
ADM Frank B. Kelso, USN (Ret)
RADM John B. Padgett, III, USN (Ret)

**SKIPPER**
Dr. Victor S. Alpher
Mr. Mark. C. Buxton
ADM Henry G. Chiles, Jr., USN (Ret)
ADM Archie Clemins, USN (Ret)
RADM Peter C. Conrad, USN (Ret)
RADM Winford "Jerry" Ellis, USN (Ret)
ADM Thomas B. Fargo, USN (Ret)

**SKIPPER (continued)**
CAPT George M. Henson, USN (Ret)
VADM Albert H. Konetzni, Jr., USN (Ret)
RADM Larry R. Marsh, USN (Ret)
CAPT George W. Martin, USN (Ret)
LT Ronald J. Mihordin, USN

**ADVISOR**
CAPT James S. Baumstark, USN (Ret)
Mrs. Terry Buchanan
Mr. Ansel C. Braseth
CAPT George B. Newton, Jr., USN (Ret)
RADM Maurice H. Rindskopf, USN (Ret)
RADM James A. Sagerholm, USN (Ret)

**ASSOCIATE**
CAPT Roy C. Atkinson, USN (Ret)
Mr. Richard H. Hopp
Mr. Don E. Messner
CDR Walter D. Tucker, USN (Ret)

*Save These Dates:*
*Corporate Benefactor*
*Recognition Days*
*2-3 February 2011+*
*DC Area Submarine Birthday Ball*
*9 April 2011*
*Submarine Technology Symposium*
*17-19 May 2011*
*Annual Symposium*
*19-20 October 2011*

## WHO SUPPORTS DOLPHIN SCHOLARSHIPS?

*by Mrs. Randi Klein, DSF Executive Director*

For fifty years, the Dolphin Scholarship Foundation has provided financial assistance to children and stepchildren of submariners to attend undergraduate colleges and universities across America. Since 1961, over eight million dollars have been awarded to more than 1,000 students. Two thirds of recent graduates have majored in the sciences and mathematics. The 2010 Scholar Profile below shows the outstanding caliber of these students.

*Where does the money come from to help these students achieve their goals?* Primarily from individuals, in a variety of ways.

**Spouse Clubs**

DSF was founded and initially funded by the submarine officers' wives' clubs, and the submarine spouse organizations continue to be a keystone of funding for Dolphin Scholarships. In Fiscal Year 2010, submarine spouse organizations in Groton, Norfolk, Kings Bay, Bangor and Pearl Harbor donated more than $130,000! As you can see in the accompanying chart, this money is over 31% of total donations to DSF. Donations from spouse clubs are raised primarily through the annual "Silver and Gold Auctions" and Dolphin Stores. These activities are operated entirely by each area spouse organization, and are independent of the Foundation. Additional money is donated from regional Dolphin Stores, which are managed and operated by submarine spouse volunteers. In FY 2010, a total of $18,000 was donated to DSF by the Dolphin Stores - enough to fund 5 scholarships!

**Submarine Community**

Some homeports such as San Diego do not have a formal spouse organization, but several submarine communities rally and donate to DSF, raising funds through auctions and submarine birthday balls. These generous communities include San Diego and Omaha.

**Submarine Veterans**

Submarine veterans have been an important source of funding for scholarships, beginning with the US SUBVETS WWII Scholarship Program. Members of US SUBVETS WWII and now the US Submarine Veterans, Inc., continue to donate to Dolphin Scholarships. Sadly, many of the donations from Submarine veterans are in memory of shipmates who have gone on "eternal patrol."

Over the past 10 years, 40% of donations to DSF have come from the submarine community - spouse clubs, Dolphin Stores, "sub communities" and Submarine veterans. The Silent Service is still a major benefactor of helping our families achieve their dreams of higher education.

**Memorial Donations**

While memorial donations are unpredictable and thus cannot be budgeted, donations made to DSF in memory of loved ones are a significant source of funds. In FY 2010, memorial donations totaled over $10,000, not including donations designated for specific memorial Named Scholarships.

**Named Scholarships**

Some memorial and honorary donations are large enough to establish and endow Named Scholarships. Scholarships currently being endowed include the ***Arlie McNeill, RADM Arlington Campbell,*** and the ***VADM J. Guy and Mrs. Janet Reynolds Scholarships.***

**Corporate Donations**

Defense related companies continue to support Dolphin Scholarships, by direct grants as well as generous sponsorships for the annual DSF Golf Tournaments. Corporate donations for FY 2010 for unrestricted gifts and golf sponsorship totaled $36,050.

**DSF Fundraisers**

The DSF staff conducts several fundraisers a year, including the cartoon calendar, now in its 48th year of publication. The increased use of home computers and PDAs makes the calendar seem "old fashioned," but loyal customers remain. Although cartoon artists are fewer and profits from the calendar are significantly less than past decades, the Annual Cartoon Calendar tradition continues as a fundraiser and marketing effort.

At least once a year, DSF mails a direct solicitation "birthday card" to the Foundation's entire mailing list, in honor of the birth of the Submarine Force. In years past, DSF also mailed Christmas cards soliciting end of the year donations, until the mailing list grew too large to justify the expense of the cards and mailing.

Dolphin Scholarship Foundation is an annual participant in the Combined Federal Campaign (CFC), with pledges and donations received from around the world. In FY 2010, DSF received over $30,000 in CFC donations.

Throughout the years, submarine spouse clubs and DSF have produced and sold cookbooks, including Dolphin Dishes, Dips & Sips, Dining with Dolphins and Diving into Dolphin History DSF has published two other books as fundraisers, a compendium of submarine service stories called Dolphin Tales and the Thirty Years of Submarine Humor cartoon book.

