APRIL 2004


YOU CAN'T SEE IT. YOU CAN'T FEEL IT.
SO, YOU'D BETTER BE ABLE TO DETECT IT.
The 21st century's rapidly changing threats demand warfare systems that are easy to upgrade and adapt. The Acoustic Rapid COTS insertion program leverages the latest computer hardware and software to track a submarine's stealthy opponents. Lockheed Martin, along with U.S. Navy, industry, small business, and academic teammates, delivers transformational capabilities to the U.S. submarine fleet using a revolutionary approach on an unprecedented scale. Innovative integration. Application of new commercial technology. Collaboration. Helping to detect and defeat enemies more efficiently and cost-effectively than ever before.
LOCKHEED MARTIN
We never forget who we're working for™

EDITOR'S COMMENTS

The FEATURES and ARTICLES in this issue reflect a broad sweep of the broad issues being faced today by the submarine community. First among the FEATURES we have the presentation made to the Corporate Benefactors by the Hon. Michael W. Wynne, Acting Under Secretary of Defense for Acquisition, Technology and Logistics. His *down-to-business-points* address the capabilities and affordability of the VIRGINIA class. His is a very important message for the submarine community. It seems imperative that we all understand the new world of *capability-based planning* for national security forces. A closely related matter is covered in an ARTICLE about DOD's requirement for 55 Attack Subs reprinted from Inside the Navy. Their reporter covered the NSL's Capitol Chapter Luncheon in January at which VADM Stanley Szemborski addressed *capability-based planning* and noted that a new study had been ordered to cover the "whole undersea mission area to include force objectives.

Our second FEATURE is a report on the "State of the Force by VADM Kirk Donald, Commander, Naval Submarine Forces in which he covers the problems being tackled by the Force as well as the accomplishments being achieved. This is also a *vision* statement with an outline of the road map for how we will get there. The third FEATURE is Part I of two parts of a paper by the Lexington Institute about the *capabilities* of modern submarines in relation to our new strategic environment and why they should be the *Weapons of Choice*. Closely coupled to all of these views, from the Secretary of Defense's Office, through ComNavSubFor's "State of the Force report to Lexington's opinion of the future, is an ARTICLE from Steve Lose, one of the managers in the Naval Sea Systems Command responsible for the VIRGINIA, about the ship's Command and Control Center. It's a deck plates view of the sharp end of future *undersea capabilities*.

Then there are two FEATURES of considerably broader concern. Jerry Holland has taken on the task of putting *real transformation* into real submarine terms. His point is that we have done it before

and are doing it again—and will continue to do meaningful *transformation.* Again, here is a concept with which the entire submarine community must be familiar, and be able to discuss in a positive manner. The last FEATURE is by Bill Norris, one of our more experienced nuclear weapons experts, and concerns NATO. It is a timely part of this treatment of *who we are, what we do and how we do it* because of the national discussion about coalition warfare and because, as VADM Donald puts it, today's "officers are more joint, more educated and...more worldlier than we were. They have to be knowledgeable about the way nation's alliances are *transforming* themselves because that will be critical to the way submarines have to work in the future.

There are two other parts of this *broad* picture touched upon in this issue. One has to do with one of the most dramatic Arctic ice operations and is re-published here to remind us all that control of those waters is not simple, but neither can we ignore the need to operate there. We do have to remember that the only submarine force in the world which can mount an appreciable attack on our homeland is home ported just on the other side of all that ice. The other reminder is John Merrill's piece about Matthew Fontaine Maury and what one naval officer did, using his interest and initiative, to bring about a whole new science and vastly improve man's ability to control the sea.

There is also a DISCUSSION between Norman Polmar and Jerry Holland about that perennial issue of whether we should build big submarines or small submarines. This contrast in opinion has a lot to do with money and is as old as the US Navy itself. Anyone with a position in this discussion is invited to join in.

And finally, do not miss Bill Grieves's Skipper's Tribute.

Jim Hay

FROM THE PRESIDENT

The Naval Submarine League completed its fiscal year on 31 March 2004. We have a surplus of approximately $10,000 following six years of deficits totaling over $387,000. This year your Board of Directors approved a budget with a surplus of approximately $66,000. After a lot of hard work the League is definitely on a path to fiscal recovery.

Our Corporate Benefactors continue to be the backbone of our organization. Now numbering 81, we added fourteen new members to our rolls in the past 15 months. Together they contribute over $130,000 to our budget and provide additional support with in-kind contributions and sponsorships of some of our events. Last year we had the first ever sponsor for symposium events and also for one of our N77 activities. We also have received additional Information Technology (IT) equipment as donations. At the Corporate Benefactor Recognition Days luncheon we honored thirteen corporate benefactors for 20 years of support to the Naval Submarine League.

Our new IT capabilities are being used to improve support to members and Chapters with better web page support and online registrations for the Submarine Technology and Annual Symposiums. A Corporate Benefactor is upgrading our web page and designing new ways to support our overall operation through a web-based database. We will make an announcement when the new look and support is on line. A broadcast capability supported by Constant Contact has been introduced to help disseminate information about events and promulgate the NSL UPDATES. It is more important than ever that we have your email address to ensure that you receive the maximum benefit from your League membership.

The Corporate Benefactor Recognition Days held 16-17 February 2004 was another successful event. The active duty submarine Flag Officers and guest speakers were the centerpiece of the event. Over 140 members of our submarine support community and individuals representing 62 corporations attended. The opportunity to interact with the active duty Flag Officers at a reception following Admiral Skip Bowman's remarks was one of the highlights of the event and provided a good return on the corporate investments in our League.

The Submarine Technology Symposium will be held at The Johns Hopkins University Applied Physics Laboratory on 11-13 May 2004. We have an exceptional slate of speakers including Admiral Skip Bowman, Admiral Vern Clark, and the Submarine Force leadership. Our Banquet speaker is the Honorable John Young, Assistant Secretary of the Navy for Research, Development and Acquisition. This year's theme, *"Development and Demonstration of Submarine Technology in Support of Fleet Operations"* focuses on how technology insertion complements the Fleet and brings them closer to being an integrated team player. This classified event is limited to the first 500 attendees because of the size of the auditorium. Be sure to use the online registration early to secure your seat; http://www.jhuapl.edu/sts/.

Our final event for this year will be the Annual Symposium held again at the Hilton Alexandria at Mark Center in Alexandria, VA on June 9-10, 2004. Our Distinguished Submariner this year will be a tribute to *"The Submarine Family"*. This year we will feature a report on the VIRGINIA story, inception to Sea Trials. We will recognize six outstanding officers and sailors and our Distinguished Civilian during our annual awards luncheon. I hope you will attend this event. Watch for the mailing of our registration package later this month.

Thanks for your support of the Naval Submarine League. Please recruit another member.

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

J. Guy Reynolds

THE SUBMARINE REVIEW IS A PUBLICATION
OF THE NAVAL SUBMARINE LEAGUE

NAVAL SUBMARINE LEAGUE • Box 1146 •Annandale, VA 22003
(703) 256-0891 Fax (703) 642-5815 E-mail: subleague@starpower.net
Web Page: www.navalsubleague.com


The sea dominates the Earth
This dominates the sea.
NORTHROP GRUMMAN
Newport News

FEATURES

AT A CRITICAL JUNCTURE

Honorable Michael W. Wynne
Acting Under Secretary of Defense
(Acquisition, Technology & Logistics)
Remarks at Naval Submarine League Corporate Benefactor Days

I stand before you today and proudly look back at the great achievements and great service that our 'Silent Service' has provided our country; and I worry about the future as I evaluate the replacement rate being offered, and wonder if there should be an 'Augustine Law' applied to Submarines. That would be that there would eventually be a single submarine sailed by all the crews that would cost as much as the defense budget; and that the submarine would be all electronics. As you know it takes a long time to design and develop a submarine, and the replacement rate is somewhat definable by the build rate. The Navy has to decide how many ultimately will sail the seas, and what age is tolerable. Frankly due to your good work, that age is lengthening, as it is across our force structure. But, lest I digress too much–Recall. . .

America has a number of strengths that make us the leader and the envy of the world. Prominent among these strengths is our industry–our ability to design and build things of incredible complexity and utility. You built and equipped NAUTILUS and SEAWOLF and several classes of nuclear-powered submarines in between. As we meet here today, the artisans and craftsmen of Electric Boat and Northrup Grumman are applying the finishing touches to USS VIRGINIA as her reactor is critical and steam flows through her engine room. JIMMY CARTER is competing with VIRGINIA to see which will get to sea first. Though this is a "submarine audience, I know that many of you were involved in building and equipping ENTERPRISE and then NIMITZ. Now CVN-21 is taking a remarkable and promising shape on the drawing boards of the best engineers in the world. It's a great honor to discuss this with you.

Our Nation is continuing a healthy and energetic debate to determine the shape and size of our armed forces, including the Submarine Force. SSBNs prove during every moment of every day that they are the cornerstones of America's national security. The TRIDENT submarine also provided the platform for one of our most significant transformational weapons systems, the SSGN. I will spend most of my time with you, however, on the current debate surrounding attack submarines.

I want to convey 4 messages. My first message is that I understand and appreciate the post 9/11 relevance of the Submarine Force. My second and third messages are more down-to-business: a few thoughts on the capabilities and affordability of VIRGINIA. Lastly, I will attempt to avoid touching the third rail and talk about the submarine build rate.

II. Submarine Force Relevance

Let me begin by giving you my view of the relevance of nuclear powered attack submarines in today's security environment.

Today's Submarine Force contributed significantly to Operation Enduring Freedom and Operation Iraqi Freedom. About one-third of the 800 Tomahawks fired in Operation Iraqi Freedom were launched from SSNs, including two British SSNs. In addition to performing Intelligence, Surveillance and Reconnaissance, Anti-Submarine Warfare, Anti-Surface Warfare, Maritime Intercept Operations, Tomahawk Strike and other operations in conjunction with Operation Iraqi Freedom, attack submarines are providing continuous coverage of highly important national missions around the world.

Endurance, persistence, firepower, and agility are critical attributes to submarines, but it is the stealth provided by the undersea battlespace that enables the submarine to carry out its mission effectively. Undersea platforms are virtually undetectable by other forces and their sensors, enabling them to move with impunity–covertly when required or overtly if desired–inside the adversary's threat envelope in advance of less survivable joint forces. Stealth enables power projection from close in, be it deployment of Special Forces or onboard weapons. Your ships bring tremendous capability to the battlespace.

III. Weapons Systems Capabilities

Today, relevance means capabilities. September 11th taught us that the future holds many unknown dangers that we must prepare for. We must have the capabilities and force structure that can adapt quickly to new challenges and to unexpected circumstances. To spearhead this change, last year Secretary Rumsfeld issued Transformation Planning Guidance to lead the Department of Defense to meet the new world order. Each of the services has accepted his challenge to transform the defense establishment. Together we have shifted more than $500 billion over the FYDP to transform our armed forces. And there is more to do.

The 2001 Quadrennial Defense Review established a framework for adapting the U.S. defense posture to a security environment primarily characterized by uncertainty. Future military threats were identified as general trends because the fluid nature of our security environment makes it difficult to predict when or where armed conflict might actually occur. So the QDR embraced capabilities and *capabilities-based planning*, a concept that focuses on achieving key military goals regardless of the specific circumstances. We know that the threats are dispersed and the spectrum of warfighting has expanded dramatically. Our response needs to be dispersed as well, both in a geographic way where we must move quickly to the furthest reaches and act decisively–and in a tactical way where we must be able to act from domains where our enemies have no counter.

We put a premium on capabilities such as deception . . . surprise . . . persistence . . . adaptability . . . and precision firepower to meet these challenges. Each of these capabilities is inherent in large measure in our nuclear-powered submarines.

To achieve our goals and maximize our effectiveness and capabilities, we are moving in a big way to interoperability and networking together systems of systems. I call this knowledge-enabled warfare. Everything is a sensor, with some sensors as shooters, everyone has an IP address on the net, data is fused into actionable knowledge, the kill cycle is shorted from sensor to shooter to target, shooters are dispersed, fires are massed, battle damage assessment is instantaneous.

Tomorrow's submarine promises even greater capabilities and greater relevance from the outstanding contributions I have just described. The Virginia class was conceived in the early 1990s with the littoral battlespace in mind. The design has extensive modularity to allow for future evolutionary modifications. The open systems architecture and COTs-based processors that you pioneered in SSN sonar and combat systems will be even more robust in this design. VIRGINIA's C4I package promises to be revolutionary. I look forward to the ship's arrival this year.

I must also mention that the introduction of SSGN will offer the combatant commander incredible capabilities. It will be an awesome platform with its 24 large and versatile ocean interfaces, and an unprecedented ability to deliver weapons and sensors from beneath the littoral sea.

IV. Affordability

Now let me move on to affordability.

Last month the Department of Defense signed a mulit-year contract to purchase 5 VIRGINIA's over the next 5 years. This multi-year procurement is expected to save $400 million over the previous arrangement of a *block buy*, which itself would have saved us money over a regular one-per-year acquisition strategy.

This is great news. It moves us in the right direction for affordability. However, VIRGINIA still costs $2.2 billion per submarine. The question of affordability is posed as "what needed capabilities do we gain for the money we'll invest? Let me make three points related to capabilities-for-dollars invested.

> *First*, there is a new avenue developing within the Department to shape and express the answer. Proponents of VIRGINIA should welcome this opportunity. This new process is called, the Joint Capabilities Integration and Development System (JCIDS), under development within the Joint Staff. If there is a joint capability gap that can only be filled by VIRGINIA and with the force structure numbers the Submarine Force argues for, then the JCIDS process will not only

make this clear, but the result should also allow VIRGINIA to be shown as very affordable. I suggest whole-hearted involvement in this process.

Second, I think any case to be made for the affordability of VIRGINIA hinges on its modularity of design and construction. As you're aware, this feature will allow timely insertion of new, genuinely needed technologies as future hulls are being built. This is certainly a strong example of evolutionary acquisition. We need to exploit this advantage with frequent, meaningful updates that will keep the class on the forward edge of technology and relevance without the need for a huge investment that would result from starting all over again. As I mentioned earlier, one of the most important capabilities to pursue is enhanced connectivity. Everyone is a provider and everyone is a user of network information. Industry must work with warfighters to determine what they need from the network and what data they can provide to the network. You are already keen in this area. Great resources to compliment your work are the Defense Science Board and DARPA. Keep thinking outside the box. Initiatives from industry will have a very positive impact on affordability. When other platforms and systems across the services reach obsolescence because they lack an inherent ease of technology insertion, a well-developed VIRGINIA program may become an attractive place for increased investment.

Third, we must add to the affordability of this remarkable ship by finding and highlighting ways to reduce total lifecycle costs, both by new designs and existing designs. VIRGINIA shows great promise here by virtue of its sophisticated yet simplified design–fewer valves, pumps, and motors, and a smaller crew. As we collect real data from real lifecycle time, we need to make clear what we've found. You have already shown a

> great ability to engineer and streamline the maintenance plans of the Los Angeles Class and Trident submarines. I know we're at the beginning of that process with the SEAWOLF class.

V. Build Rate and Force Structure

I would like now to comment on VIRGINIA build rate–what do we have to do to increase to 2 per year? In many ways, I am an observer to the requirements process but I would be happy to provide my personal views.

The Department went forward with a plan to begin advance procurement in FY2007 which would lead to the authorization of 2 hulls per year in FY2009. As you know, the congress rejected the proposal. At the same time, the multi-year buy was approved, netting the significant savings I mentioned earlier. As the Congress made these two decisions, the Appropriations Conference Report expressed their rationale:

> "The conference did not lightly agree to the Navy's request for multi-year procurement for this program. . . The House and Senate Committees on Appropriations have maintained that multi-year procurement authority should be granted in situations in which the Service has accepted a fully tested and proven system and a production capability has been fully established.

So I think we did pretty well this round. We have multi-year authority before a single ship has gone to sea. As far as I know, that's pretty rare for a program of this size. Futhermore:

> ". . . the Committees on Appropriations will . . . reexamine the decision to grant multi-year procurement authority if program milestones are not met or costs escalate.

Once we deliver, the door could be open. We should consider the multi-year authority a great accomplishment, a great vote of

confidence by the congress, and yet a great opportunity to perform up to their level of confidence.

So given this baseline, what do we do to get to 2 ships per year? Part of the answer is the need to get a strong demand signal from the Combatant Commanders. In this regard, the silent service cannot be silent.

First, get the lead ship out to sea. When VIRGINIA goes to sea, demonstrate the richness of needed capabilities that the Submarine Force leadership promised it would bring to the joint battlespace. Better yet, get it into the hands of the combatant commanders. Give them a chance to become your ardent advocates. As the compelling story comes together, we need industry to work with the Congress to help them understand the advanced and additional capabilities that VIRGINIA brings above and beyond other platforms.

Second, recognize that the Nunn-McCurdy breech will be remembered by some. To preserve the program at one ship per year, and move ahead to 2 per year, we must demonstrate beyond reproach that the program's costs are firmly under control. As your VCNO, Mike Mullen, said to an industry group last week, "you must deliver on cost and on schedule. Congress also called for a fully established production capability from industry.

I think these two stipulations, that VIRGINIA demonstrates its promise to the warfighter and that we can demonstrate costs under control, are reasonable, and I'm confident we can live up to them. We need to genuinely check these two blocks because a sufficient force structure of very capable attack submarines is so important to our national security.

Let me conclude by tying together my 4 points. For now, the Los Angeles class is very effectively carrying a huge burden at every corner of the world. When VIRGINIA goes to sea just a few months from now, the burden will begin to shift. The real value of VIRGINIA class, that is, the essential capabilities delivered for the dollars invested, should become apparent. And as VIRGINIA class proves itself, moving to a two ships per year will gain more and more advocates. For the longer term future, a focus on breaking the cost spiral though innovative design will be mandatory. Investing in reducing total life costs within the present and future fleets will also be a challenge. These are mandatory for the force structure to retain

its robustness. These are tall challenges. I offer no promises, but I think the Submarine Force and its industry partners are up to the task.

Thank you very much for this opportunity to speak to the Corporate Benefactors of the Naval Submarine League. Thanks for what you do to keep America Free, and God Bless.

NAVAL SUBMARINE LEAGUE CORPORATE BENEFACTORS RECOGNITION DAYS 17 FEB 2004

Vice Admiral Kirk Donald, USN
Commander Naval Submarine Forces

It is a pleasure to be here. Admiral DeMars, Admiral Bowman, Admiral Reynolds, Corporate Benefactors, fellow flag officers, and guests ... this is a true pleasure. My first opportunity in front of this august group. First of all let me start off by thanking the Naval Submarine League not only for sponsoring this event, but more importantly, for really serving as one of our touchstones for remaining connected to our past, present, and future. Whether it be through meetings like this, symposia, regional chapter luncheons, or The Submarine Review, the League keeps us all informed, they keep us interested, connected, and quite honestly, proud to be Submariners. Keep up the great work! I like to give a special thanks to Mr. Mickey Garverick and his staff for organizing this event. And I will just go ahead right off the bat and check the block, and thank the Corporate Benefactors, what you do is critically important to what we do, and I thank you.

I look at this opportunity to not only do those special thank yous that we need to do for great people that have supported us all these years, but really also to give you a "State of the Force at least from my perspective as Commander Naval Submarine Forces. And I will just go ahead and get to the bottom line up front – And that is that the Force is *READY*, the Force is *CAPABLE*, and we're getting better everyday. Now I have made my way around to homeports, ships, shipyards, and what sometimes seems to be my second home here in Washington DC. What I see are motivated sailors and they are eager for the challenges we give them. We have well maintained and modernized ships out there, world class support facilities, and

some exciting technologies. I also see many challenges. I will include a status on some of these key issues and some of the challenges we face in my remarks.

We commissioned USS HOLLAND in 1900 and have maintained a steady pace of submarine building ever since. My historians tell me this is true, but did you realize that, until the most recent submarine building holiday following the Cold War, the longest gap between commissioning a submarine was two years, and that happened between 1905 and 1906. It is hard to believe, but it has been 5 years since the last submarine, USS CONNECTICUT, was commissioned. That is about to change. I have had the opportunity to visit Electric Boat, Northrop Grumman/Newport News, and Quonset Point construction yards, and if you haven't had a chance to do that, you really need to. It is so impressive. They are using revolutionary techniques in building ships. We are going to commission VIRGINIA in, as appropriate, Norfolk, VA this summer; We will christen and deliver JIMMY CARTER; will christen TEXAS; and will lay the keel for NORTH CAROLINA all in 2004. As Admiral Bowman mentioned last night, we have 11 submarines under construction or contract. Let's don't forget, we also have OHIO and FLORIDA, our first two SSGNs, which are well into their refueling and conversion and on track to deliver in 2007. The last time, again my historians tell me, we had this many submarines under construction was in 1996.

What else looks different this year? The Submarine Force is integrated into the Fleet Response Plan. And what the FRP is, it supports flexible rotational deployments while also giving you a robust surge of Naval forces to meet emergent requirements. Now, the Submarine Force had a running start at the advent of this concept, and we ought to take credit because a lot of foresight was done by some of the leaders who are sitting in this room right now. They did the hard work several years ago at the end of the Cold War to align our deployment, our training, and our maintenance processes to efficiently deliver as much forward presence as we could with our force structure, and to implement an orderly, objective, building block approach to developing readiness during our interdeployment cycle. Capitalizing on that work, we demonstrated a robust surge capacity during OPERATION IRAQI FREEDOM. In

the Atlantic, two submarines were surged and two others left early on deployment; you can call that a surge. In the Pacific, four submarines were surged to support both OPERATION IRAQI FREEDOM and Western Pacific commitments. We had a total of 17 submarines operating forward on March 19, the day hostilities commenced, and we could have surged more if that had been required.

Now we have been able to synchronize our model of the Fleet Response Plan with that of the surface and air forces such that we are an integral part of every Carrier Strike Group and Expeditionary Strike Group. When a submarine returns from deployment, we immediately designate them as *emergency surge ready*, which means they would be one of the last to go in the event we had to surge. During their maintenance availability, they become *not ready* while they are getting their deep maintenance and modernization. Following their maintenance, they again become *emergency surge ready* while they are training to raise their proficiency. And then finally, about six months prior to deployment, they will be called *surge ready* and they would be among the first to go. *Emergency surge* and *surge* readiness are directly related to the proficiency of the crews in their individual warfare areas. Now we are executing the Fleet Response Plan, at the same time we strive to meet theater and national demands for independent submarine operations. We recently completed the calendar year 04 Submarine Deployed Presence Allocation Process, it is a Joint Staff led process, and if you look at the rules for deployment length, PERSTEMPO, and the like and you look at our force structure and our depot maintenance loading, we are able this year to generate a forward presence of about 9.0. That is compared to the Combatant Commanders requirements of about 12.

Now, I am not going to tell you we have the merger of the Fleet Response Plan and our independent submarine deployments all figured out. We are always having to address competing demands and too few ships. In fact, my schedulers have accused me of taking away their Excel spreadsheets and replacing them with Ouija boards and chicken bones. The force is working closely with the CSG and ESG Commanders, the Numbered Fleets, and the Combatant Commanders to distribute this presence as efficiently as we can, as

effectively as we can, all the while managing expectations as to what and when we can deliver.

We are having some successes. The ESG and CSG commanders that I have talked to are pretty pumped up as well. PELELIEU ESG, RADM Bob Conway, actually had tactical control of USS PHILADELPHIA during our first real world operation involving Special Operations Forces employed from the submarine using the Dry Deck Shelter and the Swimmer Delivery Vehicle in support of the Global War on Terrorism. Rear Admiral "Gronk Bullard, the JFK Carrier Strike Group Commander, is integrating USS TOLEDO, equipped with a sophisticated Information Operations suite and armed with tactics, techniques, and procedures that have been derived from recent fleet experimentation. His Carrier Strike Group is going to focus on IO as a mission area in its upcoming deployment. CONNECTICUT is deploying with the WASP Expeditionary Strike Group. In this strike group, they are going to focus on organic strike in support of expeditionary forces. We are also trying to integrate, in fact successfully so, with strike forces in the virtual world. We invested for years in high fidelity shore based trainers and access to high bandwidth connectivity, so that we can participate in the synthetic battlespace like the Third Fleet sponsored Multi Battle Group Inport Exercise. There will be three Carrier Strike Groups merged together in the virtual environment and they will participate to include the crew of USS MONTPELIER operating out of Submarine Training Facility, Norfolk.

The linchpin, as we all know, to all of our success has been, is, and will continue to be our great people. How many of you noticed USS MEMPHIS Sailor of the Year, MM1 Stephen Kuczirka, seated next to Mrs. Bush at the State of the Union Address? Sharp looking Sailor! We continue to enjoy a healthy recruiting and retention environment.

If you look on the enlisted side, we continue to see a positive trend in retention numbers. In fact, so much so that in 2002 we actually lowered the Selective Reenlistment Bonus in an effort to drive retention numbers a little bit lower. And if you look at our manning right now, at sea, we are typically over 100% on the SSBNs and SSNs. We actually did want to drive those numbers a little bit lower, and it did have the desired effect, but only tempo-

rarily, what we didn't count on was the spring-back that we saw in 2003. Now I am not exactly sure why that spring-back occurred, other than we do deliver a pretty good product to our sailors, there is a good quality of service that they are experiencing out there, OPERATION IRAQI FREEDOM could have something to do with it, and the job market, depending on how you look at it. What we do know is that we have the opportunity to define our human resources strategy such that we have some selectivity so that we can keep and develop the right people for our future Force. Our personnel strategy is also producing some positive results in our officer corps. Retention is slightly higher than we predict necessary to man our future Force and it looks like we are on track to maintain those numbers. I was just at Service Selection Night at the Naval Academy, a week ago last Friday night, where I saw 123 very young looking First Class Midshipmen who, Admiral Bowman informed me, all had better class standings than I did.

Our O-6's today look different from what they did just a few years ago. They are undersea warriors, to be sure, but we are also requiring them to master a much broader set of skills. These officers are more joint, more educated, and with no intentional disrespect to present company, they are probably a bit worldlier than we were. Our officers are better prepared to lead across a broader spectrum of joint warfighting. They are also more broad and versatile staff officers. But that comes with a downside. That is the sheer competition for their time and the risk that they become "Jacks of all trades, and masters of none. And that competition gets more intense by the day. Just for an example, for an O-6 to be promoted to Flag rank on the FY08 O-7 selection board, he will have to be a Joint Specialty Officer (JSO); that means a full joint tour, joint professional military education phases I and II, a little over a years worth of work, and he has to be screened as a JSO. Additionally, if you listen to the Navy vision for the future, it is going to include more access to graduate education than our officers have already. I have also previously mentioned the key role our officers will play in CSGs and ESGs. It is a very, very tall order. It's certainly a landscape not without risk. It is our *challenge* to strike the balance among all these demands. We are, after all, undersea warriors and nuclear operators first and foremost. It is our *responsibility* to give our future leaders the

training and education that they need, as efficiently as we can do it. It is our *moral obligation* not to waste their time or their talent and to give them the opportunity to develop their skills to the extent of their abilities.

Accordingly, what we are looking at in PERS 42 and the submarine leadership is giving the submarine officer career path a hard scrub. And some changes are coming. For example, we are moving the tactical portion of the PCO course prior to the Executive Officer tour. We believe passing that crucible event makes for a more confident and skilled Second-in-Command and that experience and confidence will have a trickle-down effect into our wardrooms, further spreading that same confidence and training level. Further, with many of our ships in depot maintenance, we are aggressively split touring Department Heads to ensure we build operational as well as valuable shipyard experience for those affected officers. We are taking advantage of a burgeoning market of distance learning, I am an example, that is how I got my masters degree, to help our future leaders expand their portfolio of naval and joint warfighting, business practices, and technology through masters programs, certificate programs, and joint professional military education. And there will be more. It is a full plate, but I have got to tell you, if you'd been where I was a week ago Friday night, and saw the look in the eyes of those young Midshipmen, you would be optimistic as well. They are bright young kids; eager for the challenges we are going to give them.

I talked to you a little bit about depot maintenance and the impact it has on our people and our ships. If you look across the Force today, we have 18 ships in major availabilities in 6 different public and private shipyards. We are now in the thick of the depot maintenance bow wave that we have always known was coming, and it's here. We're living it. There is good news and some not so good news in this story. First, you can almost see the end in sight as the workload tails off in 2008 and we will see the Force maximum operational availability, the coin of the realm in our surge ready Navy, go from today's number of about 67% up to about 76% once we exit the bow wave. There are some real success stories out there in the performance of our submarine enterprise and many of you had a part in this. In 1974 we projected that a LOS ANGELES class

submarine would last 30 years and it would require over a million man-days of depot level maintenance over an operating cycle of 70 months between overhauls. Today, based on sound engineering, investment in modernization that keeps our ships relevant, and a disciplined execution of the class maintenance plan, our ships are going to last 33 years and they will notionally require less than half of those maintenance man–days over an operating cycle of 120 months between overhauls. Portsmouth Naval Shipyard is on the cutting edge of production techniques and has shown that we can capitalize on our lessons learned to efficiently conduct depot level maintenance. One of the initiatives that they have put in place up there that has paid off handsomely is the implementation of the Knowledge Sharing Network. Now I like this particularity from my C4I days because I got constantly pounded by Admiral Fargo who asked "what are all these networks going to do for us and when are we going to start seeing some return on investment. A common battle cry that I am sure Admiral Reynolds would be ready to talk to any day. We single out the most expensive elements of a work package and then benchmark them against the shipyard that can perform them the most efficiently. That benchmarked process is shared with the other yards so that they, too, can benefit. The Knowledge Sharing Network takes that information in a web based collaboration tool that allows the shipyards to work together in a virtual environment on work package development, installation of alterations, and the baseline project management plans.

Our challenge, now, is to capitalize on these best practices, this one among others, throughout our entire ship repair enterprise and raise the bar of overall performance. Additionally, we have a repair infrastructure right now in the Navy, that I will say has been "right-sized to the point of "embrittlement and our flexibility to absorb things like surges is severely challenged. We see that today in the Pacific Northwest, our consolidated depot and intermediate maintenance capacity has in fact been overstretched, resulting in schedule delays and corresponding rising costs. As more repair work flows into the private sector to compensate for our thinly stretched public yards, we have to translate that long ledger of lessons learned from ship repair in the public sector into meaningful efficiencies in our private shipyards that have long been focused on construction.

