

THE SUBMARINE REVIEW



JULY 2006 PAGE

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EDITOR'S COMMENTS

This year's Submarine Technology Symposium of May and the Submarine League's Annual Symposium in June have provided rich material for this July issue.

Our FEATURES section is headed by the Secretary of the Navy's address to the Annual Symposium. Dr. Winter's remarks are a clear, high-level Navy policy statement about submarines now and in the future as to the place of the Force in national security provisions. He also included comments about the challenges we face in personnel accession and training, preservation of our industrial base, the affordability of our submarines and the absolute necessity for safety in the operation of our nuclear-powered force.

SecNav's address is followed by one from a respected observer of US national security forces and an influential adviser to the Congress, particularly on matters impacting on naval force acquisitions. Mr. Ron O'Rourke, a senior analyst with the Congressional Reference Service of the Library of Congress, has spoken previously to several of the Submarine Technology Symposiums and on each occasion he has provided us with valuable insights and a most helpful view from a different point in the Washington topography. His talk to this year's session at the Johns Hopkins Applied Physics Lab certainly lived up to our expectations based on past performance. It is presented here, in its entirety, and is, as always, highly recommended for its general content. There is, as well, a discussion of one aspect of our problem in increasing the submarine building rate which most of us had not appreciated until he pointed it out.

Also at that SubTech Symposium, VADM J. Guy Reynolds filled in as the Keynote Speaker for ADM Kurt Donald, who was engaged in the TEXAS Sea Trials. He chose as his topic the relationship of a nation's sea power to its overall position in the world's affairs. He then related that sea power to a nation's continuing investment in men and materiel, particularly in the innovation and improvement in employment and development.

There is also a special section of this issue devoted to several presentations by Submarine Force notables at the Submarine League's Annual Symposium in June. Those by VADM Munns,

Commander, Submarine Forces; RADM Walsh, Director of Submarine Warfare at the Pentagon; RADM Johson, Director of Strategic Systems Programs; and the Commanding Officer of our first SSGN are collected in the section titled THE SUBMARINE FORCE TODAY. Taken together they provide an impressive picture of understanding and adaptation to the times, technological achievement and force improvement through new construction, modernization and transformation. VADM Chuck Munns led the way with a survey of how the Force is aimed, organized and operated in today's world while being prepared for tomorrow's problems as well. He has articulated the needs of national security in terms of attainable objectives of an operating Submarine Force and is leading the entire submarine support community in a coordinated Undersea Enterprise to get the most in efficiency and effectiveness.

RADM Steve Johnson, now Director of SP, but previously Commander, Naval Undersea Warfare Center, led off his discussion of Strategic Systems with a brief commentary on the recent record in submarine acquisition, which may be unparalleled in today's defense industrial world. RADM Joe Walsh, soon to be ComSubPac, gave a summary status of the various programs which he had been shepharding through the process as Director of Submarine Warfare; also an impressive list of achievements.

In addition, CDR Mike Cockey, the Blue CO of OHIO, our first operational SSGN, gave a *Future Patrol Report* for an operation in the Global War on Terror taking place several years from now. All who heard Mike's presentation were duly impressed with the tremendous capability of this new, or rather, transformed, class of submarine. OHIO and her sisters, and the very talented officers and men who sail in them really do introduce a new era in submarine warfare.

Enjoy the entire issue, it was put together to keep you informed and involved.

Jim Hay
Editor

FROM THE PRESIDENT

The 2006 Annual Symposium was a great success! The Symposium agenda featured a discussion of submarine acquisition programs with the principal acquisition officials providing details and answering questions. Admiral Giambastiani delivered the keynote speech that focused on the requirements for submarine capabilities in relation to other DoD priorities. Vice Admiral Stan Szemborski provided the Office of the Secretary of Defense perspective on submarine acquisition. The Submarine Force leadership, Vice Admiral Munns, Rear Admiral Jeff Cassias and Rear Admiral Joe Walsh, discussed requirements and current submarine programs. Rear Admiral Steve Johnson discussed recent history of submarine acquisition and his new focus on Strategic Systems Programs. The final speaker, Rear Admiral Willy Hilarides, summarized the status of most of the acquisition programs from his perspective as Program Executive Officer for Submarines.

Commander Frank Cattani, CO, USS HARTFORD (SSN 768), described his recent deployment in executing the counter-drug program. Commander Mike Cockey, CO, USS OHIO (SSGN 726) provided a gripping presentation about a fictional deployment of an SSGN that depicted the many capabilities of this platform. Mr. Joe Buff, the First Prize Literary Award winner, presented his views on China and their emerging capabilities to rule the seas.

The Fleet Award winners made us all proud. Each recipient was present or represented by a family member. Awards were presented by the Luncheon speaker, The Honorable Donald C. Winter, Secretary of the Navy, Admiral Bruce DeMars, Vice Admiral Munns and Rear Admiral Cassias. Mr. Andrew W. Marshall, Director, OSD Net Assessment, was recognized as the 2006 Distinguished Civilian. Rear Admiral Robert H. Wertheim was honored as the 2006 Distinguished Submariner based on his contribution to the development of the submarine ballistic missile and Fleet Ballistic Missile weapon system.

At the Annual Business Meeting I reported the election of Mr. John Casey, CAPT CJ Ihrig, Mr. David Perry and Ms. Mary Pat Salomone to the NSL Board of Directors. Admiral DeMars reported that the Board appointed me to the Board for an additional year to

continue as the NSL President. The annual audit confirmed the League is maintaining its fiscal status in the black. A summary financial report is in this issue of the Review. A copy of the audit is available from the office. Nine Chapter Presidents or representatives discussed the activities they are conducting in their various locations for members of the League.

VADM George Emery completed his third year as Chairman of the Submarine Technology Symposium (STS). STS was a resounding success because of the outstanding content. Attendance was a bit lower than previous year, but in line with what is an industry trend. Mr. Ron O'Rourke provided another penetrating analysis of the submarine shipbuilding program. Vice Admiral Eric Olson, Deputy Commander, U.S. Special Operations Command provided a report on the importance of the Submarine Force to the Special Operations Forces. STS continues to be the League's most fiscally successful event.

The Fifth Annual Submarine History Symposium, "*SP At 50!*" was conducted in cooperation with the Naval Historical Center, Navy Historical Foundation and Navy Memorial on 11 April 2006. Speakers included RADM Robert Wertheim, VADM Ken Malley and RADM Charles Young. They discussed the history of the Strategic Systems Programs first 50 years. Each speaker provided their unique perspective. RADM Wertheim spent half of his career in SP and was instrumental in developing the solid fuel missile, the smaller nuclear warhead, and the integration of the missile into the submarine platform. VADM Malley discussed the development of the TRIDENT missile and OHIO Class submarine and its role in ending the Cold War. RADM Young addressed the continuing importance of SP in the future with the return to service of USS OHIO and USS FLORIDA as SSGNs. He also briefed the attendees on the development of a conventional warhead for the TRIDENT D-5 Missile.

At the June Board meeting I discussed the results of an evaluation of the League's four major symposia. RADM Bruce Engelhardt, Vice President of the League, chaired an ad hoc committee of active duty and retired members to evaluate alternatives to the present schedule structure. The League leadership has been considering these changes for some time. The changes proposed by the commit-

tee were approved by the Board of Directors at the June meeting. The schedule for 2007 is to conduct the Corporate Benefactor Recognition Days on 30-31 January, the History Seminar in April during the week of the Submarine Force Birthday, the Submarine Technology Symposium on 15-17 May, and the Annual Symposium in October/November to coincide with the N77 Fall Cocktail Party.

The League continues to address issues that are important to the Submarine Force. I ask that you let me know your ideas of what the League can do to help promote submarines and their contribution to national defense. I encourage you to make your views on the build rate for VIRGINIA Class submarines known to your elected representatives. The easiest thing you can do is to recommend that your friends and associates join the League. You can do this easily by referring them to our webpage, www.navalsubleague.com and click on "Join NSL".

Please join Jan and me as we continue to pray for the safety of our troops deployed around the world. I am honored to continue to represent you as President of the Naval Submarine League.

J. Guy Reynolds
President

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THE SUBMARINE COMMUNITY**NAVAL SUBMARINE LEAGUE SYMPOSIUM****JUNE 7, 2006****THE FORCE: OBJECTIVES & ATTAINMENTS****REMARKS BY****VICE ADMIRAL CHUCK L. MUNNS
COMMANDER, SUBMARINE FORCES**

Thanks to Naval Submarine League and Admiral DeMars for setting up this opportunity for us to talk to you all and a very special thanks to Admiral Giambastiani for making the time for us today. Rear Admiral Jeff Cassias will be following me with a brief that focuses more on submarine worldwide operations, while I will be giving you more of the strategic view. I'll talk about where we are headed, and he will talk about what we are doing. Lets set the stage with a story – first let me stipulate up front that there are only great engineers and managers in this audience... ok?... the story.

A man is rowing a boat out here on the Potomac and realizes he is lost. He spots a man over on the shore, so he shouts "Excuse me, can you tell me where I am?"

The man on the shore says: "Yes, you're in a rowboat about 20 yards from the shore."

"You must be an engineer" says the rower.

"I am" replies the man. "How did you know?"

"Well," says the rower, "everything you have told me is technically correct, but it's no use to anyone."

The man on the shore says "you must be in management."

"I am" replies the rower, "but how did you know?"

"Well," says the man, "you don't know where you are, or where you're going, but you expect me to be able to help. You're in the same position you were before we met, but now it's my fault."

As the manager of managers, I hope to show you that we do know where we are going and how we are getting there. We are focused. We are aligned, and coming at you with both a purpose and a product. We provide the tools and talented folks that our Combatant Commanders (COCOMS) need and are using, we perform day in and day out as a *scout* for our Nation in areas others can't go, and if needed, we are ready to quickly strike on Combatant Commanders' direction for our national interests.

That brings me to our agenda. I'll spend some time talking about four key areas: 1) our unique product for which we continue to work to propagate brand recognition and how this fits into the overall Naval Strategy; 2) how we are postured with men and the ships they go to sea in; 3) Submarine Force's desired effects; and 4) a discussion of our Undersea Enterprise, who we are, where we are, where we are going, why. I'll also include some examples of our successes.



Our Products



Last year at this forum I spoke to you all about establishing our Undersea Warfare *Brand Recognition*. I've reinforced that in various forums to many of you who were in attendance at the NDIA Clambake, at the NSL Corporate Benefactors Days, some of you who may have been at the Submarine Industrial Base Council, and last month at the NSL Submarine Technology Symposium. The strategic themes that make up our brand recognition are:

1. Presence with a product – bringing back knowledge collected in phase zero that can shape decisions that prevent escalation to Major Combat Operations.
2. Day in day out – Walking the field often where others can't go to allow Navy, Joint, and National command levels to act from a position of understanding.
3. The Persistent, Clandestine, Agile, Mobile Scout
4. When needed, the on-call Shooter

These messages are the unique selling propositions of our *brand* and they bear repeating to the point where all the Submarine Force's associated characteristics automatically come to mind like all the imagery and themes of your favorite marketing campaign – like the Nike Swoosh.

The Submarine Force is doing well. There is no need for us to re-brand us with a new message, because we've got it right. All those requirements that make up our brand name are well aligned with the attributes that will be needed throughout the Long War on Terrorism, a long peace, or future Major Combat Operations. We have the capabilities to add strength to the COCOMs and Joint Forces in all of those contingencies. So with the brand reinforced, let's move on and discuss the changing strategic landscape.



Our Strategy

Navy Strategic Plan Desired Effects

- Dominate Blue Green Brown water war seams
- Unique Maritime Capability to Joint Force
- Persistent Forward Presence
- Dissuade and deter MCO
- Maritime Cooperation w/ Strategic Partners



----- Capabilities of the Submarine Force ----- Forward, Deterrence, Defense, Dissuade, Defense -----

Our Strategy

Pictured is the *refined force planning construct* from the 2006 QDR under which we are operating. As Admiral Giambastiani discussed in his remarks, there is a major shift in the way of looking at the world that has taken place with the advent of the Long War and the current global security situation. The 2006 QDR continues a shift that was discussed in the 2001 QDR toward Capability Based as opposed to Threat Based planning. That means we do not make a list of enemy capabilities, project how they will grow into the future, and then make a plan that addresses each threat. Rather, under this planning construct, we recognize uncertainty and manage risk associated with that uncertainty. We need to establish the right capabilities to cover the contingencies – including contingencies we haven't even considered.