DSF has conducted two virtual submarine races to commemorate the 50th anniversaries of historic voyages by USS NAUTILUS (*"Race to the North Pole"*) and USS TRITON *("Race Around the World").* Net proceeds from these races totaled over $80,000.

In 2006, DSF hosted its first golf tournament. The 2010 Annual Golf Tournament will be the fifth tourney. A total of more than $100,000 has been raised by golfers and corporate sponsors. The 5th Annual DSF Golf Tournament will be held Friday,

October 1, at Virginia Beach National Golf Course, Virginia Beach, VA. Title sponsors for 2010 are once again Lockheed Martin MS2, General Dynamics Electric Boat and Northrop Grumman.

In 2009, DSF combined forces with sister foundations Wings Over America and Anchor Scholarship Foundations to host the "Grand Slam for Scholars" Tennis Tournament. Northrop Grumman returns as the title sponsor for the event, to be held October 29-30-31 at the Folkes-Stevens Indoor Tennis Center at Old Dominion University in Norfolk, VA. Court sponsorships are still available at $200. The winner of the tournament gets *bragging rights* for the air, surface or submarine community.

The most recent fundraising effort by DSF is the *Submarine Community Pin* designed by DC jeweler Ann Hand. Karen Young and Diane Donald are the volunteer Sales Committee; look for them at the NSL Symposium in October. A portion of the sales will benefit Dolphin Scholarships.

**Giving Circles**

Colleges and universities solicit their alumni to *give back.* Dolphin Scholars, who have received money to attend colleges, should do no less. To that end, ***The Haines Society*** was established in 2006. Named to honor John L. Haines, Jr., the first Dolphin Scholar, the society recognizes former Dolphin Scholars who donate to DSF.

The first member of *The Haines Society* was John Haines himself. He and his wife Esther give generously of their time and money. John and family members play in our annual golf tournament, and he has been on the Selection Committee in 2009 and 2010. After Gavin Matthews was selected as the 1,000$^{th}$ Dolphin Scholar, John *passed the torch* to him.

Current Scholars whose parents donate are also granted membership. At press time, there are 117 society members, with almost $22,000 donated to date. Before 2006, Dolphin Scholar alums were neither routinely contacted, nor asked to help continue the tradition of Submariners to assist our children achieve their dreams.

**Parents' Circle**

This giving circle recognizes parents of Dolphin Scholars who donate to DSF. Since the circle's establishment in 2007, over $7,000 has been directly donated by parents of Dolphin Scholars. Since tracking of donations from parents began in 2006, additional donations by parents to all accounts total over $35,000.

**Scorpion Circle of Family and Friends and Thresher Circle of Family and Friends**

These special giving circles were established in 2009. Donations made to these recognition circles honor the sacrifices made by the families and crews of USS SCORPION (SSN 589) and USS THRESHER (SSN 593).

**Other**

Bequests

Several individuals have named Dolphin Scholarship Foundation in their wills.

Two such extremely generous persons bequeathed sums of several hundred thousand dollars each: Edith Emily Kennedy, whose husband Lisle Kennedy was a submariner and worked at General Dynamics Electric Boat for many years, and Joe Henry Senft, a submarine veteran of World War II.

It is easy to remember Dolphin Scholarships in your will. Please contact DSF for more information.

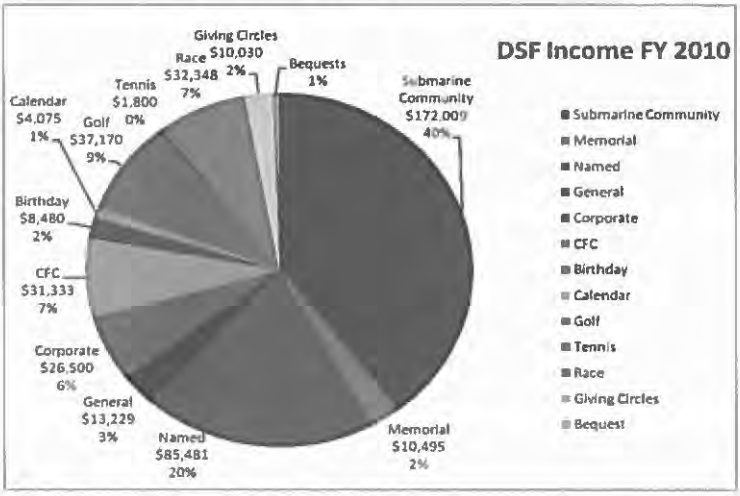
**"50 Years of Scholarships"**

Today, the Foundation supports 127 Scholars who each receive $3,400 each year, for an annual total of $431,800. The renewability of the scholarship makes it a potential award of $13,800 for each student over four years.

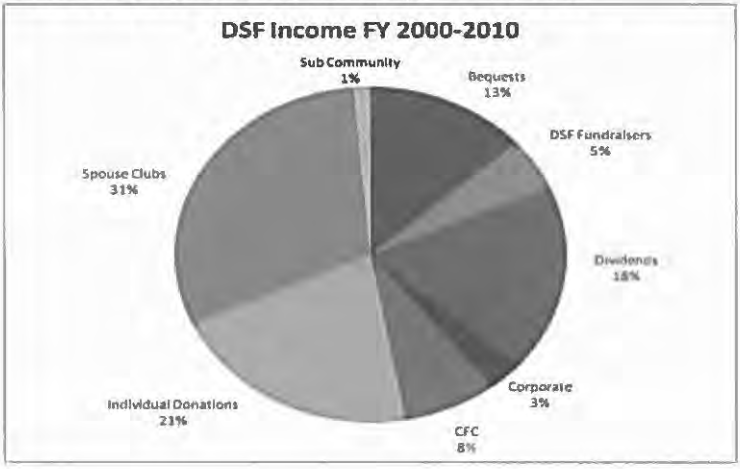
The extraordinary generosity and history for the past fifty years of financial support to children of Submariners could not have been possible without the sustained and generous support of all our donors.