Additionally, we have to think carefully about how we manage our submarine repair industrial base as we head down the backside of that maintenance backlog and capacity exceeds the available work. It's particularly important when we think about critical engineering, design expertise, and trade skills that will be very, very difficult, if not impossible, to replace, should they atrophy due to lack of work. I am going to shift gears here for a little bit. I want to go back and hit the rewind button to my presentation at the NDIA Clambake last fall *(Editor's Note: See the January 2004 issue of THE SUBMARINE REVIEW, page 7)* and talk a little bit about submarines and their place on the future battlefield. Everything I read and hear tells me that we cannot count on being so fortunate in the next significant conflict to have essentially unimpeded access like we enjoyed during OPERATION IRAQI FREEDOM. And it is the capability to render access difficult that is proliferating worldwide, which leads me, and I bet most people, to believe that the collective submarine attributes of **stealth, endurance, flexibility**, and **lethality** will be critical, to the success of the joint warfighter. We will be expected to go and stay places where others cannot be, and survive. We must be able to operate with impunity across our mission spectrum in that contested littoral. Today, submarines deliver real capability, surveilling that battlespace, collecting intelligence, developing situational awareness and building a body of experience in those tactically significant areas of future conflict. If things go hot, we have weapons, ADCAP and Tomahawks. We demonstrated in OPERATION IRAQI FREEDOM that we are joint, connected, and lethal. We worked in chat rooms for strike tasking, technical support, and strike group situational awareness, and we delivered about 30% of the Tomahawks in IRAQI FREEDOM.

What I want to see in the Force of the future is an extension of our realm of influence in the undersea and terrestrial domain. Pardon my weak analogy here, but I see the submarine entering the battlespace undetected and undeterred, well in advance of hostilities. Like a spider working in the dark of the night, an intricate web will be woven. A web of netted sensors precisely placed in the most strategically significant areas covering tens, if not hundreds, of square miles. A net that is fully integrated with onboard sensors and with that of the distributed battle force. And much as the spider

waits on the perimeter of his web, unseen to the prey, we will wait, undetected, for the slightest disturbance of our organic and distributed web. Not only will we feel the intrusion, but the Joint Force Commander will feel the intrusion, through a network of seamless, high data rate connectivity. Prior to the outbreak of hostilities, the submarine will maintain exquisite situational awareness, he will hold the enemy at risk, and be ready to interdict when directed or when rules of engagement allow. At the time of the Joint Force Commander's choosing, we can strike, whether it be directly, force on force, or from distributed weapons woven into our web, or from long-range weapon systems that originate from outside the contested area.

I think the vectors are aligned in the right direction for us to achieve this vision. We are positioned quite nicely. We have the finest people in the World. We have the most robust undersea warfare capability this world has seen. We operate routinely in littoral waters and we are improving our ability to penetrate anti-access environments and to kill enemy diesel submarines and thwart mining efforts. We will soon have VIRGINIA along with her sister ships, the SSGN, both ships optimized for littoral warfare. With the SSGN comes volume, payload, and ocean interface, precisely what will be needed for our future of unmanned vehicles, netted sensors, and precise, lethal, time sensitive fires. VIRGINIA, with Tactical Tomahawk, configurable torpedo room, enhanced SOF capability, ADCAPs, and connectivity is formidable, as well. Add an advanced sail to VIRGINIA and with it, volume and payload that will further enable our vision of extended reach, greater lethality, and increased speed in the kill chain. Now if we are going to realize this dream, we must today, *OPERATE* in the real environment, boldly *EXPERIMENT* with technology and tactics, *INVEST* in those with promise, and *ADAPT* to change. We want to dream, to be sure, we want to experiment, we want to score some wins, and yes, we want to have a couple failures, because if you're not failing, you're not trying hard enough. However, through all this, we need to stay grounded in the realm of the *real* and be ready to deliver *real* capability, *real* ordnance on *real* targets *TODAY*, tomorrow, and in fact the next day! The Country expects it! In the words of Bertrand Russell, "Change is one thing, progress is another. 'Change' is scientific,

'progress' is ethical; change is indubitable, whereas progress is a matter of controversy.

Tom Peters, in his book In Search of Excellence, picked several companies that routinely outperformed the average market and investigated them for commonality. One of the common traits that he found was an institutional encouragement to take smart risks. We, the Navy, have institutionalized a process to take such risks, and it is the budding Sea Trial process. Last year, the Submarine Force conducted the first Navy Sea Trial experiment, GIANT SHADOW. It explored how the SSGN-SOF Strike Group could be used clandestinely in an independent operation. This year, we are taking it to the next level. This year we are going to conduct SILENT HAMMER, by investigating how the SSGN-SOF Strike Group will be integrated into a joint campaign. It is not just the Submarine Force that is excited about this, but the special operators are equally as excited. They are anxious to explore command relationships and they have offered to activate a joint reach back center in support. The Marines want to link their SEA VIKING experiment to SILENT HAMMER. The SSGN-SOF Strike Group will provide more exquisite battle space preparation for Joint Forcible Entry Operations, by sewing that web of distributed sensors both on land and at sea. SEA VIKING will also stand up a Joint Task Force command structure with supporting component commanders, which will allow us to interact in real time and explore those relationships.

Commander, Navy Network Warfare Command conducts an annual experiment, that they call TRIDENT WARRIOR, and what they do is install *real* command, control, and communications enhancements on ships of an upcoming strike group, they experiment to determine the utility of the enhancements, and then they will leave that capability installed and supported for the strike group deployment. We are going to link TRIDENT WARRIOR and SILENT HAMMER in areas where we can achieve some synergy and that linkage is going to allow us to explore more fully some of the command and control relationships in the conduct of Information Operations in concert with other warfighters

During SILENT HAMMER, we are going to explore several technologies key to the expansion of submarine payloads and sensors. First will be the encapsulated launch of an instrumented test

vehicle as a surrogate for an Unmanned Aerial Vehicle (UAV). Encapsulation is the key to converting current DOD capability to undersea payload. Next we will recover and reconfigure an Unmanned Undersea Vehicle (UUV) to explore its flexibility to conduct several types of missions in a single campaign. And third, we will emplace a land-mesh network to further extend our web ashore. By the time we complete this experiment in October, we should have a much better understanding of the SSGN-SOF Strike Group and how it contributes to the Joint Task Force Commander.

We are also pursuing future concepts for assuring access in a littoral environment with another experiment called UNDERSEA DOMINANCE. It will explore how we create a Sea Shield for maritime forces in preparation for and during major combat. We will set up local tactical networks and distributed sensors that will enable collaborative participation in the areas of anti-submarine and mine warfare. All of the members of the joint force will be able to collaboratively exploit the undersea environment and coordinate fires through a prototype Common Undersea Picture. We will experiment with communications at speed and depth. The experiment is designed to further the concepts necessary to fight a major war with a near peer competitor.

Now OHIO is going to come on line in 2007 and we have a unique opportunity now with GEORGIA, who has come out of strategic service, to test our Concept of Operations for SSGN. Submarine Group Nine, under Rear Admiral Mel Williams, has broken apart the CONOPs into specific tasks that the crew of the GEORGIA will be stepping through either to validate or recommend changes. By the time OHIO comes back on line, we will have a very refined idea and plan of how she will operate. We are working in coordination with Commander, Second Fleet and Naval Warfare Development Command to deliver the SSGN CONOPs to the Chief of Naval Operations by the end of this year.

Let me give you one last challenge, and that is the reality that we are going to face this year, and likely for several years to come, is the increased focus within the Navy to reduce our operating costs. The effort to recapitalize our fleet, combined with budget pressures derived from world and national events are the key drivers in this initiative. At headquarters we are working on trying to understand

our actual costs of operations and to develop a finer sense of the relationships between those costs and the readiness that we deliver to the Combatant Commanders. We are looking closely at our *tooth-to-tail* ratio. As an example, we have recently completed a rationalization of our type commander staffs, our CONUS group staffs, and our waterfront staffs consisting of squadrons and the support commands. We approached this not as your typical *bogey* drill where we were allocated cuts merely to pay a bill. Rather, this was a bottom up review designed to align our staff functions, redistribute our precious manpower resources to lengthen the *tooth* while shortening the *tail*, and then, where it made sense, to give some billets back to the Navy. We are leaner, we are much less layered, and, I believe, more effective as a result of the effort. We still have work to do. We are looking for efficiencies across the spectrum of our operating accounts: whether they be personnel, maintenance, or combat support. Our objective is to wring every ounce of readiness that we can out of every single dollar. Try as we might, this is not, nor should it be, an effort isolated to the operating forces. If we do that, at best we will create more inefficiency than we eliminate as we make decisions disconnected from our key partners in Phil Balisle's or Charlie Young's organizations, for example. At worst, we will too closely approach that fine line that separates prudent risk taking from just plain bad decision-making that will impact our ability to operate safely and effectively in the undersea environment.

I will close by saying, we in the Submarine Force have a long history of "oneness of purpose and that is the key attribute you will see as we deal with all these issues and challenges I have discussed with you today. Solutions will come from the "Submarine Enterprise – SUBLANT, SUBPAC, NAVSEA, SP, N77, and others – all working as a team. My intention for telling you this is not to whine or tell you how tough life is. First of all, you have all heard it before in some form or the other. Second, the guy who has the best job in the Submarine Force, me, wouldn't deserve any sympathy anyway. I tell you, because I view you, the Corporate Benefactors of the Submarine League, as key members of the Submarine Enterprise. I need your help in delivering cost effective and efficient readiness. Whether it is through better performance on our contracts, suggestions to improve business practices, or innovative operational or

logistical concepts. We will take all comers and we welcome your advice, your counsel, and your good ideas.

We have radically adapted and improved over the years from the tactics and equipment to change a relatively weak scout to the Fleet Boat of World War Two, to radical transformation such as of the POLARIS program, nuclear power, and success for our Cold War operations. These changes have always been accomplished through a strong partnership between industry and the military. Through support of the Corporate Benefactors and the Submarine League, that partnership will stay on the path to success. I am confident of that. I ask you, keep the press on and keep up the great work. Have a great Navy day and thank you very much for your attention today!

Your best opportunity to meet leading Undersea Defence Strategists and Suppliers

UDT HAWAII 2004

CONFERENCE AND EXHIBITION

With the support of the NUWC, SUBPACOM and the Naval Submarine League – UDT returns to Hawaii between the 19th and 21st October 2004, with Asia Pacific's only established undersea defence conference and exhibition.

The UDT Hawaii 2004 Conference will offer you unparalleled access to leading undersea defence strategists as well as presenting the very latest research and development findings in undersea defence.

Attendees will consist of naval defence scientists and technicians, procurement specialists, trade attaches, ambassadors, government, commercial and academic researchers, senior industry executives, defence consultants and of course the leading undersea defence manufacturers.

UDT Hawaii will equip you with the most up to date research findings and test results enabling you to revise your own studies and make accurate knowledge based procurement decisions.

If you can only attend one Conference and Exhibition and this year, make sure you visit UDT Hawaii 2004 – The only international event of its kind.

UDT Hawaii 2004 • Hilton Hawaiian Village, Waikiki, Hawaii, USA
19-21 October 2004

www.udt-hawaii.com

SUBMARINES: WEAPONS OF CHOICE IN FUTURE WARFARE

The following article is excerpted from a Naval Strike Forum white paper, a project of the Lexington Institute, which was published in December 2003. The Lexington Institute is a public policy think tank located in Arlington, Virginia. For more information please visit their website at www.lexingtoninstitute.org or contact them at 703-522-5828.

For the purposes of this publication, the paper is presented in two parts. The entire document as originally published is available online at www.lexingtoninstitute.org. Hardcopies are available upon request to the Lexington Institute.

Part One:

EXECUTIVE SUMMARY

The cover of the ninth and last edition of Soviet Military Power, published by the U.S. Department of Defense in 1990, featured a picture of a Delta IV strategic ballistic missile submarine. This formidable weapon system epitomized the profound nature of the Soviet threat to the American homeland. Throughout the Cold War, the United States relied on a fleet of attack submarines to track, and if necessary destroy, these Soviet behemoths. With superbly trained and dedicated crews, this U.S. fleet was also charged with protecting surface combatants and naval convoys from Soviet attack submarines. In 1990, the United States had 100 submarines available for these anti-submarine warfare (ASW) missions.

Because of the overwhelming importance of ASW, nuclear attack submarines (referred to in naval nomenclature as SSNs – SS for submarine, N for nuclear-powered) were associated with a relatively narrow role in the ongoing drama of the Soviet-American competition. Consequently, they were often viewed as a quintessential "Cold War weapon. When the Soviet Union collapsed, some considered the SSN an anachronism.

Ironically, the contrary has proven true. U.S. military planners and joint force commanders are more aware than ever of the unique attributes of submarines that make them extraordinarily useful tools. It is a fleet that can operate in hostile shallow waters and influence events onshore because it can strike land targets quickly, conduct secret reconnaissance over extended periods and covertly deliver special operations forces.

In an even more dramatic reversal of Cold War roles, four Ohio-class ballistic missile submarines – U.S. counterparts of the Delta IVs – are being relieved of their strategic payload and are being refitted for conventional missions. Designated as SSGNs, these four submarines will have some of the same missions as SSNs, but with a much larger payload.

As the United States enters the twenty-first century and the era of global terrorism, the American submarine fleet continues to represent a capability far above and beyond that of any other country. But this advantage cannot continue to be taken for granted. Today's attack submarine fleet is barely half the size it was in 1990, and consists entirely of platforms initially designed for the Cold War environment. While these facts do not constrain the operational value of the fleet in any significant way today, the continuing evolution of the threat against the American homeland and U.S. interests abroad demand that the country continues to invest in and deploy advanced submarine technology optimized for the new environment. With adequate funding, robust training and innovative operational thinking, the submarine fleet will continue to be the Navy's "crown jewel" well into the future.

Submarines: Weapons of Choice in Future Warfare

The 1980's goal of a 600-ship Navy included 100 attack submarines. This goal was met in 1988 and sustained for several

years. But with the end of the Cold War, the SSN force objective was rapidly reduced in a series of studies between 1991 and 1993. These numbers reflected the significantly reduced role envisioned for America's non-strategic submarine fleet. As the number of active submarines declined, so also did procurement of new boats. The last Los Angeles-class (SSN-688) was funded in fiscal year 1990. Its successor program, SEAWOLF (SSN-21), was terminated in 1992, although three boats eventually were appropriated by Congress.

By the end of the 1990's military planners were beginning to have second thoughts about these reduced force levels, particularly in light of peacetime operational requirements. A 1999 study by the Joint Chiefs of Staff (JCS) set the parameters around which current planning still revolves. The JCS study asked regional commanders-in-chiefs to estimate future submarine requirements based on their own projections of the regional threat. The results forecasted a substantial increase in demand for intelligence, surveillance and reconnaissance (known as ISR) that could be provided only by submarines. They also projected a need for a much greater forward presence in the Asia-Pacific region, especially in the latter years with the increased prospects for the emergence of a peer military competitor. The study determined that these peacetime missions of submarines justify a larger SSN force structure of 68 boats. However, taking into consideration resource constraints, the JCS finally concluded that the number for war-fighting requirements (55) is an acceptable floor for the fleet at least until 2015. By 2025 the recommended goal increases to 76 (with a floor of 62) SSNs to take into account evolving threats.

Attack Submarine Force Goals

Reagan-Era 1980s	Base Force 1991	JCS Study 1992	Bottom-Up Review 1994	QDR 1997	JCS Study 1999	QDR 2001
100	80	51	45	50	55 (68)	55

Defense Capabilities for the New Strategic Environment

The 2001 Quadrennial Defense Review (QDR) established a framework for adapting the U.S. defense posture to a security environment primarily characterized by uncertainty, even as key U.S. interests endure. While general trends in the future military threat are certainly identifiable, the fluid nature of the political environment makes it impossible to predict where or when armed conflict might actually loom. Shifting alliances, maturation or deterioration of long-standing regimes, and the cyclical power of terrorist groups render traditional threat-based planning unsatisfactory for purposes of calculating future military needs. Instead, the QDR embraced *capabilities-based planning*, a concept that focuses on achieving key military goals regardless of the specific circumstances. In the future, the United States must deploy forces capable of adapting to and initiating surprise, operating covertly, and both employing and countering asymmetric warfare. Such forces must be available at all times in distant regions in sufficient quantities to swiftly defeat any adversary, with modest or no reinforcement; or, if that is not possible, to quickly pave the way for follow-on forces.[2]

These are ambitious goals, even for a global superpower. They are made even more challenging by the continuing spread of technology to potential adversaries. An unfriendly nation or terrorist organization does not have to be able to counter U.S. military power directly to hamper or even halt the employment of American force. By using or threatening weapons of mass destruction, attacking overseas airfields and ports with ballistic and cruise missiles, laying minefields in shallow water or on land, operating diesel submarines, or launching anti-ship cruise missiles and advanced surface-to-air missiles against battle groups and bombers, future adversaries may create a *sanctuary* for themselves by denying access to U.S. forces.

Against such asymmetric future threats, capabilities-based planning demands that the U.S. conceive and nurture a force with its own asymmetric ability to counter such anti-access and area-denial strategies. Among other things, this force must have "robust capabilities to conduct persistent surveillance, precision-strike and maneuver [3] within the areas the adversary seeks to deny. Many, if not most, of the area-denial and anti-access activities will take place in coastal regions, in the hostile *littoral* area of relatively shallow

water and the first few miles of land. They pose a particular problem for the U.S. Navy in its role as a key enabler of follow-on joint forces.

"If the Navy cannot clear the way, sealift and other forces cannot follow. (Congressional Budget Office, March 2002 [4])

Unique Advantages of Submarines

This discussion of the evolving threat environment makes clear the challenges facing force planners and future operational commanders. The QDR's analysis puts a premium on capabilities such as deception, surprise, persistence, adaptability and precision fire power, to meet these challenges. Each capability is inherent in the modern U.S. nuclear submarine.

The most obvious characteristic of a nuclear submarine is its stealth. While stealth is a characteristic of many of America's most modern weapon systems, only submarines are difficult to detect in all environments, by all types of sensors, when they are submerged. This makes them the ultimate covert platform.

The stealth of nuclear submarines provides the opportunity to conduct missions that are never revealed, or to provide strategic, operational or tactical surprise in both peacetime and wartime. Nuclear submarines can remain on station, hidden and carrying out their mission 24 hours a day, seven days a week, for months. This characteristic of persistent stealth is of great value in meeting key military goals reaffirmed in the QDR.

Defend the Homeland

In the Global War on Terror, submarines have a day-to-day mission to clandestinely collect intelligence. The submarine's own sensors, and its special operations delivery capability (much enhanced with deployment of the SSGNs and Virginia class, as discussed below), allow it to observe without being observed. Unlike satellites with their predictable overhead paths, submarines can be anywhere in the hostile littoral at any time. Using the same capabilities, submarines can engage in covert information operations by transmitting data to a target audience and monitoring the response. In the last several years, technology has made rapid progress in submarine communications with high data rate antennas, allowing

real-time transfer of this intelligence data via manned or unmanned aircraft or satellites to users at the highest levels.

One of the most difficult challenges of Homeland Security is the protection of ports. The United States receives 5,400 ships a year with international cargo and crews, creating an enormous monitoring task. While much effort is being devoted to enhancing security at the ports themselves, there are obvious advantages to monitoring and even interdicting suspicious shipments long before they reach American waters. Again, because of their covert nature, submarines could potentially be used to monitor ships in foreign ports and track them even in territorial waters.

The most widely reported use of submarines in the war on terror already has been displayed in Operation Enduring Freedom as the United States worked to eliminate the terrorist base of operations in Afghanistan. In the future, terrorist targets, including mobile command centers and weapons stores, could be identified by covert submarines and special forces working in tandem, and then promptly destroyed by the submarine's precision strike capability.

Deter Aggression and Coercion Forward

Deterrence is often thought to be best served by the presence of highly visible military forces. But the best movie directors have long known that the greatest suspense is created when an audience cannot see what it fears. In the prelude to any conflict, a potential adversary knows that America may well have a virtually undetectable submarine lurking off its shores, ready to make the opening moves in a counter or pre-emptive attack.

Because it is capable of total surprise in an initial strike, today's submarines armed with Tomahawk cruise missiles can attack sensitive and strategically important mobile or movable targets, such as command and control and stockpiles of weapons of mass destruction. They can also serve as key enablers of follow-on air forces by attacking surface-to-air missile sites and other defenses. In a very short time, a covert submarine attack can substantially degrade an adversary's ability to mount a defense. This capability against time-sensitive targets could be enhanced by the deployment of tactical, semi-ballistic missiles on nuclear submarines. In addition to the surprise factor of launch from a submarine, this type of

weapon (discussed in more detail below) has the speed to reach a target several hundred miles inland in a matter of minutes.

Although strike options such as these momentarily reveal a submarine's presence, other initial enabling missions allow a submarine to remain covert and conduct operations during the pre-hostilities phase of conflict, potentially deterring further action. These missions are particularly important in littoral environments. They include tracking adversary submarines and mapping mine fields.

Swiftly Defeat Aggression

Once a decision is made to go to war, submarines can engage in the type of clandestine early attacks needed by follow-on forces such as discussed above. They protect surface ships by neutralizing underwater threats like enemy submarines and mines, and by targeting enemy surface vessels with heavyweight torpedoes. Perhaps just as important, they serve as a base for special operations forces tasked with generating targeting data, seeking weapons of mass destruction and/or gathering intelligence on ground forces.

By assuring freedom of the seas, the submarine fleet can solve a major portion of the access-denial problem. "In short, summarized the Congressional Budget Office, "if naval forces as a whole represent the vanguard of U.S. military power – preparing the path and securing the beachheads for much larger ground and air forces in areas where they do not have access to land bases – then submarines may be key to clearing the way for other naval forces that are more vulnerable to an enemy's access-denial strategy. [1]

The value of submarines in the early phases of conflict has been demonstrated in recent operations, especially in Operation Iraqi Freedom. During this war the U.S. had 12 attack submarines in-theater, joined by two British submarines. Of the 800 Tomahawk missiles that were fired, about a third of them came from these 14 boats. In this rapidly paced operation where the targeting process was compressed to hours – and in some cases minutes – submarines participated as a full partner networked with the National Command Authority. And, although not much information has been made public, special operations forces were highly effective in Iraq. This "marriage of the two premier stealth forces in the nation, special

operations forces and the submarine force [6] has created a capability that will be substantially enhanced with deployment of both the Virginia class SSN and the SSGN.

ENDNOTES

1 In its 1998 report on the "Submarine of the Future, the Defense Science Board called SSNs a "key and enduring element of the current and future naval force - a crown jewel in America's arsenal.

2 See, for example, the discussion on pages 13-14 and 25 of the *QDR Report*, Department of Defense, September 30, 2001.

3 Department of Defense, *QDR Report*, September 30, 2001; page 31.

4 Congressional Budget Office, *Increasing the Mission Capability of the Attack Submarine Force*, March 2002, p. 7.

5 Ibid.

6 Rear Admiral Paul F. Sullivan, Director of Naval Submarine Warfare Division; *Sea Power*, July 2003.

Dr. Waldo Lyon Scholarship Fund

Dr. Lyon provided inspired leadership to the Navy's Submarine Arctic Warfare Program for 55 years. Between 1946 and 1981, he made more than 20 under ice patrols as senior scientist, and made history on *NAUTILUS* 1958 (Transpolar Crossing), *SKATE* 1959 (First ship to surface at North Pole), *SARGO* 1960 (First winter transit of Bering Strait), and *SEADRAGON* 1960 (First submerged transit of Northwest Passage). He twice received the Navy Distinguished Civilian Service Medal. Other honors included the Defense Distinguished Civilian Service Award and the President's Award for Distinguished Federal Civilian Service. Dr. Lyon passed away in 1998 and his ashes were scattered at the North Pole by *USS HAWKBILL*. He received his PhD from UCLA in 1941, and since 1999, the Scholarship, which is administered by the UCLA Foundation, has been awarded twice. Donations, marked for the Dr. Waldo Lyon Scholarship Fund, can be sent to:

The UCLA Foundation
c/o Ms. Camille Harper
College of Letters and Science
UCLA
P.O. Box 951413
Los Angeles CA 90095-1413

Info: Al Hayashida at alan@nosc.mil
or
http://www.csp.navy.mil/ost/Scholarship.htm

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

GENERAL DYNAMICS
Electric Boat

Stealth starts here.

TechNet International 2004
Combating Emerging Threats

May 11–13, 2004 | Washington, D.C. Convention Center

TechNet's Spectacular 2004 Speaker Line-Up

- *Gen Richard B. Myers, USAF*, Chairman of the Joint Chiefs of Staff
- *Gen Ralph E. Eberhart, USAF*, Commander, North American Aerospace Defense Command and Commander, U.S. Northern Command
- *Lt Gen Robert Shea, USMC*, Vice Joint Staff
- *The Honorable Michael Wynne*, Acting Under Secretary of Defense for Acquisition, Technology and Logistics (invited)
- *GEN Tommy Franks, USA (Ret.)*, former Commander, U.S. Central Command

Plus... Don't Miss:

- TechTalk Theater – Government/Industry Panels
- Solutions Showcase – Over 200 Exhibitors
- Career Transition Seminar
- Small Business Program
- Job Fair
- Excellent Networking Opportunities

TechNet Registration – a $50 value – is FREE!

Register Now!

www.technet2004.org

SUBMARINES IN TRANSFORMATION

by RADM W. J. Holland, USN(Ret.)

Jerry Holland, a retired officer who served most of his active duty in submarines and submarine related billets, has been a regular contributor to THE SUBMARINE REVIEW and other professional journals for twenty years.

Transformation, the action phase of the present Revolution in Military Affairs (hereafter "RMA) was a subject of great interest and debate before September 11, 2001. The War on Terrorism with its emphasis on light infantry, military police, and civil affairs has taken some of the wind out of the RMA's sails. However, the realignment of the international scene after the Cold War and the explosion of information technology promise that the subject will surface again after the hiatus caused by the campaigns in Afghanistan and Iraq. In the fervor and advocacy accompanying the RMA, few recognize that the maritime portion of this revolution was completed in large measure about twenty years ago when operating on the surface of the broad oceans became possible only with the connivance and consent of the United States and its allies. Below the surface the Transformation is much less dramatic. But even there, an opponent can expect to contest American dominance only for some finite time.

As originally enunciated, the post Cold War RMA has components of a realigned political geography, economic restraints on military spending, and changing operational processes stemming from information technology. These have been subsumed into the policy term "Transformation, short hand for a strategic design in the absence of a likely major enemy with more agile forces founded on communication and computer technology.

Instead of examining an opponent's aims and forces (i.e. *threats*) as a basis for planning in this post Cold War world, the utility of

forces, components and equipments in various situations and scenarios is examined without reference to a defined enemy (i.e. *capabilities*). Selecting these situations and scenarios sets the stage on which the performance of the various forces is compared. Because the United States has dominated the open oceans for so long, activities in that arena are rarely, if ever, examined in planning sessions, war games or similar activities.

Dealing with concrete equipments and forces, policy makers consider novelty a principle virtue of Transformation. "Legacy systems, meaning equipment and procedures of the past, whether proven effective or not, are suspect if not anathema. Historical evidence and laws of physics have proven to be unimportant when faced with attraction of new things. Even adapting whole new organizational concepts and investing in lighter faster equipment—the ostensible mandate of Transformation—may not satisfy the proponents of Transformation. The last Chief of Staff of the Army was, in street terms, "dissed even though he was instrumental in instituting a new brigade structure and replacing heavy tanks with light armored vehicles.

In this heady atmosphere admiring novelty and change, submarines stand disadvantaged because the Revolution in Military Affairs at Sea was completed twenty years ago when space based surveillance was coupled to nuclear powered submarines and long-range precision weapons. The results of this revolution are best described in the motto, "The only way that guy can get away is to go in port ."[1] This encapsulates the fact that no surface ship could evade, outrun or defeat attack by a nuclear powered submarine. "Target got by , a regular refrain as late as 1960 in attacks on surface ships, was lost to the lexicon of the submarine approach and attack. The first step in Revolution in Military Affairs (Maritime), nuclear power, gave the submarine the ability to reposition at will, persevere in pursuit and by eliminating the need to operate on or near the surface, almost perfect invisibility. The adage that at sea there were "...only submarines and targets became a reality.[2]

The harnessing of nuclear power to a submersible effectively annulled the axioms of maritime power annunciated by Mahan and significant through the ages of the ship of the line, the battleship and carrier aircraft. In the eighties, Captain Richard Sharpe, editor of

Jane's, put the matter most succinctly when he wrote, "Nuclear powered submarines differentiate a first class navy from all others." The nuclear submarine's only limitation was locating potential targets and weapons capable of sinking them. This limitation lead first to an undersea surveillance system aimed at the most likely enemy and the most important lines of communication and then, when a subsurface to surface missile of great range was developed, a world-wide area space based surveillance system. These surveillance systems solved the problem of getting the submarine into contact with its enemy.

The significance of this intelligence coup is not widely appreciated. Few actions at sea have taken place on the broad oceans. By far the vast majority have been in choke points, near ports, approaches to tactically important locations, or unavoidable transit routes. That BISMARCK could disappear in the North Atlantic while being shadowed by cruisers was not a unique or unusual situation. BISMARCK 's transmission of a long radio message after she had given NORFOLK and SUFFOLK the slip led to the lucky sighting by Maritime Patrol Aircraft that allowed the Royal Navy's battleships to engage. Today, because more capable sensors can monitor the face of the entire sea, time and distance no longer provide an easy place to hide.

As the locating problem approached solution, the supporting weapon development pressed forward. A long-range torpedo of great precision and lethality simplified the target motion analysis. The even longer range precision guided missile, the sea attack version of Tomahawk (TASM), promised to be able to cripple anything on the surface within several hundred miles of the shooter without much data beyond establishing a line of bearing within a few degrees and a range within a hundred miles. Both of these technological advances were products of computer developments in size and capability.

In their early years, these surveillance systems required translation and semantic interpretation. The necessary computer and display equipment to turn the sensor data into information was large, cumbersome and needed fairly extensive manpower. The undersea surveillance link required large fixed sites on the sea bottom and ashore. Similarly, the space based sensors required ground stations

to collect their data and intelligence centers to interpret it. The increase in computing power allowed much of the sensed data to be handled by machine, reducing the time late or latency (another Transformation term) of the information available to the submarine. Coupling these long-range weapons to wide area surveillance systems revolutionized warfare on the open oceans.

Against this combination, surface ships simply could not operate within the sphere of influence of a nuclear submarine; and the United States had the ability to put nuclear submarines wherever it wanted to in the broad oceans of the world. While submariners were generally modest about such claims, those who offered this opinion were castigated for the heresy of advocating a change to the traditional *balanced forces*. Outside the Navy however, this view was widely acknowledged, particularly after the declarations to its validity by the eminent British military historian and analyst John Keegan, in his history of modern seapower, The Price of Admiralty.[1]

The Submarine Force, constrained by the limitations of radio transmission under the ocean, early on adopted the opportunities offered by the information technology explosion in developing the processes necessary to exploit the new equipments. Pioneers in the exploitation of space based radio (Submarine Information Exchange (SSIXs) and Submarine Operational Satellite (SOSAT)), submariners developed communication and command methodologies that allowed them to exploit the information garnered from the surveillance systems and at the same time operate jointly with the airborne ASW forces operating from both shore bases and aircraft carriers. Early to exploit the UHF satellites (FLEETSAT) and primary promoters of the tactical portions of the EHF satellites (MILSATCOM), submarine forces were the primary users of these communications paths for years. Few recognize that the space based tactical radio data exchange systems that are the basis for the networks underlying the concept of Network Centric Warfare, now referred to in the Navy as Force Net, are the culmination of the efforts started by submarine communicators in the sixties and seventies.