So let's look at the roles we execute as the Submarine Force in that *Long War*. The CNO just signed the Navy Strategic Plan this May. That plan lays out the approach for the near future and addresses the priorities to be pursued in the current budget cycle for the FYDP. It will be accompanied very soon by the Naval Opera-

tions Concept a supporting document to *From the Sea* or the subsequent *Forward, From the Sea* documents. Together these two new documents will portray a Navy made up of forward forces that are **distributed and networked for day to day Maritime Security missions, but that can be aggregated as a consolidated fighting force to support the Joint Warfighter.**

Our brand name capabilities fit into several of the objectives and desired effects spelled out in the Navy Strategic Plan. These desired effects are directly addressed by our capabilities. Our ability to scout the blue and green water with persistent clandestine presence and our ability to project Special Operations Forces (SOF) into the brown water and ashore is one set of capabilities that *caulks* these seams. Our future Small Combatant Joint Command Center on the SSGNs will bring a unique maritime capability to joint forces by allowing a forward command element to operate from a clandestine posture with minimal to no footprint ashore. We also deliver unique maritime capabilities with our ability to strike with both kinetic and information attacks from a clandestine platform, and our ability to provide ASW defense to other joint forces. We have unique capabilities to sustain persistent forward presence free from support even in anti-access areas. Finally, the Submarine Force is uniquely positioned to take advantage of a common submarine culture to encourage maritime cooperation with those strategic partners that have Submarine Forces of their own.

So we support this QDR construct through acting as the Scout for our nation, direct action with SOF, artillery/shooter with TLAM, torpedoes, or electronic attack, and our capabilities as defender from the tactical level of ASW defense of the joint force to the global level of nuclear strategic deterrence.



Posture

	OSD	ACT	STRAT	SSGN/SSBN	SSBN	JCOM	INCOM	SSN	SSBN
Total	102	199		318		137	163	114	98
1120s	11	15	45	10	8	5	4	3	1

Surge
25 / 0 / n/a / 1

Deployed
12 / 0 / 12 / 3

Depot
12 / 2 / 1 / 1

Grad Ed

59.4%
(SSN and SSBN)

SSN / SSGN / SSBN / IUSS

23,439 People 4.3 : 3 Sea Shore Rotation 67% Zone A Retention

Commander Naval Submarine Forces Direct, Describe, Deliver, Disrupt, Defend

Our Posture

Here's a way to look at how our ships and people are postured. The SSNs, SSGNs, SSBNs, and IUSS assets are operating at different conditions of readiness that I will discuss in more detail later. Key to achieving those different readiness conditions is our people. This top line shows how we have spread out 1120 talent across an array of the CCOMs, OSD, and Joint Staff. We are scoping down the weighting in STRATCOM billets and working to increase our presence in others. At the O-6 level, we are currently filling six key billets on CARGRU or CRUDESGRU staffs, five critical Chiefs of Staff, including CNI, 7th Fleet, CCSG5, CCSG 7, and FLTASWCOM, five Executive Assistants, and seven key positions at OSD.

Twenty-seven and one-half percent of all 1120s have a graduate degree. If we just look at the group that has had opportunity to attend post-graduate schools by removing Junior Officers, we have 59.4% of all the remaining 1120s with Graduate Degrees.

With respect to joint -- if you look at the population that has had time for a joint assignment and forecast about 18 months into future we will have worked so that 2/3 of that group has joint duty.

We have a total of 23,439 people in SUBFOR. That includes 17,726 active enlisted, 2,309 active officers, 1,567 civilians, 526 contractors, and 1,311 Reservists.

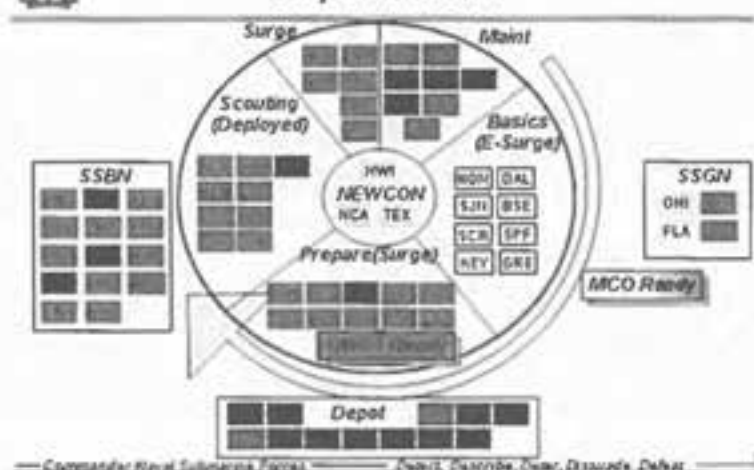
The average sea shore rotation is undergoing some changes. The shore tour length is staying 36 months, while the average non-nuclear sea tour is going from 49.4 months to 51.8 months.

Retention is OK with Zone A at 67%. Meanwhile, Zone B retention is 70% and Zones C and D are at 80%.

The Undersea Enterprise is clearly an organization focused on Effects Based Thinking. This approach is a way to begin with the desired end in mind. In one sentence that captures all of our desired effects, I'll say that our enterprise is all about having ships and crews at work that are properly aimed, providing submarine expertise, ensuring a healthy submarine culture, and programs to provide future capability. Let's look at each of these five effects to show you how we're going about reaching them.



Ships at Work



Ships at Work

This picture displays how we're getting operational availability from our ships. This slide shows all of our SSNs, SSBNs, and

SSGNs. We have ships that are still under construction, and we have ships that are in extended maintenance periods and are not ready. The remaining SSNs are shown in the middle as they rotate through the cycle of readiness that supports the Fleet Response Plan.

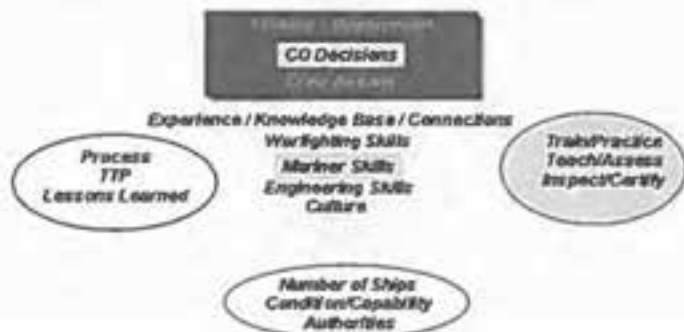
As ships come out of maintenance and start the path towards a normal rotational deployment, we start the training cycle by working on the basics. During this period, these ships are Emergency Surge Capable. If needed to deep surge for Major Combat Operations, they would go within some reduced work-up timeframe.

As the ships progress through the normal preparations for deployment, they advance to the Surge capable category within the POM cycle. These ships can be sent out for crisis response, if necessary, with much less additional preparation than those in the Emergency Surge category.

The rotation plan puts ships out on deployment to scout for the nation and bring back product day in and day out. When they return, they are still available to surge back out for crisis or MCO response until they go back into maintenance.



Properly Aimed



Commander Naval Submarine Forces Fleet, Declass, Data, Declass, Data

Properly Aimed

This slide shows all of the functions that go into delivering product. We must have the ship available, of course, and we have to task it by sending it out on deployment. The CO must make good

decisions that balance risk with rewards, and the crew must take actions based on those decisions.

The ability of the crew to act properly on the decisions depends on the skill sets they have developed. We do pretty well on Warfighting skills and we hold a pretty even keel on Engineering Skills. The area of focus this year is Mariner Skills.

The outer ovals are the external contributors to the process. The one we are focusing on right now is the assessment role played by both the ship and the ISIC.

One of the roles for the Navy that continues to grow is the use of Navy Personnel to relieve stress on the Joint Warfighters. This role plays into our desired effect of providing submarine expertise across the Joint, Interagency, and Combined Spectrum. The specialized skills of our submariners have application and are in demand outside the limited field of Undersea Warfare. One of the success stories I think we should be proud of is our outstanding success rate at deploying Individual Augmentees. Navy wide, there has been a 22% *Failed to Deploy* rate of Individual Augmentees that receive orders to deploy. Many of those turn out to be due to conditions that were known and represent failures of pre-screening processes—Up to date security clearances, satisfactory physical condition, sound medical and dental condition, and with financial, legal, and personal affairs in order. We have provided 143 Individuals to date that are now serving in Iraq, Afghanistan, and JTF-Horn of Africa. Of the SUBFOR individuals who have received orders, only 3 have been determined to be undeployable.

That's a clear indication that our culture is aligned with the quote here from VADM John Harvey, "There's an awful lot of skills these great Sailors have that are directly applicable. The requests I've seen pretty much run the gamut of what the Navy is able to provide. There are no sidelines anywhere. If you're wearing this uniform, you are on the front lines of service."



Healthy Culture

- Art Of Submarining



- Science Of Submarining



Commander Naval Submarine Forces

Admiral, Director, Naval Submarine Command

Healthy Culture

Our desire for a healthy submarine culture dovetails with all the points I just made with respect to the Individual Augmentees. Our Submarine Culture is a unique one. It's a combination of scientist and Warfighter. It's a combination of maverick and engineer. We show the ability to take difficult situations of mismatched tactics, training and materials to develop whole new methods of employment and tactics on the fly. At the same time, we have the cultural background to analyze a process and make it unimpeachably safe, secure, and consistent. We can train, drill, and maintain to rigid procedural compliance, and fully analyze failures and implement process changes to prevent recurrence.



Future Capability



Future Capability

These are only a few of the programs we are working through in the current budgeting cycle. Let me explain how we prioritize them.

1. Safety/Obsolescence – Some things will become obsolete and replacing them is not really a matter of choice. An example is our submarine batteries. They have a limited life and the old batteries aren't made anymore – they're obsolete, so we have to modernize them. We don't really have much choice.
2. Warfighting Parity (Maintain Gap) – These things keep pace with advancement of threat and complexity of environment and are necessary just to keep from falling behind.
3. New Capability/Enhancements/Gap Closure – These initiatives expand our reach and provide new capability. These will be the hardest to fund in times of the tight budgets we foresee for the immediate future.

One important issue is the Virginia Class Build Rate. In order to afford the build rate that we need to keep the force structure we need, we must get the cost down from about \$2.4 Billion to \$2 Billion per ship in FY 2005 dollars. We're going about that task from three directions. By ordering in multi ship contracts we will reduce the cost per ship by allowing the builders to purchase components in more economic quantities. A seven ship Multiyear Contract will save money on each ship. We are also focusing on ship design alterations for less expensive components that retain the same capability wherever possible.

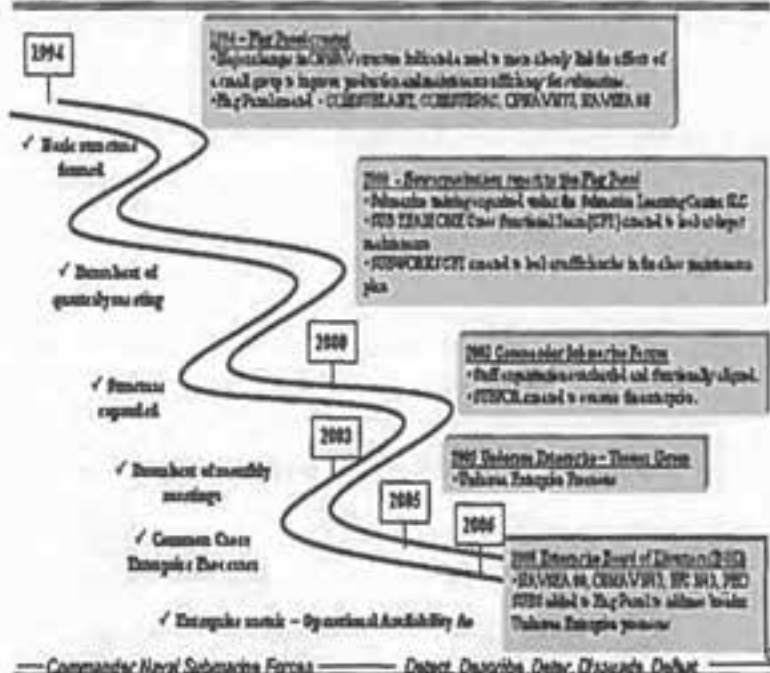
Finally, we are working on improving the shipyard productivity to allow the construction processes to be more efficient and cost less. One example of that last focus area is the Capital Expenditure Program. So far we have set aside \$91 Million to provide for shipbuilder investment in facilities and process improvement. The \$40 Million we have spent so far is expected to save a total of \$300 Million across the rest of the ships of this class. These capital improvements allow increased modular construction, an improved sheet metal fabrication facility, and final assembly & test improvements. All of these will also enable updates to the build plan that result in more efficient production and reduced construction span time.