For more information about Dolphin Scholarships, or to donate online, visit www.dolphinscholarship.org.

## CHART 1 DSF Income, FY 2010




## CHART 2, DSF 10-Year Income, FY 2000-2010



**2010 Dolphin Scholar Profile**

**All Selected 2010 Scholars**

| | | |
|---|---|---|
| Gender: | Female 19 | Male 8 |
| Relationship: | Child 27 | Stepchild 0 |

Average SAT Score: 2015
Average ACT Score: 32

**Sponsors**

| | | | |
|---|---|---|---|
| Active Duty | 6 | Retired 19 | |
| Discharged | 1 | Reserve 1 | |
| Officer | 15 | CAPT – 6 | |
| CDR – 7 | | LCDR – 2 | |
| Enlisted | 12 | E9 – 3 | |
| E8 – 2 | | E7 – 6 | E6 - 1 |

**High School applicants – 18 selected**

Academic

- Average Weighted GPA = 4.6, very strong schedules including AP and IB classes
- Test score ranges: SAT 1610 – 2350; ACT 28 - 36
- 7 Scholars ranked in the top 1% of their graduating class

Financial Need

- FAFSA EFC range $8,162 to $86,650
- Cost of college attendance and other financial aid expected were also considered in determining financial need.

Commitment and Excellence in School and Community

Multiple activities, including employment, over several years with evidence of leadership

(Example: Office in student government, varsity team captain, Eagle Scout).

**College applicants – 9 selected** (5 freshmen, 2 sophomore, 2 junior)

Academic

- Average GPA = 3.785, very strong majors at highly competitive colleges
- Test score ranges (freshman applicants): SAT1640 – 2150; ACT 34 - 35

Financial Need

- FAFSA EFC range $4,303 to $45,232
- Cost of college attendance and other financial aid expected were also considered in determining financial need.

Commitment and Excellence in School and Community

Multiple activities, including employment, over several years with evidence of leadership continuing at the college level.

# APPRENTICESHIP IN THE SUBMARINE FORCE: THE ROLE OF A PRIMARY MENTOR

*by CAPT Jim Patton, USN(Ret)*

*Captain Patton is a retired submarine officer who is a frequent contributor to THE SUBMARINE REVIEW.*

## Background

In two previous issues of this journal, in articles curiously enough named *The First Skipper* and *The Last Skipper*, I paid homage to those Commanding Officers who provided the *bookends* of my seagoing submarine career. In these pieces, I tried to articulate just how important it is for the first skipper to light a fire in the belly of a new submarine officer and for the last skipper to round off the rough edges of that same individual—now his XO. What went unsaid, and what I am now attempting to describe, is the even greater contribution made (for those lucky enough to have had one), by the developmental continuity provided by a *primary mentor*—someone around to help, advise and train throughout those long years between initial accession and command. I was extraordinarily lucky to have had one of these in the person of Kenneth Monroe Carr.

## Discussion

LCDR Ken Carr was the XO of SCORPION when I reported aboard in the Fall of 1961—one of the first wave of direct inputs—as the boat was leaving Post Shakedown Availability (PSA) at Electric Boat to become the first nuke in Norfolk. Unlike many of the subsequent XOs I served with as a junior officer, Ken Carr never appeared frazzled and overworked, but always had a grin, a quick wit and great NAUTILUS sea stories, having spent seven years on her as a Plankowner. All of the Wardroom, but particularly Ken Carr, took great pains to bring two boot Ensigns—myself and a USNA classmate—up to speed without the slightest tinge of *second-rate citizenship* for not having done the then routine *dues paying* of a year or more on a surface ship *before*

subschool, then a year or more on a diesel boat before nuclear power school. Everything we did and experienced was crafted as a learning experience.

Two events in particular stick in my mind. In addition to being the Sonar Officer and the Supply Officer, I was also the Public Affairs Officer and responsible for answering letters sent to the ship from the general public, enclosing a nice glossy 8"x10" of the ship running fast on the surface. The commissioning supply of these had just about run out, and I went to the XO and asked what to do. He told me to write a work request to the photo shop on the ORION, our tender in Norfolk, and showed me basically how to do it. I shortly thereafter was back in his office with a work request for 50 pictures. He asked "How many do you need?", and I said "50 Sir, just like I wrote in the form". He then said "Well, the photo shop will probably come back to you and tell you they're very busy, and could you get by with half that number, so if you think you need 50, you'd better ask for 100". "Yes Sir", and I went off to come back with a new work request for 100. Ken Carr then grinned, said "I'm going to teach you one more thing—think big!" and added another zero to the requested number. A couple of days later the Chief at the Photo Shop called to ask if I could make do with 500.

In the early 60s the SSBN building boom was in full swing, and about six months into my SCORPION tour, Ken Carr was ordered Another memorable event was when, in accordance with the COs dictum that my classmate and I would be OODs within a month of reporting aboard, I was standing my first OOD watch – the 04-08 – and was to come to periscope depth at 0600 to copy the broadcast. I was so excited and involved in the process that I didn't even notice that the XO was kind of inconspicuously *hanging around* the Control Room – clearly, as I later realized, as a safety observer. When the scope broke and I watched the sun rise after an appropriate look around, my stage whisper comment to no one in particular was "Wow, this is fun!" – after which I became aware of the XO's presence when he replied "When it stops being fun I'm going to get out."