These developments presaged the information revolution's effect on other military matters. Deployment of these systems solved the problem of who was where on the oceans – solving the first and

most important tactical problem: *where is the enemy?* This coordination of space based assets and development of processes to sort the targets from the innocents (the job of the Fleet Ocean Surveillance and Intelligence Centers) formed the view that Admiral Bill Owens brought to the Joint Chiefs of Staff and subsequently advertised as the "System of Systems ."[4] Others had difficulty envisioning this concept but by the 1990's submariners considered this was the way things worked. And if such a scheme worked at sea, why would it not work elsewhere? Thus Transformation was born.

These steps completed a dramatic change in the nature of warfare at sea that started with the U-Boat campaigns of 1916. During the progress of this transformation, many officers not only failed to recognize the nature of the changes, many actively rejected any notion of their impact. ("*Diesel boats forever*!) For the foreseeable future, there is no question of what consists of a balanced force for control of the high seas—nuclear submarines, space based and sea based ocean sensors, the communications links to couple them together and the processes to turn the data from one into information for the other. These forces, coupled together, are too expensive and technically demanding for other countries to duplicate. They give the United States an asymmetric advantage (another aspect of Transformation) that assures that the use of the high seas by others depends upon American forbearance.

The final concept in the Transformation model is the gain in agility resulting from shortening the time between detection and delivery of weapons. The wide area search capability coupled with rapid dissemination of information permits maneuvering forces with a minimum of orders and direction. A secondary effect of this time compression is the potential for drastic reduction in the numbers of echelons of command. Again submarine command and control, evolving from the methodology developed during World War II, demonstrates the principle. Generally there have been no more than two echelons between the Combatant Commander (today's word for what was the *Theater CINC*) and the submarine commander conducting the mission. Compare that to the Army arrangements in Europe where there are seven echelons. Transformation aims to take advantage of the ability to deliver a Common Operational Picture to everyone in action thereby reducing the role and number of echelons

between the top and bottom of the command and control process.[5]

The Navy in general has little difficulty with this concept, *Command by Negation* having a long established history and practice in US naval doctrine. But watching the ground where there really is *cover* and *shadow* is much harder than watching the surface of the ocean. The other services' doctrine and procedures founder in the complications that arise in the diffusion of authority in this scheme, particularly in joint operations. As one flag officer put it, "I find myself as emissary between the Army and the Air Force. [6]

The end of the need for forces other than submarines to maintain mastery of the ocean has allowed the Navy to be transformed into an organization focused on attacking targets ashore. Since the change in the world's political climate leaves the US Navy without a fleet against which to compete, the Navy's modus operandi is summarized in Sea Base and Sea Strike. In most conferences or war games involving maritime affairs the sea control attention meter remains on the peg. In these activities, the submarine's contribution, when considered at all, is as a strike vehicle. The opening assumption in most war plans, if not in the exercises and activities that support them, is that US submarines will eliminate any surface opposition quickly and in some fairly short time submarine opposition as well.

The trick to keeping this happy state of asymmetric capability or dominance of the battlefield (also large in the Transformation lexicon) is maintaining the technical and operational effectiveness of the arms of this combination and the communications systems that link them. This translates into modernization of all three pieces, sensors, submarines and command and control equipment and processes, plus investment in people and time into making sure that the pieces work as a system. This is an issue of focus not of force size. The number of submarines required to maintain this RMA (Maritime) is not as important as their individual and collective quality in the field, continued robust sensing capability, efficient intelligence analysis and a command and control system to tie them together. At present, keeping all this is in place without being subverted by admonitions against *legacy systems* and *Cold War leftovers* or emphasis only on the *idee de jour* requires understanding, effort and most of all, persistence.

ENDNOTE

1. CDR N. B. Bessac, Commanding Officer, USS SCORPION (SSN 589), 1959.
2. Vice Admiral George P. Steele, USN, "Killing Nuclear Submarines , US Naval Institute Proceedings, November 1960.
3. John Keegan, The Price of Admiralty, The Evolution of Naval Warfare, London, Century Hutchinson Ltd., 1988.
4. Admiral William A. Owens, High Seas, Annapolis, Maryland, Naval Institute Press, 1995.
5. Rear Admiral Doug Crowder, USN, "Operation Iraqi Freedom: Lessons Learned , Briefing, Retired Navy Flag Officer Symposium, Fort Belvoir, Virginia, November 5, 2003.
6. For a more extensive discussion of this aspect of Transformation, see William J. Holland, Jr. "Where Will All The Admirals Go? , US Naval Institute PROCEEDINGS, May 1999.

NATO's CONTINUING BATTLE WITH *ISMs*

by Captain William L. Norris USN(Ret.)

Captain Bill Norris is a retired submarine officer who has been a frequent contributor to THE SUBMARINE REVIEW, particularly in discussion of nuclear weapons matters. After retirement from the Navy, Captain Norris served for several years on the staff of Sandia Corporation. He is still active in the political-military-technological field.

When NATO was formed in 1949, its purpose was to be ready to stop the forceful spread of Communism. An accomplished side affect was to develop a democratic forum and model that gave internal strength to the countries of Western Europe in recovering from the second of two World Wars that had devastated much of the landscape. There was much truth in the unofficial and oft repeated comment that the purpose of NATO was to keep the Soviet Union out, the Germans down and the Americans in.

After a ten year hiatus as it searched for a new identity, today's NATO is a different animal. Instead of planning to combat the unthinkable next war, its forces are involved in peacemaking and peacekeeping, both in and out of its traditional area. NATO also has an emerging competitor for missions and as the spokesperson for Europe and the European Union. Now NATO has two new threatening ISMs to worry about, the optim*ism* that everything is possible and pessim*ism* that very little is really possible. To paraphrase the previous unofficial purpose, today's NATO is trying to keep Russia down but involved, a Europe united and free and the Americans a benevolent and multilateral*ist* hegemon.

Let's look at how we got here in a simplistic manner. The Cold War NATO was mainly a static force in place and ready to further mobilize its armies to halt the Soviet Union in the Fulda Gap in Germany. Based on each member's experience in the previous

forty years of European history, this meant they each maintained a military that could contribute to a common defense, but never forgetting the main mission was still to be able to defend its national sovereignty. The only real mobility required was for the North American reinforcement of Europe after hostilities began.

As we moved further and further away from both World War II, the height of Cold War tensions in the early eighties and witnessed the emergence of a new and powerful European Economic Community, meeting NATO commitments began to occupy decreasing importance in national governments. More money was diverted from military requirements to internal national needs. The demands of rising capital*ism* and social*ism* became more important to the populations.

When the Berlin Wall came crashing down on 11/9 (1989), it signaled the demise of the Soviet Union as a threat to Western Europe. Somewhat of a vacuum was left between the eastern borders of NATO and the Western borders of Russia. There was great uncertainty about what Russia would become. NATO lost its historic mission and its focus while searching for a new identity. Every nation looked for a peace dividend and NATO commitments suffered even more. Without a monolithic threat, the forces of isolation*ism* swept the entirety of NATO, maybe especially so in the United States. In fact, several speakers opined that Russia would be irrelevant on the international landscape for the next fifteen years. At the same time, many began to categorize European political philosophy as pacif*ist*.

The 1990s injected several new challenges. The first Gulf War of 1990-1991 brought home the economic dependence on Mideast oil as well as the disparity in the ability of nations to deploy their military forces out of national boundaries. It also began to emphasize how the US was beginning to adapt advanced technologies to military uses and that a capabilities gap was emerging. Through the middle 90s, a new force emerged, global*ism*. The interdependence of the world economic community was firmly established. By the end of the 90s, the continuing inability to resolve both the Israeli-Palestinian problems and ethnic cleansing in the Balkans highlighted ethnic and religious differences and radical Islamic fundamentalism as world problems that must be addressed.

NATO acceptance of its first peacekeeping/peace-making mission in Bosnia-Herzegovina as a part of the Dayton Accords began a new era for NATO. NATO expansion, started at NATO's fiftieth birthday celebration, began to fill the vacuum between NATO and Russia. This was rapidly followed by another first, the NATO air war over Kosovo and the subsequent NATO peacekeeping force there. The Kosovo air war further emphasized to NATO that the Revolution in Military Affairs in progress in the US was widening the capabilities gap. It also highlighted the problem of timeliness in political control of the NATO military leaders and their forces during a real conflict.

9/11 (2001) was the next touchstone for NATO and introduced global terror*ism* as a major world threat. The historic NATO invocation of Article V in response was muted by the apparent non-use of all of NATO in the subsequent conflict in Afghanistan. Many would attribute this to the desire of a unilateral*ist* US to not be hobbled in a manner similar to the Kosovo air war. The second Gulf War in Iraq in 2003 was fought in a more conventional mode than that of Afghanistan, but by much the same coalition of the willing. Three highlights of this conflict were the dichotomy of US military power (a real hyper power), the difference in threat perceptions across Europe and the eventual doubt cast upon the intelligence used as a basis for the war. This war also further heightened the image of the US in majority of the Islamic world as the Great Satan and, besides Israel, the real target of future terrorist events.

Today's NATO is a much more dynamic organization than at anytime in its history. It has real forces engaged in the Balkans and Afghanistan. In Afghanistan, NATO is planning to expand its role and involved forces. The new Secretary General has implied that if the new Iraqi government requests NATO assistance on 30 June (when it is now scheduled to begin rule), that NATO will respond. There will soon be 26 NATO members, and for the first time more members than Partners for Peace. No wonder the optim*ists* are smiling.

So why is there anyone with skeptic*ism* or pessim*ism* about NATO? NATO still has nearly 100,000 troops in the Balkans with only a questionable end in sight. There are some that expect the EU will want to take over responsibility for the Balkans. But when

NATO went in, they promised to stay until there was no need. If NATO therefore leaves, why is there even a need for EU troops? If NATO leaves and the EU takes over, it does not necessarily free up troops for use elsewhere as in most cases the same countries would be providing troops drawn from the same pool.

European countries in NATO have about 1.5 million men and women under arms. Various speakers I have heard over the last month have said that only somewhere between 3% (45000) and 10% (150000) of these are deployable outside their home country. In many cases even if ministers at NATO headquarters reach consensus to deploy NATO forces, the actual deployment must be approved by national legislatures/parliaments.

There is now a NATO commitment to have 6,000 troops in Afghanistan. After about six months that total has not been reached. About 40% of the troops there are logisticians. It took extreme arm-twisting to get even a marginal number of helicopters to Afghanistan to support the NATO forces there. Now NATO is looking to assume a larger role in Afghanistan, expanding their force commitment to possibly as many as 15,000. The requirement to support 15,000 troops in a country like Afghanistan requires even more helicopters and logistical effort. If the same ratio of logisticians is in the new force, it is possible that increasing the forces by a factor of 2.5 could only increase the fighting force by about 2.

Time and again the speakers would emphasize that NATO is in both the Balkans and Afghanistan for the long haul (as many as 20 years) and that NATO cannot afford to fail. Three to ten percent of NATO's troops mean that somewhere between 45,000 and 150,000 are deployable. In most cases a continuous deployment requires three times as many troops as are deployed at any one time (1/3 deployed, 1/3 training to deploy, and 1/3 recovering from deployment). So the requirements today are about 100,000 in the Balkans (300,000 total required) and as many as 15,000 (45,000 total required) for Afghanistan.

What would be the commitment for Iraq, if asked? Some say around 30,000. This would require another 90,000 total troops. The total of these three commitments would then be as many as 435,000 troops. So how does NATO find a minimum of about 285,000 additional deployable troops (and as many as 390,000) at the same

time it is trying to build a 60,000 man Rapid Reaction Force and the EU is trying to build roughly the same size force from the same manpower pool? NATO would seem to be headed to the same military overstretch now facing the US.

Deployable forces are not just troops when you are talking about operating out of area. Very, very few of the European nations of either NATO or the EU have the strategic lift to deploy and support forces out of area. Because of their threat perceptions few of the European countries are willing to increase defense expenditures to obtain this capability. Many pundits say that if the Europeans did a restructuring of their forces to fight today's battles, to be more techno centric, they could realize savings that could then be converted to make them also more deployable. Cynic*ism* would say that national governments would allow the military to restructure but would use any savings to meet other more pressing national needs.

One of the interesting facets of NATO expansion is that, as part of the Membership Action Plan, prospective new members receive very specific guidance on which forces they should keep and which they should delete. In many cases, the new members on joining are more ready to contribute deployable and specialized forces than existing members. In many cases, if existing members did restructure their forces to make them more deployable, they might no longer have the force they have traditionally needed to defend their national interests. This is virtually the same surrender of sovereignty that all EU nations have to consider as they surrender some of their national sovereignty over economic, civil and judicial matters. It may be one thing to surrender some sovereignty for economic gain and quite another to place your national defense in the hands of others. One is reminded of one of DeGaulle's justification for an independent French nuclear force which is roughly, "Would the US sacrifice Detroit to save Lyon?

The formation of the NATO Reaction Force called for at the Prague Summit is another example of the fight between optim*ism* and pessim*ism*. Some would say that this was America's last offer to NATO to remain relevant as a military alliance. In today's world many characterize America as Clausewitzian. Its forays into Afghanistan and Iraq were the continuation of policy by other means. Europe on the other hand believes that war should be the

continuation of law by other means. This is not unlike the "hard power (Kagan*) versus "soft power (Nye**) arguments.

Many would say that the nations signed a blank check when they agreed to the NATO Rapid Reaction Force at Prague. The fact that this force must be both *certified* and *deployable* must have been optimistically defined by nations. Of course, as long as the US is a part of NATO, the forces can be physically transported and logistically supported. But being deployable for several countries requires a legislative/parliamentary approval. The second part is to develop a metric for what will define certification. Certification of a joint and multinational force will certainly be different from nations certifying their own forces. For years NATO has had more than a thousand standards documents that have been very loosely enforced. New members have made promises about meeting standards prior to entry which have been revised on entry because they did/could not meet them. Old members submitted the dates when they expected to meet the standards of which many are still uncompleted.

Another source of pessim*ism* might be the NATO consensus system. The political control of the NATO Kosovo air campaign has already been cited as a problem. That was NATO at sixteen. What will happen in a NATO at twenty-six? Can the decision making process be streamlined so that a rapid reaction force doesn't become a slow reaction force or will a rapidly deployed techno centric force be frozen in place awaiting the political consensus for its next move? What happens when a certified NATO Reaction Force is given hard tasking and a (some) nation's (nations') parliaments don't back the NATO consensus and refuse to sanction the deployment of their forces?

---

*Robert Kagan is senior associate at the Carnegie Endowment for International Peace. His most recent book Of Paradise and Power discusses that the US and its military power drive its behavior toward intervention in the world where it feels its interests threatened and Europe's lack of usable power lead it to seek economic or political solutions. Kagan likens the US to Mars and Europe to Venus.

** Joseph Nye is the Dean of the Kennedy School of Government at Harvard University. In his book The Paradox of American Power, he espouses that the US should better balance the use of military power (hard power) with its other tools (economic, political and legal-soft power).

The new Secretary General lists four priorities as he takes office:

1. Get Afghanistan right
2. For NATO to be prepared if called to do more in Iraq
3. Ensure that NATO transformation happens
4. Increase Transatlantic cooperation

There is no minor goal there. There is significant challenge in every one of them. Although there seems to be moves afoot to patch up past differences, are Europe and the US still, as Kagan says, Mars and Venus? The difficulties for NATO to achieve these goals are not insurmountable, but a new consensus of national wills must be built. NATO and the US are really both overstretched now and it would be easy for them to concentrate on internal challenges. The EU "Headline Goals for ESDP are still a stretch. The World is waiting to see who will step up and meet their commitments. Will hindsight prove the optim*ists* or the pessim*ists* correct?

ARTICLES

VIRGINIA'S COMMAND AND CONTROL CENTER – NEW CONCEPTS FOR A NEW SUBMARINE

by Steve Lose
– PMS450 C3I System Manager

Does VIRGINIA really offer something new and different for the Submarine Force? You bet it does! One of the many improvements VIRGINIA has to offer is its Command and Control System Module (CCSM), the nerve center of the submarine, unmatched by that of any previous submarine class. It will focus more information on a variety of displays, all within easy view or reach of the Commanding Officer, thereby giving him the ability to reach decisions with far more information drawn from superior sensor systems. This will revolutionize how submarine warfare is conducted.

Unlike previous classes, the CCSM is located on the second platform instead of the first platform, and therefore has more space for assembling an attack team and including equipment for maximum combat effectiveness. It holds the submarine's traditional Control Room/Attack Center, which is still referred to as *Control*, and serves as an integrated space for Ship Control, Sonar, Combat Control, Imaging, Navigation, countermeasure & launcher control subsystems, Radar, and Architecture (computers and networks). The Electronic Surveillance (ES) and External Communications System (ECS) are also located on the 2nd Platform, but in separate adjacent spaces for security purposes.

Key to locating the CCSM on the second platform is the use of Photonics Masts in the Virginia Class instead of the conventional optical periscopes used in previous Classes. Photonics Masts in these ships telescope upward from the base of the sail, do not penetrate the pressure hull, and use video cameras with digital imaging technology to gather images and present them electronically on display surfaces. So the interior space previously lost to periscope stowage and operation is available to the Captain and his Attack Center team. This also gives them an unobstructed view of

the entire space, permitting a much easier survey of the information available from the sensor systems in Control, facilitating enhanced warfighting effectiveness. In addition, the color, black and white, and infrared images available through the Photonics Mast can be viewed by many crewmembers at once on vertical large screen displays (VLSD's).

The Captain's station, located at the center of the entire CCSM, affords him control of the 2 VLSD's – one on either side of the Ship Control Station – through a dual-console Command Work Station (CWS). He also has control of the Photonics Masts at this station via a *joystick*. Very close to him are his principal systems: one step to port are the Sonar, Tactical Support System (TSS) and Submarine Regional Warfare System (SRWS) – all presenting information in color on flat panel displays; directly in front of him is the Ship Control System; a step to starboard are the Combat Control flat panel displays and the countermeasure/launcher control. Immediately behind him is the Horizontal Large Screen Display (HLSD) Navigation/plotting table, the Imaging System Photonics Mast Workstation (PMW) and the Navigation Data Display and Distribution (NDDD) System console. To starboard aft of the Combat Control System is the Special Purpose Console that controls the Radar systems and the computer network. Outboard of the Combat Control System are ES and ECS.

Typical of any submarine, space in Virginia Class remains at a premium. But it's obvious that the information displayed and made available in Control is far in excess of that seen in earlier classes of submarines. Using the numerous displays just mentioned, together with photonics images, he can quickly gather a very complete picture of his tactical situation.

The Ship Control System (SCS) also contrasts strikingly with previous classes. It is a software-controlled *fly-by-wire* fiber optic system with combined Ship Control Panel (SCP) and Ballast Control Panel (BCP) functions. Ship control and maneuvering is accomplished with a joystick similar to an F-16 fighter pilot's stick instead of the steering and diving yokes that have been used for years. The pilot's stick includes action buttons in true fighter pilot style. In fact, the new SCS watch station positions are now termed *Pilot* and *Co-Pilot* – vice Helmsman and Planesman, and the number of

watchstanders has been reduced from 4 to 2, as the functions of the Diving Officer and Chief of the Watch have been incorporated into the *Pilot* and *Co-Pilot*. Many functions are automated, and there is high redundancy to ensure reliability.

CCSM's Interior Communications (IC) have also been vastly improved. The Officer of the Deck (OOD) and system operators have access to multiple circuits, and the ability to connect with other system operators directly. These enhancements greatly support the development of a comprehensive tactical and operational picture.

All OOD's have had occasions when the Messenger of the Watch needed to be contacted while on an errand, but had to wait for his return to Control. No longer. In Virginia Class, this watchstander carries *wire-free* communications and can be contacted from Control – regardless of location.

Design of the Virginia Class occurred in an environment of explosive growth and ready availability of Commercial Off The Shelf (COTS) products, a changing battle space role for the Submarine Force, and a Congressional mandate for reductions in submarine shipbuilding costs. The commercial availability of these state-of-the-art products and tools provided the catalyst for changing how we design, develop and deliver submarine Combat and Non-Propulsion Electronics (NPE) systems, and how we design and construct ships.

For instance, in previous classes of submarines, the Combat and Non-Propulsion Electronics (NPE) systems were specified and ordered years in advance of the start of ship construction. Systems development was a long and expensive process, and in many instances the technology and capabilities were obsolete at ship delivery. In the Virginia Class, CCSM development embraced the availability and capabilities of the COTS products to economically provide a much more robust product – one that will have the ability to upgrade performance simply by replacing the individual computer cards with newer, more powerful cards. This also reduces supply support costs. Thus the Navy will receive a ship fitted with systems in step with 21st century technology, ready to support the Fleet's missions, and more easily supported logistically.

The power of the COTS software design tools also sparked a revolution in submarine design and construction. COTS-based tools

have moved ship design from the drafting table to the computer, and facilitated modular ship construction and assembly at multiple sites. Significantly, ship designers and architects are now able to lay out, modify, refine, analyze and visually *walk through* any space or compartment in the ship - well in advance of the start of construction. Perhaps no space on the ship better reflects the blending of COTS-based Combat and NPE systems and the revolution in ship design and construction than the CCSM. The Photonics Masts removed the large design constraint of linking the sail, periscopes and Control together, giving more freedom to move and rearrange Control during the ship design process.

Captain David Kern, PCU VIRGINIA's Prospective Commanding Officer, and his crew have been through training curriculum, worked together on system trainers, drilled at the CCSM Off-Hull Assembly and Test Site (COATS) facility, and spent many early-morning hours on VIRGINIA's tactical system as the installation matured. All are looking forward to exercising the entire system at sea. As the team becomes more proficient in use of the CCSM and its enhancements, he expects recommendations to further improve its effectiveness. He's very much aware of the crew's familiarity with the latest computer technology, and recognizes the opportunity they have to set a new course for submarine warfare with this new ship.

When asked about the larger implications of the ship's capabilities, he mentioned that 1/3 of the Tomahawks launched during Operation Iraqi Freedom (OIF) came from submarines. VIRGINIA will carry all the weapons used by SSN 688 class submarines during that operation, and have a more sophisticated communications system that will allow them to participate in the digital data nets that are evolving from the systems used in OIF. This is the course set by the Chief of Naval Operations as the Navy continues to evolve its communications and computer systems to increase the exchange of tactical information. Captain Kern has noted that the submarine continues to evolve in its warfare roles, and he expects Virginia Class ships will take us a long way in that evolution. VIRGINIA is ideally suited to participate via FORCENET with the Operating Forces as a key player in the CNO's Seapower 21 construct.

THROUGH BERING STRAIT IN MID-WINTER

by VADM John H. Nicholson USN(Ret.)

Admiral Nicholson was one of the two first officers ordered in to be in the crew of the first nuclear submarine. He served as Main Propulsion Assistant in NAUTILUS, then as Engineer and then as Executive Officer. He was Navigator and Executive Officer on SKATE for that ship's 1958 Arctic cruise. He commanded SARGO, STONEWALL JACKSON, SubRon 15 and SubGru 8.

When I took command of SARGO from Commander Dan Brooks, my first big job was to ready SARGO for her Arctic cruise. We had only a few months to install special equipment, test it, and train the crew for the Arctic Operations. I'd been aboard SKATE with Jim Calvert on her earlier trip to the Pole and had also studied the reports of NAUTILUS when Bill Anderson took her to the Pole via Bering Strait, so I knew some of the problems involved. But both NAUTILUS and SKATE had made their Arctic cruises in the summer. It was thus imperative to know if our submarines could operate effectively in the strategically useful Arctic Ocean in mid-winter. And it was also imperative to see whether SARGO could be taken to the Pole via Bering Strait under the worst ice conditions.

NAUTILUS's course into the polar regions had been through the Bering and Chukchi Seas–the shallow route into the deep North Canadian Basin, some 75 degrees north latitude. But even in the summer her way was blocked repeatedly by deep ice ridges extending as much as 80 feet down from the surface. Time after time she had been forced to backtrack and try new routes before she got through. And once, the boat (which measured 50 feet from keel to top of sail) passed under an 80-foot deep ridge in 142 feet of water, leaving only six feet clearance above and below! Because

NAUTILUS's sonar couldn't detect deep ice ridges until they were virtually overhead, Commander Anderson had broken off the mission. NAUTILUS returned to Pearl Harbor, was refitted with the proper equipment and eventually made a successful transit to the Pole.

Getting SARGO ready made for the most hectic four months imaginable. Yard workers labored frantically, even on Christmas and New Year's Day, to finish the job on time. Then immediately after installation was completed, SARGO was off for sea trials. The inertial navigation system was tested, vertical ascents and descents were practiced, and the new iceberg detector was tried out. This was tested using another submarine in place of the ice ridges SARGO would face. From these exercises we were able to check out the equipment, learn its range capability, estimate depths of *ice ridges,* familiarize ourselves with appearances of various objects on the scope of the overhead sonar.

We were ready to leave for the north when I got a pessimistic letter from an old friend from my days aboard SKATE, Walt Witmann, the Navy's senior ice forecaster. He predicted, after reconnoitering the northlands, that the winter would be a particularly tough one. Bering Strait, the gateway to the Arctic from the Pacific side, might have such deep ice ridges it could be closed to submarine traffic. With that letter in my pocket I slept uneasily the last few nights before we cast off for the north. But I kept the bad news to myself.

One week out of Pearl, SARGO surfaced. We had made good time underwater past the Aleutian and Pribilof Islands, and were nearing Saint Matthew Island in the Bering Sea, still some 1,800 miles from the North Pole. A navigational fix was needed before going under the edge of the ice pack, which was only a few miles north. In fact, I was much aware of ice as SARGO was cautiously surfaced with periscope and antennae retracted into the sail. Such caution moreover paid off. As SARGO broke the surface, chunks of ice bounced off her, making sharp rapping sounds on the hull. Seals cavorted about, and dead ahead was the solid edge of the ice pack. We were at the starting line and now our work had begun.

We then contacted the STATEN ISLAND, one of the five U.S. icebreakers. She was thirty-one miles to the north. Our orders were

to rendezvous with her before we began the long and difficult Arctic exploration.

We closed with STATEN ISLAND after a vertical dive out of the drift ice around us, and tested our iceberg detector and overhead sonar as we went. Close by the icebreaker, we established underwater telephone contact with her, then surfaced nearby. Commodore Robertson, the Royal Canadian Navy's top Arctic expert, and STATEN ISLAND's skipper, Commander Larson, came aboard for a one-day, under-ice demonstration on SARGO. Later, during the night as we cruised close to the STATEN ISLAND, the ice thickened directly overhead. Eager to transfer the two officers back to the icebreaker so SARGO could resume her transit through Bering Strait, I found that getting her back up through the heavy polar winter ice cap was no simple problem.

We searched for a frozen polynya or lake with our upward beamed echo sounder. When one was found we performed a Williamson Turn to go back down our track and find the polynya and then began a vertical ascent with pumping and flooding of ballast to control her upward rate. (If the overhead ice was hit too hard, serious damage to the sail with its periscopes, masts, antennae, and other indispensable equipment might occur. If SARGO didn't hit hard enough, she wouldn't break through.)

SARGO bumped the underside of the ice. Nothing happened. She hadn't broken through. The sonar showed one of the 25-foot deep ridges of ice was closing in on SARGO rapidly. Quickly negative tank was flooded and SARGO dropped to a keel depth of 120 feet.

We soon located another polynya, positioned SARGO and again tanks were blown cautiously until with an echoing bump SARGO was hung up. I ordered Lieutenant Fred Stelter, our diving officer, to blow the ballast tanks. Almost immediately, with grinding and crunching sounds all around her, SARGO broke the rest of the way through the ice and into the air near the patiently waiting Staten Island.

I raised the periscope and saw the icebreaker 300 yards on SARGO's starboard beam. The only other thing I could see was solid ice all around. Opening the upper hatch, I went to the bridge and all but stumbled over the cockpit full of ice, the thickest any submarine had ever penetrated. On the after deck was an enormous

block of ice five feet thick and measuring 15 by 20 feet—a 13-ton ice cube.

After letting the Commodore and the Commander walk over to the Staten Island, we flooded tanks, dropped vertically toward the bottom, and steered northward. At dawn the next day, SARGO cracked through the ice forty-one miles off Saint Lawrence Island for a final navigational fix before running submerged through the shallow Bering Strait. The day was bright and so clear that the hills of Saint Lawrence Island could be seen. One long last look at the world above the surface was taken. We were not to see the sun again for twelve days after SARGO dropped out of this frozen polynya and headed into the Arctic night.

Slowly, SARGO cruised northward toward Bering Strait, keeping a keel depth of 100 feet. But the sea grew shallower and shallower as SARGO approached the fifty-mile strait that separates the U.S. from the U.S.S.R. By midnight she had crossed the 25-fathom curve and soundings shoaled rapidly up to 126 feet. SARGO was passing under 20-foot ice ridges and avoiding the deeper ones, thanks to the effectiveness of the iceberg detecting sonar. Adding to the problems was the scarcity of sounding in this area. As SARGO cautiously cruised along with barely more than 25 feet above and below her, it was a matter of groping our way along to find a way through.

Then the overhead sonar failed. This left us totally blind to what might be above SARGO. The ocean depth was a scarce 126 feet, leaving little leeway, so I gave the order to reverse course. With infinite care, our planesmen and helmsman brought SARGO about while maintaining a precise zero bubble. The slightest tilt could have resulted in her propellers grinding into the ocean bottom leaving her seriously disabled under the pack ice. (SARGO was backtracked for two miles before finding her way around the danger spot).

All this time the sonarmen worked feverishly to restore the all important overhead *eyes*. And they were up to the job. With repairs completed, SARGO moved on, threading her way at very slow speed among the treacherous icy ridges above, as if penetrating a minefield. For the next thirteen hours SARGO twisted and turned tortuously in an ordeal of ice. As the ridges got deeper, SARGO passed under some ridges as much as 52 feet deep and avoided many deeper ones. At the end of that thirteen-hour trek SARGO was

nearing the Bering Strait. I decided to surface—if we could find a spot in this shallow sea.

The depth was 170 feet. I began maneuvering SARGO for a position to make a vertical ascent though a flat spot in the overhead ice. As we moved, we suddenly began losing depth control and started sinking rapidly toward the bottom. Quickly, I ordered the main ballast tanks blown to check SARGO's descent. Then I ordered the vents opened so SARGO wouldn't rise rapidly and hit the thick ice overhead. But the huge air bubbles which escaped so distorted the pictures of the overhead ice on the sonar that I ordered the boat down again to seek another skylight to burst through. It was two hours before one was found—in a shallow 170 feet. This time SARGO made the vertical ascent smoothly. Up she went and her sail hit the ice. Just as before, she stuck. Fred Stelter ordered the ballast tanks blown—but gently. SARGO's sail then broke through three feet of ice. A new record. The hull took an up angle, then a down angle, then an up angle again and the bow crunched through solid ice. SARGO's stern, however, remained below and she came to rest with a 4 degree up angle.

On the bridge I found the ice scattered about in huge chunks. Aft, the ice was even thicker, and it was this heavier ice that prevented SARGO's stern from coming up. But it was a great relief for us all to be above the ice again, even if briefly. We were only halfway through our shallow transit and the pressure on the entire crew was great.