You see a splash of color on the chart for the Submarine Design Base. For the first time since 1960 we find ourselves without a new class of nuclear submarines in the design phase. The expertise associated with Submarine Design is not something easily reconstituted if it is allowed to disperse. We're looking at the right way to maintain that design capability at the right cost through this period between new classes of submarines.

This last desired effect is the one that most dramatically illustrates the need for a true Enterprise approach. Future capability touches so many different organizations at so many different levels.



USE – A Decade of Development



Undersea Enterprise – A Decade of Development

This is the path we started on back in 1994 to link across the different organizations that touch undersea warfare. As time progressed we have developed a structure to bring business practices to bear on the challenges we face. The precept of the Enterprise approach is to view the organization not under the lens of traditional command structures, but as functional contributors working together to produce some product. We have OPNAV Codes, NAVSEA, Submarine Learning Center, PERS Codes, and others brought together to produce Undersea Warfare Capability oriented towards the five effects I showed you earlier.



We've been integrating across traditional command lines for quite a while now. Oversight is provided by the Board of Directors, who set the vision, strategy, and objectives of the enterprise. Below the Board of Directors are four different Cross Functional Teams that work to improve productivity of the processes and act on the decisions of the Board to create our desired effects. This approach has yielded a lot of successes. I briefed the CNO in May on several of those successes, and one I'd like to highlight to you now is the success of our ARCI program.

(Editor's Note: See the more detailed explanation of the Undersea Enterprise in the Staff Brief following VADM Munns presentation)



ARCI - COTSification Increased Performance – Lower Cost

► Capitalizing on the rapid improvement in commercial processing

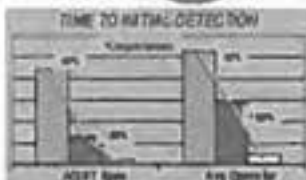
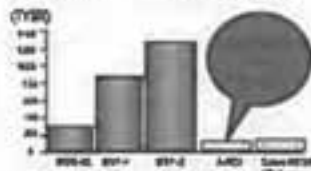
► Orders of magnitude improvements in processing

► Navy standard for combat systems

Performance



Cost



Submarine can be outfitted with the most advanced equipment to attack Commercial Off-The-Shelf (COTS) technologies through ARCI



Commander Naval Submarine Force

Destroyer, Destroyer, Destroyer, Destroyer

ARCI COTSification

The success story of ARCI (Acoustic Rapid COTS[consumer off the shelf] Insertion Sonar system) started a decade ago and was the result of an effects based effort to achieve the processing improvement over legacy systems that allowed this improved acoustic

performance. We partnered with business to make this possible. By focusing on the right effect instead of focusing on how to make the legacy process work better, we reaped the rewards of all of these second and third order benefits. We get our desired order of magnitude improvement in performance with respect to acoustic advantage, but we also get these orders of magnitude improvements in detection time, and most importantly in cost. As a bonus we can upgrade the systems every two years for software and every four years for hardware to have a more modernized fleet on an ongoing basis. We have a more standardized common baseline for all our units for more productive training and logistics. We also have other potential benefits we are still exploring in the area of maintenance such as Maintenance Free Operating Periods and distance support that could change our approach to shipboard maintenance and pipeline training for even more savings in the future.



Opportunity



Commander Naval Submarine Force Detect, Describe, Decide, Distinguish, Defeat

Summary

I finish with a look back at our people because we should emphasize the talent they bring to the ships and to the force. It is our





— Commander United States Forces ———— Dates: December, 1961 ———— 5

A BRIEF ON THE UNDERSEA ENTERPRISE THE BUSINESS OF UNDERSEA DOMINANCE

The Undersea Enterprise is composed of all stakeholders and resources supporting or operating SSNs, SSGNs, SSBNs, fixed surveillance, or mobile surveillance forces. The primary elements of the Enterprise and its Resource Sponsors include dollars and manpower for current and future platform and crew readiness. Commander Naval Submarine Forces (CSF), the head of the Undersea Enterprise, sets the strategy, priorities, requirements, and overarching direction for suppliers, resource sponsors, and producers to ensure a quality product for the enterprise customers.

Why was the Undersea Enterprise (USE) Established?

- The Commander Naval Submarine Forces (CSF) established an enterprise governance structure in order to more effectively and efficiently provide undersea combat power as directed by the Chief of Naval Operations (CNO) and the Commander, U.S. Fleet Forces Command (CFFC).
- USE focuses on achievement in five key areas, as measured by the key Effects Metrics
 - **Operational Availability** - "Around the World; Around the Clock" - Submarines and undersea surveillance assets deployed for sustained battle space preparation and deterrence
 - **Improved Commanding Officer Decision-Making** - CO's making optimal decisions under the demands and complexity of the undersea environment
 - **Submarine Expertise** - Experienced people integrated throughout the Joint warfighting, military technology, and defense/government management communities
 - **Culture/Standards/Conduct** - "Pride Runs Deep"- Assimilating new crew members into the submarine culture, while maintaining high standards and conduct
 - **Future Capabilities** - Forecasting and meeting tomorrow's requirements for undersea superiority

- The Commander, Naval Submarine Forces (CSF), as the CEO of the USE, sets the strategy, priorities, requirements, and overarching direction through the BOD, whose membership includes suppliers, resource sponsors, producers, and customers of the Enterprise.
- The USE BOD works to improve Enterprise productivity by changing processes and removing productivity barriers, while also providing specific standards of accountability. Oversight is provided by the USE Core BOD, whose members include CSF and the CSF and CSP deputies, OPNAV N187 and N13, Director, Strategic Systems Program, and NAVSEA 00.
- The USE structure includes Cross Functional Teams that are used to integrate enterprise activities and meet USE objectives.
- Cross Functional Teams manage integration in four areas:
 - Maintenance/Sustainment
 - Total Force Readiness
 - Resource Management
 - Operations
- Execution is carried out by Sub-Process Teams, including:
 - Maintenance/Material - Warshot Reliability Action Panel, SUB TEAM ONE
 - Personnel - Undersea Warfare Training Council (UWTC)
 - Acquisition - USE Shipbuilding Strategy
 - Operations - Tactical Requirements Group, SSGN Team

Examples of USE initiatives in two Cross Functional Teams

- Total Force Readiness CFT. The group worked to refine submarine manning factors, permitting a 9% reduction in officer accessions in FY04 and a 13% reduction in FY05 (which saved \$31.3M in FY04 and \$72.3M in FY05 in manpower costs).
- Maintenance/Sustainment CFT. The team has initiatives in Production, Contracts, and Design to reduce VA-class Submarine cost to \$2B per ship.
- Maintenance/Sustainment CFT. It is implementing a number of performance initiatives to eliminate the loss of 1,100 ship days in FY05 caused by maintenance schedule overruns. ■

NSL 24TH ANNUAL SYMPOSIUM MILESTONES IN SUBMARINE CONSTRUCTION

REMARKS BY REAR ADMIRAL STEPHEN E. JOHNSON DIRECTOR, STRATEGIC SYSTEMS PROGRAMS

Rear Admiral Johnson served as the SEAWOLF Class Program Manager before achieving Flag Rank and becoming Commander, Naval Undersea Warfare Center and Director, Undersea Technology. He became Director, Strategic Systems Programs in May 2006.

Over the past two years, the Submarine Force has quietly delivered three new-construction and two converted ships to the Navy. Unknown to most people, the shipbuilders delivered these ships despite a declining industrial base and a green workforce—no small feat. These achievements are integral to maintaining the required number of submarines over the coming decades. Below is a synopsis of our recent successes:

USS CONNECTICUT was commissioned in 1998, early and under budget. CONNECTICUT, second of the three SEAWOLF Class submarines, was part of the industrial bridge to a new class of submarines now known as the Virginia Class. This ship would be the only submarine that the United States would deliver for six years.

General Dynamics Electric Boat (GDEB) delivered USS VIRGINIA (SSN 774) on October 12, 2004 and the Navy commissioned her on 23 October. These dates are within weeks of the ship's original target dates that were set in the mid-1990s. Although the ship experienced some cost growth, it was not unusual for a lead ship. This submarine hosts revolutionary technologies, such as fly-by-wire ship control and Photonics Masts, and regardless of complexity, VIRGINIA's initial sea trials went exceedingly well. The superb performance on initial underway is a testament to the ship's builders, GDEB and Northrop Grumman Newport News (NGNN). Under VIRGINIA Class teaming arrangement, the shipyards alternate delivery with the delivering yard building two-thirds of the submarine with the other conducting the remaining third of work.

TEXAS (SSN 775) will be commissioned in Galveston, Texas, on September 9, 2006. Although technically the second boat of the Virginia Class, TEXAS is in many ways a first-of-a-class ship as it is the first submarine delivered by NGNN since USS CHEYENNE (SSN 773) in 1996. To fulfill the Congressional mandate to maintain two nuclear submarine shipbuilders, NGNN restarted its submarine production line after a ten-year hiatus. Despite some growing pains, TEXAS delivered in June 2006 and like the lead ship VIRGINIA, achieved a *clean sweep* of initial sea trials. The cost and schedule issues encountered are mostly attributable to the restarting of the nuclear submarine production line and, based on the six additional hulls now under construction, VIRGINIA program costs and schedules are improving.

USS JIMMY CARTER commissioned on February 19, 2005 and closed out the three-ship SEAWOLF Class that delivered on time and under budget for both the USS JIMMY CARTER and for the SEAWOLF Class. USS JIMMY CARTER is in many ways its own separate class of submarine due to a 100-foot hull section inserted behind the sail. The additional hull section, called the Multi-Mission Platform (MMP), took less than five years to go from concept to underway. Weighing in at approximately 2,500 tons, this hull section represents a complex engineering feat. The MMP enables USS JIMMY CARTER to accommodate the advanced technology required to develop and test new generations of weapons, sensors and undersea vehicles for naval special warfare, tactical surveillance and mine-warfare operations. USS JIMMY CARTER was delivered on time and within the Congressionally mandated cost cap despite the MMP's added complexity and condensed design and construction timeline.

The SSGN Program, too, had significant accomplishments over the past two years. USS OHIO (SSGN 726) delivered back to the fleet in December 2005 and had a Return to Service Ceremony on February 7, 2006 while USS FLORIDA (SSGN 728) delivered in April 2006 and had its Return to Service on May 25, 2006. The SSGN conversion program is refueling the four oldest OHIO Class SSBNs and converting them into land attack and Special Forces platforms. Each SSGN has the ability to carry up to 154 TOMAHAWK Cruise Missiles and 66 Special Operations Forces. While

GDEB is conducting the conversion work, Puget Sound Naval Shipyard and Norfolk Naval Shipyard are conducting the refuelings. Therefore, workers from GDEB are working at the Naval Shipyards' facilities and side-by-side with Naval Shipyard personnel in a first of its kind arrangement. The public / private teaming has worked out exceedingly well and this synergy has paid off with the first two SSGNs completing on time and within budget.