In the early 60s the SSBN building boom was in full swing, and about six months into my SCORPION tour, Ken Carr was ordered off as the Blue crew XO in the precommissioning crew of JAMES MONROE at Newport News, having been relieved by some no-name called Carlisle Trost, who continued our education in the same gracious manner he is well known for.

In the thirteenth month of our tour, upon returning from our third North Atlantic deployment, both I and my classmate found orders waiting that directed us to report to JAMES MONROE, via instruction at the Bettis Labs, as the Blue and Gold submarine qualified and *sea-experienced* JOs that all new construction SSBNs were promised. At the end of the Bettis training, the early Winter of '63 drive from Pittsburgh to Newport News Shipyard in an Austin Healy Sprite was long and cold. On arrival in the evening, after handing my orders to LCDR Ken Carr, again my XO, he dropped what he was doing and took a very tired, hungry and broke LTJG to a local restaurant for a steak dinner.

Ken Carr again took the lead in continuing our professional training—not just on the specifics of submarine equipments and operations, but also about the proper personal attitudes to cultivate and maintain. As the ship was getting ready to go to sea for the first time, some work was being done inside the after group of Main Ballast Tanks which had their flood ports covered over and the vent operators removed for access. Welding sparks had apparently ignited some rags at the bottom of the tank, and the word came over the General Announcing System "Fire in Main Ballast Tank number four". As the Duty Officer I went to the scene topside, where I was joined by Ken Carr and we watched shipyard firefighters in emergency breathing equipment enter the ballast tank. As we were watching, both COs and the other XO showed up and entered the tank *without* emergency breathing equipment. The Blue XO and I looked at each other, and Ken Carr said "Well, it's a hell of a quick way to fleet up".

*JAMES MONROE* was the first new construction submarine to go on sea trials after the long hiatus following the loss of THRESHER. Sea trials Alfa were well supervised, as might be expected, with many Naval Reactors and SUBLANT personnel

riding. On sea trials Bravo, however, we were essentially without *adult supervision*, and almost everyone was very much up tight. On the second night out, at 400 feet and 10 knots with no testing scheduled, the movie was started in the wardroom. Halfway through the first reel, Ken Carr looked over his shoulder at the cluster of speed/depth instrumentation on the bulkhead, threw back his chair and raced out of the wardroom. In a heartbeat or two both COs, the other XO and both Navigators also threw back their chairs and raced out. The movie stopped, the lights came on and the Supply Officer and I, both having just come off watch, looked at each other, decided that whatever the problem was it had plenty of command attention, and continued eating dinner. In a minute or two, Ken Carr came back, sat down and began eating more popcorn. "Where did everyone go?" we asked. With a grin he said "I don't know about everyone else, but I went to the head".

Gene Lindsey, the OOD, later said that it was rather startling when, shortly into what appeared to be a dull watch, the forward door to the Control Room flew open, and without a word, both COs, the Gold XO and both Navigators looked all around for a few minutes, then left. When they returned to the wardroom, the lights went out, the movie restarted and nothing was said about the interruption—after that, things were markedly less tense.

When the MONROE was up and running well, Ken Carr finally got his orders to Command (he had really wanted to go from SCORPION to pick up THRESHER out of her overhaul at Portsmouth Naval Shipyard). It was the precommissioning crew of FLASHER at Electric Boat, and it was to be the third crew ordered in—the first disbanded when the decision was made to lengthen FLASHER, GATO and GREELING by 14 feet, and the second disbanded after THRESHER sank and it was decided to make FLASHER the first fully sub-safed submarine.

NAUTILUS had been unique in that it had had no PSA, and now CDR Carr's mantra was that neither would FLASHER. When the shipyard wanted to shift some work to PSA because "...it would take 2000 man-hours to accomplish", Ken Carr's response (with a grin) was that "...if you send a thousand men down to the boat, it'll be done before lunch" (i.e. try harder!).

When FLASHER got out of the shipyard and headed to Pearl Harbor, she was scheduled for a PSA there. However, returning to port from some local ops one Friday, the Squadron Commander was on the pier and asked CDR Carr if he could be ready to deploy on Monday (most of the other nukes in Pearl were literally worn out from overuse, since we had yet to fully realize that material readiness is a consumable). Ken Carr's response was, predictably, "I can be ready tomorrow". We left on Monday, and that would become the first of seven Special Operations in a year and a half period, and FLASHER did indeed avoid a PSA before her first overhaul. In classic Ken Carr fashion, when debriefing COMSUBPAC on this very successful and Pacific ocean-spanning Legion of Merit operation and asked to what he attributed his great success, CDR Carr replied, again with a grin "...good training, advanced planning, and the fact that the OOD cleared baffles a half hour before I had told him to".

I served with then CAPT Carr next at the Pentagon, on a medical hold, in a small OPNAV Division dealing with submarine R&D. Again there were many training/learning events, one of which was the salvaging of a program called "The Permit/Plunger Sonar" which had several times failed to make the cut for the Five Year Defense Plan (FYDP). This was done merely changing the name to "The DNA Sonar" (DIMUS, improved Narrowband, Accelerated active search) – the press being full at the time about the achievements of Messrs. Watson and Crick and their Deoxyribonucleic Acid. Submariners would more quickly recognize the equipment as the BQQ-5 sonar.

When I was later subjected to the adversary proceedings of a formal Medical Board for "Idiopathic Seizure Disorder", RADM Ken Carr, then senior military aide to the Deputy Secretary of Defense, testified and was asked "If you were ever COMSUBLANT, would you want this officer to command one of your ships?" RADM Carr's answer was "Him and twelve more like him" – a tribute I didn't think I deserved, but was grateful for.