We got a radar fix on Cape Prince of Wales, the westernmost point on mainland Alaska. Next morning SARGO made a vertical dive out of the ice. Fred Stelter expertly dropped her down and leveled her off at 120 feet—but the many hours in the ice had frozen the bow plane controls so they couldn't be used for the intricate depth control and trimming needed. Even using the bow planes, it was difficult enough to maneuver and maintain depth control. Without them it was almost impossible at slow speeds.

A new technique was developed very quickly. SARGO was cruised at higher speeds than heretofore and a maximum rudder angle of only 3 degrees was used. If a faster turn was required to dodge the rock-hard ice ridges overhead we used 5 or even 10 degree rudder but then needed to blow ballast tanks to keep off of the

bottom and counter flood the negative tank to keep from smashing into the ice above. It was nerve wracking.

Once Stelter had SARGO down, she was jockeyed about warily for half an hour before a clear corridor could be found which headed in the general direction desired. Then for the next three hours, the depth continued at around 140 feet. We maintained 20 feet of water between SARGO's keel and the bottom until suddenly the soundings decreased to 10 feet below her keel. Then, just as suddenly they sloped sharply off to 55 feet before shoaling up quickly again to 40, 30, 20, 10 feet. The bottom was still rising when the diving officer on watch, Lieutenant Dave Phoenix, ordered the boat up 10 feet—just in time. As he blew the main ballast tanks with the vents open, the boat surged up 10 feet. At the same time the fathometer registered only five feet below SARGO's keel. We braced ourselves to bounce off the bottom but the soundings went deeper again before SARGO could hit bottom. Many sighs of relief were breathed. The planesmen named the sea mount we had just crossed, "Tall Gonzales .

Immediately after the climb over Tall Gonzales, word got to the crew quickly of our narrow escape. After that, virtually everyone huddled around the iceberg detector to watch SARGO being conned around the overhead ice ridges. Alternating at the conn with me were my executive officer, Lieutenant Commander Bill Yates, and my engineering officer, Lieutenant Commander Ned Dietrich. Watching the iceberg detector reassured all hands as they saw how ice ridges were spotted and a course was plotted around each one.

With the tight squeeze behind, SARGO transited Bering Strait late in the afternoon and by early evening had crossed the Arctic Circle without ceremony. Our objective, the North Pole, was still 1,400 miles off. SARGO ran north all that night, and on the thirteenth day out of Pearl Harbor things went routinely for the first time in a week. As SARGO continued north the water got deeper—180 feet. Seldom had 30 fathoms looked so invitingly deep to a submariner. With the deeper water and the simple transit, the bow planes were worked—trying to free them from their icy bonds. Frequent manipulation was used to loosen the frost-bound controls. But it wasn't until later that the bow planes were finally freed.

The next day was the fourteenth out of Pearl and a navigational

fix was needed. But at this point, the bow planes still weren't freed. Without that gear we had to resort to frequent blowing of ballast to make a vertical ascent. The air bubbles unfortunately threw off the sonar so that when SARGO tried to surface through what appeared to be thin ice, she couldn't poke through. The ice was thicker than the instruments indicated. SARGO was dropped out of that spot, and some hours later, after the bow planes finally were working properly and after one more unsuccessful attempt to crack through the ice, she surfaced through a skylight only 13 inches thick.

The brief time on the surface allowed a navigational fix and radio reports. Also two of our divers plunged into the 29-degree water for 22 minutes. It was their first cold water dive. While in the water, they checked the malfunctioning garbage ejector and removed a flattened can that had jammed it closed. Later they made other repairs.

Next day, SARGO resumed her northward course. The bow planes were again frozen but this was of little worry as the 50-fathom curve and then the 100-fathom curve were passed. Speed was increased to 16 knots as SARGO zigzagged her way toward the top of the world. Our momentary relief at being in deep water was short-lived as the iceberg detector failed. We had to fix it or replace it if we were to be able to return via the Bering Strait rather than the Panama Canal. So on the following day SARGO was surfaced through 7 inches of ice in a 600 by 2,000 yard frozen polynya. Repair of the iceberg detector was then begun. Working in twenty below zero weather, two men at a time worked in half-hour shifts to dismantle the train mechanism and get it below for repairs. The heavy support beam under the detector had to be cut before it could be lowered to the deck below. During this, there was a screeching and groaning of ice as it was being forced up and over the SARGO's main deck. After 40 hours, with the training mechanism finally gotten below, SARGO dove and continued zig zagging our way towards the Pole. We discovered a lot of previously unexplored territory including a ridge subsequently named Sargo Ridge.

At 0934 on February 9, SARGO passed 350 feet under the North Pole and began searching for an opening. A small one was discovered and SARGO smashed through 3 feet of ice and surfaced just 25 yards from the Pole. It was 33 degrees below zero as we raised the

Hawaiian State flag alongside SARGO. When SARGO attempted to dive that night she was frozen in solidly. It took 30,000 pounds of extra ballast to tear her loose and start her plummeting down. We got a trim in time and then circled the earth in seven minutes. (That's real easy when so close to the Pole.) Then SARGO headed South—the only possible direction to go from 90 degrees North.

Enroute South, the iceberg detector was jury rigged with another sonar by an ingenious system of synchros, gears and linkages devised by our crew and two designers of the iceberg detector. Tests with the modified ice detector proved satisfactory. Later SARGO rendezvoused with Ice Island T-3, drifting in the Beaufort Sea and manned by a crew of scientists. After passing under the ice island and determining it to be 4 miles by 10 miles in size and 160 feet deep, we conducted sonar tests with them and then headed back toward Bering Strait.

Just before entering the Strait, SARGO was surfaced through thick ice and a navigational fix taken. Then SARGO dropped out of the ice into 155 feet of water and cruised at 7 knots into Bering Strait – 24 feet off the bottom. The deep ice ridges began to appear, but evading them was tougher because of the shortened and distorted ranges provided by the jury-rigged detector. Later, when a pair of deep ridges were spotted 500 yards ahead, I ordered a course to take SARGO between them. At 125 yards, the ridge off the port bow looked very deep while the one on the starboard side had disappeared. I altered SARGO's course 15 degrees to starboard and WHAM! The boat heeled to port as it was shoved down 25 feet, with a 6 degree down bubble. The conning officer sounded the collision alarm and rang up *all stop*. With the depth gage reading 148 feet, almost on the bottom. I took the conn, ordered "back two thirds then ordered ballast tanks blown while leaving the vents open. As SARGO came up, I ordered "ahead two thirds on one shaft and we regained depth control. SARGO was clear of the ridge and all compartments reported "no damage . It was a close call.

We determined that our modification of the iceberg detector had resulted in unwanted side lobes on the short scales, so we decided to leave the iceberg scope on the long scale, and maneuver around the ridges while still 600 yards away. Additionally, SARGO cruised 16 feet off the bottom to give more clearance from the ridges. But

late on the next day, a solid wall of ice was spotted 800 yards ahead. Scanning the huge ice ridge showed no openings, so SARGO was steered parallel to the ice wall for a long period until she was able to skirt around its end and resume base course.

As soon as possible we surfaced to inspect the damaged sail. It was quite a sight. The top of the sail was dished in so that one of the periscopes couldn't be raised, but the supporting members in the sail were sound. We had been very lucky.

There was just one trouble spot left - Tall Gonzales. I planned to avoid this pinnacle 5 miles, but then the inertial navigational system chose to get out of line a bit. Despite my calculations for set and drift to compensate for the system errors, soundings showed the bottom shoaling up rapidly under SARGO and a deep ridge up ahead. I reversed course and headed for deeper water just as the boys put the inertial navigator back on the line. The corrected equipment showed we were five miles North of our estimated position, hard by Tall Gonzales. We dodged our way through another field of heavy ridges and finally reached better ice conditions.

Two days later, February 25, SARGO cleared the ice pack after 6,003 miles and 31 days under the ice and successful accomplishment of a very risky operation. One crewmember summed up our thoughts, "the only ice I want to see for a long time is in a tall glass.

SONALYSTS

Creator of Award Winning Media

www.sonalysts.com Sonalysts, Inc.

***Sub Command*™** also available at computer stores everywhere.

United States Submarines also available at book stores everywhere as well as at amazon.

A Century of Silent Service video/DVD also available at amazon.com
or by calling the Naval Submarine Force Library and Museum at 1-800-343-00

DOD MAINTAINS REQUIREMENT FOR 55 ATTACK SUBS, BUT LAUNCHES NEW STUDY

by Jason Ma

The Defense Department's requirement for at least 55 attack submarines "remains firm today, but that could change in the future as DOD re-examines its undersea warfare forces in a new capabilities-based study, according to Vice Adm. Stanley Szemborski, the Pentagon's principal deputy director for program analysis and evaluation.

During the 1980s, the submarine production rate was three or four annually, but the 1990s saw a "procurement holiday, said Szemborski at a luncheon meeting of the Naval Submarine League's capitol chapter Jan. 7. Defense spending is going up again, he said, but where the sub procurement rate will go is "still an open question.

The 2001 Quadrennial Defense Review calls for 55 attack submarines, and DOD has maintained that requirement, he noted.

"So are we there? he said. "The answer is today, yes. Tomorrow, the answer is maybe.

Szemborski's remarks came a week after Deputy Defense Secretary Paul Wolfowitz approved Navy Secretary Gordon England's proposal to delay buying two Virginia-class attack subs annually, a rate Navy officials have said is necessary to maintain a fleet of 55 attack subs.

Previously the Navy planned to buy two subs annually in FY-07 and FY-08, but the Navy revised those plans when submitting FY-05 budget proposals to Office of the Secretary of Defense last year. That met resistance from some officials, including Szemborski, who favored buying two subs annually in FY-07 and FY-08 (*Inside the Navy*, Nov. 17, 2003, p1).

But in a program decision memorandum signed Dec. 30, 2003, Wolfowitz blessed the Navy's proposal to purchase one sub annually from FY-04 to FY-08 and two in FY-09 (*Inside the Navy*, Jan. 5, p1).

At last week's luncheon, Szemborski did not discuss the FY-05 budget. He drew a distinction between the numbers of platforms versus their capabilities. The Navy needs to examine the future challenges and risks in undersea warfare in order to determine what capabilities it needs, he said.

"I guess the major point of my talk right now is this: it is not only about how many submarines should there be. It's a lot more than that, he said.

He added later: "We have to describe what we need in the undersea warfare, describe it in a capability type way. If that translates to more submarines or better submarines, then so be it. But that's the case that has to be made.

To evaluate future risks and challenges in undersea warfare, the Navy, the Office of the Secretary of Defense and the Joint Staff conducted an undersea warfare study over the summer, at the request of Wolfowitz. The study looked at what new technologies, such as unmanned vehicles, the Navy could exploit to maintain undersea superiority.

But in recent weeks, Wolfowitz asked for a more thorough undersea warfare study. Szemborski said the study would cover the "whole undersea mission area to include force objectives.

"And we have to evaluate the future challenges and risks from that capability standpoint, and then we need to look to see if our investment is about right, he said. "We may decide that it is. We may decide that it's not.

Navy officials have noted advances in diesel submarine technology and its proliferation among international navies. Diesel subs could challenge the U.S. Navy's underwater dominance, especially in littoral waters, officials have said. Szemborski said last week that the United States must not concede its underwater advantage to another country.

"We cannot afford for one of our enemies to come along and take that sanctuary away from us and dominate, he said. "If we lose that sanctuary, we could lose sea power. If we lose sea power, we lose a lot of what we were using in our air power with the Air Force, and a big part of what we're doing these days.

THE CHIEFS TAKE CHARGE

> These privileges, these responsibilities do not appear in print. They have no official standing. They cannot be referred to by name, number or file. They exist because for over 200 years the Chiefs before you have freely accepted responsibility beyond call of printed assignment and have, by their actions and performance, commanded the respect of their seniors as well as their juniors. —*from The Chief's Creed*

by Captain David Marquet, USN

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

Next to the submarine piers at Pearl Harbor stands a tired and unassuming 2-story building. This structure was the periscope repair facility and during World War II it was a constant scene of activity as technicians worked to refurbish and focus the periscopes of our submarines before they set out in search of Japanese shipping. These were the tools that men like Dick O'Kane, Mush Morton, and Gene Fluckey would use to bring the Japanese empire to its knees.

Half a century later, the functions of the building had been replaced by a larger and up-to-date facility a hundred yards away and the second floor had been converted into a homespun lounge of recycled furniture. On a Friday afternoon in January 1999, a group of as-yet unrecognized men sat in the lounge. They were the chiefs of USS SANTA FE and they had a problem.

Since its commissioning 7 years earlier, the ship had had an undistinguished career. She had won no unit awards and sported a mediocre record on inspection results. More alarming, perhaps, was that during the past 12 months, she had only reenlisted 3 Sailors which placed her squarely at the bottom of fast attack submarines (SSNs) for retention. This was evidence that the Sailors on board were not happy.

Now, in one of the most amateurish change-of-command ceremonies in recent memory, these chiefs were given a new commanding officer—me. And while most Friday afternoons in Pearl Harbor were designated *Aloha Friday* with work wrapping up early, allowing the Sailors to take advantage of the Pacific waves before it got too late, on this day, the Chiefs had a more pressing agenda, and had asked me to participate in their session.

As we sized each other up, the Chiefs listed their problems:

- Below average advancement rates
- Poor performance on official and unofficial evaluations
- A spiritless qualification program, with Sailors delayed in qualifications waiting on checkouts and examinations from the wardroom
- An inability to schedule, control and commence work on time, resulting in men languishing around in the morning, only to have to stay late in the afternoon to get the ship's work accomplished
- An inability to control the schedule of their men, with leave chits getting lost in the chain of command, schools getting canceled and the chiefs getting second-guessed on their manning plans.

Resulting in:

- Low morale and retention
- Mediocre performance

It's an oft-repeated Navy adage that "the chiefs run the Navy. However, in this case the authority of the Chief Petty Officers had long been eroded away. The reasons for this went from institutional (requiring more senior officer supervision for more activities in an effort to manage problems) to personal (as some officers reacted with over-control and micro-management in an effort to avoid mistakes). Whatever the history, the bottom line here was that the Chiefs did not run USS SANTE FE. And that was their problem.

In retrospect, two things were remarkable about that meeting. First, the chiefs made a conscious decision to take charge. And as we discussed the implications of that, it was clear that along with

assuming the authority to run the boat, would come the responsibility for its success and failure. During my short time on board I had observed, at all levels in the chain of command, the crew referring to other crew members as *they*. This carried the implicit psychological meaning that the crew did not think of themselves as one intertwined unit whose fates were intimately linked. It was clear from this meeting that practice would end. And more than anything else, the subsequent success of the boat was due to the fact that this group of men voluntarily and unconditionally accepted responsibility for its future.

In fact, the language issue being so significant, we agreed that henceforth, *they* could only refer to someone not belonging to the crew of USS SANTA FE—and from now on no member of the crew could refer to any other group or member of the crew as *they*. We would be *we*. The torpedomen would refer to the nukes as *we*, the chiefs would refer to the officers as *we*, and the crew would refer to the chiefs as *we*.

The second remarkable aspect of the meeting was that the chiefs focused on mechanisms that would put them in charge. There wasn't much time wasted on discussing the philosophy of what the role of the chief petty officer was in today's Navy, and there wasn't much time wasted on exhortations and speeches. We didn't have time for those luxuries—and the sole output would be concrete mechanisms.

Mechanism 1: Chiefs take charge of their men

First and foremost, we wanted to put the chiefs in charge of their own men: their schedules; leave; schools; and advancements.

The current process for managing leave (encouraged by the Standard Submarine Organization and Regulations Manual, known as the SSORM) was that all enlisted leave chits needed to be approved by the Executive Officer. As in most hierarchical organizations, documents get reviewed by everyone up to the approving authority. Hence, our Sailors' leave chits were being signed by the requestor's leading first class petty officer, divisional chief, departmental chief, Chief of the Boat, Division Officer, Department Head and finally the Executive Officer. We had more signature requirements than spaces on the form!

And the issue of signatures hinted at another problem. Leave chits would frequently get caught in a sort of administrative ping-pong, bouncing between members in the chain of command who could not agree on approval.

Perhaps it was Chief Machinist Mate Welzenbach who suggested that enlisted leave chits be approved by the Chief of the Boat (COB).[i] Chief Welzenbach ran the machinery division and was thinking about retirement when he accepted orders to USS SANTA FE at the behest of the commodore. He was a continuous source of professionalism and innovation.

This change would require the Executive Officer to delegate his authority for leave chit approval to the Chief of the Boat. Administratively, the number of signatures would be cut in half, but more significantly, the fate of the Sailors' leave would lie in the hands of their chiefs.

I was reluctant to agree. In my previous jobs I had, on several occasions, countermanded ill thought-out leave plans. Additionally, I was concerned that the junior officers would lose the experience of learning personnel management and lose touch with their divisions. The chiefs agreed upon some methods for mitigating these impacts on the junior officers but fundamentally they convinced me because they were willing to take responsibility for the performance of their men. Poor performance, as a result of a poor personnel management, would be reflected in the responsible chiefs' evaluations. Thus argued, I agreed.[ii]

The result of this seemingly minor administrative change was leveraged to put the chiefs squarely in charge of all aspects of managing their men including their watchbills, qualification schedules and schools. The only way the chiefs could own the leave planning was if they owned the watchbill. The only way they could own the watchbill was if they owned the qualification process. Hence, this change acted as Archimedes' lever, placing the chiefs in charge of all aspects of leading their men.

Mechanism 2: Chiefs take charge of the schedule

The scheduling process was a hierarchical top-down approach. Inputs were provided to the department heads and executive officer,

who published the Plan of the Week and Plan of the Day. It was inefficient and largely ineffective.

Chief Electronics Technician Larson may have been the one who suggested that the Chief of the Boat prepare the Plan of the Day and present it to the Executive Officer (XO), rather than the XO publishing it from *on high*. Chief Larson had served on 2 688-class submarines before, and arrived a couple months previously from the Submarine On-Board Training developers in New London, CT. Chief Larson spearheaded several innovative uses of computer-based training, chart management, and maintenance management. He served as acting COB for me on several occasions.

This simple transition also forced a cascading impact on how the schedule was managed that no amount of lecturing or exhortations could have caused. The only way the COB could write the daily schedule was if he wrote the weekly schedule. The only way he could write the weekly schedule was if the chiefs got together and cooperated on writing a coordinated schedule. This forced them into the planning process. The result was a much more efficient scheduling process, owned by the chiefs.

This is not to say that everything proceeded without a hitch from then on. We occasionally would have a gun shoot for the engineering department scheduled the same day as a reactor startup—two incompatible events. However, these occurrences were significantly reduced and when they did happen, the chiefs knew who to blame.

In a word, this change forced the chiefs to take ownership of the entire scheduling process, and to evaluate and improve that process to make it more effective.

Mechanism 3: Chiefs take charge of performance

This piece evolved over the next year following several *near misses*. As I sat through a couple critiques, it appeared that there was a correlation between Chief Petty Officer involvement and success of an evolution or maintenance action.

It could have been our Engineering Department Master Chief, or *bull nuke*, Chief Electrician's Mate Jensen who suggested that a chief be *in charge* of every evolution and maintenance action on the boat. Chief Jensen was another of the recent arrivals to the ship. He

proved to be a continuing source of improving standards and processes on board.

The administrative mechanism was to add a column to the night orders and in-port maintenance planning forms listing the chief-in-charge. The result was that nothing happened on the boat for which no chief felt it was his responsibility to make sure it proceeded correctly, per procedure. If the evolution or maintenance action went south, the *chief in charge* would be prominent at the critique.

The officers and crew quickly adapted to this framework, and it was a standard report when getting permission to perform an evolution to report the chief in charge.

The only rule for being a *chief in charge* was that you needed to be on the ship and know the evolution was occurring. Beyond this, we avoided specifying the level of involvement, preferring instead to allow the chief to determine his own level of involvement—from on-site monitoring, pre-evolution certification, or simply acknowledgment that he was the chief in charge.

We defined a *chief* for the purposes of this control function as a real chief or anyone qualified Duty Chief Petty Officer. This allowed the Duty Chief to be the chief in charge during weekend duty section evolutions without having to call in chiefs off liberty. The additional benefit was that it added a visible step increase in responsibility for those qualified duty chief, and was an added incentive.

The net impact of these changes was to put the chiefs in charge of the boat. The real power of this only surfaced later, as reenlistment rates soared. As I talked with crewmembers about their decision to reenlist, it became apparent that looking forward to having a job that influenced the destinies of their men, which is how they now viewed their chiefs, played a vitally important role.

ENDNOTES

i. No minutes were kept of the meeting so who proposed what is lost and I apologize for mistakenly giving credit to the wrong chief. My attributions are based upon my own recollections of the meeting and matching the traits of the chiefs with the nature of the recommendations.

ii. I delegated the officer leave approval to the Executive Officer.

Chiefs of USS SANTA FE, early 1999:

MMCS Bruner, COB	MMC Welzenbach
EMC Jensen, EDMC	EMC Refvem
HMCS Hill	ETC Foster
ETCS Norbury	STSC Worshek
ETCS Hughes	MMC Hutchins
MMC Downham	MMC Kanahele

MSC Jennings

Editors Note:

Within 3 years of this meeting, USS Santa Fe had earned the Arleigh Burke Fleet Trophy, the squadron Battle "E," 3 unit awards and commendations, received the highest possible grades on inspections, and had risen to the number one spot for overall retention among all SSNs, Atlantic and Pacific. In 2001 nine of the ten eligible first class petty officers were selected for chief, one of every three enlisted men on board was advanced, and she set a record for reenlistment bonuses during deployment that was only recently surpassed and by ships that deployed longer than 6 months.

PHILLY HITS THE MARK

by Robert A. Hamilton

Mr. Bob Hamilton is a journalist who is a frequent contributor to THE SUBMARINE REVIEW. He has long reported on defense issues and currently writes on submarine-related subjects for The New London Day.

Lieutenant John Adkisson of Wylie, Texas, was thrilled to report to USS SUNFISH (SSN 649), in time to make its 1,000th dive in January 1996. One thousand dives is a milestone that most nuclear attack boats never reach. But at 5:39 p.m. on December 4, 2003, at an undisclosed location on the equator, he did it again.

"I would like to announce that USS PHILADELPHIA has just made her 1,000th dive, Adkisson, who was serving as officer of the deck for PHILADELPHIA's 1,000th dive, said over the 1MC as the ship disappeared beneath the waves. "Very few boats in the Submarine Force have completed this task, and the PHILADELPHIA is the first 688-class submarine to reach this milestone, and probably the only one to have dived directly on the equator. As ship's diving officer, I'm very proud of everyone's participation on the PHILADELPHIA's 1,000th dive. Carry on.

And so PHILADELPHIA became the first Los Angeles-class submarine, and one of only a handful of nuclear submarines, ever to make 1,000 dives.

"If anyone in the future ever asks me what one of the most memorable moments in my life was, I can proudly say "I was driving the submarine USS PHILADELPHIA when she made history by diving into the depths of the ocean for the 1,000th time, said Yeoman Seaman Aaron D. Phelps, who was controlling the diving planes at the time. "This is a moment that I will remember for the rest of my life, and that I may never get to see again for the rest of my career.

Phelps and other crewmen on PHILADELPHIA were interviewed via email for this story because PHILADELPHIA remained on deployment for about six weeks after the momentous event.

Commander Steven M. Oxholm, captain of PHILADELPHIA, said the 1,000th dive "is exciting because it is such a significant milestone not only in the ship's life, but also in the Submarine Force heritage . . . The ability of a submarine to withstand the demands of 1,000 dives is a tribute to the excellent design, exacting construction and careful maintenance inherent in the Submarine Force.

"In USS PHILADELPHIA's 26 years of commissioned service, approximately 1,000 men have dedicated their lives to her mission as part of the ship's crew. The magnitude of this selfless dedication is daunting, Oxholm said. "Today's 1,000th dive is a tribute to all those who sail on her today and have sailed on her in the past. I am personally humbled to be part of this historic event.

Three of the crewmen were also on board USS SUNFISH (SSN 649), a Sturgeon-class submarine, when it reached the 1,000-dive milestone in January 1996—Lieutenant Adkisson; Chief Electronics Technician Larry Sabotta; and Electronics Technician 1st Class Michael S. Conn.

"It was different on SUNFISH, Conn said. "It really didn't click in my mind with the significance of the moment. It was just another underway. PHILADELPHIA was different. Seeing the excitement in the junior guys' eyes, it had an effect on me I really did not expect. This really is something special and meaningful that we do.

Conn recalled the orders being passed over the 1MC: "'All stations Con, going deep. Dive, submerge the ship to one-five-zero feet.' This is something that you hear on a regular basis as a submariner. You don't really think about it much, other than it's the beginning of another chapter in your life under the sea. Until you realize it's the 1,000th time that this modern marvel of engineering and teamwork we call a submarine has done it.

"That's saying a lot, (because) out of all the submarines that have been in our fleet, only four have dived for the depths that many times, Conn said.

Among those in the "done 1,000 dives club were USS NAUTILUS, USS TREPANG and SUNFISH of the Sturgeon class, and USS FLASHER of the Permit class. Crewmen were particularly

pleased PHILADELPHIA, one of the oldest boats in the undersea fleet, has proved its continued worth as the first Los Angeles-class boat to make it over the bar.

"USS PHILADELPHIA has demonstrated that there are no bounds for man and machine when she plunged into the depths performing her 1,000th dive, wrote Senior Chief Sonar Technician Robert J. Grismer. "The quest for man has always been to make a difference in the world we live in and PHILADELPHIA has done just that. She first plunged into the depths during the fierce Cold War battle between the United States and the USSR. She mastered her environment through the use of the latest technology, HY-80 steel and the sweat and blood of hundreds of crew members who served aboard her. Slicing through the cold Atlantic waters to bear her weapons and technology where needed, she made the difference that maintained peace in the world. She saw the end of the Cold War from the front lines, serving as the force behind our victory, and she fights on today in the war against terrorism . . . I am proud to be on board, helping to make a difference in the world, as we take her down for the 1,000th time.

Most of the sailors said it would be easy to become preoccupied with the numbers and lose track of the technological achievement that 1,000 dives represents.

"I have done quite a few dives in my 12 years, said Senior Chief Machinist Mate W. Michael Marion, the engineering department master chief on PHILADELPHIA. "Something so complex yet because of our training it seems routine. Yet there is nothing routine about it. I could not believe the Philly was actually going to make her 1,000th dive. Who would have thought that a submarine whose keel was laid 30 years ago would still be on the front lines going strong? Certainly a testament to her builders and the men who maintained her all these years.

The Navy can only say that PHILADELPHIA was "conducting an important operation when the 1,000th dive was performed, but could disclose that it took place December 4 at 5:39 p.m. local time, directly on the equator.

The weather was sunny and 85 degrees, what Lieutenant Matthew Valle of Alpharetta, GA., the off-going officer of the deck, called "a perfect day to conduct the 1,000th dive.

"A sense of anxiety spread across the crew in the days leading up to the dive, according to one email from the submarine. "Certain crewmembers were less excited than others. However, when the day finally came, the 1,000th dive was the (topic of) everyone's conversation.

"Crewmembers were spread throughout the control room and some overflowed into the command passageway, the email said.

"This is a true Philly dive, quipped one crewman.

As the submarine dove, crewmembers not on duty retired to the mess hall for a dinner of barbeque ribs, seasoned potatoes and chocolate cake.

USS LOS ANGELES (SSN688), the first of the class, was built at Newport News (Va.) Shipbuilding, commissioned in November 1976, and made its first deployment, to the Mediterranean, in 1977. Seven months after LOS ANGELES commissioning, on June 25, 1977, Electric Boat built USS PHILADELPHIA and Newport News built USS BATON ROUGE (SSN689), were commissioned simultaneously.

LOS ANGELES still operates out of Pearl Harbor, but because of the vagaries of mission requirements was still dozens of dives short of the 1,000 mark as PHILADELPHIA closed in on four figures. BATON ROUGE collided with a Soviet Sierra-class submarine, the Barracuda, while on patrol in the Barents Sea in 1994, and was taken out of service less than a year later. The cost to repair and refuel BATON ROUGE proved too great in an era when the Navy was downsizing the SSN fleet.

So PHILADELPHIA, though tied for second in the LOS ANGLES class in terms of length of its life, nevertheless made it first to the 1,000-dive mark. Nuclear submarines, which make their own air and water, can submerge for as long as the food holds out, so they tend not to dive as much as the old diesel submarines that surfaced frequently to run their diesel engines and charge their batteries.

Some diesel submarines, in fact, made as many as 10,000 dives—the Groton–based USS SPIKEFISH, which was formerly a *school boat* that brought students out into Long Island Sound and made several dives each day, became the first to reach that milestone in 1960. And Robert F. Marble, a retired Senior Chief Torpedoman

living in Port Charlotte, Fla., said USS PIPER (SS 409), has claim to the title "the divingest boat ever, with 13,724 to its credit.

"We've even had a patch made with that number on it, 13,724, Marble said. "We're pretty proud of it.

Marble said PIPER, too, was a school boat in Groton, often make 24 dives in a single day as it cycled Basic Enlisted Submarine School students through the various stations.

"That's how you rack up that many dive numbers, you play yo-yo all day long, giving everyone a shot at the helm and all the other stations, so they can find out what submarining is all about, Marble said. He added with a laugh that modern submarine school students today don't need school boats, "because they've got more brains than we had and they learn it faster.

Commander Emil C. Casciano, deputy Commander of Submarine Squadron Two, which includes PHILADELPHIA, said Los Angeles-class submarines are certified to operate for 33 years, and the hull is inspected periodically to make sure it is structurally sound anyway.

Casciano commanded PHILADELPHIA before Oxholm, and did more than 150 dives during his time at the helm. PHILADELPHIA left port more than six months ago with 973 dives to its credit, and was at 988 by mid-September. On December 4, it hit the 1,000 mark.

There was considerable thought given to who would be on the ship control party that conducted the historic dive.

Oxholm said Senior Chief Machinist Mate Thomas E. Wright of Sandpoint, Idaho, the longest-serving member of the PHILADELPHIA crew, was named diving officer of the watch, and Adkisson was officer of the deck in recognition of his participation in the SUNFISH record-setting dive.

Three volunteers were picked: Phelps, of Newalla, Ok.; Electronics Technician 3rd Class David A. Fritz of Groton at helm control; and Machinist Mate 1st Class Harry M. Allison of Ashville, N.C., as chief of the watch.

Senior Chief Storekeeper Nicholas E. Parham II of Seabrook, N.H., was picked as "phonetalker, who coordinates communications during the dive, because he had served on PHILADELPHIA previously as leading storekeeper.

Rounding out the ship control party were Wright, Adkisson, Lieutenant JG Christopher G. Raymond of Londonderry, N.H., as

junior officer of the deck, and Electronics Technician 1st Class James G. Campbell of Boise, Idaho, as quartermaster of the watch.

The PHILADELPHIA Recreation Committee is working on several different items to commemorate the dive, the first being a T-shirt of a design that will be put to a vote by crewmen.