These five ships delivered on time and two were under budget. This is an enviable track record. Since 2004:

- Three lead ships (JIMMY CARTER, VIRGINIA, TEXAS)
- Four unique ship designs (SEAWOLF, JIMMY CARTER, VIRGINIA, SSGN)
- Five submarines on schedule and the successful restart of a nuclear submarine construction yard.■



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**NSL 24TH ANNUAL SYMPOSIUM
UPDATE ON SUBMARINE FORCE PROGRAMS
REMARKS BY RADM JOE WALSH
DIRECTOR, SUBMARINE WARFARE**

WEDNESDAY, 7 JUNE 2006

Admiral Reynolds, thank you for that kind introduction. Today, I would like to provide you with an update on Submarine Force programs and issues that are important to our Navy, Industry, and to members of the Naval Submarine League.

First of all, the Submarine Force continues to have a great year. Since I last spoke to you in this forum, USS VIRGINIA (SSN 774) completed her first deployment in October 2005, and all four SSGNs are either well into their conversion, or have already been delivered back to the Navy. USS OHIO (SSGN 726) returned to service on February 7, 2006, and USS FLORIDA (SSGN 728) returned to service on May 25, 2006. USS MICHIGAN (SSGN 727) will complete conversion in late 2006, and USS GEORGIA (SSGN 729) will complete conversion in 2007. TEXAS (SSN 775) completed Sea Trials in May 2006, will be delivered to the Navy on June 20, 2006, and then be commissioned on September 9, 2006 in Galveston, TX.

We currently have 53 SSNs in the force, comprised of 49 LOS ANGELES Class (688), three SEAWOLF Class, and one VIRGINIA Class. We also have four SSGNs and 14 SSBNs, and these numbers will remain steady pending any changes to the Nuclear Posture Review. We have two SSBNs undergoing two-year refueling overhauls. USS HENRY M. JACKSON (SSBN 730) started her overhaul in 2005, and USS ALABAMA (SSBN 731) started her overhaul in 2006. We will continue overhauling SSBNs at a rate of one per year until all of the SSBNs are completed. USS ALASKA (SSBN 732) will commence her overhaul in 2007.

Let me take a few moments to discuss SSN force posture. Today, the majority of SSN requirements reside in the Pacific. Our current force distribution of about 53% SSNs in the Pacific and 47% SSNs in the Atlantic is not optimal to meet all of PACOM's requirements. In fact, over the past two years, three Atlantic based SSNs have deployed to the Pacific in support of Combatant Commander

operational requirements. To better align the Submarine Force with joint warfighting requirements, the Navy has decided to split the SSN force with 60 percent in the Pacific and 40 percent in the Atlantic. In support of the 60/40 split, all three SEAWOLF Class SSNs will be collocated in the Pacific Northwest. This collocation plan allows the force to take advantage of the maintenance efficiencies gained by having all three SEAWOLF Class submarines in one geographical area. USS JIMMY CARTER (SSN 23) is already homeported in Bangor, WA, and USS SEAWOLF (SSN 21) and USS CONNECTICUT (SSN 22) will change their homeports to Bremerton, WA in 2007.

Last year, the CNO approved the repair of USS SAN FRANCISCO (SSN 711) using the bow section of USS HONOLULU (SSN 718) after she arrives in Bremerton, WA following the completion of her final deployment. SAN FRANCISCO will undergo repairs at the Puget Sound Naval Shipyard in Bremerton, WA, and then return to service in either San Diego or Pearl Harbor. To restore the Pacific Area of Responsibility (AOR) SSN operational availability, USS BUFFALO (SSN 715) will transfer from Pearl Harbor to Guam to replace SAN FRANCISCO, and USS HAMPTON (SSN 767) will transfer from Norfolk to San Diego. These two change of homeports will take place in 2007.

Let me talk about submarine tenders. Many of you are aware that the Italian Minister of Defense has asked the U.S. Department of Defense to withdraw the Submarine Tender EMORY S. LAND (AS 39) from La Maddelana, Italy. As a result of this request, the Secretary of Defense has ordered the withdrawal of EMORY S. LAND from Italy. The timetable for this withdrawal is still under development, but the Navy is aggressively working on the Submarine Tender Transition Plan. The bottom line is the Navy is committed to maintaining two forward deployed submarine tenders in the fleet. USS FRANK CABLE (AS 40) will remain homeported in Guam, and EMORY S. LAND's future homeport is still to be determined.

Let me touch on POM 08, some of the program challenges we face, and my priorities. First and foremost, POM 08 will be a tough fiscal environment. I can honestly say our resources will be pressurized more this cycle than any other cycle with which I have been

involved. Despite these pressures, my number one priority is getting VIRGINIA cost down to \$2 billion (FY05\$) per hull, and achieving a build rate of two ships per year no later than 2012. I am sure Admiral Hilarides will talk more about VIRGINIA Class cost reduction initiatives during his brief tomorrow.

Another one of my priorities is modernization. I think the Submarine Force deserves a pretty good *pat on the back* for the way we have modernized our ships. Today, USS LOS ANGELES (SSN 688), the first 688, commissioned in 1976, is as modern—maybe even more modern—than USS CHEYENNE (SSN 773), which was the 62nd and last 688-class submarine that we built, some 20 years later. Later in my brief, I will talk in much greater detail about our modernization programs.

Another top priority is Comms at Speed and Depth. We are committed to delivering to the Submarine Force the capability to communicate at tactically relevant speeds and depth. Comms at Speed and Depth will provide the theater or tactical commander with the ability to communicate with his assigned submarines while they are deep, and allow the submarine to be an active participant in FORCEnet, exchanging tactical information with other operating forces. Comms at Speed and Depth will ensure the Submarine Force remains relevant in today's ever increasing netted force.

Let me shift topics and discuss the SSGN conversion program. The SSGN conversion is truly remarkable considering the program did not receive its first SCN funding until January 2002. To meet the desired Initial Operating Capability (IOC) of 2007, the design, manufacturing, and conversion were conducted concurrently using many of the same design tools and processes pioneered by the VIRGINIA Class Program. As I mentioned, OHIO and FLORIDA have already returned to service and are currently undergoing modernization and maintenance periods in their respective homeports of Bangor, WA and Kings Bay, GA. OHIO will conduct a SOF Operational Evaluation (OPEVAL) in early 2007, and then deploy later in the year. FLORIDA will conduct a Strike OPEVAL in 2007, and then deploy in early 2008.

The SSGN is an outstanding example of the Navy's commitment to getting everything possible out of the existing submarines in the force. In addition to carrying as many as 154 TOMAHAWK land

attack cruise missiles in its Multiple All-Up-Round Canisters (MACs), it can carry two Advanced SEAL Delivery Systems (ASDS), each a 60-ton ship, or two Dry Dock Shelters (DDSs), or a combination of one each, plus up to 102 Special Operations Force (SOF) personnel, including all of their ordnance.

Let me give you an idea of just how much SOF equipment an SSGN can carry in addition to the two SOF delivery vehicles. An SSGN can carry 26 combat raiding craft, 150 6-gallon fuel bladders, 39 outboard motors, small arms weapons and over 8,700 pounds of high explosives. Carrying up to 8 SOF Stowage Canisters and dual Lockout Chambers for SOF egress and ingress further enhances the SSGN's warfighting capabilities. With this kind of manning, equipment, firepower, and payload, an SSGN can support a SOF campaign, with multiple, simultaneous operations taking place. This represents a significant improvement in SOF capability over that of a 688 Class submarine.

As I mentioned earlier, I am committed to modernizing the force. Today, we are aggressively installing over 15 new or improved systems into our submarines fleet-wide, and continue the development of numerous others that will reach their initial operating capability in the not too distant future. Let me take a few minutes to discuss some of the programs and initiatives that are rapidly delivering capability to the fleet.

First and foremost is ARCI. You are all aware that ARCI, and more importantly, the ARCI business model we follow, led the way for rapid capability insertion into our sonar systems. Today, we are applying the ARCI business model to the BYG-I Combat Control System, BLQ-10 ESM System, navigation and radio systems, and our torpedoes. This process enables rapid capability insertion, as well as cost-effective sustainment of these systems for the life of the ship.

The next system I would like to talk about is the Electronic Charting Display and Information System – Navy, or ECDIS-N. ECDIS-N is comprised of hardware and software that is integrated with the Voyage Management System that is already installed on our submarines. ECDIS-N will give our submarines the capability to conduct paperless navigation; from chart preparation and voyage planning, to piloting and open-ocean navigation. Certification of

ECDIS-N and electronic navigation onboard submarines is scheduled for November 2006. By 2007, all SSNs and SSGNs will have ECDIS-N installed, and by 2009, all SSBNs will have this capability.

We are also continuing to develop new acoustic sensors, and improve our towed arrays. For example, the Sparsely Populated Volumetric Array (SPVA) is a much more capable replacement for the WLR-9. Unlike the WLR-9, the SPVA provides instantaneous bearing and range to active sources, and with three SPVA sensors instead of the two WLR-9 sensors, there is no shadow region/blind spot. SPVA is a great tactical control tool for operating in high contact density environments. This system will reach its Initial Operating Capability (IOC) in 2007.

Another new acoustic sensor is the Low Cost Conformal Array (LCCA). LCCA is comprised of three sonar arrays mounted on the front and sides of the sail providing 360 degrees of active and passive HF coverage. LCCA is another tool to provide increased tactical control while operating in high contact density environments. In June of this year, we successfully tested LCCA onboard USS CHEYENNE (SSN 773), and this system is scheduled to reach its IOC in 2010.

Similar work to improve our towed arrays is ongoing. The next generation fat line towed array, the TB-34, will replace the TB-16. The TB-34 provides increased frequency coverage and improved performance against diesel submarines, and is scheduled to reach its IOC in 2008. The TB-33 thin line towed array, a replacement for the TB-29, has the same performance of the TB-29, but addresses its poor reliability. The TB-33 reliability will be improved through the use of fiber optic technology, and by reducing the number of electrical connections within the array from 70,000 in the TB-29, to 300 in the TB-33. We successfully tested the TB-33 in December 2005, and we expect the TB-33 to reach its IOC in 2009.

Finally, I would like to talk about the Thin Line Twin Line (TLTL) towed array. The TLTL towed array has numerous advantages over a single line towed array; significantly improved detection ranges, longer hold times, and the ability to instantaneously resolve bearing ambiguity, to name just a few. We currently have TLTL towed arrays on our SURTAS ships, and are enjoying excellent success with this system. We clearly desire this capability on our

submarines – not necessarily in a system with the complexity of twin towed arrays, but an engineered solution that provides similar capabilities.

Earlier, I mentioned the importance of the submarine remaining relevant and being connected with the netted force. The Common Submarine Radio Room (CSSR) is another system that will help us *stay connected*. The CSRR uses upgradeable, scaleable, open architecture hardware to enable joint communications for U.S. submarines. The CSRR is being installed on SEAWOLF, VIRGINIA, SSGN and SSBN Class submarines, and represents the Navy's evolving approach to network-centric, IP-based, secure communications. We recently completed a Quick Reaction Assessment of the CSSR onboard USS SEAWOLF (SSN 21) in support of her summer 2006 deployment, and we are on track to complete the OPEVAL for the other classes of ships scheduled to receive the CSSR.

Another system that has reached its IOC recently is the Integrated Submarine Imaging System (ISIS). ISIS IOC'd onboard USS HAMPTON (SSN 767) in June 2006. ISIS incorporates infrared imaging from the NIGHT OWL System, radar range finding information from the PATRIOT System, and real-time digital image processing from the Type-8 and Type-18 periscopes. The ISIS data is shared throughout the Combat System, and provides the Command Team, Officer of the Deck, and watch standers in Control with a set of extremely effective contact management tools. ISIS, NIGHT OWL, and PATRIOT radar are three extremely effective systems that provide our crews with the tools necessary to maintain absolute tactical control while operating in high contact density environments.

We are also delivering improved weapons capability to the fleet. The MK 48 Mod 7 heavy weight Advanced Capability (ADCAP) torpedo, CBASS, which is short for Common Broadband Advanced Sonar System, will IOC in 2006. What makes CBASS different from previous ADCAPs is rather than transmitting and receiving at a specific operating frequency, CBASS transmits and receives at an operating frequency that generates the highest target signal-to-noise ratio. This capability improves its shallow water performance, clutter and false target rejection capability, and enhances the torpedo's

ability to defeat countermeasures. The Advanced Commercial Off the Shelf (COTS) Guidance Control System leverages advanced COTS processors, and uses open architecture and software portability to support ARCI-like Advanced Processor Build (APB) processes for future software torpedo improvements. We have just finished operational testing of the Mod 7 weapon, completing over 30 successful shots in shallow and deep water, against both diesel and nuclear submarines.