## Conclusions

Good mentors are far more than just good friends. They have to have come by their mentoring skills by having been mentored themselves—in Ken Carr's case by such as Admirals Bill Crowe and Dennis Wilkinson—and they have to have the ability to see the potential in someone that even that person doesn't realize exists. The Army might *say* "Be all that you can be", but good submarine mentors make individuals more than they otherwise could have been—VADM Carr was indeed COMSUBLANT when I commanded PARGO—a position I never imagined I would achieve when I first met him.

Not only was Kenneth Monroe Carr my XO (twice), my CO, my boss at OPNAV, my Type Commander, and a surrogate father, but he also introduced me to my wife while at Electric Boat and is our youngest son's Godfather. I certainly hope that the mentoring tradition is still alive and well in today's Submarine Force—it works wonders.

**THE SUBMARINE REVIEW**

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

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

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

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

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

***A LETTER TO THE EDITOR***

## FILIPINOS IN THE SUBMARINE SERVICE DURING WORLD WAR TWO

***by CDR Mark Condeno***
***Philippine Coast Guard Auxiliary***

The saga of Filipinos serving in the various branches of the United States and British Armed Forces during the Second World War is well documented in various Philippine and Foreign published history books; especially Official Histories and memoirs. Notable units include the 1st and 2nd Filipino Regiment in the United States Army, Philippine Army officers that were commissioned into the United States Coast Guard and Two Filipino Sergeants that served in the British Eight Army during the Battle of El Alamein and the hundreds of Filipino sailors that were in the United States Navy where some took part in the key battles of the conflict like that of Coral Sea and on Leyte Gulf.

It is in this context that I would like to put forward a request for information to fellow members of the League, readers of the Review and veterans for any details concerning Filipinos that served with the United States Submarine Service during the war. This particular curiosity in the subject came upon reading **Pigboat 39:** *An American Sub Goes to War* by Bobette Gugliota which I believed was reviewed in this esteemed journal way back, a few years ago. It is mentioned in the book that of the Submarines crew two were Filipinos, namely Steward Mates **Amador Tayco** and **Cecilio Fabricante**. This is the first book that I've read mentioning Filipinos in the Submarine Force.

Any information or assistance on the matter would be highly appreciated and could be forwarded to my e-mail at Coast_Guard78@yahoo.com.ph by way of courtesy please cc the Editor for any information that you would like to put forward.

## *BOOK REVIEWS*

### AN HONORABLE GERMAN
### BY CHARLES McCAIN,
***Published by Grand Central Publishing, New York, in 2009***

***Reviewed by Lieutenant Joel Ira Holwitt, USN***

*Lieutenant Holwitt is a submarine officer currently assigned to Naval Submarine School in Groton, CT. He served as a division officer on board USS Houston (SSN 713), based out of Apra Harbor, Guam, from 2007 to 2010. A 2003 graduate of the U.S. Naval Academy, he earned a Ph.D. in naval and military history from Ohio State University in 2005. He is the author of "Execute Against Japan": The U.S. Decision to Conduct Unrestricted Submarine Warfare, published by Texas A&M University Press in 2009, and reviewed in April 2010 issue of THE SUBMARINE REVIEW. His book was also named as one of the 20 most "Notable Naval Books of 2009" by the U.S. Naval Institute PROCEEDINGS Naval Review issue.*

After you read enough technothrillers or nautical historical novels, you start realizing that many of these books reflect the influence of the TV show *Star Trek*. In these books, the same personnel are always on watch, the captain invariably has the conn, and ships are able to survive remarkable damage with minimal casualties, impact on living conditions, or warfighting abilities. I recently stopped reading one World War II novel when a U.S. destroyer captain, having taken the deck, issued helm orders, while the officer he had ordered to take the conn did so by relieving at the helm. Novels like these, which show a palpable lack of effort by the author to provide a realistic portrayal,

disappoint and mislead the casual reader, who hopes to vicariously experience the past.

Charles McCain's *An Honorable German* does not suffer from these problems. Every chapter reflects the author's 30 years of research to create a credible historical setting and realistic characters. These characters take the time to initial the deck log, properly turn over the watch, endure training and monotony, and experience transitory victory and permanent defeat. The latter is only to be expected, as McCain has boldly chosen to write about a German naval officer in World War II. And despite the cover that depicts a U-boat and praise for the book that compares it to *Hunt for Red October* and *Das Boot*, McCain's novel is not simply a U-boat novel but actually encompasses a broad range of events that a *Kriegsmarine* officer might have experienced in the Second World War.

Young, idealistic, and proud naval officer Max Brekendorf starts off as a watch officer on board the pocket battleship ADMIRAL GRAF SPEE, where he participates in classic cruiser warfare, has a grandstand view of the Battle of the River Plate, and bitterly dissents from his captain's decision to scuttle GRAF SPEE rather than charge again into the overwhelming forces of the Royal Navy gathered outside the River Plate. Afterwards, Max manages to escape from South America and experience the furtive life of commerce raiding on board an armed merchant raider. After additional harrowing experiences in combat and the open sea, Max turns to the U-boat service, where he is immediately elevated to command, despite his complete lack of experience. Although his chances of survival are next to nil, Max survives a near-sinking during basic submarine training and his first war patrols to become a submarine warrior. He and his crew attack convoys and attempt to stay one step ahead of Allied anti-submarine warfare units.

McCain's novel jumps from experience to experience, at one point skipping 14 months of Max's life! Although this keeps the narrative flowing swiftly, it means jumping past some experiences that would have explained Max's success as a U-boat commander, particularly his first war patrol on board a U-boat. But this is a small quibble.