Master Chief Electronics Technician Patrick D. Agnew reported to PHILADELPHIA last August, for his first tour as a Chief of the Boat and his first operations with a drydeck shelter (an enclosure that allows Special Forces to exit the submarine without fully surfacing). Now he can add being on the first Los Angeles-class submarine to reach the 1,000-dive mark.

"I have never experienced so many firsts in such a short time aboard a submarine, said Agnew, a 23-year veteran of undersea warfare. "This 27-year-old submarine and its crew is one of the best that I have ever served with.

Your best opportunity to meet leading Undersea Defence Strategists and Suppliers

UDT HAWAII
CONFERENCE AND EXHIBITION

With the support of the NUWC, SUBPACOM and the Naval Submarine League – UDT returns to Hawaii between the 19th and 21st October 2004, with Asia Pacific's only established undersea defence conference and exhibition.

The UDT Hawaii 2004 Conference will offer you unparalleled access to leading undersea defence strategists as well as presenting the very latest research and development findings in undersea defence.

Attendees will consist of naval defence scientists and technicians, procurement specialists, trade attaches, ambassadors, government, commercial and academic researchers, senior industry executives, defence consultants and of course the leading undersea defence manufacturers.

UDT Hawaii will equip you with the most up to date research findings and test results enabling you to revise your own studies and make accurate knowledge based procurement decisions.

If you can only attend one Conference and Exhibition and this year, make sure you visit UDT Hawaii 2004 – The only international event of its kind.

UDT Hawaii 2004 • Hilton Hawaiian Village, Waikiki, Hawaii, USA
19-21 October 2004

www.udt-hawaii.com

MATTHEW FONTAINE MAURY: NAVAL OFFICER, SCIENTIST, AND OCEANOGRAPHER

by John Merrill

Mr. Merrill is a retired engineer from the New London Division of the Naval Undersea Warfare Center. John is a frequent contributor of THE SUBMARINE REVIEW.

Introduction

In a millennial hall of maritime fame, we could probably find a great candidate for each century. The particular defining contribution may not be as earthshaking as the impact on maritime navigation of our contemporary high technology Global Positioning Satellite (GPS). But in his own time and place, the contribution by the candidate could have been as significant. For example, the creativity, patience and genius of 18th century John Harrison with his chronometer and Salem's own Nathaniel Bowditch quickly and easily come to mind. Matthew Fontaine Maury, a candidate for the 19th century, sometimes seems to be lost from the pantheon of maritime fame.

In retrospect, Maury was always interested in large problems and questions frequently of worldwide interest. It is his development and introduction of reliable and useful charts of the seas beginning in 1847 that take highest place. One hundred and fifty years ago, Maury understood the need for and the value of charts of the sea made from complete and up to date oceanographic findings.

Maury succeeded in spite of the attitudes of some of his peers, superiors, and others regarding his interest in scientific matters and methods that were considered unusual for a naval officer at that time. He spent nearly twenty years in Washington, where, even with his consistent integrity and desire to achieve in ways to help others, the always rampant political scuffling hounded him and later followed him south to the Confederacy in 1861 with a cost. Optimizing the use of limited resources with a tendency toward the practical

are other Maury trademarks. Further characteristics include his creative ability in a variety of scientific areas, which continued productively throughout his entire life. The extensive Maury holdings at the National Archives attest to his legacy.

Mid-1855

If Lieutenant Matthew Fontaine Maury USN, the sitting superintendent of the Depot of Charts and Instruments, found time in his busy mostly fifteen-hour days, he could look back with perhaps more than modest pride on his thirty years of Navy service and his family life. The next decades would demand as much from Maury as the preceding ones.

His work at the Depot starting in 1842 and national and international acknowledgment of his achievements as superintendent by the 1850s were a matter of record. In his position, he came to know nine Presidents. The fact that he was 19 years in the grade of Lieutenant while promotion remained elusive probably caused some consternation. International honors he had, but at the moment, the continuing bickering with Joseph Henry at the Smithsonian Institute and Alexander Bache at the Coast Survey must have been annoying to him. The underlying source of the friction seems to have arisen from Maury's great practical successes on a grand scale and his perception by the general public and others as a man of science. His self-education and lack of academic credentials seems to have made a difference to some in the Washington scene.

Looking Back

In 1855 and 49 years old, Maury's life divided into several stages, connected but distinct. First there was his early life with his family on a rural cotton farm in a remote part of Tennessee until he was 19. Next, the initial phase of his Navy career as a midshipman and passed midshipman included almost nine years of consecutive sea duty on three cruises mostly in the South Pacific. By the end of his second cruise from September 1826—June 1830, Maury was on the sloop-of-war VINCENNES when it made the first circumnavigation of the globe by an American warship, the second to go to China. By June 1831, Maury was making his second trip around

Cape Horn, this time as acting sailing master on the sloop-of-war FALMOUTH bound for squadron duty off the West Coast of South America.

His duties on FALMOUTH included directing the officer of the watch on the vessel's course and how much sail to carry. He would also be the captain's navigator. In preparation, Maury looked for information on the winds and currents to be expected in rounding the Horn. His searches in New York and elsewhere were unsuccessful. He consulted libraries, merchant ships, and ship chandlers but failed. Lack of accurate information on winds and currents shaped his planning for the forthcoming voyage and did not go unnoticed.

During the following three years off the West Coast of South America, he served as first lieutenant on several Navy ships in the squadron and returned on the frigate BOSTON. Upon returning, probably highlighted in his memory was his marriage in 1834 to his Virginia cousin Ann Herndon from nearby Fredericksburg, Virginia, and the following year the birth of the first of his eight children.

At that time, the Navy had a very limited number of vessels with one ship of the line, three frigates, and some small ships. The number of officers' billets was small. This could mean years on the beach at half pay for officers waiting a ship assignment. Maury was ashore for the next several years, with the exception of a short tour aboard a Navy ship doing hydrographic work along the East Coast of the United States.

In 1839, while visiting his parents in Tennessee whom he had not seen in nine years, he received orders for sea duty aboard the brig CONSORT, then at the New York Navy Yard. In October, returning north for duty by mail stagecoach, the coach overturned. Maury's right leg was severely damaged by a thighbone fracture badly set, and for the rest of his life he walked with a limp. Slowly recovering in Ohio, he missed his ship in New York but by January1840 was at his home in Fredericksburg. From then on, his fitness for sea duty would always be in contention and occasionally questioned. Convalescence was slow, and during these years his writing skills emerged further.

Two years after recovering from the accident, 1841 brought hope for a possible return to sea duty in the Pacific Squadron aboard the frigate UNITED STATES. Then, as a result of efforts by his friends,

relatives and several of Fredericksburg's medical doctors, a letter was sent, unknown to Maury, to the Secretary of the Navy advising him that, Maury, because of his leg injury was in no physical condition for sea duty aboard a man--of-war. In November, surprised and possibly embarrassed by the letter, he asked the Secretary to be relieved from orders to sea. His request was approved.

Superintendent of the Navy's Depot of Charts and Instruments

After three years of inactive duty, Maury reported July 4, 1842 as superintendent of the Navy's Depot of Charts and Instruments in Washington. Established in 1830, the Depot was the first scientific institution in the Navy. It was the center for all Navy nautical and astronomical research.

What did he bring to his Depot assignment? His nine years at sea in all the oceans certainly provided a good credential. Between 1838 and 1841 while ashore, he wrote widely on civilian and Navy matters and built up a favorable public readership. Prominent among his topics were the need for a Naval Academy, the use of steamships, and recommendations for the Navy to establish Bureaus in lieu of a Board of Commissioners. His pen names included Will Watch, Union Jack, Ben Bow and Harry Bluff. The public interest created by the articles made it necessary to reveal Maury as Harry Bluff in July 1841. For his views, comments, and recommendations, Maury was not only popular, but highly regarded and very well known. His popularity led to his being considered for the position of Secretary of the Navy. Maury was not interested.

His publications on navigation and oceanography prior to his superintendence included On the Navigation of Cape Horn and Plan of an Instrument for Finding the True Lunar Distance, published in July 1834. These were followed in 1836 by a navigation book, A New Theoretical and Practical Treatise on Navigation. The motivation for writing the book stemmed from his desire to provide a text appropriate for the novice navigator and midshipmen, not the veteran mariner. He felt the existing texts were aimed at those whose sea experience was extensive.

This was the first scientific book written and published by an American naval officer. In the Southern Literary Messenger, a

Richmond, Virginia publication frequently dealing with Army and Navy topics, the assistant editor and critical reviewer Edgar Allan Poe lauded the book.

The book was a success. Professors, naval officers, and Nathaniel Bowditch commended it. It took the place of Bowditch's Practical Navigator as a textbook for junior Navy officers and in 1837 was placed on every ship in the Navy. Later in 1845, when the U. S. Naval Academy was established, it became one of the standard texts used. From the textbook and his other writings for Navy reform, Maury was well known when he arrived at the Depot. He brought his seamanship, experience, his published book and papers, and a totally inquiring nature. A few months after the initial introduction of the navigation book in 1836, Maury, the Passed Midshipman and author, became a Lieutenant in the U. S. Navy.

Almost immediately after assuming the superintendent's work, Maury became involved in developing improved charts of the sea. However, there were additional assignments. The Depot's work included building the new Navy astronomical observatory, equipping, staffing and placing it in operation. Between 1845 and 1855, under Maury's leadership the Observatory catalogued 100,000 stars and became known as one of the nation's important scientific institutes.

Maritime Scene Mid-19th Century

With sails still the predominant propulsion mode, wind and current charts were significant. By the middle of the century, merchant shipping and the number of ships around the world continued to grow. In competition with the sailing vessel, the steamship was a strong and growing presence in the 1840s and 50s but not in the large numbers that would prevail by the end of the Century. An examination of the front page of the New York Shipping and Commerce List reporting ship arrivals and clearings for January 22, 1851 shows the numbers of steamers and steamships to be very small compared to hundreds of barques, brigs, and schooners listed for that day.

Sails for propulsion, especially on the longer voyages, ruled for another quarter century. The Navy itself only gradually warmed to the notion of using steam for warships, and by then it was past mid-

century. A coal burning Navy vessel was difficult to accept by some. With sails dominating, the winds and currents still were among the main challenges to shipmasters.

Increased shipping came in part from the discovery and exploitation of gold in California. The sea paths from the East Coast to California around Cape Horn or to the Isthmus of Panama with a trek to the Pacific Ocean side and up to San Francisco by sail were long. From England merchant ships sailing to Australia and return took significant amounts of sailing time with the limited information and understanding about seaways available before Maury's wind and current charts. Further, steamers at that time frequently were equipped with sails either in an auxiliary or predominant propulsion role and winds and currents still counted. The 150 clipper ships at their peak validated Maury's wind and current charts.

Wind and Current Charts

Assuming office at the Depot, Maury remembered his experience in 1831 when as a sailing master preparing for his second trip around the Horn at the tip of South America he was unable to locate adequate wind and current charts. Not long after arriving at the Depot, Maury took action to increase understanding and knowledge of wind and currents, which he knew was lacking.

"Less than two months after he took up his post he had to admit that the files of the office could furnish no hydrographical information as to certain portions of the Gulf of Mexico. Charts of naval vessels were found to be over one hundred years old and quite useless. In 1845 he wrote to the Secretary that the office did not know whether there was a frigate harbor on the east side of Florida, a remarkable circumstance since we have owned Florida for more than a quarter of century and since we purchased it chiefly for national defense. [1]

Maury started his research for developing better charts by making use of what was available. The Depot was the archive for Navy shiplogs and official Navy records, not in the sense of an organized

1. Louis J. Darter Jr., "Federal Archives Relating to Matthew Fontaine Maury. American Neptune, Vol. 1: p. 154

collection but as a place for storage. Initially, old ship logs were examined to determine the nature of winds and currents on the Atlantic. Because many of the available logs covered the north-south path to and from Rio de Janeiro, these were the first analyzed. This effort required scrutinizing thousands of pages to find data on wind, rain, current, fog, and other navigational information in the logs. From these efforts, charts were made showing the best sailing paths for the seasons of the year.

As Maury worked with old logs, their inadequacies were realized. He came up with the idea for a new type of abstract log sheets for mariners to use to provide data that would lead to making useful wind and current information for future navigators.

He requested and received approval from Commodore William M. Crane, head of the newly established Bureau of Ordnance and Hydrography,* to implement the log sheets and have the data sent to the Depot. In the fall of 1842, a Bureau circular to captains and masters of merchant vessels requested that they send navigational, meteorological and hydrographic data observed by the ships to the Depot. Maury needed information on currents, depths, salinity, temperatures of the oceans, and of wind patterns from direct observation to develop his charts.

Navy captains were slow to respond to the request to fill in and forward the blank charts provided. However, the response overall provided enough data so that the following March Maury published Directions for approaching the West Coast of Sumatra based on the newly collected information.

By 1851, 1000 sets of abstract logs were sent to Washington. The number grew and by the latter part of the century, in 1887, 26 million filled-in charts had been provided from all sources.

The first wind and current charts for ships in the open seas were published in 1847. During the first year of publication, 5000 copies of the charts were made available. Charts saved time and dollars in long sea voyages. The trip from New York to Rio de Janeiro was reduced from 55 to between 35 and 40 days.

*The Bureau system implemented at this time replaced the old Board of Commissioners and provided the basis for Navy management until the last half of the 20th century. Prior to Congressional action mandating the Bureau system, Maury was one of the voices favorable to its establishment.

Sailing tracks for the North Atlantic came out in 1847. As charts covering the South Atlantic and the Pacific became available in 1849, sailing times steadily lowered. An 1850s estimate indicated $15 million savings per year from the use of charts. The round trip from Great Britain to Australia and New Zealand dropped from 240 to 160 days. In 1852, the passage from New York to San Francisco decreased to 92 days from 118. With as many as 145 clipper ships using charts and saving time and money on their extended voyages, Maury's celebrity status grew. Savings in Indian Ocean crossings were estimated at $1 million. Overall, British commerce saved $10 million per year and United States more than $2 million per year.

In a celebrated New York–to–California race in the fall of 1852 between four clipper ships, Maury's Wind and Current Charts played a significant role for all the contestants. Maury criticized Captain Nickels of *Flying Fish*, the winner. "So forgetting that the charts are founded on the experience of great numbers who had gone before him, Nickels, being tempted turned a deaf ear to the caution, and flung away three whole days and more of most precious time, dallying in the doldrums. [2]

After this, captains used the charts and sailing directions and filled in the Abstract Logs and sent them to the Observatory. "By the end of 1851, Maury could report a thousand American ships on the high seas were faithfully recording this information and at the end of each voyage sending it in to him. [3]

In the decade before the Civil War, Maury became one of the most famous men in the world. These years were marked by success after success always in some practical scientific area. However, adversity did strike at mid-decade.

International Science

In part due to his instigation and in conjunction with British scientists, Maury helped to foster the first International Conference

2. Frances Lee Williams, Matthew Fontaine Maury: Scientist of the Sea, Rutgers University Press, 1963, p. 191.
3. Ibid. p. 192.

on Meteorology held at Brussels August 23, 1853. The goal of the conference was to create an environment of cooperation between the attending nations leading to a universal system for observations at sea. Initially Maury would have preferred the conference to cover both land and sea. Belgium, Denmark, France, Great Britain, Netherlands, Norway, Portugal, Russia,Sweden and the United States accepted invitations. The meetings continued until 8 September and concluded with the acceptance of an international standard for abstract logs, one for men--of-war and one for merchant shipping, and the establishment of the International Hydrographic Bureau.

Maury attended as the United States representative and was well received. Through these meetings he came to know and develop close relationships with important international European scientists. In particular, he came to know Baron Von Humboldt, a major figure in physical geography.

OTHER MID-1850s ACHIEVEMENTS

Transatlantic Telegraph Cable

Charged with the laying of a transatlantic telegraph cable, Cyrus W. Field began discussions with Maury in 1853 regarding best placement of the cable. Maury's knowledge of the ocean bottom and depth derived from several years of measurements made earlier at the behest of Maury and with help from Congress. In 1854, Maury published the first bathymetric chart of the Atlantic Ocean from 10° S to 50° N and provided guidance to Field. The depths identified were to 24,000 feet. Later, when the project was successfully completed, Field is reported as saying, "Maury furnished the brain...England gave the money...I did the work. This brought more praise and fame to Maury.

North Atlantic Steamer Lanes

In the 1850s, as steamer traffic across the Atlantic increased, ship collisions and loss of life caused great concern. A particular tragedy on September 20, 1854 on the Grand Banks 50 miles east of Cape

Race, Newfoundland called the public's attention to collisions at sea on the paths between United States and Europe. The French ship VESTA, with watertight compartments and iron construction, struck ARCTIC, a side-wheeler passenger liner en route from Liverpool to New York.[4] ARCTIC sank in four hours; 350 people died; and the 87 survivors were all men. The sinking was a highly publicized event and brought about attention to the increased density of steamers in transit at one time on the high seas.

Maury was asked concerning the practicability of laying down separate lanes for ships plying between Europe and America. He conceived a plan for two lanes, one to go and one to return on appropriate great circle paths with room to maneuver. The plan,"Chart showing two steamer lanes each twenty miles wide, North Atlantic, was published in 1855. The U.S. Navy encouraged the use of the plan. Some steamship lines put it to use, but it was near the end of the century before it was fully subscribed. Like a great deal of Maury's work, the end results provided practical solutions to difficult problems.

During the next seven years, his recognition at home and abroad saw him made a member of 45 learned societies, 20 of which were in foreign countries. Denmark, France, Portugal, Russia, Norway, Sweden, Holland, and Austria found it appropriate to recognize and reward Maury. In 1860, the Pope, whose papal fleet was involved in the data collection and benefited from Maury's wind and current charts, sent him a set of thirteen medals in appreciation.

Physical Geography of the Sea

The sweep of Maury's interests is probably best reflected in his book Physical Geography of the Sea. As a personal enterprise, he wrote at home after working hours, completing and publishing it in a little more than a year. The book had five printings in the first year, 1855. This first modern oceanographic textbook remained

4. Comdr. A. G. Brown (retired), " The Arctic Disaster: Maury's Motivation, "United States Naval Institute Proceedings 94:1 (January 1968), pp. 78-83

continuously in print for 25 years in the United States and England and was printed in six continental languages. Like most things having the Maury stamp, the book was large, almost 500 pages. With the book the science of oceanography was opened. There were many early critics, but a 1930 comment called the theoretical treatment remarkable considering the time when Maury wrote it.

This friendly comment aside, some of Maury's contemporaries and other scientists later in the century were not always in agreement with some of his explanations and hypothetical generalizations of the sea. That he contributed to science and navigation is not challenged.

It was Maury's interpretations and speculations in the Geography that were brought to task during his lifetime and after his passing. In 1963, the same year that Williams's book appeared, John Leighly of the University of California at Berkeley edited the Geography.[5] In a 30 page Introduction, Leighly documents many of the challenges and strongly attests to Maury's flaws in his scientific thinking. Leighly does not entirely excoriate Maury. He does allow that the book did exert some limited scientific influence. Frances Leigh Williams in her 1963 precise biography observes "But Maury was a pioneer investigator of the phenomenon of the seas; and although research in later years proves some of his concepts wrong, he was a bold workman who believed beginnings had to be made. [6]

The introduction to the first edition in 1855 clarifies his rationale for wind and current data and how the new book came to be. He wrote "The primary object of the Wind and Current Charts out of which has grown this Treatise on the Physical Geography of the Sea was to collect the experience of every navigator as to the winds and currents of the ocean, to discuss his observations upon them, and to present the world with the results on charts for the improvement of commerce and navigation.

---

5. John Leighly (editor), The Physical Geography of the Sea and Its Meteorology: by Matthew Fontaine Maury, The Belknap Press of Harvard University Press, Cambridge, Massachusetts, 1963, Introduction

6. Frances Leigh Williams, Matthew Fontaine Maury: Scientist of the Sea, Rutgers University Press, New Brunswick, NJ, 1963, p. 260

Adversity

In 1855, when Maury was a highly recognized international scientific figure, Congress passed the Navy reform bill, which Maury favored. His published writings under several pseudonyms encouraged reform and changes in the Navy. His recommendations included the Navy's adaptation of the Bureau system for managing the Navy and establishment of a Naval Academy, both of which came to pass.

Another of the reform measures passed by Congress created a selection board of Navy officers to review the careers and suitability of Navy officers for sea duty. The board was sometimes referred to as *the plucking board*. The convening board of Navy officers held secret deliberations and kept no records. It was their recommendation that Maury be placed on inactive duty. Unaware of this action Maury, with thirty years of service, was advised of this in September 1855. It took more than two and a half years of vigorous contesting involving Congress, a court of inquiry, and others for this action to be rectified. In January 1858, Maury was reinstated by President Buchanan and promoted to Commander.

During the Congressional hearings related to Maury's return, Senators Stephen R. Mallory of Florida and Jefferson Davis of Mississippi strongly opposed returning Maury to active duty. It is ironical that a few years later in April 1861, when Maury elected to return to Virginia and join the Confederate Navy, he would encounter Davis as the President of the Confederacy and Mallory as the Secretary of the Confederate Navy. Most of Maury's service to the Confederate Navy seems to have been impacted by their attitude toward him.

In April 1861, a little more than three years after his reinstatement, Maury began his career in the Confederate Navy as a scientist. During his first year with the Confederacy, he investigated and successfully demonstrated electrically detonated mines both underwater and on land. Partially due to Maury's innovative work, more of the 58 Federal ships sunk during the Civil War were lost due to mines than from all other causes combined. The uneasy relationship with Mallory and Davis probably brought him the role of Confederate Envoy in England for the last three years of the Civil War.

Without amnesty to return home from England, Maury served briefly in Mexico as an advisor on scientific and colonization activities for Emperor Maximilian. While in Mexico, he was instrumental in the successful introduction of cinchona plantations as a source for quinine. Back in England, and with President Johnson granting amnesty, Maury was able to return to U.S. during September 1867. Several offers to lead academic institutions in the south were proffered. He chose the Virginia Military Institute and, on September 10, 1868, and was appointed professor of physics. His productivity never faltered as he entered the last five years of his life. The state of Virginia honored Maury by placing his tomb between Presidents Monroe and Tyler.

Captain Miles P. DuVal, Jr., in his book Matthew Fontaine Maury: Benefactor of Mankind summarizes a great deal of Maury's goal: "the military role of Navy is to control the seas, to accomplish this goal the Navy must know all about them.

IN MEMORIAM

LCDR Richard Coupe, USN(Ret)
LT J. Harvey Gleberman, USN(Ret)
CDR Stanley Hecker, USN(Ret)
CAPT James T. High, USN(Ret)
ADM Thomas Moorer, USN(Ret)
CAPT Norman Shriver, USN(Ret)
CAPT Albert H. Thomas, Jr., USN(Ret)
CAPT Leif Tollefson, USN(Ret)

Perot Systems Government Services, Inc., a wholly owned subsidiary of Perot Systems Corporation, provides consulting, technology-based solutions, and program management support to the federal government. More than 1,500 associates in the Washington, DC area and around the globe deliver information technology, engineering, environmental, and financial management services to federal defense, homeland security, and civilian agencies. We focus on innovation and customer intimacy to drive quality results for our clients.

Our associates are committed to delivering effective solutions for a wide spectrum of submarine challenges. We directly support engineering, life cycle management, submarine safety (SUBSAFE), quality assurance, and logistics program and program management requirements for ships and nuclear-powered submarines.

perotsystems®

Government Services

THE HUNT FOR USS ALLIGATOR: THE U.S. NAVY'S FIRST SUBMARINE

by Commander Richard C.Poole,USNR
& J.L.Christley EMCS(SS), USN(Ret.)

CDR Poole has been assigned to the Office of Naval Research (ONR) since November 2001, working with the Naval Research Science and Technology Action Team (NR-STAT), ONR-Global and, currently, the Tech Solutions Program. A native of Albany, New York, Rich currently resides in Washington, DC.

Mr. Christley is a retired Senior Chief Petty Officer who served from 1962 to 1982 on seven submarines ranging from diesel boats to fast attacks and missile submarines. After working in the field of submarine noise reduction until 1997, he started a third career in fine arts. Jim presently resides with his wife Peggy in Lisbon, CT where he has his studio.

Imagine living in Philadelphia during the early days of the Civil War and reading the latest issue of the *Philadelphia Evening Bulletin.* A front page story reveals a strange and alarming tale: Harbor police have captured a partially-submerged, cigar-shaped "infernal machine moving slowly down the Delaware River.

This submarine was the creation of French inventor, Brutus De Villeroi, who had moved to America in 1859. Although little is known about De Villeroi personally, it is clear that he possessed a healthy self-image; in the 1860 census, he listed his occupation as *Natural Genius.*

A native of Tours, De Villeroi had spent much of his adult career in Nantes, working as a mathematics teacher and part-time inventor. One of the devices he had developed in France was a small submarine that could function as a support platform for hard hat divers. He

built one that was tested in a bay on the west coast of France. Although the French Navy was not interested in the device, De Villeroi was undeterred.

Among his students was Jules Verne, who would later write about the fantastic voyages of the submarine, NAUTILUS in the book Twenty-Thousand Leagues Under the Sea. Considering that De Villeroi had named an earlier undersea prototype NAUTILUS, it is not farfetched to surmise that the inventor had been a strong influence on young Verne's imagination.

Working in Philadelphia on an anthracite coal exporting venture, De Villeroi interested some insurance backers in the concept of using a submarine similar to the one he built in France to search for and salvage gold, most notably from wrecks of the DE BRAAKE and CENTRAL AMERICA. He was testing his small salvage submarine in the Delaware River when the police took notice. They arrested De Villeroi as well as some of his workmen. They also impounded the curious iron tube, which measured some 33 feet long and about five feet in diameter.

Needless to say, the police had no idea what this vessel was but they knew it needed to be put under Naval control. They contacted Captain Samuel F. DuPont, commandant of the Philadelphia Navy Yard. In response, Captain DuPont appointed three officers to examine the device, interview the inventor and report their findings. Whether by design or not, De Villeroi had succeeded, by November 1861, in signing a contract with the Navy to build the Union's first submarine.

The officers chosen by DuPont were ideally qualified to inspect De Villeroi's novel vessel. The senior officer was Commander Henry K. Hoff, an expert in ship design. As second officer, Commander Charles Steedman was an expert in naval warfare. The third officer, Robert Danby was an eminent naval engineer. After completing their examination, the three submitted their report on July 7, 1861.

The Hoff Commission reported that De Villeroi's screw-propelled submarine, resembling a whale in form, appeared to be a successful venture. The officers singled-out four distinctive operational characteristics of the submarine: 1) the ability to remain submerged for a length of time without exposing anything to the

outside air; 2) the ability to sink and be raised at will; 3) the ability of a man to leave and return to the vessel while both remained submerged and lastly; 4) the ability of a man to survive outside the submarine while submerged by breathing through an air tube connected to the inside of the boat.

While the Hoff Report was being filtered upward through various Navy bureaus, De Villeroi sent letters describing the invention to both Secretary of the Navy Gideon Welles and President Abraham Lincoln. His letter to Lincoln was forwarded to the Navy Department. In response to his correspondence from De Villeroi, Welles ordered Commodore Joseph Smith, Chief of the Bureau of Yards and Docks, to report on the submarine. Smith informed Welles that the Hoff report had reflected favorably on the vessel but that, in her present configuration, she was too small to readily test as a weapon. In response, Smith recommended that a larger version be built on a *no payment for failure* basis.

De Villerot's Submarine boat, seized by the government at Philadelphia, May 16th, 1861—*from a sketch by our special artist.*

With the assistance of a Philadelphia contractor, Martin Thomas, a contract to build a new submarine was drawn up among a trio of interested parties: De Villeroi, Thomas and a group of financial backers, and the US Navy itself. Located in the National Archives, the contract for construction of the Alligator underscores the Navy's intention for the vessel as well as a tantalizing *secret*:

> In case the said De Villeroi shall perform valuable services with said propeller for the United States by the destruction of an enemy's ship or vessel by direction of the Secretary of the Navy and to his satisfaction, then the government of the United States shall pay to the party of the first part a further sum of eighty six thousand dollars ($86,000) subject to and appropriated by Congress.
>
> The secret of said invention shall be divulged by the inventor, M. De Villeroi, under his solemn oath or affirmation in a written paper subscribed by him to be sealed and deposited with the Chief of Bureau of Yards and Docks, with the certificate thereon of Mr. W.L. Hirst that he has carefully examined the paper and firmly believes it to be of the secret of said invention, not to be opened until after the payment of said eighty six thousand dollars, or the death, disability or dereliction of duty of the inventor shall occur.
>
> The said invention shall not be used by or the secret divulged to any government, power or individual without the consent in writing of both parties to this agreement.

The stream of these events in 1861 mark the very beginning of the U.S. Naval Submarine Force, as reflected in the little-known story of *United States Submarine Propeller U.S.S. Alligator,* a technological wonder akin to other great maritime advances of the Civil War era, including the celebrated ironclad U.S.S. MONITOR, and the recently-raised Confederate submarine, C.S.S. HUNLEY.

The Alligator Comes to Life

Construction of the vessel began immediately at the Neafie and Levy Shipyard, in the Kensington section of Philadelphia. Although the Navy had specified that the submarine's construction take no more than 40 days at a cost of $14,000, the project would suffer long delays.

On December 7, 1861, De Villeroi wrote to Commodore Smith that the vessel was "almost entirely finished, but he nonetheless emphasized that the construction time would need to be extended in order to finish "delicate pieces of the interior. He also noted that, because vessel was entirely different than anything that the yard had built before, it was scarcely possible for the contractor to truly appreciate how long construction would take. De Villeroi added that the contractor (Thomas) had not scheduled things properly. The seeds of disagreement were thus sown, guaranteeing a disruption of building process and further delays.

Because the Neafie and Levy shipyard was expert in building boilers, marine engines, and smaller tugs, it could easily build the submarine's main structure and propulsion system. Contrary to De Villeroi's contention in his letter to Smith, the vessel's internal workings were not overly complex. It is likely that the inventor was attempting to further delay the project in order to cut out Thomas and his backers from the project.

Enter Mr. William L. Hirst. A Philadelphia lawyer, Hirst was hired to serve as a go-between in the ongoing dispute between De Villeroi and Thomas. Commodore Smith granted a fifteen-day extension on December 10, 1861, the date the boat was to be finished. On December 20th, Smith received word that the *secrets* were in Hirst's possession and locked in his safe. Smith's hard stand

on finishing the ship was based, at least in part, on his own deadline. Norfolk had fallen and word of the conversion of U.S.S. MERRIMAC into C.S.S. VIRGINIA had reached Washington. In his letter to De Villeroi, Smith noted that any contract scheduling difficulties were "no fault of mine."

The letter passed on from Hirst to the Bureau asking for another 14 days to finish the work. At about the same time, the inventor wrote to Smith that the delays were entirely the fault of the contractor (Thomas), in that money was not forthcoming to allow work at night and on weekends. De Villeroi further stated that a crew was needed to be hired soon so they could be trained. At the end of the letter, De Villeroi recommended to the Commodore that the two of them correspond directly, not through the contractor, to resolve any remaining problems.