Another weapon I would like to discuss is the Tactical Tomahawk land attack missile, or TACTOM. TACTOM provides tremendous capability improvements over the Block III missile. Let me highlight a couple of noteworthy points. It's about half the cost of the Block III missile. It has about one fourth the number of parts, which contributes to its improved reliability, and it has a 15-year maintenance cycle time compared to 8 years for the Block III. It has a two-way satellite data link, which allows flexible in flight retargeting. The Tactical Tomahawk Weapons Control System greatly simplifies strike coordination and planning, and supports overland mission planning onboard the submarine. Although TACTOM has been in the fleet for about a year, this summer, USS BOISE (SSN 754) will be the first submarine to deploy with both TACTOM and the Tactical Tomahawk Weapons Control System. This combination provides the Combatant Commander with a significantly improved, stealthy and persistent strike capability.

The last time I spoke to this audience I discussed the Mission Reconfigurable Unmanned Underwater Vehicle (MRUUV). As many of you remember, MRUUV is a 21-inch diameter UUV launched and recovered via the submarine's torpedo tubes. MRUUV will be capable of conducting autonomous, clandestine mine countermeasures (MCM) and Intelligence, Surveillance, and Reconnaissance (ISR) missions with approximately two days endurance, and ranges up to 30 nm. In late January 2006, final MRUUV launch and recovery testing was conducted onboard USS SCRANTON (SSN 756). During this testing, the MRUUV successfully homed on, and docked in the recovery arm. Considering the complexity of this system, and the requirement for the MRUUV to be able to overcome the hydrodynamic forces of the recovery submarine making way, this is a real success story. This final test

brings to a close the propulsion, launch and recovery phases of the MRUUV program; however, work continues on the mission and payload phases of the program.

Let me shift gears and talk a little about submarine rescue. The latest addition to the Navy's submarine rescue equipment is the Atmospheric Diving Suit, or ADS. ADS is really not a diving suit at all, but rather, it is a one man submersible that allows the operator, or *pilot*, to remain at one atmosphere of pressure regardless of operating depth. Unlike the typical surface supplied diving suit that was used in the rescue of the SQUALAS, ADS can dive as deep as 2000 feet for up to six hours without any of the physiological hazards of depth, such as the *bends* or nitrogen narcosis.

Once a disabled submarine has been located, ADS will be the first piece of rescue equipment to arrive on the submarine. ADS will conduct an initial survey of the submarine while providing the rescue team with video, sonar and personal observations. The primary task of ADS is to clear debris from the submarine hatch, remove the hatch fairing and connect the downhaul cable from the submarine rescue chamber to the submarine hatch, or prepare the disabled submarine for the arrival of the Submarine Rescue Diving and Recompression System (SRDRS), which I will discuss next. ADS is scheduled to IOC in this year.

The US Navy's approach to submarine rescue is moving from the sea-surface-independent, Deep Submergence Rescue Vehicles (DSRV) like MYSTIC and AVALON, to a new, tethered, remotely operated, mobile, pressurized rescue module called the Submarine Rescue Diving and Recompression System, or SRDRS. The primary elements comprising SRDRS are the Pressurized Rescue Module (PRM), and the Submarine Decompression System (SDS). The PRM, remotely controlled from a topside control console located onboard a vessel of opportunity, will descend to the submarine, mate with the escape hatch, and transfer the crew under pressure, if necessary, from the disabled submarine to the SDS. The entire system is designed to be air transported anywhere in the world to effect emergency rescue operations. SRDRS is scheduled to IOC in late 2007.

An area that I have not discussed in this forum in the past has been school house trainers. This is an area that deserves some

discussion. I recently attended USS FLORIDA's return to service ceremony in Kings Bay, GA, and while at Kings Bay, I had the opportunity to tour the Trident Training Facility. I can tell you the trainers I saw in operation there were nothing short of spectacular. One of the trainers I saw was the Fleet Interactive Display Equipment Training Simulator, or *FIDE*. FIDE is a full scale, completely interactive trainer that gives operators realistic, real-time experience in the normal and casualty operations of the ship's nuclear propulsion plant. Instructors are able to program the trainer with specific casualties that cannot be simulated on the submarine. The trainer then responds to the operators' reactions to the scenario with typical nuclear plant responses, and also replicates the sounds, temperature and humidity for the operators inside maneuvering as if they were actually in the engine room. FIDE invokes in the operators the same stress and sense of urgency experienced operating an actual propulsion plant, and is an excellent addition to our training program. Currently, there are two trainers in operation, one in Bangor, WA and one in Kings Bay, GA. Additional trainers are scheduled to come on line in all fleet concentration areas over the next several years.

Another trainer worth mentioning, although not yet installed in Kings Bay, is the Submarine Multi-Mission Team Trainer (SMMTT) (Phase 3). SMMTT 3 is a completely integrated Submarine Attack Center that can be reconfigured for almost any combination of Sonar and Combat Systems. With SMMTT 3, gone are the days of attending attack centers that use sonar and combat systems different from those found on your ship. SMMTT 3 provides a totally immersive, realistic and complex operating environment that uses the actual tactical software found on your ship, real world ocean environments, and extremely accurate modeling and emulation for sonar and weapons performance. In fact, the trainer's Weapons Control System can be linked with the Weapons Analysis Facility at the Naval Undersea Warfare Center (NUWC) in Newport, RI, to monitor actual weapon's performance. By the end of FY 2007, all training centers throughout the fleet will have SMMTT 3 systems installed.

In closing, you can see the Submarine Force has made good progress over the past year. VIRGINIA completed her first deploy-

ment, OHIO and FLORIDA have been delivered, and TEXAS has completed sea trials. We have a clear way ahead for delivering Comms at Speed and Depth to the fleet, and we remain committed to modernization. Numerous programs are at or approaching their IOC, and we continue to deliver tactically relevant warfighting capability to the fleet.■

Thank You.

A NEW ERA IN SUBMARINE OPERATIONS
AN SSGN PATROL IN SUPPORT OF THE
GLOBAL WAR ON TERROR
PRESENTED AT NAVAL
SUBMARINE LEAGUE SYMPOSIUM

JUNE 7, 2006

BY CDR MIKE COCKEY, USN
COMMANDING OFFICER, USS OHIO (SSN726) BLUE

Good morning, I am absolutely thrilled to have the opportunity to talk to you for a few moments this morning. I bring greetings from the Pacific Northwest where there is much excitement in the Submarine Force. As they have for more than 20 years, SSBNs are still operating out of Bangor. In the past year both MAINE and LOUISIANA have come to Bangor. In addition, USS JIMMY CARTER, SSN 23 has arrived to much fanfare. Soon, her sister ships, CONNECTICUT and SEAWOLF will arrive. But I have to say that the most exciting thing to happen to the Pacific Northwest is the arrival of the SSGN. By next year, SSGNs will be operating out of Bangor and deploying forward in support of the global war on terrorism. Today, I would like to talk about two aspects of the SSGN. First, I will describe what a magnificent ship we have built and second, I will introduce to you the *can do* spirit of the crew.

Each time we present dolphins to a sailor on board OHIO, we read an exciting passage from tales of war patrols past from heroes of the Submarine Force. I am always in awe of the exploits of these heroes and their submarines. These readings allow us to reach across history and connect with our past Submarine Force heroes and to put our current missions in perspective. These submarine heroes fought their ships aggressively to prevail in our country's past battles. Their *War Patrols* were stuff of which legends were made.

Submarine warfare has changed dramatically since the days of WWII. With the advent of the SSGN, the future of submarining has even more changes in store over the next few years. Today, I would like to take you into the future, although not so many years away as you might think, to a future *War Patrol* for USS OHIO SSGN 726.

My presentation today will show you a hypothetical SSGN patrol in support of the global war on terrorism that took place from April to July 2009. This war patrol will demonstrate many of the SSGN capabilities as defined in the SSGN Concept of Operations.



Shown is the nominal deployment cycle for the SSGN. The SSGN will maintain a 15 month cycle. The cycle will start with a 100 day maintenance period in Bangor followed by transit into theater, 4 missions and 3 crew change outs in theater. During the crew change outs voyage repairs will be made by fly away teams from Bangor as supported by the tender. Highlighted is the start of the most recent Blue Crew patrol. OHIO was initially loaded out in Bangor and modifications were made to that load out in Guam as the new missions were further defined.

CERTIFICATIONS AND LOADOUT

- Completed homeport training period and certified by CSS 19, CSS 1 and Special Warfare Group 3 in:
 - ASW
 - ASUW
 - Special Forces Operations
 - Strike
 - Indications, Surveillance and Reconnaissance
 - Shallow water Operations
 - Mine warfare

Having two crews and only 1 boat, the Blue crew certified for the mission in the trainers at Trident Training Facility. Submarine squadron 19 certified the crew in ASW, ASUW, shallow water operations, ISR, Strike, special operations and all aspects of basic submarining. The initial SOF certifications were completed at the start of the 15 month cycle. A refresher qualification was completed by selected portions of the crew and SDVT 1 in Pearl Harbor during the in port training period.

The ship returned from its previous patrol with the Gold crew in outstanding material condition. A fly away team from Bangor made minor repairs to several components. Most of the refit was occupied with load out for the mission and training with the Special Operating Forces.

CERTIFICATIONS AND LOADOUT

- Departed Bangor by MAC flight to Guam on 1 June
- Relieved the Gold crew on 5 June
- Completed loadout and voyage repairs in Guam on 26 June
- Departed Guam 27 June



For Official Use Only

SSGN LOADOUT

MAC BEING LANDED ON
SSGN728 ON 18JAN



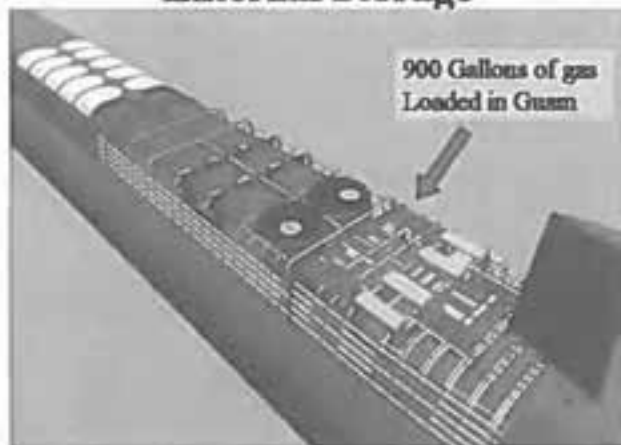
SSGN728 MISSILE TUBE
FOXTUPE

Tomahawk load out was completed in Bangor and at Indian Island, before the Gold crew patrol.

Flexible Payload Module
"The Integrator"


A flexible payload module was loaded in Guam. The module is capable of handling several types of weapons, OHIO's was loaded with 3 AIM 9 anti air missiles in case of an air threat in theater.

Superstructure Removed, Showing MTs #1-14, LOCs, and SOF External Storage



Nine hundred gallons of gas was loaded topside in designated SOF storage facilities. This gas would be capable of supporting more than 30 missions/sorties. This capacity allows OHIO to plan for multiple sorties and backups, giving the Special Operating Forces much more flexibility than previous classes of subs.

Capacities

+1145 cuft. each can.

- +26 CRUC
- +39 Motors
- +90 MK25 UBA
- +4200 LBM's Small Arms
- +48,000 rounds (5.56)
- +900 gallons of fuel in 6 gal bladders (external)



SOF Stowage Canisters Elevation View



Tube 5&10
general SOF
stowage, 30
inch across



Tube 7&8
general SOF
stowage, 34
inch across



Tube 5&6
SOF
ordnance
stowage, 30
inch across



Tube 3&4
general SOF
stowage, 34
inch across

Reconfigurable
Stowage
Ammunition in
56" Diameter
Canisters
Provide Flexible
Stowage
Capability

FWO

Eight missile tubes were loaded out with SOF canisters. Total capacity is more than 2 - 18 wheel trailers. As part of this load out, more than 6,000 cubic feet of SOF ammunition was loaded. Missile tubes 5 and 6 were specially modified with magazine sprinkler systems to hold this ammunition. Due to the design of the missile tubes, the Special Forces can access their gear and munitions from internal to the ship. The canisters were loaded in Pearl and flown into theater and then loaded on OHIO in Guam. The munitions canisters were loaded with equipment in Guam after the canisters were loaded on the ship.