Max's experiences also show what life in Nazi Germany was like as defeat became more certain. As one might expect, Max is neither a Nazi nor a racist, but he has to constantly deal with the government he is sworn to serve. He survives a near-fatal experience with the *Gestapo* at one point, while his father is imprisoned for a relationship with non-Aryan. And Max also has to deal with fanatical Nazis in his crew, including his own First Watch Officer.

My only reservation with McCain's description is that he downplays the role of Nazism in the prewar *Kriegsmarine*. McCain correctly notes that the prewar *Kriegsmarine* forbade German naval officers from joining political parties or voting, and he also notes that some German naval officers, like GRAF SPEE's Captain Hans Langsdorff, chose to view their service as service to Germany and not to Adolf Hitler or his policies. But these men may very well have been in the minority. As Michael L. Hadley describes in his excellent history of U-boats and German culture, *Count Not the Dead* (1995), many former and current *Ubootwaffe* officers celebrated Hitler's rise to power and correctly credited him with resurrecting the U-boat force. A startling number of First World War U-boat aces became SS officers, while many younger pre-war German naval officers were ardent, if not fanatical, Nazis, including some of the top U-boat aces like Günther Prien, Joachim Schepke, and Wolfgang Lüth.

Ultimately, however, An Honorable German succeeds in allowing a reader to experience the history it relates in fiction. McCain's descriptions of life at sea are accurate, as are his scenes that display some of the more mundane details of life on board the warships he describes. Although there is an occasional error of detail, these are hidden in a sea of correct descriptions. And McCain has created a sympathetic – and honorable – protagonist who we come to identify with and care about. Although readers of naval history and naval fiction will devour *An Honorable German*, anyone who enjoys a gripping and enjoyable read will find this to be a rewarding book.

## WAR BENEATH THE WAVES

**By Don Keith**

*Published by April 2010 by Penguin Group, Inc. New York*

*Reviewed by Captain Bill Clautice, USN (Ret)*

War Beneath the Waves is a true story but has all the attributes of superb fiction. The main character, LT Charlie Rush (USNA '41), Chief Engineer and 4th officer on board the Australia based submarine, USS BILLFISH (SS 286), saves his crew and submarine after 14 hours of depth charging nearly 200' below test depth in Makassar Strait on Armistice Day, 11 NOV 1943. The Captain, XO and 3rd officer were incapacitated from foul air and fear. But how do you prove it really happened after 60 years of silence and no mention of the real story in the Patrol Report? When Captain Charlie Rush at age 84 was awarded the Navy Cross in Memorial Hall of the Naval Academy, the truth was told.

The author, Don Keith, although never a submariner, is an experienced storyteller and has written 4 books about submarines. After just a few hours of phone interviews with Captain Rush and extensive archival research, the accuracy and completeness is amazing. Even today, they have not met face to face and the first clue that *the story* had actually been published happened in April when a box containing 5 books was delivered on Charlie's doorstep.

Don Keith had 3 challenges in writing this story. First was to relate the story with fidelity. Second was to explain why the crew was silent for 60 years. And third was to recognize that, while some of the individuals acted heroically, others fell short and it is important to the families to present the shortcomings in the context of the harshest of conditions and to appreciate their subsequent contributions to the war and their country. My only suggestion for improvement would be to have included a chart of the area depicting the patrol track. However, I can't recommend this book

too highly, but one of my reasons is very personal and for this reason, what follows is not a classic book review.

Charlie Rush, an author himself (Strikers' Men and Battle Down Under), is a close friend of 25 years. I met Charlie in 1985 at a cocktail party for Floridians to meet their Congressmen in the Rayburn Office Building. In my summer whites, I was paying homage to Bill Nelson who had appointed our daughter and son to the Naval Academy. Charlie introduced himself as a former submariner now working for Autonetics. Four years later, at my Naval Research Lab Change of Command and Retirement Ceremony, Charlie and his wife, LaVonne, invited Joyce and me for a week in the Abacos aboard their 50' sailboat. After a few days of marvelous sailing, we were at anchor one evening telling sea stories, when Charlie (at age 71) related that fateful experience on his sixth war patrol 46 years earlier.

Despite my own experience of a WestPac deployment in 1961 on the Pearl based USS BASHAW (SS 241) and subsequently being Chief Engineer of that boat on a deployment off of Russia (before being called into the Nuclear Program), I had not previously heard this story. But I could certainly relate to it and understood the part Charlie played. What I didn't appreciate at that time was the fact that it was not known by the Navy Department and I was now one of the few who were even aware of it.

Five years ago, LaVonne called to say that Charlie was going to be awarded the Navy Cross at the Naval Academy and that his crew was having a reception for him that evening in case we would like to attend. Needless to say we flew from our home in Florida to be there. Charlie and LaVonne were staying near Annapolis with her daughter, who had cats ... to which Charlie was allergic. We invited them to stay with us in our Annapolis summer home. One evening, the girls had turned in and I asked Charlie, "why 60 years late?" He then related "the rest of the story" which had not been mentioned to me in the Abacos 13 years earlier.

After 14 hours of depth charging, a J.O. offered to take the dive and Charlie climbed into the Conning Tower to report his relief. What he saw was shocking ... no helmsman, the XO sitting

on the deck nearly unconscious from the lack of oxygen and the CO in a fetal position muttering to himself. The third officer had earlier *lost it* and was in his bunk sedated by the corpsman. Charlie announced to no one in particular, "I have the Conn." He called for a helmsman and looking at the DRT, realized that BILLFISH had been on a steady course for over 14 hours. With a suspicion that a fuel ballast tank was leaking oil to the surface, providing the 2 Japanese destroyer with a perfect datum, Charlie ordered the helmsman to perform a *button hook* (later named a Williamson Turn) to reverse course and open under the oil slick track. Bottom line is that this maneuver left the Japanese depth charging the same position for several more hours during which BILLFISH opened. When the batteries were depleted and air so foul that he was becoming dizzy, Charlie gave the order to come to periscope depth and surface.