Commodore Smith was furious. On December 3rd, he wrote to De Villeroi, spelling out the facts of bureaucratic life. He noted that he would be happy to correspond but "as for the contract, the Department knows no one but the contractor. He further stated that, because of the delays and evident problems, the ship would not be considered received until it had been fully tested and determined by the Navy to be fit in all respects.

The second extension passed and the vessel still was not finished. It appears that there were some things the inventor wanted for the boat that Thomas had not provided and these were needed to produce the *secrets* mentioned in the contract. From the existing records, it seems that the secrets refer to a form of air purification system and a type of battery. An air purification system would be of great use in allowing the submarine to stay submerged. The usefulness of the battery is somewhat a mystery. One conjecture is that it would be used to detonate mines or charges laid by the divers.

De Villeroi wrote to Smith on January 18th, magnanimously stating that his payment for work on the submarine would be "the glory and successful completion of the work." He added that, "after taking on the ballast of lead and some pieces of platina which have not been furnished me," the work would be finished. Because the completion date and the extensions had passed, he once again recommended that he and Smith henceforth communicate directly

with each other: "Now that you have done away with the contractor...business ought to be between the government and the inventor."

On the January 22nd, Smith brusquely informed the inventor that no further money would be forthcoming until the boat was finished and tested. He added that the government still knew no one but the contractor with respect to the boat. A week later, Smith sent Thomas an ultimatum: If the boat was not finished and ready to be shipped aboard USS RHODE ISLAND in three or four days, the time for using the submarine would have passed, adding "... MERRIMAC (C.S.S. VIRGINIA) is out of dock and ready for trial at Norfolk".

The submarine was reported ready for launch on January 29th but, according to Thomas, some of the oars that were to be used for propulsion had to be reworked, thereby further delaying the launch. At about the same time, De Villeroi advised Smith that the latest delay was being caused by ice on the river. In the meantime, the boat was being painted, green outside and white inside.

February arrived and the boat was still not complete. Commodore Smith was becoming increasingly anxious, both because of the apparent lack of progress of the submarine and the imminent threat being posed by C.S.S. VIRGINIA. A letter to De Villeroi on February 1st suggests that, while Smith had little faith in the usefulness of the boat, he still felt it warranted a trial.

Smith had made a tactical error in that letter by assuring De Villeroi that Thomas was to provide everything he needed to finish the submarine. De Villeroi immediately wrote back and listed each of the required materials that had not been supplied, which he contended held up completion of the boat. These included explosives, two hydraulic jacks, platina, a telescope which could give distances (a patented invention of De Villeroi's that proved to be of particular use in the submarine), and a chest of tools. In the same letter, he also listed a litany of complaints about Thomas--including his having had *unethical* discussions about De Villeroi's inventions with other scientists and not spending enough money to complete the work in a timely manner. The monies spent on the project, he insisted, were much less than the $14,000 allotted in the contract. Suggesting that there had been threats against the boat, he also urged that the Navy to take possession of the vessel while it was

still being completed, in order to keep it safe from harm.

Before this letter had reached the Bureau, Smith informed Thomas stated the terms of the contract had not been met and that the boat would not be received by the Department until *such time as further opportunities avail themselves*, when the contract would have to be renegotiated. De Villeroi, upon hearing of this development, rushed off another letter to Smith. He insisted that he (De Villeroi) was still employed by the government and was therefore entitled to pay until such a time as the Navy Department suspended his nomination as engineer of the work.

Smith shot back that the relationship among Thomas, De Villeroi and the Navy Department was *unique*. He then issued his sternest ultimatum:

> ... the time has elapsed for the completion of the boat and the contract is forfeited. You now decline, as I learn, to give certificate of the completion of the boat because the contractor demurs to furnishing a quantity of costly material which the chemists say is unnecessary.
>
> Therefore work and superintending is stopped and will remain so until you and Mr. Thomas come to terms... If the contractor will deliver the boat in 10 days complete and with your certificate and you and your crew will be there, the government will test the efficiency and if she proves satisfactory, payment will be made. Until there is compliance with these terms, the Department will...consider the bargain as closed.

After that, Hirst tried to salvage the project by initiating a flurry of correspondence between Thomas and De Villeroi. As a result, the parties came to terms on everything but the platina for the battery. The problem was not whether they were necessary, but what size they were to be. Thomas tried to placate the inventor by sending him money to get the plates that he could not find. De Villeroi wrote a letter to Smith saying that he considered the offer insulting, calling it an "insidious proposition. He also wrote to Lincoln, still trying to cling to the hope that he could be named as commander of the vessel. With little subtlety, he wrote "(I) haven't received a commission as yet as commander of the Propeller—I would be happy to

receive it from you. No reply to this letter has, as yet, been located.

After Thomas notified Smith that attempts to resolve the various problems had failed, Smith decided to consider the contract null and void because its terms had not been met. Hirst again interceded to try to save the project. Smith agreed to send Captain Davis of his staff to negotiate with the parties and attempt to resolve the impasse. De Villeroi refused to meet with Davis. In objecting to certain changes to his plans for the vessel's construction, the inventor effectively exited himself from the process and was later officially dismissed as supervisor. Completion of the submarine would go on without him.

On May 1, 1862, the new submarine was launched by a crane which lowered her slowly into the water of the Delaware River. Mr. Levy stood on the deck as if to show his confidence. Later that day, she was towed to the Philadelphia Navy Yard. The submarine had actually become the property of the Navy since April 28th, when the Navy Department made payment to the shipbuilder.

After reading a newspaper account of the Navy's acquisition of the boat, De Villeroi became furious. He wrote a scathing letter to Secretary Welles. Receiving no reply, he then sent a letter to Smith, degrading the honor of virtually everyone associated with the project. In his reply to the inventor, Smith diplomatically tried to placate De Villeroi, but to no avail. De Villeroi was no longer interested in taking any part of the project. The boat was now without a system expert.

A salvage diver, Samuel Eakins, was brought to the attention of Martin Thomas and was soon appointed to oversee completion of the boat, finish her details, and act as her skipper. Eakins had worked in clearing the Sevastapol harbor of wrecks left after the Crimean War.

One month later, Commodore Smith directed Hirst to formally turn the submarine over to the Commandant of the Philadelphia Navy Yard, a task he completed on the June 13, 1862. Eakins would serve as *Acting Master* of the vessel, with a crew that would be paid by the Navy.

Painted green and propelled by a row of nine oars on each side, the vessel quickly became known as the ALLIGATOR by virtue of the reptile she resembled. These following particulars at the time of

her launch are gleaned from the designer's drawings and written descriptions, since no official Navy drawings or sketches of the vessel have yet been located:

Length: 47' (Hull)
Beam: 4'-6" (Hull)
Extreme Beam: 8'-2" (over oar guards)
Keel to top of hull: 6'-0"
Keel to top of air tube: 8'-2"
Color: Dark green with white interior
Displacement 27 tons surface/ 35 tons submerged
Propulsion: A system of 18 oars, nine on each side.
Crew: One officer, one helmsman, and 18 oarsmen (one or two of whom are presumed to have also served as divers); total-20
Weapons: Divers and explosives, torpedoes (mines)

ALLIGATOR was fashioned of riveted iron plates, rounded at both top and bottom and tapered at the bow. It is not certain whether the stern was similarly tapered or more rounded. The access to the interior was via a hatch set forward on the upper side of the hull. After Eakins took over superintending the vessel's completion, he arranged to build a small cast-iron dome to replace the upper access hatch. It doubled as a hatch and, punctuated with several small windows, had just enough room for the boat's commander to stick his head up inside to see out. A second hatch on the lower side of the tapered bow structure was designed for diver access. A small diver lockout chamber was located in the bow.

By the time the ALLIGATOR was ready, C.S.S. VIRGINIA was gone, scuttled by her crew. Commodore Smith had ordered the

submarine to the command of Flag Officer Louis M. Goldsborough of the North Atlantic Blockading Squadron. Goldsborough quickly determined that ALLIGATOR could be a great asset in helping to clear obstructions in the James River, near Drewry's Bluff. Not only would this assist the Union Army, now stuck on a line from Harrison Landing northward around the east side of Richmond, it would also allow ironclad ships, such as U.S.S. GALENA and U.S.S. MONITOR, to pass upriver, flank the Confederate line and bombard Richmond.

The submarine was towed to Hampton Roads by the crew of the tug Fred Copp. Her awaiting missions: to destroy a strategically important bridge across the Appomattox River and to clear away various obstructions in the James River. When ALLIGATOR arrived at the James, with Eakins in charge, a fierce battle was being waged in the area. As directed by Goldsborough, the submarine was moored alongside the ship SATELLITE, which he ordered to provide berthing, messing and other necessities for ALLIGATOR's crew. In effect, he created what would become a new concept: the forward area based submarine tender.

Goldsborough turned over tactical command of the submarine to Lieutenant (Commanding) John Rogers of U.S.S. GALENA. On June 25th, Rogers inspected the vessel and later, at a meeting with Eakins, rejected using the boat for the twin tasks of breaching the obstructions and blowing up the railroad bridge at Petersburg. His logic, even today, is irrefutable. The submarine required at least six feet of water to operate submerged and another 18 inches minimum to lock out a diver. Both the James and the Appomattox were less than seven feet at the points of operation. The ship would have to operate semi-submerged and therefore would be vulnerable to cannon fire. Rogers recommended that the vessel be sent back to Hampton Roads to prevent capture and use by the Confederates.

By the end of June, ALLIGATOR was on her way back to the Hampton Roads, en route to Washington for further experimentation and testing. Ironically, the Union's first submarine had earned the distinction of being the very first submarine to be deployed to a combat zone, but after eight days there, had not been used.

Reconfiguration

In August 1862, Lieutenant Thomas O. Selfridge accepted command of the submarine, after being promised promotion to captain if he and ALLIGATOR's new crew destroyed the new Confederate ironclad, VIRGINIA II. During test runs in the Potomac, ALLIGATOR proved to be underpowered and unwieldy. During one particular trial, the vessel's air quickly grew foul, the crew panicked, and all tried to get out of the same hatch at the same time—prompting the future Admiral Selfridge to deem the submarine unseaworthy and the whole enterprise *a failure*. He and his crew were reassigned and the vessel was sent to dry dock for extensive conversion. The dream of using this *secret weapon* against *VIRGINIA II* was scrapped.

Despite Selfridge's negative report, ALLIGATOR won some converts and, during the winter of 1862, underwent a propulsion change. Her oars were removed, replaced by a hand-cranked screw propeller. In a test witnessed by President Lincoln on March 18,1863, the boat made four knots. A letter to Commodore Smith makes note of the test, describing ALLIGATOR's performance as admirable.

Now, in the spring of 1863, another task beckoned. Samuel F. DuPont, the same officer who had headed the initial investigation of De Villeroi's invention eighteen months before, was now in command of the South Atlantic Blockading Squadron. Stationed in Port Royal near Charleston, he and his staff were trying to determine how best to invade and open up Charleston harbor. Unlike Farragut before him, he could not simply force passage by running past the forts into the inner harbor. Even there, his ships would have been sitting ducks. Moreover, two Confederate ironclads, C.S.S. CHICORA and C.S.S. PALMETTO STATE, were threatening to break the blockade by escorting cargo ships past the Union Naval forces off the harbor entrance. Using ALLIGATOR for attacking these two ships at their anchorage seemed to be the ideal solution. Upon DuPont's request, the submarine and her crew, once again commanded by Eakins, were ordered to Port Royal to participate in the capture of Charleston.

An Early Demise

On March 31st, one day before departing Washington, Eakins and his crew transferred freight aboard U.S.S. SUMPTER, the ship that would tow the submarine around Cape Henry and south to Cape Hatteras, en route to Port Royal. Included in the freight were large lead ingots that would be used as ballast for ALLIGATOR, which was connected to the tug by two lines, or hawsers. Both crews were situated aboard SUMPTER.

Samuel Eakins

After a calm first day at sea, the men began to experience what the *New York Times* would later describe as a "succession of gales and tornadoes which were almost unparalleled in severity. On the afternoon of April 2nd, off the coast of Cape Hatteras, the storm's fury increased to the point where SUMPTER was "plunging under to the foremast, according to the ship's Acting Master, W.F. Winchester. Suddenly, one of two hawsers snapped, causing the submarine to yaw wildly. As described by Eakins in a letter dated April 9th to Secretary Welles, the situation forced a difficult decision:

> About 3:40 p.m., it was reported to me that the Port Hawser attached to ALLIGATOR had parted and at 5:30 p.m., I was informed that the ship was laboring heavily and that it would be impossible for the Starboard Hawser to hold out much longer... I concurred with the opinion of the other officers of the ship and the order was given to cut the Hawser, which was accordingly done.

According to the reports sent to Welles, ALLIGATOR was *lost* at sea, in an area where the ocean's depth is as great as 9000 feet. The little submarine that was en route to make history was never seen again.

Fast Forward

In the 140 years since ALLIGATOR's loss, relatively little has been written about her. Louis Bollander's scholarly article in the June 1938 issue of U.S. Naval Institute Proceedings refers to the ALLIGATOR as the *first federal submarine of the Civil War*. Other articles have subsequently been published in periodicals such as All Hands, Civil War Times Illustrated, and America's Civil War. In his book, Submarine Warfare in the Civil War, Mark Ragan has woven the story of ALLIGATOR into the historical context of submarine development throughout the 18th and 19th centuries, with particular focus on the 1860's. Despite these and other publications that describe ALLIGATOR, the boat's story has remained obscure—up until recently, that is.

One day in early 2002, the Chief of Naval Research, Rear Admiral Jay Cohen and his wife were browsing a local bookstore. Mrs. Cohen brought her husband's attention to a small magazine article on ALLIGATOR. A career-long submariner, Cohen was amazed that he had never heard of the vessel. Later, as he read the piece, he became fascinated with the tale of De Villeroi, his possible connection with Jules Verne as well as the myriad secrets that still surround the vessel.

Shortly thereafter, during a trip to the site of the remains of John F. Kennedy's famed PT-109 in the Solomon Islands, Cohen shared the tale with two colleagues: famed marine explorer Bob Ballard and Dan Basta, head of the Marine Sanctuaries Program of the National Oceanic and Atmospheric Administration (NOAA). Before long, the three men were asking the same question: Can we find her?

Upon his return, Cohen assigned Commander Richard Poole of ONR to coordinate both the uncovering of historical information on the vessel and the pulling together of a steering committee to make recommendations based on this information. Working at the National Archives and the Library of Congress, Poole found numerous letters and articles written in the 1860's—including the letters from Eakins and Winchester that describe ALLIGATOR's loss. Poole also enlisted the help of various experts on the topic—including historians Jim Christley and Mark Ragan. Recognizing the historical significance of the vessel, Christley and Ragan

were pleasantly surprised to hear of the Navy's interest; they had never imagined that serious consideration would ever be given to the possibility of finding her.

In late November 2002, the Chief of Naval Research hosted a meeting attended by Christley, Ragan, NOAA representatives, as well as retired Rear Admiral Malcolm MacKinnon, a noted expert on towing. After reviewing historical information uncovered to date, the attendees were asked to consider: 1) what might have happened to the submarine after she was cut loose; and 2) the possibilities of forming an ongoing, collaborative effort to both raise awareness about ALLIGATOR and, eventually, locate her. A consensus was reached that the boat was probably taking on water and was in the process of sinking at the time of her being cut loose. Knowing the general area where she was separated from SUMPTER, work could begin on studying whether the submarine might still be intact and locatable.

Separate surges of effort thus began on what would become known as ALLIGATOR Project. Personnel from ONR and NOAA continued to conduct research into the documented history of ALLIGATOR and the probable area of her sinking. With the assistance of NOAA's Michiko Martin and faculty of the U.S. Naval Academy, four U.S. Naval Academy midshipmen, all majoring in oceanography, participated in a semester-long project on ALLIGATOR. After carefully considering storm conditions, the last noted location of the submarine, geology of the ocean bottom in that area, wind and wave conditions, and the vessel's structural properties, the students reached the following conclusions:

- ALLIGATOR was most likely lost in the middle of the Gulf Stream.
- Presuming the submarine sank in deep (9000 feet or so) water, it is probable that that she remains on the seabed in relatively intact condition.

Meanwhile, Poole and Christley reviewed existing historical records about the construction and use of ALLIGATOR at the Philadelphia Historical Society, the National Archives, the Mystic

Seaport Library and Submarine Museum Library in Groton, Connecticut. On the 140th anniversary of the sinking of ALLIGATOR, a conference was held at ONR where results of these preliminary investigations were presented. It was agreed that the search for ALLIGATOR should proceed and, at the recommendation of Rear Admiral Cohen, that a symposium be held in the near future to increase public awareness about the vessel.

The actual search for ALLIGATOR commenced in June 2003. During a routine cruise, the NOAA research vessel Thomas Jefferson devoted several days of her survey time to conduct a sonar search for Alligator-like objects in an inshore section off Cape Hatteras. Because no likely signatures were detected, this area was eliminated from future consideration.

In October 2003, a "Hunt for the ALLIGATOR symposium was staged at the Naval Submarine Museum in Groton, Connecticut. Attended by over 75 people, including representatives of the media, the event featured lively dialogue and presentations on aspects of ALLIGATOR's history and scenarios surrounding her loss. Among the speakers was Bob Ballard who, referring to his experience in locating the TITANIC, PT 109 and other shipwrecks, addressed prospects for finding the submarine.

Another presenter was NOAA's Catherine Marzin, who revealed news of an exciting discovery she had recently made at the French Navy's historical archives, the Service Historique de la Marine: the only design drawings of ALLIGATOR found to date. Drafted by De Villeroi, the drawings provide new details about the vessel's architecture and breakthrough technologies. Marzin also reported finding a number of original, hand-written letters exchanged in the spring of 1863 by De Villeroi and the French government. The letters document De Villeroi's repeated but unsuccessful attempts to persuade the government of his native country to purchase his submarine design.

By the end of 2003, after distribution of a joint ONR-NOAA press release, word of ALLIGATOR began to spread like wildfire. Focused on the news of the discovery of the French blueprints, the release resulted in the publication of articles in numerous newspapers across the country, including the Los Angeles Times, the Washington Post, the Baltimore Sun, the Philadelphia Inquirer, and

the Atlanta Journal-Constitution. Electronic media picked up the story as well, with interviews on NPR's Morning Edition and ABC.

The Way Ahead

While it is still too early to tell what will come from the new groundswell of interest in the submarine, it is safe to say that the hunt for ALLIGATOR will continue. To date, very little has been spent on the project and it is likely to remain so, unless a major contributor comes through with funding to support a sustained search.

In any event, as a result of the recent efforts of both ONR and NOAA, the ALLIGATOR Project has developed a momentum of its own. Admiral Cohen has frequently invited everyone interested to join what he lightheartedly calls "AA—*Alligator* Anonymous . Interested individuals as well as organizations such as NAUTICUS, the Naval Historical Center, and the Navy and Marine Living History Association (NMLHA) have responded to that call by helping to increase public awareness about ALLIGATOR. For example, in addition to NOAA's ALLIGATOR website (http://www.sanctuaries.noaa.gov/alligator/), NMLHA has developed its own, highlighting its various ALLIGATOR-related educational activities (http://www.navyandmarine.org/alligator.htm).

And so, more than 140 years later, the fascination with DeVilleroi's *infernal machine* is rekindled. As the Alligator's 150th anniversary approaches, the question looms larger: "Can we find her?

Our Focus & Heritage

– providing the U. S. Navy Submarine Force and its prime contractors with absolutely the best value in sonar systems and sonar arrays.

Please come see us or give us a call to discuss your requirements for:

- antisubmarine warfare
- mine warfare
- underwater acoustic communications
- underwater acoustic navigation

We think you will appreciate our combination of big company expertise and resources combined with small company responsiveness and flexibility.

Electro-Ceramic Products
- A Unit of EDO Corporation

- •People
- •Technology
- •Experience
- •Quality & Teamwork

THE THRESHER DEBRIS FIELD

by Captain Frank Andrews, USN(Ret.)

This is the story behind two artist's sketches taken from an official report titled Deep Ocean Search in the Thresher Loss Area, 1964 (ONR-24).The report, dated February 9, 1966 is to Rear Admiral John K. Leydon USN , Chief of the Office of Naval Research, and Commander of Task Force 168. It is from the author of this paper who was also Commander Task Group 168.1. Two searches were conducted in the THRESHER loss area. (See figure 1) The first was in 1963 starting on April 10th of that year which was the day the Thresher (SSN593) casualty occurred. The second was in the summer of 1964 and is the subject of the report to Rear Admiral Leydon.

THRESHER was attached to the Submarine Development Group II in New London, Connecticut. I was the Commander of the Group and eventually became the long term search commander for both the 1963 and 1964 search operations.

The first graphic (Figure 1) is the location of USS THRESHER (SSN 593) now in broken parts on the continental shelf about 220 mile east of Cape Cod in waters 8250 feet deep. The geographic position is accurate enough in latitude and longitude, but the artist exaggerates the slope of the shelf terrain. It is more like a few degrees downward moving east.

THRESHER had been in the Portsmouth, New Hampshire Naval Ship Yard for a nine month post shakedown availability which started in late summer of 1962. On April 9, 1963, the ship had completed the yard time and left the Shipyard for its first under way operations. It arrived in the assigned operation area in the evening. Test dives and other shipboard routines were commenced the following morning, April 10, 1963. Commander Wes Harvey was now the skipper having relieved Commander Dean Axene, the commissioning skipper, in early fall of 1962. USS SKYLARK (ASR 20), a submarine salvage ship, was in company with THRESHER and was in fact in under-water-telephone communication (UQC) whenever THRESHER was dived.

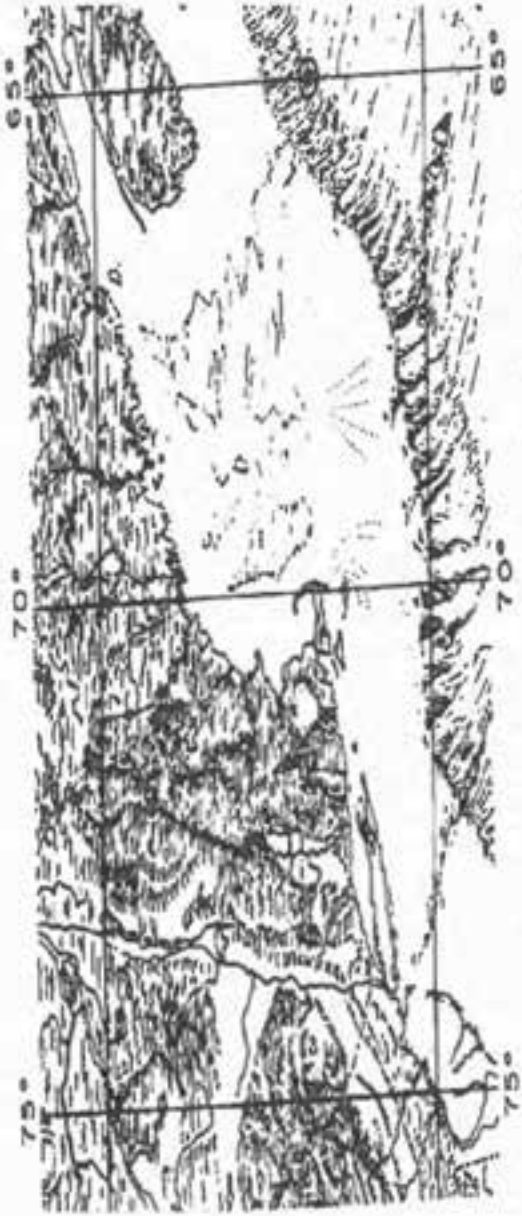

Fig.1 Location of Thresher on the Atlantic Continental Shelf

A dive to test depth was carried out by THRESHER in mid morning and led to the catastrophic implosion of THRESHER's pressure hull, probably at 2500 feet or deeper. The deep dive was underway no more than fifteen minutes when Commander Harvey reported having some difficulties to nearby SKYLARK. Not too many minutes then went by before SKYLARK heard first what sounded like ballast tanks being blown and later thereafter hull break up noises.

Vice Admiral Joe Grenfell, ComSubLant in Norfolk, ordered his deputy in New London, Rear Admiral Red Ramage to the dive scene as Commander of Task Group 89.1. On that day, there was no real search organization, no search technique, nor specific operating procedures for locating an object on the ocean floor at 8000 feet. In the first few frantic hours after Thresher's loss, a full scale search effort consisting of 13 ships was laid on with the aim of scouring the ocean surface for possible life or floating signs from the THRESHER. Within 20 search hours, all hope for survivors had passed. The project then began to change from that of a standard Navy Search and Rescue operation to that of an oceanographic expedition. I was ordered to relieve Admiral Ramage and became the search commander for the balance of the summer. The operational group still remained Task Group 89.1 with ComSubLant in Norfolk as CTF 89.

The initial search area in 1963 was defined as a 10 mile by 10 mile square area with the center at THRESHER's most probable location. This latter point was named point Delta. Point Delta was determined by the navigational position of USS SKYLARK which was in UQC communication with THRESHER at the time of the latter's breakup. The search area was reduced to 1 mile by 1 mile near the end of the summer.

There were certain clues which brought about this happy situation. The Woods Hole Research Vessel ATLANTIS II and science team searching near point Delta, were able to obtain bottom photographs of bits of wire, and twisted metal in an otherwise quite clean ocean floor. Next the CONRAD (AGOR-3) from the Lamont Laboratories at Columbia University, using a scallop dredge in the now reduced size search area recovered a packet of O-rings with name plate data on each of the O-ring envelopes. Soon ATLANTIS,

also dredging, brought up a section of battery plate. Finally, CONRAD some time later, using a towed ocean floor rig with attached camera obtained good pictures of a submarine oxygen bottle sticking almost upright in the ocean floor and a 10-foot piece of sheet metal identified as sonar baffling used on the exterior of a submarine.

The above evidence encouraged the use of the Bathyscaphe Trieste I. Lieutenant Commander Don Keach was its Officer in Charge. The hope was to have a close up look at the debris area by the three crew members who manned the TRIESTE I. Over a 10 dive cycle period TRIESTE I did manage on dive # 6 to get into the debris area, did see what Keach described as "an automobile junk yard , and was able to retrieve a small section of twisted piping by use of an external claw arm. The piping was subsequently identified by the Portsmouth Ship Yard as part of THRESHER's galley freshwater system. Extensive pictures in the area would have been great but the TRIESTE I Camera had broken down.

The first search for THRESHER was closed out by CTF 89 in late August 1963. There seemed to be little more to be gained now as the heavy sea state season was coming on. The point Delta area had been searched with evidence that the remains of THRESHER were close by the point . The ocean scientists needed time to think over their search system designs. TRIESTE I was in need of repairs. And finally the Court of Inquiry at the Portsmouth Ship yard had completed its review and closed out. The pressure was off the Navy to do much more.

The conclusion of the Court was that in THRESHER's engineering spaces, massive internal flooding from a sudden break in a salt water piping joint could not be contained. The nuclear reactor was scrammed, most if not all electrical power was shorted out and the blow system could not handle the surfacing problem at the depth at which the casualty occurred.

THRESHER's commissioning skipper was Commander Dean Axene. He has been required to submit a report to the CNO at the end of one year of operations. This he did in spring 1962. When I took over the Development Group in summer 1962, Dean showed me a copy of the report. The opening paragraph stated that the greatest single design deficiency in THRESHER was the literally

yards and yards of sea water piping within the engineering spaces. Seawater piping feeds one side of a number of independent heat exchangers distributed throughout the engineering spaces. At all submerged depths, pressure in this piping is exactly equal to sea pressure outside the hull. The Board of Inquiry conclusion and the reported design deficiency were certainly a match.

In Spring 1964, scientists in the Oceanographic community began talking up a second search for THRESHER for several reasons. They and others realized the inadequacies of deep ocean search and recovery techniques. A Deep Search, Salvage and Rescue Group (DSSRG) study had been organized in parallel with the Court of Inquiry. This group headed by a submariner, Rear Admiral Ed Stephan USN(Ret.), had completed its report which proposed a number of unique and provocative ideas for doing what could not be done in the case of the THRESHER casualty. It seemed a shame to many involved that THRESHER search and examination was only partly finished. Indeed it was now clear that US Navy operational readiness was inadequate in operating search sensors and recovery devices in world wide deep ocean areas.

The Pentagon leader for supporting a second THRESHER search was Dr. Jim Wakelin, the Under Secretary of the Navy with principle interest in Research and Development. Admiral Smith, CINCLANT, and Vice Admiral Grenfell, COMSUBLANT, would have none of it. Wakelin then proposed that the Chief of the Office of Naval Research , Rear Admiral John Leydon lead a research project in THRESHER loss area. Leydon would be Commander Task Force 168 and be completely independent of the Atlantic Fleet commands. This was most unusual, as you can imagine, in that Rear Admiral Leydon was an Engineering Duty Only (EDO) officer. The latter normally do not command Navy ships at sea. Smith and Grenfell apparently had little option and hence the project was laid on. Admiral Smith did agree to provide the services of USS HOIST (ARS 40) for tending TRIESTE II and providing an on-scene base for CTG 168.1 who would be the at-sea leader of the so-called research project , "Deep Ocean Search in the Thresher Loss Area .

The units in TG 168.1 included USS HOIST (ARS 40), TRIESTE II (an overhauled and redesigned TRIESTE I), and the USNS MIZAR (TAK 272) with a research team on board led by Mr.

Chester *Buck* Buchanan of the Naval Research Laboratory (NRL). MIZAR's search methods utilized a towed device with an installed magnetometer, sonar and camera all of which were capable of performing at 8000 feet.

MIZAR also had a hull mounted acoustic triangulation system capable of real time bottom location of the towed device . The towed device was basically a number of metallic pipes welded together into a box like structure. Sensing equipment was hooked on to the pipes as appropriate. The operators called the device the *fish*. The connection between MIZAR and the fish was 12,000 feet of sturdy cable for tow and a parallel smaller cable for reception of a magnetometer signal, and for electrically turning the camera on and off when a sizeable signal was sensed by the magnetometer.

Admiral Smith as CINCLANT did set forth his views later for not conducting a second search for THRESHER. There were four: 1) Little more could be learned about the cause of the THRESHER loss in that the Court if Inquiry had completed a very good analysis; 2) It was time to let the sailormen of the THRESHER sleep; 3)TRIESTE was insufficiently advanced in deep-sea capability to contribute more than she had already; 4) Continued operations with Trieste posed the ever present further loss of life with inadequate compensation in the way of new learning.

Admiral Smith was certainly correct on numbers 3 and 4 above and number 1 to some extent. As for lessons learned however , one often learns as much from tragedy or near tragedy as from marvelous success. One near explosion on TRIESTE II showed this. The details follow later in the paper. Point # 2 was based on the enormous coverage of THRESHER's loss by very aggressive newspaper, radio and TV activities. During the first summer search, Admirals Smith and Grenfell were both constantly badgered by congressmen, dependents, and media people asking millions of questions of which some were not so polite. The White House and the Pentagon shared also in initiating this often angry *Why this and Why that?* cross examination . THRESHER after all was the first nuclear submarine we had ever lost at sea. This was further aggravated because THRESHER was the first of a brand new submarine class. In 1963, we were in the middle of the cold war with Russia and did not need this kind of at-sea performance nor publicity.