OHIO deployed initially from Bangor with 2 dry deck shelters. One was off loaded and replaced with the Advanced Seal Delivery Vehicle in Guam due to mission requirements.



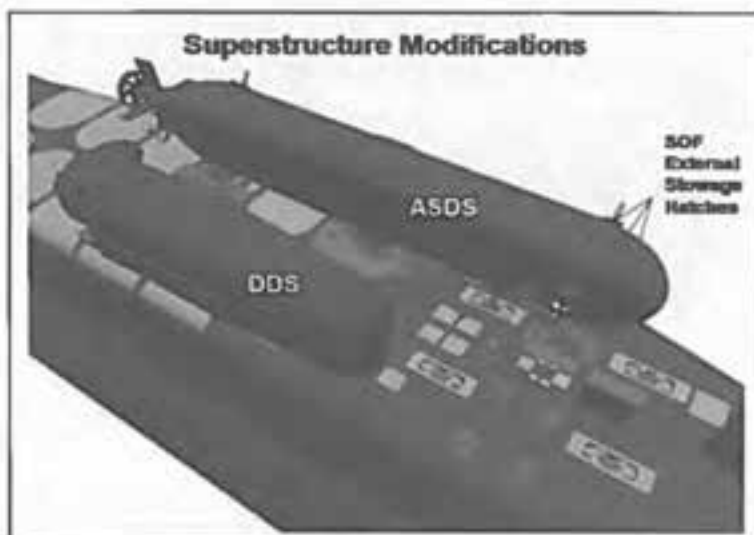
Advanced SEAL Delivery System



Dimensions: 98.0' (L) x 10.0' (D) x 10.0' (H) Weight: 12,000 lbs. Fuel: 1,000 gal.

Pictures of the ASDS being loaded on a Los Angeles Class submarine can give an appreciation for its size.





The SSGN can carry one of each vehicle topside. Note that the first 10 tubes are blocked when the vehicles are loaded. Tomahawks could be loaded under the ASDS but in OHIO's case, the tubes were loaded with SOF gear to support multiple sorties.

Before OHIO left Bangor, a large diameter UUV was loaded. This UUV was specially designed to search and map mine fields. The UUV is linked back to OHIO's navigation and fire control systems to allow for remote identification of minefields.

The OHIO was converted to carry an additional 66 racks for support of additional SOF for 90 days as well as a surge capacity of up to 102 people. Additionally, there are over 25 permanently installed pieces of exercise gear for maintenance of optimum muscular and cardiovascular fitness.

There is an enormous capacity for weapons, personnel and experimentation on the SSGN. Not only a storehouse for weapons, but the embarked staffs and additional support personnel give the SSGN endurance and multi mission capability.

- Tubes 3 to 10 - Fully loaded Special Operating Forces Canisters
- Tubes 11 to 14 and 18 to 23 - Fully loaded multiple all up round canisters (70 Tomahawks)
- Tube 15 - Flexible payload module with AIM 9 missiles
- Tube 16 - UUV
- Tube 17 - UAV
- Tube 24 - Chemical-biological facility
- 26 Combat Rubber Raiding Craft
- 39 Outboard Motors
- 66 additional special forces
 - 20 from SDV team I
 - 30 Seals from various Seal teams
 - 16 Advanced elements of Special Operating Command Pacific Staff (Core elements of the Joint Special Operations Task Force)
- Crew of USS OHIO - 160
 - CO - Major Commander
 - 160 Strong
 - 4 man IT division to support 5 separate LANs
 - Horizontal and vertical FT divisions
 - Specially trained missile technician division to support new missile tube missions
 - 10 man LOC/SOF division drawn from several other divisions
 - SSN/SSBN/SSGN NECs and skill sets
 - 50% married
 - 30% married with children

The ship departed Guam fully ready for all mission areas and loaded out to stay on station up to 90 days.

Mission statement

The small Pacific island of OWAHU is suspected of harboring a terrorist cell closely aligned with radical extremist groups and country Orange. Satellite imagery indicates a possible chemical weapons facility on the southern coast of the island. Additionally, national assets indicate that the facility is being supplied by country orange.

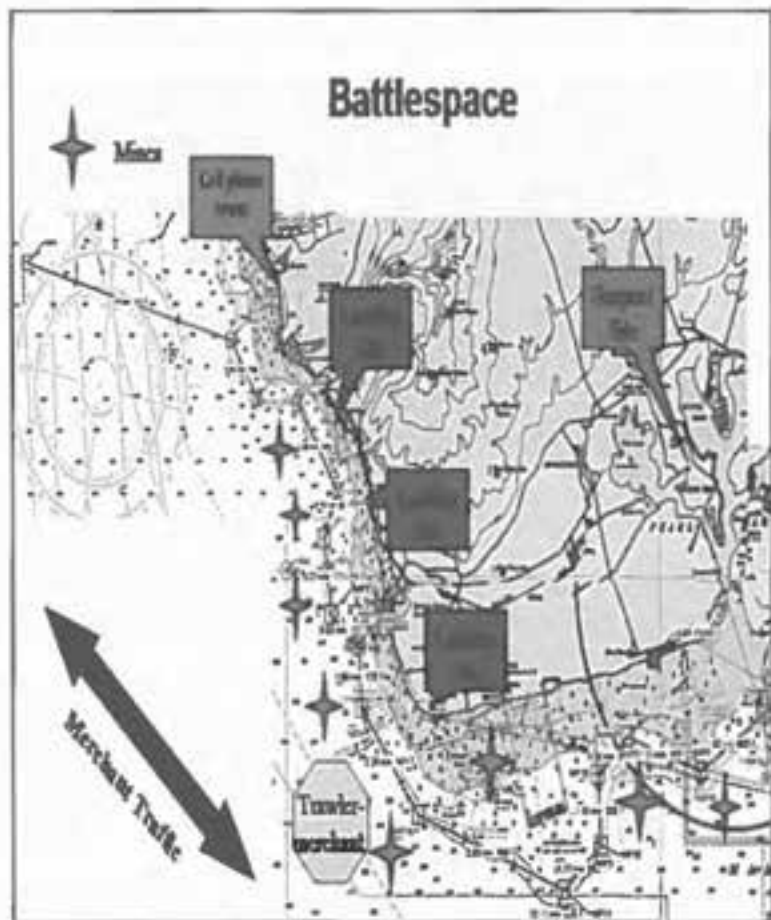
Commander's intentions that define our goals for the mission.

- Conduct covert surveillance in the vicinity of Owahu.
- Launch SOF missions to the island to confirm the presence of chemical weapons and a link to country Orange
- Prepare the battle space for future missions and potentially major combat operations

The ship transited to the areas of interest while continuing to rehearse with the special forces and practice all mission areas.

BATTLESPACE PREPARATIONS

- Arrived in the vicinity of Owahu and conducted 5 days of covert surveillance
 - Discovered a minefield and a path for infiltration
 - Determined traffic patterns and numerous interactions of country Orange vessels with local craft
 - Mapped out several possible SOF landing sites
 - Mapped out the local ESM environment



The ship conducted a covert surveillance in the vicinity of the island of OWAHU and determined the following information. (see slide with map) Most of this info was such that it could not be gathered by other national means. This not only set us up to launch our SOF missions but provided valuable data back to the combatant commander. The large diameter UUV worked better than advertised and we ended up with an amazingly accurate map of the local minefield as we attempted to layout SOF mission execution points.



Our large volume and storage capacity provided the SOF mission commander with flexibility to change the sortie plan as the threat, sea state and weather changed. We launched more than 20 sorties against the island.

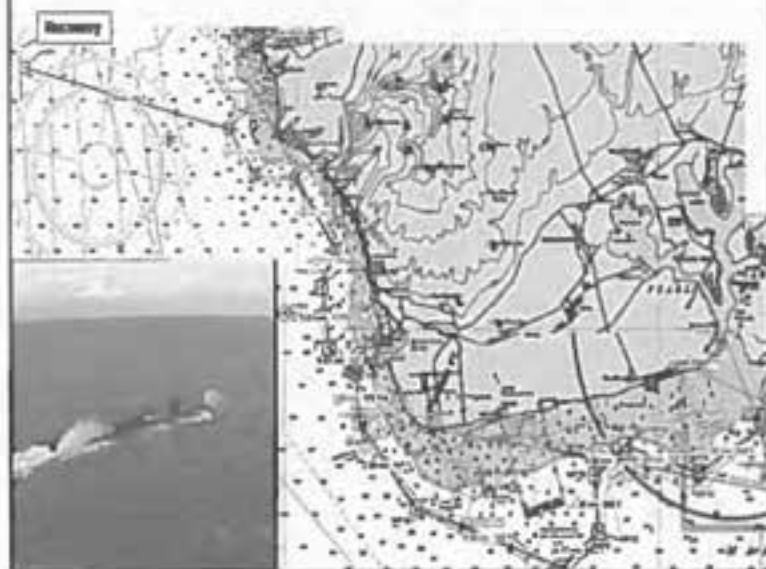
SOF MISSION EXECUTION

- Conduct multiple sorties to confirm the presence of chemical weapons facility and links to country Orange
- Establish a network of information nodes by planting unattended ground sensors

We worked in conjunction with airborne assets on one occasion to lay unattended ground sensors(UGS). The UGS provided us a network of sensors and a continuous flow of information.

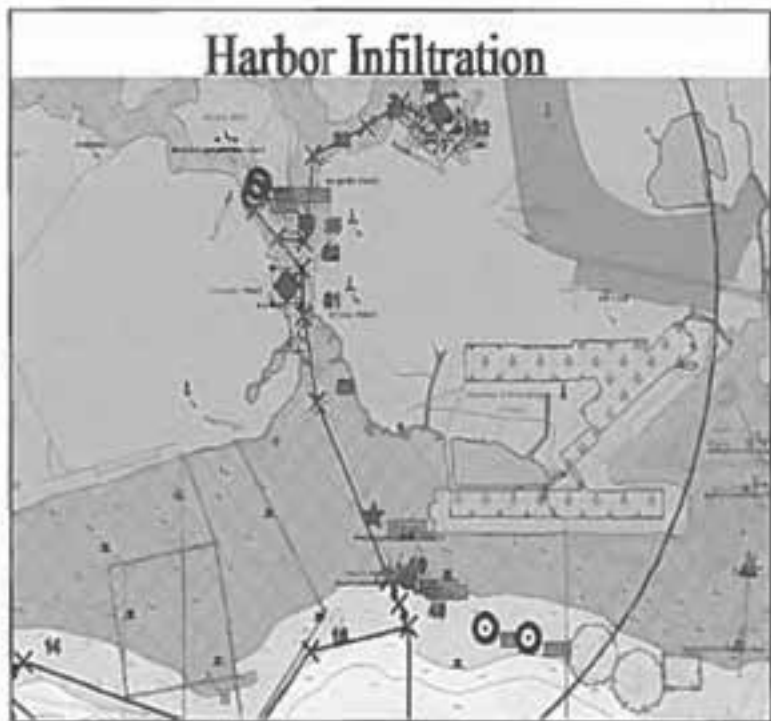
Execution - Infiltration

Conducted 30 NM submerged transit from launch point to harbor



One evening, there was no visual or ESM threat so we surfaced to conduct CRRC ops and fly a drone that the Special Forces brought for more airborne reconnaissance.





On one occasion the ASDS penetrated the harbor for nighttime photos.

On one occasion we lost depth control and had to conduct a break away for the SDV team and the embarked seals.

While conducting the SOF missions, the embarked elements of the Joint Special Operating Task Force planned future missions and maintained continuous communications with the rear element.

STRIKE MISSION

- On board analysis confirmed chemical weapons facility
- Local intelligence coupled with national assets confirmed that country Orange supplied raw materials and transported the chemical weapons from Owahu
- JSOTF Commander and 20 additional staff to embark and direct operations against Owahu and prepare for operations against Orange

Following confirmation of the weapons facility, OHIO came off station to embark the remaining elements of the Joint Special Operating Forces Task Force (JSOTF) including Army General Jones, the Special Operating Forces Commander, PACOM.