The seas were so calm that he ordered the forward and after hatches opened with the main induction closed to draw fresh air throughout the boat and supply air to one of the four main engines not flooded out. Still in danger from detection by Japanese spotter aircraft and shipping, they fixed what they could, including the other three main engines, and pulled one main motor back on its mounts with chain falls after it had sheared the mounting bolts. After a day or so, BILLFISH and crew were able to continue toward their rendezvous with BOWFIN to sink ships.

When a message was received about a convoy of 5 ships escorted by 2 Japanese DDs, Charlie was OOD with only the Captain on the bridge. Charlie headed for the convoy but the Captain ordered a course reversal to open. Charlie confronted the CO that this was not right. They needed to attack and be prepared to assist BOWFIN who couldn't dive because their main induction was hit by gunfire and could not be shut. At first, the Captain agreed turned toward and then again turned away saying he couldn't close. Charlie asked permission to take the Conn and attack. The skipper said he couldn't do that but promised that if they made it back to Fremantle he would resign his command. When they returned to port with 24 of 26 torpedoes still on board (2 failed in a long range attack on another ship), the skipper

resigned and the crew said nothing to avoid casting doubt about other wartime submarine skippers. Their CO wrote a *minimal* (false) patrol report leaving out the details of 11 NOV 43 and the other lost opportunities.

Forty-eight years later, Charlie was visiting a classmate in CA, Captain Jack Bennet, who had received the Navy Cross himself for action in a vicious sea battle at Guadalcanal. He wrote several citations based on the courageous actions he witnessed on the burning decks of his ship and was determined that men receive the recognition due them for actions in battle. Despite all he had seen in war, he was amazed at the BILLFISH story. He then visited a BILLFISH crewman on that patrol, Chief John Rendernick, who coincidently lived nearby. After hearing his version of the story, Bennet was convinced that these men deserved proper recognition and personally wrote a citation to award Charlie the Navy Cross. He first considered the Medal of Honor but the action must be observed by a senior officer. Since all 3 had passed away by then, this requirement could not be met. However, given that the crew verified what happened, the decision was made to award Charlie the Navy Cross (second highest award), of which only about 6,000 have been awarded since its inception in 1919.

Charlie felt it was important that two of the crew be recognized for their damage control efforts in saving the ship, so he wrote their recommendations. Chief Engineman (SS) Charley Odom (now 97) received a Commendation and Chief Electricians Mate (SS) John Rendernick was approved for the Silver Star (3rd highest award in the Service) but died of cancer before it was awarded. RADM Paul Sullivan representing the Secretary of the Navy presented the Navy Cross to Charlie at the Naval Academy. Later, in 2004 the Damage Control Wet Trainer at Pearl Harbor was renamed in honor of Chief Rendernick by RADM Sullivan, then COMSUBPAC, at a ceremony with Rendernick's daughter present.

Today, Charlie Rush at age 91 lives in Port St. Lucie, FL with his bride of 34 years who will celebrate her 80th birthday in October. When I asked him to speak at a Space Coast NSL luncheon 2 years ago, he agreed. In addition to many local

submarine retirees, the entire wardroom of the Naval Ordnance Test Unit at Cape Canaveral attended. However, in his remarks, Charlie did not mention one word of his experience on BILLFISH or QUEENFISH, which he later commanded during the Korean War. But rather, he gave detailed accounts about the best submarine CO he had ever served under .... Moke Millican, who was CO in 4 of Charlie's 5 patrols in THRESHER (prior to BILLFISH). While I was a little disappointed that Charlie did not relate his personal stories in his talk that day, looking back I should have expected nothing less from this humble hero of WWII. He didn't even tell me about War Beneath the Waves. Last month, my dermatologist mentioned that he had just read about a new book telling the story of a WWII submariner who had been awarded the Navy Cross 60 years late. I told him about Charlie and asked the name of the book. It was not yet in our public library so I ordered it that day from Amazon.com. After reading the book I called Charlie to chastise him for not keeping me informed. Since they were going to be in Annapolis the following week, I invited them for lunch. I also invited Sam Ginder (USNA'51) and his wife, C.J., since Sam wrote a marvelous book in 1995, McKinnon's Way (a WWII submariner's story). What an experience to have these two authors meet each other in our home and to see the respect shown. Charlie has since read McKinnon's Way and called me yesterday to get Sam's phone number to compliment him on his fine book.

We have all heard about the *greatest generation*. Nowhere was this more true, than in the Submarine Force. We stand on their shoulders. During the 1347 days of WWII, 465 submarine skippers took 263 boats into battle on 1736 patrols with 16000 submariners aboard. Of those 263 boats, 52 were lost and 3600 men went on *eternal patrol*. The Submarine Force was less than 2% of the Navy but responsible for 55% of Japan's maritime losses (1200 merchant ships and 200 naval vessels). President Roosevelt said, "I can only echo the words of Winston Churchill, never have so many owed so much to so few."