From the view of the Oceanographic community however, locating and mapping out the entire THRESHER hull and components was a matter of significant scientific interest and challenge. And so the new search got under way in early June 1964.

The high point of the search was the ocean floor picture photography by the unmanned fish towed by MIZAR. The individual pictures were assembled in Figure 2, a photo mosaic artist's sketch of the entire THRESHER debris field. The low point of the search was the horrible gasoline explosion that literally came within inches of happening to TRIESTE II shortly after surfacing from a several hour dive into the THRESHER loss area. Near misses make one humbly thank the Almighty. But they also make one think and think long about how come this potential horror almost happened.

A step back for a minute. Task Group 168.1 was formed on May 18, 1964. The mission of the group was really to study deep ocean search methods and ocean floor navigation. There was no attempt nor expertise in the group to consider further the cause of THRESHER disaster. TRIESTE II led by LCDR Brad Mooney would test the ability of a *manned* vehicle team to perform. The MIZAR team led by Chief Scientist Buchanan from the NRL would do likewise using an *unmanned* search vehicle. USS HOIST was a good support ship used for towing TRIESTE II to the operational scene, and for providing both logistical support and radio communication services for the entire three element Task Group.

It was apparent from the outset that supporting and operating the *manned* TRIESTE II was an order of magnitude more difficult than operating an *unmanned* vehicle.

This situation has continued to hold in the more sophisticated systems now available for deep ocean search and recovery. It is also true for the outer space projects of NASA.

In deep ocean work an unmanned search vehicle can be small in volume, can be sent down at any time day or night, in most any sea state as long as the topside crew can manage, can stay down longer and allow the topside crew to take chances not permitted when operating a manned vehicle. Concern for human safety changes everything when operating a manned vehicle .

The near catastrophic dive of TRIESTE II was its number 15 for

the summer. On surfacing from this dive, the insulation in topside control wiring was discovered to be burned. The wire was sparking to the metallic deck. As a result of the sparking, a hole had been burned into the top of the hull battery tank. This tank was in the stern of TRIESTE II and was surrounded with salt water. Had the hole been burned a mere 8 inches or so further forward on the topside of TRIESTE II, 75,000 gallons of hi-octane gas would have been exploded. All five or six TRIESTE II crew members topside would have been killed and the flash from the explosion could have severely burned bridge and deck personnel on nearby USS HOIST. TRIESTE II without doubt would have headed back to the ocean floor. This was a low point of the summer operation. HOIST and TRIESTE II returned to Boston for repairs.

Brad Mooney as Officer-in Charge of TRIESTE II took the whole matter of the near horror most seriously. TRIESTE I and II were really only pieces of laboratory equipment supported by laboratory research money. The Bureau of Ships had assumed no responsibility for design and safe operation of either of the TRIESTES. Further, there was no specific fleet command like a submarine division command, for example, to insure adequate operational procedures and training prior to deployment. Thanks to Brad, others in the Submarine Force were soon aware of these problems and eventually Submarine Development Group I was established on the west coast to be the home for future Navy Deep Search and Rescue vehicles. Brad was a major leader in bringing about this latter happening. His motivation, and that of many other alerted submariners, was the driver that eventually produced a first class deep ocean search and recovery capability in the U.S. Navy.

The *high point* of summer 1964 was the many photographs taken by MIZAR. Buchanan and his NRL team had spent the entire winter of 1963 in designing, and installing equipment on MIZAR. Clever search tactics that produced the Mosaic shown in Figure 2 were also developed. Search tactics commenced by moving slowly (at one knot) through the search field with the towed fish 12 to 15 feet off the ocean floor, with camera eye closed, but with the magnetometer system operational. When and if the magnetometer indicated a hit, the MIZAR was put into a tight turning circle and the camera turned on. As long as the magnetometer reading was high the camera eye

was held open until finally there was no more camera film. The fish was then hauled in for are review of photographs taken.

The heroes of the second summer search efforts were certainly Buck Buchanan and his MIZAR team. This included photographer R.N. Sibley of the Naval Reconnaissance and Technical Support Center (NRTSC).

THRESHER debris field mosaic (Figure 2) was put together by TG 168.1 staff members at the headquarters of NRTSC at Suitland MD. Photographs taken mostly, but not all, by MIZAR, were laid out on a large floor, perhaps 40 by 50 feet in one of the NRTSC buildings. All photographs had to be resized as if taken at 10 feet height off the ocean floor and preciously located in their correct geographical position relative to the other photographs.

Individual components of the mosaic were sketched onto the artist's panel with identifying numbers (1 through 10) assigned to each individual major component.

In Figure 2, a geographical plot shows where the numbered parts are finally located relative to each other. A summary statement on page 8 of the final report to CTG 168 (Chief of Naval Research) is "The THRESHER hulk is located at 41° 44.5' N, 64° 56.4' W in 8250 ft. of water , is split into six large parts , and occupies an area on the bottom no larger than 400 yd. by 400 yd.

I did talk to technical people at the Naval Ships Research and Development Command at Carderock, MD as the report to CTG 168 was being prepared. They had conducted model tests as a means of understanding the scenario when THRESHER passed through crush depth. From Figure 2, they pointed to the likelihood of THRESHER collapsing first at its tail section . The idea of major flooding in the engineering spaces plus the squeezed shape of part #1 (tail section) seemed to support this conclusion. They suggested that this implosion of part #1 developed a huge wall of water which moved forward at tremendous speed to blow off the various sections forward of the tail section. This all took place in milli-seconds of time. The smooth hydrodynamic shape of intact THRESHER thus became instantly a set of loosely related jagged parts looking and falling randomly like large leaves off a tall tree. Part #8 is connected to THRESHER's reactor compartment. The reactor itself was never identified and is believed to be buried under the section one sees as part #8.

With out question, all human life on THRESHER was ended instantly when the THRESHER stern imploded at the submarine's crush depth.

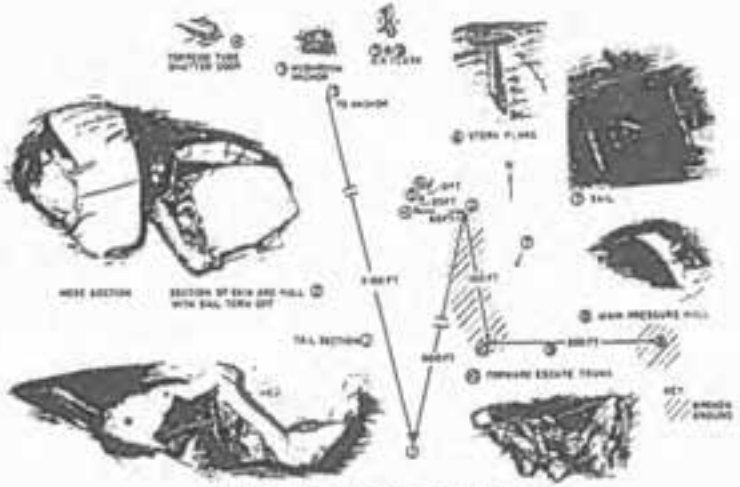

Fig. 2 Mosaic sketch of Thresher wreckage

THE SUBMARINE COMMUNITY

SKIPPER'S TRIBUTE

by Bill Grieves

Billy Grieves enlisted in the Navy April 3, 1939 at the age of 18. While in boot camp at Newport, RI, the submarine, USS SQUALUS (SS192), was lost in the Atlantic off the coast of Portsmouth, NH. Training completed, Bill was one of 12 volunteers sent north to help raise SQUALUS. As the salvage progressed he became more and more fascinated with submarine life and when SQUALUS was brought into port at the Portsmouth Navy Yard, he volunteered and was accepted for submarine duty. In due course he was assigned to USS R-10 (SS87), a school boat at New London, CT. Not satisfied with this duty he requested new construction and was transferred to the brand new submarine, USS THRESHER (SS-200). They went into commission August 27, 1940. In April, 1941, THRESHER joined the Pacific fleet at Pearl Harbor.

In the course of World War II he participated in 13 war patrols in the Pacific, 11 aboard THRESHER and 2 aboard USS LIZARDFISH (SS-373). He served as a TM 1/c in charge of the Forward Torpedo Room and he was awarded the Submarine Combat Medal and 2 Bronze Star Medals. He was honorably discharged from the Navy October 10, 1945.

He then served 27 years in the Detroit Fire Department retiring with the rank of Lieutenant. This was followed by 10 years service as an Industrial Fire Fighter with the Ford Motor Company in Dearborn, MI. He married the former Muriel Jeanne Bach in 1947 and reared two daughters. Bill and Muriel reside in the retirement community of Sun City West, AZ where they lead an active life style.

The sea was calm off Tokyo Bay that morning. Through the periscope, the skipper sighted a freighter with one destroyer escort coming out the channel. The date was April 10, 1942 and the skipper was Commander Bill Anderson.

It was THRESHER's (SS200) third war patrol. We conducted the approach and, in due course, fired one fish with the torpedo depth set to pass beneath the keel. When the magnetic exploder detonated the war head, the 3,039 ton Sado Maru was blown into two sections. She sank in two minutes. But the destroyer, following the torpedo wake, was right on top of us. Their first depth charges were close aboard the stern and drove us down to 410 feet, well below THRESHER's test depth. Hanging, as if suspended, down by the stern, the planesmen fought to regain our lost trim. Slowly we struggled back up to 350 and as sea pressure decreased, the hull cracked loudly as if being struck by shell fire as the pressure hull regained it's configuration.

Then a more ominous problem became evident. The severe concussion had knocked the port propellor shaft out of alignment causing the boat to fish-tail wildly. This set up loud vibrations throughout the boat. In the torpedo room, cans of food stowed in the frame spaces behind the reload torpedoes, sprang loose and crashed into the reload racks. In the engine room, a heavy wrench suspended on the side of a locker, set up a loud drum-like thumping. In every compartment men pounced on the sources to eliminate the noise but we couldn't find them all. When power was placed on the port shaft the noise was intolerable. But without the port screw, depth control was impossible. Then two more destroyers joined the hunt.

In the hours that followed, the destroyers trailed tenaciously. Whenever we came up above 300 feet, depth charges drove us back down. At 11:30 that night, after 14 hours under attack and 18 hours submerged, the oxygen content in the boat was perilously low. Normal breathing was in deep, rapid gasps and the depleted batteries were running critical. An air of hopeless resignation settled over the crew.

It was then Captain Anderson made a precarious decision. He ordered a 180 degree course change back towards Tokyo. This was followed by, "ALL AHEAD FULL— SURFACE! As we came up past 300, depth charges rained down close aboard on all sides violently rocking the boat. But, *miraculously*, we came up through

them. We broke the surface 500 yards astern of the closest destroyer which was playing the water with powerful search lights. But a submarine in a low, flooded down condition upon surfacing and one that is going away has a very narrow silhouette. And the sea was so filled with depth charge echoes, the sound of our screws went unnoticed. When we were clear, four main engines were placed on the line and from the horizon we could see the sweeping search lights and hear the probing pings of their sonars as they echo-ranged on an empty ocean.

When we limped into Pearl we were immediately placed into dry dock. Both sides of the hull were dented in and rippled like a wash board. A strip 100 feet long and six feet wide was replaced on the starboard side and a strip 60 feet long and six feet wide was replaced on the port side. The port propellor shaft was replaced.

But many of our boats had exciting stories to tell, didn't they? We submariners know this because we've been listening to these stories for more than 50 years. And yet, there is one story that has never been told: And that is the story of the *Skippers*, the commanding officers who took their boats out on patrol, gave them direction through attack after attack and then led them home. Is there anyone here today who would have cared to change places with the skipper, Bill Anderson, when, against all odds, he gave that order to surface? And yet, every skipper who ever took a boat out on patrol was repeatedly faced with these life or death decisions.

Captain George Grider, skipper of FLASHER, in his book, put it this way, "When we went out on patrol we were on our own. There was no one to give us orders how to make the approach, how to attack, how to follow through. It was us against the enemy. We were corsairs in a world that had almost forgotten the word. And when the boat was being rocked by depth charges and the lives of 80 men hung in the balance, it was up to the skipper to maintain his focus and give the orders to get his boat free and home safely into port. Because on a submarine there is one man who cannot escape for an instant the onerous grasp of responsibility for the safety and performance and the morale of his boat. He is the Skipper. It is the most lonesome, overwhelming responsibility God ever placed on a man.

What was this rare, innate quality our skippers called upon to handle such formidable responsibility? Was it guts? Could you call

it that? Evil Knievel has guts. And guts can be foolhardy. Guts can be fatal. It took more than guts. It took *unshakeable* determination. It took *superb* competence. It took *unprecedented* concentration. On life or death missions, there are no rules. Success rests on leadership. . .and composure. And let's not forget the ability of the crew. On a submarine, every man knew his duty and every man could do his job with or without supervision. But, in the final analysis, the success or failure of the mission belonged to the *Skipper*.

On numerous occasions during the war, after a prolonged or successful attack, as I walked through the narrow passageway past the tiny cubicle known as the *Captain's Cabin*, I was fiercely tempted to stop and put my head in and say, "Good job, Skipper. Thanks a lot. But it wouldn't have been appropriate then, would it? Because the crew would have accused me of being patronizing. Or, worse yet, trying to make Chief on my first cruise. And so the years passed. And then in 1991, the submarine convention was held in San Antonio. And the first *Skipper's Brunch* was set into motion. On the day of the general membership meeting, about 300 guys assembled in a large meeting room. But the entire front row of seats was reserved. It was reserved for *skippers*, and there were about 45 or 50 of them there. When the meeting opened, Joe McGrievy, the coordinator, took the floor and called off each skipper's name together with his boat. When his name was called, the skipper stood and faced the audience. And when all were standing the crowd snapped to it's feet as one man and I have never heard such loud, enthusiastic, prolonged applause from a group that size in my life time. As the skippers marched out to their breakfast the applause continued to the last man. And then it came to me. . .these were the *thank yous* that were never said. These were the congratulations that were never offered. As I recognized this I was glad that I didn't have to speak because with that lump in my throat it would have come out like a wimper.

But let's bring this story up to date. As all submariners know, the need for cool-headed, dedicated competence in our submarine skippers did not expire with World War II. It didn't expire with the Cold War. Nor with any of the subsequent wars of lesser magnitude. That demand is out there today where our boats prowl the oceans of the world, silent and unheralded, protecting this country against an

ever changing enemy which will be forever with us. And there is one man who can never escape for an instant the grasp of responsibility for the safety and success of the mission. . .he is the *Skipper*.

As I have said, there were things that could not be said back then. But thanks in large part to the leadership and the peerless performance of our submarine skippers, we who survived the ordeal of war, we who came back, are privileged to be here today. . .and I can say to them now. "Good job, Skippers. Thanks a lot.

HONORS FOR BOTH USS TRITONS

by Mr. Lorie Allen

Lorie Allen is Secretary of the Naval Submarine League'sCapitol Chapter. His wife, Jeanine McKenzie Allen, was the subject of the article One Woman's Search for USS TRITON (SS201) in the July 1996 issue of THE SUBMARINE REVIEW by Commander Dennis Murphy. Mrs. Allen's father was a Torpedoman who was lost with TRITON on March 15, 1943.

The Navy will dedicate TRITON HALL, a giant new training facility, at the U.S. Naval Training Center, Great Lakes, Illinois, on June 23-26, 2004. The occasion will mark the service to the nation of the two renowned United States Navy submarines which have borne the name USS TRITON (SS-201) and (SSRN-586), as well as those officers and crewmen who served aboard them.

TRITON (SS-201) was one of 52 U.S. Navy submarines lost during World War II. TRITON (SSRN-SSN 586) served the nation during the Cold War and completed the first submerged circumnavigation of the world, a feat of seamanship which stands as a record of great significance.

After the conclusion of the bloody battles of World War II, Fleet Admiral Chester W. Nimitz, from the Federal Office Building, San Francisco, California wrote:

> "We, who survived World War II and were privileged to rejoin our loved ones at home, salute those gallant officers and men of our submarines who lost their lives in that long struggle. We shall never forget that it was our submarines that held the lines against the enemy while our fleets replaced losses and repaired wounds.

Our submarines, hunting the enemy wherever he tried to be on the high seas, hastened the collapse of the Empire of Japan. USS TRITON (SS-201) was one of those Navy submarines fighting during the dark days of 1942 and 1943 taking the war to the enemy virtually alone, while the nation began recovering from the Pearl Harbor attack. TRITON (SS-201) distinguished herself during six war patrols; she fired the first torpedo at an enemy vessel in anger after Pearl Harbor, and was the first Navy submarine to destroy an enemy vessel by deck gun fire in World War II. She also guided our bombers by radio beacon on the first land-based bomber attacked on Japanese-held territory, Wake Island, in World War II and sank an arriving Japanese oiler as part of the same war patrol. She was thus one of the U.S. submarines which carried the battle to the enemy early in the war. She was awarded five Battle Stars for her aggressively conducted war patrols.

After TRITON's loss in battle with 74 officers and crewmen, in the spring of 1943, the Commander-in-Chief of the South Pacific arena, Admiral William F. Halsey, sent a Top Secret communication describing TRITON's service to the nation:

> "Truly bitter pill is the loss of the TRITON X a wonderful ship manned by a magnificent crew which has been outstandingly successful from the beginning of the war and has inflicted irreparable damage on the enemy X Mackenzie maintained the high standard set by his skillful predecessors Lent and Kirkpatrick X carrying on without the TRITON means that each of us will have to fight harder with her deeds as an inspiration X

Concerning the 52 boats lost during World War II, Vice Admiral Charles A. Lockwood, Jr., Commander Submarine Force, 1943-1946 would say:

> "I can assure you that they went down fighting and that their brothers who survived them took a grim toll of our savage enemy to avenge their deaths.

Then, during the dangerous and pressure-packed days of the Cold War, when the safety of our nation was threatened by the former Soviet Union, USS TRITON (SSRN-586), under the command of Captain Edward L. Beach, USN, secretly completed, on her shakedown cruise, the never before attempted or accomplished feat of seamanship, an epic voyage—the first submerged circumnavigation of the world, in 1960. It was a voyage that captured the world's attention and thrust the United States Navy into technical leadership in undersea surveillance and warfare, a role which ultimately resulted in the breakup of the Soviet empire. It was a war won without a shot being fired.

TRITON's (SSRN-586) officers and crewmen remembered and honored TRITON (SS-201) during the epic voyage as described in the ship's deck log, as follows:

> "Sunday, 27 March 1960, 1349: We will soon be passing through our nearest point of approach to the presumed location at which the first TRITON (SS-201) was lost in action during World War II. As a matter of interest, this took place almost exactly seventeen years ago, and by a strange coincidence, the first TRITON departed on her last patrol from Brisbane, Australia, on the same day (16 February) as we, her namesake, departed from New London on this voyage. TRITON I is presumed to have been lost as a result of depth charge attack by three Japanese destroyers on 15 March 1943, in a position almost exactly 800 miles due south of where we are now.

The services were announced at 1340, with directions that all hands not on watch assemble in the crew's mess, the Combat Information Center or the officer's wardroom. At 1345 the services, broadcast throughout the ship, began by the playing of Tattoo. This was followed by the National Anthem and a scripture reading, a short prayer similar to the committal service was read, followed by reading of the tribute, which would hardly be called a eulogy but which was an attempt to put the significance of the occasion into words for our own better inspiration and understanding: The sacrifice made by the first TRITON, and all the sacrifices by all the

people lost in all the wars of our country, sanctify the service of those who follow in their footsteps.

Rendering of proper honors gave considerable occasion for thought, and it finally was decided that the only salute a submarine can fire is actually the most appropriate one anyway. Upon command, TRITON's course was changed to due south and the Officer of the Deck was directed to stop all engines. The entire ship's company was then brought to attention, and all were directed to face forward. This was, of course, possible even at their regular watch stations. Then, with the entire crew silently at attention, the forward torpedo tubes were fired three times in rapid succession.

We could hear the resounding echo of the water-ram and feel the fluctuation of air pressure on our eardrums. Three times the harsh war-like note traveled through the ship; and as the lost air fluctuation died away, the clear notes of Taps sounded in proud and thoughtful tribute.

The moment of reverence was a real one, truly caught. Everyone on board felt it; and though their response was by command, their personal participation sprang from deep within themselves and was given willingly.

USS TRITON (SSRN-586) received the Presidential Unit Citation and the Navy Unit Commendation during her service with the fleet. USS TRITON (SSRNSSN-586) was the sole U.S. Navy submarine to have been equipped with two nuclear power plants. Because of cutbacks in defense spending, TRITON's (SSN-586) scheduled 1967 overhaul was cancelled and the boat was decommissioned on 3 May 1969. She is at Puget Sound Naval Shipyard awaiting salvage by the cutter's torch in 2005. Currently, an effort is underway to recover SSN-586's sail, or a portion thereof, for transport and re-assembly as a permanent exhibit for display at TRITON HALL, at the Great Lakes Naval Training Center.

The June, 2004 dedication of TRITON HALL will firmly establish the naval heritage of these two submarines, those who served aboard them, and the Navy's commitment to the training of future shipmates following in their footsteps to defend the United States.

DISCUSSION

COMMENTARY
BIGGER IS BETTER—SOMETIMES

by Mr. Norman Polmar

Norman Polmar is a well known commentator on naval subjects and is the author of a number of books, the first of which, The Death of the USS THRESHER, appeared in 1964 and was republished in 2001. He has been a frequent contributor to THE SUBMARINE REVIEW.

Jerry Holland has emerged as the most prolific and articulate advocate of large, nuclear-propelled submarines for the U.S. Navy. Unfortunately, many of his historic examples put forth in Really New SSNs (*Submarine Review*, January 2004, page 60-62) are not supported by facts. This calls his entire thesis into question.

(1) Discussing submarine development from 1920 to 1940, he states "The end result of this ever larger, ever more capable submarine was the Fleet boat." The largest U.S. submarines constructed in that period were ARGONAUT (2,710 tons surface displacement), NARWHAL, and NAUTILUS (both 2,730 tons). After those three submarines the Navy returned to smaller boats—they were followed by DOLPHIN (1,540 tons) and other smaller submarines, which evolved into the 1,525–ton GATO/BALAO fleet boats.

In the Atlantic the Germans had a similar experience; much larger attack submarines were built, but the 750-ton Type VII, which could be more cheaply produced, were more successful, operating from the North Sea to the Caribbean. Its successes almost won the European War for the Germans.

(2) Jerry next selects the diminutive SSK as his target. But two submarines were slated for mass production in the late 1940s—the SSK and the TANG class. The latter design was successful (once their engines were replaced). TANG's at 1,821 tons surface were only marginally heavier (but much shorter) than their predecessor

fleet boats. Of course, the ultimate U.S. non-nuclear submarine, the BARBEL, was only 225 tons heavier than the fleet boat (surface) and was almost 100 feet shorter.

(3) The author commends the steadfastness of the aviation community in building only 90,000+ ton (full load) carriers, the latest of which will cost more than $11 *billion*. In reality, the U.S. Navy also builds smaller (albeit not *small*) carriers. These are the LHA/LHD amphibious assault ships.

These *are* aircraft carriers, the current size being 40,000+ tons and costing almost $2 billion. They operate helicopters and AV-8B Harrier attack aircraft; in the future they will operate the MV-22 tilt-rotor aircraft and the Joint Strike Fighter (JSF). The latter aircraft will be the first-line fighter/attack aircraft of the Air Force, Navy, and Marine Corps.

The 12 LHA/LHDs currently in service have amphibious designations only for political reasons. The first U.S. Navy ship of this type, USS THETIS BAY, was recommissioned in 1956 as a helicopter assault carrier (CVHA 1), i.e., a member of the aircraft carrier family (CV). Follow-on ships were being built but to assuage congressional critics of aircraft carrier spending, the designation LPH (amphibious assault ship—not "landing platform helicopter") was adopted for these ships.

If one has any doubt that the LHA/LHDs are in fact aircraft carriers please visit one. These ships are larger than all foreign carriers except for the Russian ADMIRAL KUZNETSOV. Still, the LHA/LHDs are far smaller than the NIMITZ-class carriers now being built, thus the Navy does have two sizes of *aircraft carriers* under construction, not just *big* ships.

(4) Jerry then cites U.S. CYCLONE–class of coastal patrol ships (PC) as an example of smaller not being better. Without arguing the merits of that 331-ton (full load) *warship*, submariners should note that there are two types of surface warships—major combatants (battleships, cruisers, destroyers, frigates) and *small* combatants (PCs, mine craft, torpedo boats, missile boats). To compare them in this context is akin to comparing a U.S. Trident submarine with a

German Type 209. Both are submarines and both carry torpedoes, but....

Unlike the U.S. submarine world, the surface ship world is continually producing paper designs for new surface combatants. I have participated in several of these design studies and am doing so at this time. In the surface combatant world *smaller* has often been better: In the early 1970s Admiral H.G. Rickover fought for the 17,000-ton, nuclear-propelled strike cruiser (CSGN) as the Aegis platform of the future. Instead, the Navy's leadership selected a modification of SPRUANCE–class destroyer, resulting in the 9,600-ton cruiser TICONDEROGA. Much cheaper, with the same Aegis radar/fire control system, but with *more* combat capability.

Similarly, the 4,100-ton frigates of the KNOX class were succeeded by the 3,658-ton Perry class (with displacement later increased to almost 4,000 tons). While one could argue the merits of their respective sonar systems, the Perry's are faster, more flexible, easier to maintain, and more heavily armed than their predecessors.

Larger is better in many things in human endeavor; certainly in ice cream sundaes and pizza pies. And, possibly, in nuclear-propelled submarines. But Jerry has not made the case in his efforts to refute the Naval Institute Proceedings article (June 2003) by Captain Tom Jacobs entitled "Where is the Really New SSN.".

COMMENTARY ON COMMENTARY IN SHIPS, BIGGER IS NATURAL

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

Jerry Holland is a retired officer who served most of his career in submarines and submarine-related billets. He is a frequent contributor to THE SUBMARINE REVIEW.

To be termed "articulate by a writer as skilled as Norman Polmar is high praise indeed. In his rebuttal to my assertion that a "clean sheet design will not render the smaller less expensive, but just as capable, submarine advocated by Captain Tom Jacobs, Mr. Polmar accuses me of using historical examples that are not supported by facts. His accusations stem from a reading of history that is somewhat different than mine.

The Navy's return to smaller designs for submarines following ARGONAUT, NARWHAL and NAUTILUS stemmed not from any mission analysis or superior design initiative as intimated by Mr. Polmar but from the 1930 London Naval Treaty which limited submarines to 2,000 tons and fleet submarine tonnage to 52,700 tons. These treaty limits forced a trade-off between numbers and individual ship size. A series of submarine classes were built, each larger than the last as the Bureau of Construction and Repair worked its way up from USS CACHALOT (SS-170) of 1170 tons laid down in 1931 to the 1939 prototype for the World War II fleet boat, USS TAMBOR (SS-198), of 2340 tons.[1] The history of submarine construction during this period suggests that as operational experience is gained warships increase in size.

Using the German Type VII as a sample of an effective small submarine, Mr. Polmar cites the ships' size as 750 tons. This was the size of VIIA, but before the Germans finished building the Type VII F in 1943, it had grown to 1181 tons – a 57% growth! The experience of wartime operations in the broad ocean was reflected in the Type XXI, 2100 tons including "a freezer, a shower and a basin for the crew among other things... not to mention three times the

battery capacity of a Type VII and a snorkel. Clay Blair's analysis claims that after the *happy days* of 1940 – 1941, the underpowered and lightly armed Type VII fared poorly and by the end of the war, the larger submarines had accounted for as much success in a shorter period against targets that were better protected.[2]

The SSK's were a failure—in spite of being operated by some of the most talented officers at the time. Too slow to get to station and lacking endurance to stay there long enough, they were intended for a mission that they could not perform. TANG's all grew: a hull extension had to be inserted so they could be re-engined. Those of us who served in them lived through the same agonies that plagued the engineers of the unreliable and underpowered submarines of the nineteen twenties and thirties. Learning the lesson about propulsion reliability a second time was a costly and unnecessary mistake driven by the goal of smaller and cheaper.

If my essay implied that LHA's are not a kind of aircraft carrier I regret such an implication though I cannot find it. However, I suggest that in comparing LHA's to CVN's, Mr. Polmar is guilty of the error of which he accuses me. Further, that the new Amphibious Assault Ship is planned to be even larger than the LHA seems to buttress my argument that warships naturally grow in size as experience is gained.

Attack aircraft carriers have grown from ESSEX Classes' 32,000 tons to NIMITZ Follow Ships's 110,000 tons as the airplanes they carry have grown in size and weight. Experience as well as technological advances has caused this growth, not mere indulgence. There is no comparison in the missions between a CVN and an LHA. Even though a CVN can execute much of what an LHA can do, the reverse is not true. The *clean sheet* CVN (X) is larger than her predecessors because the naval aviators who operate these ships are unyielding in commitment to size as a function of utility.

Analyzing CYCLONE or the PG classes, again it was not my intent to try to compare them with battleships as Mr. Polmar charges. My point, obviously not well made, was that the duration of their service indicates that small ships designed for specific limited missions are very expensive no matter how well constructed or operated. Ships that can serve only in narrow functions have short lifetimes as missions evolve or turn out to be more complicated and

difficult than anticipated. Jefferson's gunboats are illustrative. Even though imagined by one of the most creative and intelligent minds in history, they were an expensive failure.

Mr. Polmar reports, "Unlike the U.S. submarine world, the surface ship world is continually producing paper designs of new surface combatants. The results of such efforts are not very encouraging. Paper ships are not deployable. The DD (X) has gone through at least ten years of expensive paper designs yet the first ship of the class is still at least six years away from the sea. The Littoral Combat Ship illustrates the problem in designing a small ship. From "Streetfighter's 1500 tons she has grown to 3500 tons yet is still limited in the missions she can undertake. Now as large as the Perry class frigates, making this class a multi-mission platform today entails modular components. Such a design acknowledges that the ship may have to leave station in the midst of a crisis to go back to load the appropriate ASW/AAW/Strike/Interdiction module.

Technology will not stand still. Cruiser construction between the two World Wars, small numbers in successive classes, illustrates how operational experience at sea leads to improvements from one class to the next. The last flight of the Arleigh Burke's is more capable than the first and almost a thousand tons heavier. The 62 submarines of the Los Angeles class were really three different classes. *Clean sheet* designs often rest on the allure of technological promise that turns out to be overblown or illusory.

Among the faults of today's budgeting/appropriation system is the bias against new programs. This leads to the predilection for continuing existing programs and improving existing classes rather than trying to justify new. In the nineteenth century, the same problem resulted in bringing ships into the shipyard, removing the name boards, constructing a new ship and then reinstalling the old stern transom. USS CONSTELLATION in Baltimore harbor is such a product: she has few of the original timbers. VIRGINIA experience demonstrates not only how hard it is to start a new class. The follow ships in this class also show that spiral improvements can be more fruitful than leaps of faith.