Coordinated Strike

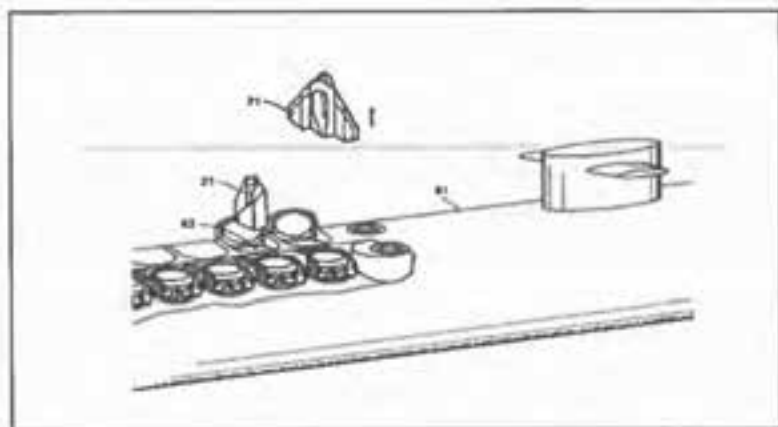
- On board mission generation
- JSOTF authorized to conduct strike
- SOF team ashore and airborne drone for battle damage assessment

With the national command authority to conduct the Tomahawk strike, the JSOTF coordinated a 20 missile strike and battle damage assessment. Special Operating Forces remained on the beach to assess damage to the facility and to gauge enemy response.



Following the strike, OHIO's goals were to recover the Special Forces ashore, monitor the local response and to monitor the response from country Orange.

Initially, the JSOTF was unable to call in any air assets for the surveillance of country Orange, so the decision was made to launch OHIO's long range UAV. The UAV was launched from OHIO's missile tube and provided surveillance for 18 hours until additional air assets could be brought to bear.



As the additional airborne assets were made available, the JSOTF established a network of forces to continue the surveillance. These assets extended OHIO's range of influence over 500 miles and made her a true force multiplier.



As we recovered the final SOF team, country Orange assets, in the form of an ASW helicopter, and SSK and Frigate came into the area in response to the attacks. As the final team made their way back to OHIO, they were engaged by the helicopter. OHIO responded by launching an AIM 9 missile from her flexible payload module and destroyed the helicopter.



Seeing the destruction of the helicopter, the frigate raced towards the last position of the helicopter so OHIO was forced to take out the frigate with one well placed ADCAP. There was no further encounter with the Orange SSK.

OHIO then prepared to transition back to Guam and handoff the battlespace to MICHIGAN who relieved us on station.

- Launched several more Tomahawk strikes against targets on Owahu
- No encounters with the Orange SSK
- Turnover of the battle space and situational awareness to others in the network of forces
- Relieved on station by Michigan
- Returned to Guam for reload and crew swap out

SSGN *tough* a new term for a new breed of warriors

- Combination of SSN/SSBN skill sets
- SOF/Divers/SDVT teamwork

- *Can do* spirit to operate first of a kind equipment
- First of a kind lock out chamber operations
- SSGN volunteers

Our mission was a complete success. The SSGN operated on station, independent when needed and in consort with a network of forces when needed. We took into theater an entire JSOTF staff which executed a strike mission in conjunction with Special Forces missions and transitioned to major combat operations. We carried out traditional submarine operations as well as large volume tomahawk and SOF strike and even anti air operations. Finally, OHIO provided control for an entire network of forces while maintaining her covert status in theater. SSGN – a new era in submarine operations.■



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FEATURES

NAVAL SUBMARINE LEAGUE 24TH ANNUAL SYMPOSIUM

REMARKS BY
DR. DONALD C. WINTER
SECRETARY OF NAVY

HILTON ALEXANDRIA MARK CENTER
ALEXANDRIA, VA
THURSDAY - JUNE 8, 2006

Admiral Reynolds, thank you for that kind introduction. It is a great honor to be here among so many whom I consider to be heroes of the Cold War, members of the Silent Service who sacrificed much on behalf of the United States.

I am eager to share with you some of my thoughts on the role of submarines in today's world, and some of the challenges we face. Most of you know, I am sure, that the history of modern submarines started in the U.S. Navy.

In thinking about those early years, I am reminded of a story from a time when life was much simpler. In 1873, the engineer John Holland submitted a design for a submersible to the Secretary of the Navy. The Secretary—whose name I will not divulge, out of professional courtesy—rejected it, calling it “a fantastic scheme of a civilian landsman”. He then passed it on to a subordinate, who added that “No one would be willing to go underwater in such a craft,” and even if the idea had merit, “to put anything through Washington was uphill work.” OK, perhaps some things in life have not changed all that much . . .

In all seriousness, I would like to thank all of you for your service and for your support for the submarine community. You and your predecessors have made and continue to make a tremendous contribution to the defense of our country.

Today I would like to focus on the Submarine Force in the current security environment. Notwithstanding the intractable nature of the ways of Washington, the world has changed—profoundly.

For example, Admiral DeMars is just back from a trip to Russia, where he participated in the 100th anniversary celebration of the Russian Submarine Force. That former adversaries would meet in a setting of mutual, professional respect and friendship, merely serves to illustrate how events can dramatically change relations between nations. Admiral DeMars' warm reception and friendly interaction with Russia are in line with my own experience in Kosovo, where Americans, Russians, and Ukrainians worked closely together in support of a common objective.

What has emerged since the end of the Cold War is the recognition that our challenge today is two-fold. We must fight today's Global War On Terror while simultaneously building the fleet for an uncertain future.

Potential future threats cover a broad spectrum. We must be prepared to face threats that emerge from near-peer competitors, rogue states, transnational non-state actors, and criminal elements. Geographically, they span theatres from the Persian Gulf to the coast of South America to the Pacific Rim.

Given these conditions, the US Submarine Force is as vital to our security as ever. The need for our strategic deterrent force remains. But the idea of deterrence has now expanded beyond nuclear to include non-nuclear assets.

We have also expanded tactical strike capability from SSN-launched Tomahawks to SSGN strike. SSGN conversion is a key component of our transformation efforts in the submarine domain. SSGN can now carry up to 154 Tomahawks—a capability that surpasses that of the average strike group.

Other changes in submarine warfare are also underway. As many of you know, we have proposed the Conventional Trident Ballistic Missile in the FY07 budget that is now before Congress. A conventional ballistic missile will provide the President with additional, timely, long-range strike options. Given the importance of real-time intelligence in the Global War On Terror, this capability would provide us with a powerful new weapon in our warfighting arsenal. And from a terrorist's point of view, the deterrent value of such a weapon is clear—a terrorist would realize that he could be struck within an hour no matter where on the globe he chooses to operate.

Another important development to note is that attack submarines

are evolving, with the Los Angeles class and the Seawolf submarines paving the way for a new generation of Virginia class submarines and SSGN's. The integration of Special Forces into the submarine community is receiving increased emphasis. While SOF missions have long been a part of submarine warfare, SSGN and Virginia class submarines significantly expand their capabilities.

Today's young submariners are being trained to think of submarines with a degree of versatility that might impress some of the Cold War veterans in this room.

Our focus on nuclear power propulsion, however, has not changed. There has been much discussion of future propulsion systems for US submarines, but we must recognize that we derive tremendous leverage from nuclear power. Given the geography of the world, and the global nature of future threats, I want to make it clear: *our Submarine Force will remain nuclear powered.*

Our responsibilities are global, and we need to operate worldwide. Moreover, the extended, covert, on station capability of nuclear submarines—and the intelligence-gathering potential that that implies—is indispensable.

Other nations that are primarily concerned with a self-defense capability are developing technologies in other directions, notably, Air Independent Propulsion. This development is, unfortunately, a double-edged sword. On the one hand, it provides our allies with enhanced security, but at the same time, it can threaten our interests abroad if such capability falls into the wrong hands.

With support from surface, air, and submarine assets, we need to be in a position to adequately counter the submarine advances of other nations. We will be taking advantage of an all-nuclear Submarine Force to confront the uncertain threat environment of the 21st century.

I recognize that the decision to focus exclusively on nuclear power creates some challenges. But I believe that we can deal with them. Let me explain.

First and foremost, the most important challenge concerns personnel. It is often said that people are our most important resource, an assertion that is especially true with respect to the Submarine Force. Finding the numbers and quality of individuals the Submarine Force needs for its nuclear power training pipeline is

becoming increasingly difficult as it competes for the best talent at the Naval Academy, at our nation's top universities, and in high schools across America.

That need is clear, but there is also a competing demand for talent in other, non-technical areas that are key to America's ability to successfully wage the Global War On Terror. For example, I support an increased emphasis on foreign languages and cultural knowledge. Building partnerships with coalition nations in support of a 1000-ship Navy is, indeed, an important objective, and cultural understanding will be a key component of that effort. But this goal must not come at the expense of developing students with the technical skills necessary to operate Naval nuclear-powered vessels.

The *second* challenge is preserving our industrial base. Building nuclear submarines is not like building a commercial tanker or a container ship. The design and production of nuclear submarines is extraordinarily complex. We are building on decades of learning when we design and build submarines, and such knowledge, is a rare commodity. The expertise of just one engineer, or one highly skilled technician, takes years to replace. We are at a challenging point in the history of the business, and with respect to the demographics of the workforce. It is evident that industry needs to accommodate both near-term and long-term trends.

The Navy has adopted a 30-year shipbuilding plan that projects its expected future shipbuilding requirements. Ultimately, the fate of the plan is in the hands of Congress, but we must encourage stability in our shipbuilding plans. Industry will need to invest in modern facilities and better align its workforce demographics with the Navy's shipbuilding plan. This is an issue that I have publicly discussed in recent months, and an issue that is important to the future health of both Navy and industry. We are working with industry to find solutions to this challenge.

Third, the affordability of submarines is increasingly a concern. At the same time that we are investing in the submarine fleet, we are also building the totality of the fleet towards a 313-ship Navy.

The submarine portion of this plan assumes a fiscal objective of achieving a per unit cost of \$2 billion for Virginia class submarines. We need to achieve a cost reduction of \$200 million per boat through technology insertion and investments in more efficient

construction processes. We believe this is an achievable objective. After the cost reductions are achieved, then we will be able to increase the rate of production to two submarines per year, beginning in 2012. This will result in additional cost savings through economic order quantities.

Increasing the build rate before we effect these important cost reductions will jeopardize our ability to build the 21st century fleet our nation needs. Our submarine acquisition strategy is a critical component of our shipbuilding plan. We need to have the Navy together on this, and I ask you for your support.

The *fourth* challenge I would like to discuss this afternoon concerns safety. As I mentioned a few moments ago, one of the unique elements of our submarine program are the exacting safety requirements that we have adopted. One of the many superlatives earned by our Submarine Force is a great safety record. It is an impressive success story.

I commend the many submariners in this room who have contributed to the submarine community's unsurpassed safety record. Compiling an outstanding safety record over the course of many decades is no accident. The extraordinary emphasis we place on submarine safety has paid off in a culture within the submarine community that does not compromise safety standards for any reason. When we look at some of the experiences others have had, we are reminded of the value of SUBSAFE.

There can be no deviation, there will be no deviation, and no compromise on safety. The tendency to become complacent must be resisted, and renewed efforts to ensure the safety of nuclear-powered submarines will continue as a priority on my watch.

In conclusion, the U.S. Submarine Force has much to be proud of, and many challenges ahead. The Submarine Force that has become the envy of the world succeeded in its mission to deter war with the Soviet Union, and is today proving anew its value as an irreplaceable asset in our nation's defense arsenal. It is taking a leadership role in the global war on terror, and transforming to position itself as a key component in the national strategy to prepare for an uncertain future.

Indeed, submarines remain integral to the Navy. A new generation of submariners will play a pivotal role in the global war on

terror, and will continue to adapt to the changing security environment. The submarine community that has produced great leaders in the past is today represented by outstanding leaders such as Admiral Giambastiani. I fully expect that submariners will continue to provide the Navy with top leaders in the years ahead.