**NAVAL SUBMARINE LEAGUE**

**COMPARATIVE STATEMENT OF FINANCIAL POSITION**

| | 31-Mar-09 | 31-Mar-10 |
|---|---|---|
| **ASSETS** | | |
| **CURRENT ASSETS** | | |
| Cash | $ 182,663 | $ 163,031 |
| Cash Equivalents | 24,177 | 24,211 |
| Accounts Receivable | 6,379 | 16,504 |
| Investments at Market | 274,708 | 379,448 |
| Prepaid Expenses | 7,156 | 8,825 |
| Total Current Assets | $ 495,083 | $ 592,017 |
| **FIXED ASSETS** | | |
| Furniture & Computer Equipment | 36,359 | 36,359 |
| Office Condominium | 251,021 | 251,021 |
| | 287,380 | 287,380 |
| Less Accumulated Depreciation | (162,310) | (168,875) |
| Total Fixed Assets | 125,070 | 118,505 |
| | $ 620,153 | $ 710,522 |
| **LIABILITIES** | | |
| **CURRENT LIABILITIES** | | |
| Accounts Payable | $ 0 | $ 0 |
| Accrued Expenses | 4,392 | 0 |
| Deferred Income | 87,731 | 69,900 |
| Deferred Membership Dues | 64,277 | 61,504 |
| Rental Deposit | 675 | 675 |
| Total Current Liabilities | 157,075 | 132,079 |
| **LONG-TERM LIABILITIES** | | |
| Deferred Membership Dues | 219,579 | 220,758 |
| Total Liabilities | 376,654 | 352,837 |
| **NET ASSETS** | | |
| **UNRESTRICTED** | | |
| Undesignated | 222,349 | 336,535 |
| Board Designated for Equipment | 21,150 | 21,150 |
| **RESTRICTED** | 0 | 0 |
| | 243,499 | 357,685 |
| | $ 620,153 | $ 710,522 |

NAVAL SUBMARINE LEAGUE

COMPARATIVE STATEMENT OF ACTIVITIES
For The Year Ended: 31 March 2010

| REVENUES | Restricted | Unrestricted | 31-Mar-09 Total | 31-Mar-10 Total |
|---|---|---|---|---|
| Contributions | | | $230,312 | $162,651 |
| Dues | | | 81,275 | 67,678 |
| Annual Symposium | | | 215,510 | 265,356 |
| Subtech Symposium | | | 293,913 | 282,926 |
| History Symposium | | | 3653 | 4500 |
| Bank Interest | | | 0 | 0 |
| Interest & Dividends | | | 15,755 | 9,022 |
| Advertisements | | | 26,100 | 31,886 |
| Rent | | | 8,640 | 8,640 |
| Realized & Unrealized Market Gain (Loss) On Investment | | | (112,489) | 95,750 |
| Royalties | | | 0 | 1,211 |
| CB Days Receipts | | | 43,500 | 58,750 |
| Other | | | 3,719 | 7,477 |
| Total Revenue | | | 789,888 | 995,847 |
| EXPENDITURES | | | | |
| Awards and Grant | | | 28,667 | 9,370 |
| Publishing | | | 85,924 | 93,099 |
| Promotion | | | 83,064 | 87,000 |
| Annual Symposium | | | 224,334 | 259,953 |
| Subtech Symposium | | | 230,984 | 218,972 |
| History Symposium | | | 6245 | 8581 |
| Chapter Support | | | 16,279 | 17,549 |
| Total | | | 675,497 | 694,524 |
| SUPPORTING SERVICE | | | 224,814 | 187,137 |
| Total Expenditures | | | 900,311 | 881,661 |
| INCREASE (DECREASE) IN NET ASSETS | | | (110,423) | 114,186 |
| NET ASSETS, BEGINNING OF YEAR | | | 353,922 | 243,499 |
| NET ASSETS, END OF YEAR | | | $243,499 | $357,685 |

**NAVAL SUBMARINE LEAGUE**

**COMPARATIVE STATEMENT SUPPORTING SERVICES**
**For The Year Ended 31 March 2010**

Detail of expenses for Supporting Services in the Statement of Activities follows:

| | 31-Mar-09 | 31-Mar-10 |
|---|---|---|
| **SUPPORTING SERVICES** | | |
| Accounting/auditing | $ 6,560 | $ 6,810 |
| Bank Charges | 18,288 | 12,825 |
| Depreciation | 8,155 | 6,565 |
| Equipment rental & repair | 6,409 | 5,913 |
| Miscellaneous | 1,877 | 1,998 |
| Office Supplies | 6,621 | 10,639 |
| Payoll Taxes | 16,188 | 13,651 |
| Casual Labor | 2,016 | - |
| Postage | 9,111 | 12,063 |
| Printing | 7,338 | 299 |
| Fees | 7,340 | 7,143 |
| Telephone | 3,451 | 3,568 |
| Transportation | 2,169 | 2,785 |
| Wages | 113,667 | 88,724 |
| Memberships & Subscriptions | 1,522 | 1,870 |
| Office occupancy | 7,091 | 8,007 |
| Computer Install/Training | 1,312 | 344 |
| Investment expense | 1,383 | - |
| Insurance | 4,316 | 3,933 |
| Total | $ 224,614 | $ 187,137 |

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FIRST PLACE
**Rear Admiral Jerry Holland, USN (Ret)**
**Reflections On The Cold War At Sea: Part One**
**"Up Scope For A Look Around"**

SECOND PLACE
**Mr. Mark C. Jones**
**"Experiment at Dundee: The Royal Navy's 9th Submarine Flotilla And Multinational Naval Cooperation During World War II"**

THIRD PLACE
**Commander John Alden, USN (Ret)**
**"Downed by a Dud"**

LITERARY AWARD FOR BEST ARTICLE
BY AN ACTIVE DUTY AUTHOR
**Lieutenant Commander Jon Walsh, USN**
**"Close-Aboard Ranging with the Periscope"**

*UNDERSEA WARFARE PHOTO AWARDS*

FIRST PLACE
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HONORABLE MENTION
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