None of this is to suggest that it is impossible to build a good submarine smaller than what is presently operating. The step down

from SEAWOLF to VIRGINIA sacrificed many capabilities. However, every design must be viewed with the understanding that these submarines will not serve for four or five years but for thirty. They will be routinely deployed in distant seas for months without support or services, with a volunteer crew, well trained, highly paid and very valuable. The ships must have room for a decent payload, for growth and modification and for ease of maintenance. There are certainly some inventions that help constrain ship size though not necessarily their cost, i.e. micro-chips. But until the next major innovation in propulsion—an all electric drive or direct conversion of fission to electricity—there is not a great promise for a small submarine that fits the mission needs of the United States.

Views of history are always slanted by the experience and position of the observer. This observer has served in or with every American attack submarine class since DARTER (1957). Touring PINTADO (SSN 672) on her decommissioning and finding the ship in nearly as perfect condition as when she was commissioned 27 years before was astonishing compared to the difficulties of trying to keep SARGO class operating when they were not quite 20 years old. Operating with a sphere and towed array as the primary sensor in place of the BQR-2 and 4 dramatically influences how one of my background views the need for space to grow and modify. Husbanding battery capacity during an approach or struggling to regain depth after an error on the trim manifold adds to appreciation of nuclear power. Teaching operation of the digital fire control system warps my attitude that technological advances will live up to their publicity. In all of these regards, I can only plead bias born of experience. I regret that I am unable to articulate these views convincingly for Mr. Polmar.

ENDNOTES

1. Gary E. Weir, "Building American Submarines, 1914-1940" Washington, D.C., Naval Historical Center, 1991.
2. Clay Blaire, "Hitler's U-Boot War, The Hunted , New York, Random House, 1998.

CLEAR THE BRIDGE . . . ADMIRAL. . . NOW!!!

by Dr. Robert Beynon

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

Perfecting the dive procedure, in particular clearing the bridge, was a high priority aboard the WWII American submarine. The 5 or more men on bridge watch were energized by the command, "CLEAR THE BRIDGE. Each had to be in the conning tower within a very short time, getting it right in a specified time of 50 seconds or less was a goal to be obtained.

During USS BOWFIN's (287) third patrol, a distinguished visitor came aboard[1]. Admiral Ralph W. Christie had two reasons to be piped aboard the boat. He was desirous of earning a combat pin and more important to be satisfied HIS torpedoes were doing the job. For two years submarine skippers were complaining the torpedoes were not performing as expected. War reports were citing captains with words indicating "they ran too deep, they did not explode on contact, they explode prematurely, and they do not carry enough torpex even when contact is made.

No less than seventeen very successful commanders had written patrol reports that the Mark 14 and 16 armament was not effective[2]. Read the report of Richard O'Kane on the TANG. The boat had zeroed in on a freighter after an hour of pursuit. "Right full rudder; all ahead two-thirds. The approach on the target was routine. "All ahead 1/3–open outer doors. This torpedo attack was the after room's first chance on this patrol. Captain O'Kane continued,

"Constant bearing...mark
Set
Fire

The command fire coincided with the freighter's stern dead center on the periscope wire. The four torpedoes set on a spread from stern to bow were running straight and true. She was a sitting duck. "OH HELL was the only response. Two of the shots broached sending streams of water sky high. The two minute run to contact give the enemy captain enough time to change course; all four torpedoes missed and exploded on the beach. Little consolation to a disappointed captain and his after torpedo room crew.

The Medal of Honor awardee, Lawson Peterson Ramage, had a similar experience[3]. His war report read in summary:

> "Fourteen (14) torpedoes fired, one was premature, and five were duds. A 43% failure rate.

Needless to say for an aggressive boat. . .led by an eager captain and crew. . .this was not acceptable. The higher brass still insisted on *control errors or firing at too close a range*. Submarine crews could not and did not accept this position.

One incident relating to the torpedo problem is worth repeating. Ramage before leaving on TROUT's fourth patrol had the following encounter with Admiral Christie.

> "What's your armament? Christie inquired.
> "Sixteen torpedoes and 23 mines, was the reply.
> "I want you to sink 16 ships with the torpedoes. [4]

Ramage was incensed. His only reply was "If I get a 25% reliable performance, I'll be lucky.

Christie in turn was enraged. Imagine a submarine skipper addressing an admiral about one of the admiral's pet projects–submarine torpedoes. He was angry to have one of his men show distrust and suspicion about an admiral's torpedoes.

Because of this incident and because of TROUT's poor performance: 4 attacks, the firing of 15 of 16 torpedoes–all misses–Ramage was evaluated by Christie as "RED had a miss last patrol. . .many chances and many failures. He is due for relief and will be sent back to the States for a new boat and rest at the same time.

Admiral Christie being aboard BOWFIN caused quite a stir among crew members. What did it all mean? Was it an honor to have him aboard? What was the reason? It had been known for a long time that Christie was wanting to make a war patrol. All his requests had been denied. Did an admiral dare *disobey?* Apparently so! What did the admiral have in mind?

In the meantime, the crew continued to guess at the Admiral's motives. What was the pretense? Was he here to check-out the efficiency and effectiveness of the crew? Was he here to evaluate a well respected skipper, or still, was he here to determine the exactness of his beloved Mark XIV torpedoes? All the inquiries went unanswered while tensions mounted among the crew.

The Admiral was not all show. He earned his keep by standing watch on the bridge along side Captain Griffith. This allowed him to make two observations: (1) to evaluate the skipper and (2) to determine what all the fuss was about concerning HIS torpedoes.

Being on the bridge also gave him an opportunity to experience war time submarine duty[3]. Captain Griffith and the Admiral agreed what they had in sight was a tanker. Griffith's decision was to remain on the surface. Bow and stern tubes were made ready. All 6 bow tubes missed because at the last possible moment the enemy went on a zig-zag course. This aggressive captain, with an admiral aboard, did not hesitate–a second chance had to be taken. Six torpedoes were fired. Four missed, 2 hit. Damage only was inflicted upon the enemy ship. He in turn spotted BOWFIN and opened with gun fire. The enemy captain, not without experience, began to zig-zag to avoid BOWFIN. Several times he changed course, this tactic put the two vessels on a bow to bow course. Griffith fired two bow shots; both missed. At this point, the non-combat Admiral became concerned. He remarked:

> "We were too close, within machine gun range. I thought we would dive, but Griffith chose to hold the initiative by remaining on the surface. I thought surely he (the enemy) must have seen us. . .the enemy could easily have sunk us with gun fire or at least swept our bridge with machine gun fire.

Griffith held his course and fired two stern shots. The anxious Admiral awaited the results. He soon found out! BOWFIN was close enough for the detonation to cause Christie to have fallen to the deck. He had been slammed against the railing and in addition lost his gold braided hat over board.

Because the enemy had not been sunk and because he was returning fire with 4 inch and 20 mm cannons, the decision to clear the bridge was in order. The bridge hands have about 45 seconds to be in the conning tower with the hatch closed.

A very special method is employed for using the conning tower ladder. An experienced submariner grabs the two vertical supports, puts his feet on the verticals and *slides* down. At no time are the horizontal rungs used. The supports are only used on the way UP never on the way DOWN. Sliding down saves time and many lives were saved as a result.

Experienced submariners know the meaning of "Clear the bridge. Without hesitation the order is interpreted as 'NOW. . .QUICKLY. . .LOOK OUT FOR YOURSELF. Out of deference to rank, the Admiral was the first to leave the bridge. Being first meant get out of the way. Using the ladder rungs was not fast enough for the next man. Eugene "Bud Knoche rode the shoulders of the admiral all the way to the conning tower deck. After all was secure, the admiral remarked:

> "I don't believe I hit a rung of the ladder to the conning tower. [6]

The story became quite a topic throughout the boat. Art Carter confirms the story with his version of Knoche's shouting 'GET DOWN OR GET OUT OF THE WAY.

Bud gives a more convincing evidence of what happened. He related:

> "I was after look-out. The enemy vessel had his searchlight on us and it was brighter than daylight. What ran through my mind was "I'll never see my mom again.' About this time Mr. Bertrand ordered me to the starboard side of the periscope shears as the enemy vessel was to our port beam. Captain Griffith was skipping away to avoid having to dive. A little

while later the order "Clear the bridge rang in my ears. I was second down and someone was blocking the hatch, so I yelled to him to get his ASS down or get out of the way. After we were submerged one of the stewards told me the captain and the Admiral were having a big laugh over my telling the admiral to get his ass out of the way. Later in the control room, I apologized to him. His only reply was "Don't worry about it, I was worried about the man in front of me. *

In summary: "CLEAR THE BRIDGE means get going irrespective of who is on the bridge. So Admiral. . . "CLEAR THE BRIDGE. . .NOW !!!

ENDNOTES

1. Clay Blair, Jr. Silent Victory, The Submarine War Against Japan (New York: Bantam Books, 1970), p. 391.
2. Richard O'Kane, Clear the Bridge (Novato, California: Presido Press, 1977), p. 233.
3. Blair, ibid., p. 355.
4. Blair, ibid., p. 391
5. Edwin P. Hoyt, Bowfin (New York: Van Nostrand Reinhold Company, 1983), p. 80.
6. Hoyt, ibid., p. 80.

* Personal notes from Eugene A. Knoche.

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 Perfect. If possible to do so, accompaning a submission with a 3.5" diskette 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.

BOOK REVIEW

RISING TIDE: THE UNTOLD STORY OF THE RUSSIAN SUBMARINES THAT FOUGHT THE COLD WAR

by Gary E. Weir and Walter J. Boyne, Basic Books, 2003
Reviewed by Mr. Phil McGuinn

Phil McGuinn is the Deputy Public Affairs officer for the Commander, Naval Submarine Forces in Norfolk, VA. He serves as Vice President for the Hampton Roads Chapter of the Naval Submarine League and is a Captain (select) in the U.S. Naval Reserve.

Rising Tide could have just as well been titled *Rising Curtain* for the authors have opened up to us a fascinating cast of heroes and dramas beneath the sea from behind the former iron curtain. Through a combination of personal stories and research, Weir and Boyne bring humanity to *Ivan* and help us to understand the cold wars between the American and Russian submariners and between the Russian submariner and his bureaucracy. Written in a manner that is easy for the non-submariner to understand while retaining enough factoids and jargon to keep the interest of the dolphin wearer, Rising Tide's pages turn easily once through the brief history of the Russian Submarine Force's beginnings.

Gary Weir, historian of science and technology at the U.S. Naval Historical Center and winner of the prize for naval history for Forged in War: The Naval-Industrial Complex and American Submarine Construction, 1940-1961, brings his wealth of submarine knowledge to the book. He has teamed with Walter J. Boyne, New York Times best selling author of the Influence of Air Power on History and former director of the National Air and Space Museum of the Smithsonian Institution.

An incredible book has been drawn from the oral histories of twelve Russian submarine commanders taken during the winter of 2002 and spanning the breadth of the Cold War. The authors set out to describe, using firsthand accounts, the untold story of Soviet

submariners in two "brutal contests . They recount the underwater jousts with the U.S Navy and the Royal Navy. Throughout the stories of the second conflict between the Russian submariner and bureaucracy, Weir and Boyne reinforce their thesis that the man to "blame for exposing Soviet seamen to totally unwarranted and unnecessary dangers was Sergei Gorshkov, Admiral of the Fleet of the Soviet Union. Rising Tide provides an intimate and often frightening account of the Cold War Soviet Submarine Force and, in a sense, a prolonged chat with NATO's Cold War adversaries.

Those stories reveal a determination by the submarine commanders to meet the demands of the expanding missions of the Soviet Navy while dealing with the limitations and defects of the Soviet submarine designs and nuclear catastrophes. The book is organized roughly chronologically and moves quickly from a short history of the Russian Navy into the Soviet Submarine Force after World War II and its expansion into deep waters. It includes chapters on the birth of Soviet nuclear submarines, the submarine operations in the Cuban Missile crisis, two chapters on the technical problems faced by the Russian submariner in operations and nuclear plant designs. One chapter on intelligence gathering focuses on the Soviet trawlers and their importance in gaining information, including the monitoring of an SLBM launch from the USS JAMES MADISON and recovering U.S. Navy telemetry buoys in 1970. Chapter Nine reports the apex of Soviet submarine operations that openly challenged Western technological superiority and is followed by a final chapter on the mystery of the *KURSK* disaster as seen from an insiders' view.

The expansion of the Soviet Navy beyond a coastal defense force is told by the memory of Rear Admiral Vladimir Lebedko who in 1956 deployed to deep waters in the Pacific with the S-91. He also participated in an unplanned-on his part-deployment aboard the S-178, a Whiskey class diesel submarine. The authors use the alert deployment of the S-178 as the first illustration of Gorshkov's use of submarines to challenge United States naval power no matter the human cost. Lebedko, who took a friend's duty as a favor, read orders directing the commanding officer of S-178 to get underway and prepare "to attack and destroy the surface ships and vessels of 'the adversary'. (50)

The litany of Soviet submarine accidents and nuclear incidents discussed is both chilling and enlightening. Weir and Boyne argue convincingly that Gorshkov "decided in favor of the nuclear submarine fleet, and against the lives of the submariners who manned them. (284) Perhaps the repeated descriptions of incidents involving the first Soviet nuclear sub, the K-3, best illustrates the informed choices made by the men of the bureaucracy and the Sailors on the submarines. The authors report that the K-3 was designed by engineers in a project so classified that no naval specialists were consulted in the initial program. K-3 experienced a leak in its steam generator and cracks in its nuclear fuel elements during a cruise in 1960. According to the authors, "The incident was really a metaphor for the problems of the entire Soviet system, for over time the leak...killed more than a dozen crewmembers via radiation sickness, and the news of that was suppressed for years. (67)

K-3 remained in service and experienced another tragic event in September 1967 when a fire broke out in the torpedo room. Although 39 men died, a greater catastrophe was averted because Captain-Lieutenant Malyar prevented the men from opening the hatch and spreading the fire. The fire "died out before any of the twenty torpedoes (including two that were nuclear tipped) could explode. (109)

A second chilling focus of Rising Tide centers on the lack of controls for nuclear weapons. In the chapter on the Cuban Missile Crisis, Weir and Boyne present clear evidence from the oral histories that "the final decision to launch a nuclear torpedo or nuclear missile ultimately resided in the hands of individual submarine commanders. According to Captain Shumkov, commander of the B-130, one of his admirals issued a cryptic response to a question about the rules of engagement regarding the use of a 3.5 megaton nuclear tipped torpedo as Shumkov was about to deploy to Cuba, saying, "Once your face has been slapped, don't let them hit your face one more time. In hindsight, it is little wonder that the world watched anxiously as the crisis unfolded and Shumkov's nuclear-armed submarine was forced to the surface by three grenades in international waters.

The brutal reality of the Cold War with the sacrifice of men to

the greater good of Gorshkov's goals is portrayed as the authors provide faces, names and personality to the previously nameless Soviet adversaries. One enjoys the sense of accomplishment as Captain First Rank Anatoli Shevchenko surfaces at the North Pole in August 1979 and goes on to challenge the American Navy off its own coast. Shevchenko directed two highly successful operations, "APORT and "ATRINA , in the mid-1980s. In an attempt to demonstrate that the Soviet Navy could acquire important operational intelligence about the U.S. Navy using "ingenuity and sheer determination in the face of the American technological superiority, five Victor class submarines were ordered to take up station in the Western Atlantic. Using the Gulf Stream like a duck blind, the Victors hid from American Anti-Submarine Warfare (ASW) patrols while tracking U.S. submarines and gaining valuable intelligence from the U.S. response to try to find the Soviet submarines. Shevchenko's "APORT" surprised the U.S. Navy and revealed SSBN patrol areas, tactical response and the extent of the SOSUS coverage area. (202-208)

So successful was APORT that the Soviet leadership used similar strategy in 1986 with a smaller entrapment operation called "ATRINA. Designed to determine NATO's responses, ATRINA sent five Victor-3 submarines to pre-assigned rendezvous locations to gauge detection and response tactics. The operations repeatedly demonstrated the Soviet ability to conduct coordinated operations far from home and near American coasts while testing NATO's ASW defenses. (209-210)

However, Weir and Boyne indicate that this was the Soviet Navy at its best as the Russian military met hard times with the fall of the Berlin Wall and subsequent breakup of the Soviet Union. They recount the saga of the K-414, a Victor-3 Class submarine, that in 1994, while en route to the North Pole, experienced an emergency surfacing because of an oxygen leak from a torpedo and four days later suffered a reactor scram under the ice. All of this as a prelude to the loss of the KURSK.

In the longest chapter of the book, *The Mystery of the KURSK*, the authors expertly weave information from Russian naval experts, personal accounts and news sources to present a detailed analysis of the loss and problems with the rescue attempts. Weir and Boyne

begin the chapter with a brief synopsis of the successful recovery of crews from the loss of S-178 and K-429 and lament that the KURSK did not have the same fortune. Centered on the St. Petersburg Submariners Club and the retired submariners, Weir and Boyne explore the Russian informants' versions of KURSK's sinking, including the collision and on-board explosion scenarios. They report the coincidence of USS MEMPHIS's, a U.S. Los Angeles class attack submarine, arrival in Norway for repairs days after the KURSK's sinking, but then show that the evidence and ultimate conclusions pointed to a faulty torpedo as the cause.

With informed opinion, Weir and Boyne conclude that the KURSK disaster may signal the end of the "Soviet/Russian submarine force and the beginning of the Russian Federation's presence deep in the world's oceans. (252) This view is a chilling and potentially accurate conclusion when viewed along with the sinking of the decommissioned K-159 in August 2003 and recent comments by Admiral Vladimir Kuroyedov that the nuclear-powered cruiser PETER THE GREAT was in such poor condition that its reactor could explode at any moment. In contrast, the authors compare the KURSK and COLUMBIA tragedies in the Epilogue and bemoan the *what if* the capital and creative talent that made the Cold War exploits described in the book possible had been used to protect the environment. Although some might deem this worthy of consideration, the comparison seems detached from the reasoning of the book.

The book also contains sixteen pages of unreleased photographs from the informants' collections. The most striking are the photos taken from the trawler that witnessed the ballistic missile launch and then jockeyed with American Sailors to recover parts of the missile and buoys. Other photos help put faces to the stories and provide humanity to the former adversaries. Beyond these images, however, the reader unfamiliar with the layout of submarines interiors would benefit from some basic schematic diagrams in order to better follow the description of fires spreading from one compartment to another as the crew tries to access an escape module.

Some readers may fault the lack of sources to validate the claims presented by the oral history accounts. Weir and Boyne acknowledge this shortcoming and provide footnotes that offer more

background. They openly explain the limits that continued classification of U.S. patrol reports and operational information created in cross-referencing claims such as when one sub commander reportedly tracked a U.S. SSBN for five days. Nevertheless, the detailed description of a collision between "two nuclear powered submarines, each one equipped with nuclear-tipped missiles following a botched underwater pirouette without a footnote frustrated this reviewer. (112) The existing footnotes, however, were especially valuable in providing additional context. For example, they include comments from former U.S. submariners that indicates a continued contest over who could claim to have bested the other in contact acquisition and tracking contests and one from Vice Admiral Emery, former COMSUBLANT, who provided explanatory insight into submarine operations. Others may note that some of the text for the appendix on submarine characteristics finds it way into the main text when the authors are describing submarine class specifications.

Clif's Notes fans will appreciate *Appendix One-The History of the Russian Navy according to Gorshkov* that presents an annotated version of Gorshkov's view of naval history and saves the actual reading of Gorshkov's Red Star Rising at Sea.

The authors introduce caveats to the ideas presented by Gorshkov and provide a context in which he created the new Red Navy. The authors also include a greatly needed guide to U.S. and Soviet submarines that allows the non-technical reader to understand the differences between the confusing array of submarines types. In addition, Appendix Two provides details that helps the reader understand the differences between the U.S. and Soviet submarine capabilities that contributed to the under sea drama. The two appendices contribute greatly to the context of the main portions of the book by placing them within the strategic framework of the Soviet Navy's Leadership and a comparison of the submarines taking part in the Cold War.

Rising Tide fills a gap that intelligence couldn't during the Cold War and reveals insights into the Soviet and Russian submarine force and its leadership. Whether read for entertainment or reference, Rising Tide makes you respect the submariners and angry with the bureaucracy that cost so many lives. It belongs in any submariner's collection.

SURVIVING SPOUSES RECEIVING VA BENEFITS CHANGE IN LAW

The Veterans Improvement Act of 2004 has made a major change in entitlement for certain survivors receiving VA benefits because their spouse's death was caused by or accelerated by their service connected conditions.

Under the law that became effective December 16, 2003, a surviving spouse who remarries on or after their 57th birthday will continue to be entitled to VA benefits including DIC, CHAMPVA (*if not eligible for TRICARE), and Loan Guaranty benefits.

Surviving spouses who have been removed from the roles because of remarriage on or after their 57th birthday have until December 16, 2004 to apply for reinstatement of benefits. If they do not apply for reinstatement by that date they are ineligible to receive DIC unless their present marriage ends in death or divorce. At that time they can be restored to DIC. Should they remarry again after having been restored, and they are over the age of 57 they will continue to be entitled to DIC.

Surviving spouse who married prior to age 57 are ineligible for restoration to the DIC roles unless their current marriage ends in death or divorce.

Drafted by Compensation and Pension Service
February 20, 2004

DOLPHIN SCHOLARSHIP 2004 CALENDARS
ORDER YOURS TODAY!

Name:_____

Address:_____

_____

City_____State____ Zip_____

Phone:_____ e-mail:_____

Please send me the following:

_____ Large 2004 Calendars ($7.75 each, postage included)

_____ Small 2004 Calendars ($4.00 each, postage included)

Mail to: Dolphin Scholarship Foundation
5040 Virginia Beach Blvd. Suite 104-A
Virginia Beach, VA 23462

757-671-3200 **www.dolphinscholarship.org**

NAVY-MARINE CORPS BALL
SATURDAY, MAY 15, 2004

Celebrating our 100th Anniversary!

Held at the Washington Hilton and Towers
Connecticut and S Streets, NW
Washington, DC

1830 Reception
2000 Dinner

Military Dress Uniform
Civilian Black Tie

Pricing:

Industry/Corporate Table	$1400.00
Flag/General Officers & SES	$85.00 pp
06/GS15	$80.00 pp
05/GS14 & below	$75.00 pp
03 & 04	$70.00 pp
E7-02	$65.00 pp
E1-E6	$60.00 pp

NAVY-MARINE CORPS BALL

CELEBRATING A CENTURY OF SERVICE

The Navy-Marine Corps Relief Society traces its roots to the 1903 football game between the US Naval Academy Midshipmen and the Cadets from West Point. Although the Navy lost that game, Sailors and Marines were winners because President T. Roosevelt gave the Navy one-third of the gate receipts ($9,000) thus providing initial funding for our organization.

Throughout the past 100 years, volunteers and employees of the Society have been stretching out their hands to render financial assistance to clients for a broad spectrum of needs. These include emergency transportation, first-time insurance premiums, food, shelter & utilities, college scholarships & loans, medical bills, funeral costs, automobile repairs and more. Not all of the Society's business involves money. Tens of thousands of Sailors and Marines call or visit our 250 offices ashore and on board ships to learn how to prepare a budget, set up home visits by one of the Society's Visiting Nurses, or apply for a layette or junior sea bag.

Most of the financial support received by the Navy-Marine Corps Relief Society comes from the active duty and retired military family. This year, during a period when the nation is asking so much from our men and women in uniform (and their families), we are inviting others to join us in supporting them. Your participation will enable us to increase the financial, educational and non-financial support to our servicemen and women. There is always a need for more Visiting Nurses and to expand our Budget for Baby programs. We want to work some more on reversing the cutbacks in scholarship grants that we were forced to implement in 2003. Your donation and participation will be used in its entirety to support Sailors and Marines and their families.

REUNIONS

USS TRITON (SS201/SSN586)
23-26 June 2004
Great Lakes, IL
Contact: Harold Weston
757-481-5557
e-mail: HEWeston@webtv.com

USS EMORY S. LAND (AS 39)
17-19 September 2004
Virginia Beach, VA
Contact: J. R. Black
8214 Wedgewood Dr.,
Norfolk, VA 23518
757-583-0284
e-mail: JRBSMB39@aol.com

USS CANOPUS ASSOCIATION
Crewmembers that served on the AS-34 and AS-9 including supporting Marine detachments, SUBRONs, ARDMs and ASRs are invited to our reunion.
Sept. 30 to Oct. 3, 2004
Atlantis Casino Resort, Reno, NV
Contact Richard Retin,
1755 Rockhaven Drive
Reno, NV 89511
775-851-1077
e-mail: usscangpus@mail.com
or http://www.usscanopus.org

USS DIABLO (SS479)
September 26-30, 2004
Branson, MO--Contact Ozark Mtn Sightseeing
P.O. Box 1167
Branson, MO 65615 **USS BUMPER (SS-333) ASSOCIATION**
October 6-8, 2004
Best Western Motor Inn
Vero Beach, Florida 32966
contact: Edward W. Stone, Secretary
308 Merritt Avenue
Syracuse, New York 13207-2713
(315) 469-3825

QUILLBACK, TRUTTA, PICUDA
October 21-24, 2004--Charleston, SC
contact: Charles Krewson
109 Powder Horn Dr.
Gaston, SC 29053
e-mail: CKREWSON@SC.RR.COM

NAVAL SUBMARINE LEAGUE
HONOR ROLL

BENEFACTORS FOR MORE THAN TWENTY YEARS

AMERICAN SYSTEMS CORPORATION
BAE SYSTEMS (ROCKVILLE MD)
BWX TECHNOLOGIES, INC.
EG&G TECHNICAL SERVICES , INC.
ELECTRIC BOAT CORPORATION
GNB INDUSTRIAL POWER
LOCKHEED MARTIN MARITIME SYSTEMS & SENSORS-UNDERSEA SYSTEMS
NORTHROP GRUMMAN CORPORATION OCEANIC & NAVAL SYSTEMS
NORTHROP GRUMMAN NEWPORT NEWS
PRESEARCH INCORPORATED
THE BOEING COMPANY
TREADWELL CORPORATION
ULTRA ELECTRONICS/OCEAN SYSTEMS, INC.

BENEFACTORS FOR MORE THAN TEN YEARS

AMADIS, INC.
APPLIED MATHEMATICS, INC.
CAE USA INC. MARINE SYSTEMS
CORTANA CORPORATION
CUSTOM HYDRAULIC & MACHINE, INC.
DRS TECHNOLOGIES, INC.
DYNAMICS RESEARCH CORPORATION-SYSTEMS & TEST EQUIPMENT DIV.
ELIZABETH S. HOOPER FOUNDATION
GENERAL DYNAMICS-AIS
HYDROACOUSTICS, INC.
KOLLMORGEN CORPORATION/E-O
LOCKHEED MARTIN CORPORATION
L-3 COMMUNICATIONS OCEAN SYSTEMS
MARINE MECHANICAL CORPORATION
NORTHROP GRUMMAN CORPORATION-MARINE SYSTEMS
NORTHROP GRUMMAN INFORMATION TECHNOLOGY-TASC
PEROT SYSTEMS GOVERNMENT SERVICES
RIX INDUSTRIES
ROLLS ROYCE NAVAL MARINE INC.
SARGENT CONTROLS AND AEROSPACE
SIPPICAN, INC.
SONALYSTS, INC.
SYPRIS DATA SYSTEMS
SYSTEMS PLANNING AND ANALYSIS, INC.
VEHICLE CONTROL TECHNOLOGIES, INC.

BENEFACTORS FOR MORE THAN FIVE YEARS

ADVANCED ACOUSTIC CONCEPTS, INC.
AETC INCORPORATED
AMADIS, INC.
AMERICAN SUPERCONDUCTOR CORPORATION
BURDESHAW ASSOCIATES, LTD.
CURTISS-WRIGHT ELECTRO-MECHANICAL
CORPORATIONELECTRO-MECHANICAL DIVISION
CUSTOM HYDRAULIC & MACHINE INC.
DIGITAL SYSTEM RESOURCES, INC.

E. C. MORRIS CORPORATION
GOODRICH CORPORATION - EPP DIVISION
HAMILTON SUNDSTRAND SPACE SYSTEMS INTERNATIONAL
DEVELOPMENT GROUP
MATERIALS SYSTEMS, INC.
RAYTHEON COMPANY
SCOT FORGE
VEHICLE CONTROL TECHNOLOGIES, INC.
CURTIS WRIGHT ELECTRO MECHANICAL CORPORATION

ADDITIONAL BENEFACTORS

BURKE CONSORTIUM, INC.
BUSINESS RESOURCES, INC.
DIRECTED TECHNOLOGIES, INC. (NEW IN 2004)
DRESSER RAND COMPANY (NEW IN 2003)
DRS POWER & CONTROL TECHNOLOGIES, INC.
eMAGIN CORPORATION (NEW IN 2003)
INSTAKNOW.COM, INC. (NEW IN 2003)
KOKES MARINE TECHNOLOGIES, LLC
LOCKHEED MARTIN MARITIME SYSTEMS & SENSORS
LOCKHEED MARTIN MARITIME SYSTEMS & SENSORS-TACTICAL SYSTEMS
LOCKHEED MARTIN MARITIME SYSTEMS & SENSORS-RADAR SYSTEMS
L-3 COMMUNICATIONS CORPORATION
L-3 COMMUNICATIONS INTERSTATE ELECTRONICS
L-3 COMMUNICATIONS SPD TECHNOLOGIES
L-3 COMMUNICATIONS SYSTEMS WEST
LENAPE FORGE, INC. (NEW IN 2003)
MARINE SONIC TECHNOLOGY, LTD.
MICROPORE, INC. (NEW IN 2003)
OCEAN WORKS INTERNATIONAL, INC. (NEW IN 2003)
OIL STATES INDUSTRIES/AEROSPACE PRODUCTS DIVISION
PACIFIC FLEET SUBMARINE MEMORIAL ASSOCIATION, INC.
PEROT SYSTEMS GOVERNMENT SERVICES
PROGENY SYSTEMS CORPORATION
SSS CLUTCH COMPANY, INC.
SUPERBOLT, INC.
UDT-UNDERSEA DEFENCE TECHNOLOGY (NEW IN 2003)
ULTRA ELECTRONICS/EMS DEVELOPMENT CORP. (NEW IN 2003)
UMBANET, INC. (NEW IN 2003)
WHITNEY, BRADLEY & BROWN, INC. (NEW IN 2004)

NEW SKIPPERS

RADM R. M. Ghormley, USN(Ret)
RADM W. J. Holland, Jr., USN(Ret)

NEW ADVISORS

Mr. Harvey Horowitz
Mr. James Phalen
LT Henry Roenke, USN

NEW ASSOCIATES

LT Brian Nowak, USN
LCDR William F. Ruoff, III, USNR(Ret)
Mr. & Mrs. Scott Stevens
LCDR Robert M. Smith, USN(Ret)
CAPT. R. M. Springer, Jr., USN(Ret)
Mr. Robert Wade