Thank you for all your contributions to our nation's defense, and thank you for all your outstanding support for the submarine community.■

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**SUBMARINE TECHNOLOGY SYMPOSIUM
REMARKS BY
RONALD O'ROURKE
CONGRESSIONAL RESEARCH SERVICE
MAY 16, 2006**

Introduction

Thank you, admiral, for the kind introduction. It's an honor to be here. It's great to be back at APL, and to have a chance to share my views with you. So again, thank you for inviting me today. As usual, I should note that these views are my own and not necessarily those of my employer.

By now, I think most of you know that I don't sugar-coat my assessments. In the debate on defense issues, there's already plenty of cheerleading, so you don't need me to add to it. And if all you ever hear is cheerleading, you can drift into self-deception and fail to take actions to better prepare for the future. So I try instead to describe things as I see them, on the theory that you'll find it helpful, if not always comforting.

Seeing things as they are isn't doom and gloom, and it isn't pessimism. If you hear someone describing it that way, you should take it as a possible sign of cheerleading intoxication, and organize an intervention to get that person into rehab, before it's too late.

Some things worth noting

Now, having said that, I want to start today by noting some things that deserve positive recognition. There are a lot of things I could mention, so these are just a few examples.

First, I think the submarine community has put together what looks like a promising general approach for reaching the CNO's Virginia-class cost target. The target figure appears somewhat arbitrary, and I don't understand why attack submarines appear to be the only type of ship that has to meet its target as a condition for all ships of that type to be kept in the shipbuilding plan. And the Senate authorizers have directed that the plan be better defined in terms of specific goals and benchmarks. But the general approach looks promising.

It's worth noting that the target is a goal that the Navy has set for itself, and that Congress, while taking it into account, can choose to set it aside if it likes. It's important to note this, because there's been some discussion on the Hill about how and when the target can be met, and when these discussions get going, it can be easy to forget that this is an internal Navy goal, and not one that has to control congressional action.

Within the Navy's cost-reduction plan is an idea to reduce installation costs and shorten construction time by not installing certain elements of the combat system that are simply going to be removed and replaced during the PSA. There might be some challenges in implementing this idea, but assuming they can be overcome, this strikes me as a real innovation in the shipbuilding process that might be applicable to other shipbuilding programs as well.

Another item worth mentioning is the provision in the Virginia-class contract, and also the CVN-21 contract, for the Navy to front the investment cost of shipyard improvements that can lead to reductions in recurring production costs.

Beyond this, the Navy has also mentioned the possibility of making some adjustments to the teaming agreement that could reduce Virginia-class construction costs by \$25 to \$80 million per boat. I understand why the two yards might be reluctant to reopen the agreement, because one of them would lose some work, and because changing the agreement once might be viewed as the first step on a slippery slope to further changes. But in light of the potential savings, it would be helpful to hear from the yards why this idea, in their view, is bad or wouldn't work.

Finally, as many of you know, the submarine community in recent years has shifted to an open-architecture strategy that permits frequent and affordable combat system upgrades. This looks like a possible standard against which to judge open-architecture efforts elsewhere in the fleet.

Full plate of challenges

Now, when Admiral Emery invited me to speak, he told me he looked forward to hearing my challenges. I thought that was admirable, because the submarine community already has a lot of

challenges on its plate, without me adding any more.

One of those will be getting to the CNO's cost target. A second will be maintaining, with 48 boats, the same level of forward deployments that has been maintained in the past with more than 50 boats. A third will be making sure that existing boats remain in service for 33 years, even though the Force is being used intensively. And a fourth and continuing challenge will be managing a new-construction supplier base consisting largely of single sources, some of whose business situations might be fragile.

Beyond those four challenges, there are at least three others already on the Navy's plate that I want to address in the remainder of my talk. As I go through them, and particularly as I go through the second and third, I'll throw a couple of additional challenges on the plate.

Submarine Design and Engineering Base

The first of the three challenges is finding a way to maintain the submarine design and engineering base. This challenge was foreseen, and is now upon us, and yet there is no firm plan in place to address it.

Addressing this challenge was one of the reasons behind last year's proposal in the House for starting design work on a new SSN to succeed the Virginia-class design. That proposal was being opposed by the Navy even as I was mentioning it to you last year, and it didn't survive conference. In terms of up-front cost vs. downstream break-even point, I can understand why someone might decide to not support this option. But it would have preserved the design and engineering base for several years, and now something else needs to be done instead.

There are some other options out there, such as expanding the scope of the Virginia-class redesign effort, or designing a new ASDS. These options would help, but they likely wouldn't be sufficient, due to limits on the volume of work they would provide and the number of skill areas that they would engage.

Another option would be to design a diesel boat for Taiwan. This would offer a greater volume of work, and it would engage a large number of skill areas. But there currently is uncertainty over whether and when this project will occur, making it hard at this point

to confidently incorporate it into a plan for preserving the design and engineering base. In addition, this option would not preserve certain skills, such as those related to nuclear propulsion plants, and it could raise concerns regarding the potential for unintended technology transfer.

The most sufficient option for preserving the design and engineering base would be to design a new nuclear-powered submarine, and since designing a new attack boat has been rejected, that leaves the option of bringing forward the start of design work on the next SSBN. At this point, it appears to me that this option will likely form a part, and perhaps a large part, of the strategy going forward. The Senate version of the defense authorization bill recommends \$10 million to start this project.

The expanded Virginia-class redesign, the new ASDS, or the Taiwan diesel boat, if they happen, could be added on top of the accelerated SSBN to make the solution more robust. And upon completing the SSBN design, the Navy could then turn to designing a new SSN. An approach along these lines could preserve the design and engineering base for a number of years.

SSN Procurement Rate and Projected SSN Shortfall

I'll get back to the next SSBN later, but I want to turn now to the second issue, which is the SSN procurement rate and the projected shortfall in the SSN Force. I'm going to spend most of my time today on this.

This is an issue that has been building in Navy force planning for a long time. I first testified on it 11 years ago, in '95. At the time, I said the Navy was starting on a trajectory that could reduce the SSN Force to 41 boats by the mid-2020s. Eleven years later, that projection remains pretty close to the mark.

Over the last 11 years, I've testified and reported on this issue on many occasions. And finally, the issue has attracted some attention. But now that the Navy has finally acknowledged the projected SSN shortfall, it's also saying that, because of budget constraints, there's not much that can be done about it, at least not without seriously disrupting other programs.

It reminds me of something that somebody once said years ago, in a spirit of dark humor, about the process for developing a new

weapon. He said the process has two basic stages, the first being "it's too early to tell," and the second being "it's too late to stop it."

When the Force bottoms out at 40, it'll be missing one boat out of every six that it's supposed to have. That's a pretty deep shortfall to manage. And the bottom will happen just as the SSGNs are scheduled to leave service, so the SSGNs won't be around to compensate at that point.

Now it's true that the Force will be substantially below 48 for only a certain number of years. But potential adversaries can know in advance when that will occur, and make plans to take advantage of it.

The Navy says the requirements in the 313-ship plan are for 2020, and they can change after that. If the SSN requirement goes down after 2020, it could reduce or eliminate the projected shortfall. But the requirement could also go up after 2020, which would make the shortfall worse. The Navy can't know at this point which way the requirement might change after 2020, so the argument about changing requirements doesn't get the Navy off the hook.

The House version of the defense authorization bill addresses the projected shortfall by recommending \$400 million in FY07 funding to support the acceleration of 2-per-year Virginia-class production to FY09. That would produce a force that bottoms out at 43 boats rather than 40, and it would reduce the total shortfall period from 14 years to about 8 years.

This funding, however, is competing against two other major options for FY07 shipbuilding plus-ups. One of those is to fund two additional LCSs, and the other is to accelerate the ninth LPD from FY08 back into FY07. Both of these items are on the Navy's unfunded requirements list, while the Virginia-class acceleration is not.

Although the Virginia-class acceleration requires less funding in FY07 than the other two options, it requires a lot more funding over the FYDP. The 2 additional LCSs are about \$500 million, while the acceleration of the single LPD actually reduces funding requirements over the FYDP. The \$400 million for Virginia-class acceleration, in contrast, is only the first increment of an additional \$7.4 billion that would be required over the FYDP for the three extra boats.

The Senate version of the authorization bill funds the accelerated

LPD rather than the Virginia-class acceleration. Some Members have been quoted in the press stating that, in their view, retaining the \$400 million for Virginia-class acceleration in the final version of the bill will be an uphill battle.

30-Year Shipbuilding Plan

The issue of SSN procurement and force size encompasses two challenges. The first is to procure all the SSNs that are in the Navy's 30-year shipbuilding plan. That's going to be a challenge, because the plan as a whole may simply not be executable.

The Navy says that for the plan to be executable, 4 things need to happen. First, O&M spending needs to remain flat. Second, MilPer spending needs to remain flat. Third, R&D spending needs to go down and stay down.

All three of these things, the Navy says, are necessary for the Navy to increase the shipbuilding budget to the higher level that the Navy is planning.

And the fourth thing that needs to happen is that the ships have to come in at their estimated costs.

Now, each of these four things poses a risk. Past DOD efforts to control O&M spending have not been fully successful. The Navy doesn't have complete control of MilPer spending, because that can be affected, for example, by decisions that Congress makes on pay and benefits. And while it may be feasible for R&D spending to go down over the next few years because a number of systems are transitioning from development to procurement, it may be difficult to keep R&D spending at that reduced level over time, because the Navy at some point will likely want to start development of other new systems. And as many of you probably know, CBO believes that the ships in the plan will cost substantially more to build than the Navy estimates.

Now, some of the 4 required things might happen. But I don't know of anyone outside the Navy who has studied the situation who thinks that all 4 of them are going to happen.

If one or more of them don't happen, then the 30-year plan will come under pressure, and perhaps fall apart completely. This won't necessarily happen in the near term, because the more expensive part of the plan doesn't start until a few years from now, when the Navy

starts trying to get 1.5 cruisers and destroyers and 2 submarines per year. But if the plan begins to come under pressure at that time, the goal of procuring 2 submarines per year will likely be reassessed.

Adding 8 more SSNs

Assuming that all the SSNs in the 30-year plan can somehow be procured, the second challenge is to reduce or eliminate the projected SSN shortfall by adding up to 8 more SSNs to the plan between now and FY22.

In attempting this, one of the most significant barriers you'll face will be the projected shortfall in cruisers and destroyers. It may come as a surprise to you, but the SSN shortfall isn't the only projected shortfall in the 313-ship plan—and it's not even the biggest, because there's an even bigger projected shortfall in cruisers and destroyers.

The cruiser-destroyer force-level goal is 88 ships. That implies a 35-year steady-state rate of about 2.5 ships per year. But the 30-year shipbuilding plan procures an average of only about 1.75 ships per year.

As a result, the cruiser-destroyer force, which has a lot of ships today, will eventually fall to a low of about 62 ships. That's 26 ships below the goal. And in the long run, the cruiser-destroyer force never gets back to 88—it only gets back to 70, and then plateaus.

In more than 20 years of tracking Navy force-structure and procurement planning, this may be the biggest disconnect I have seen. This part of the Navy's plan is just completely broken—and the Navy right now has no announced plan for fixing it. Indeed, the Navy barely even acknowledges the problem. There was a mention of it in the draft version of the report on the 30-year shipbuilding plan, but it was deleted from the final version. In long-term Navy force planning, this problem is the unacknowledged elephant in the room.

If you haven't heard about this cruiser-destroyer shortfall before, that's understandable, because the Navy isn't going out of its way to alert people to it. That's similar to a situation in '95, when I first testified on the SSN shortfall. The Navy back then wasn't talking much about that projected shortfall either, so it came as news to a lot of people.

The Navy might be operating on the theory that the cruiser-

destroyer shortfall is so far in the future that there's plenty of time for someone else to do something about it. That's a risky game to play, because past experience shows that once you get onto a certain trajectory, it can be difficult to change it, and that the longer you wait to do something about the situation, the harder it becomes to do anything about it. The cruiser-destroyer shortfall is no further in the future today than the SSN shortfall was when I first began warning about it in '95. And look where we are now with the SSNs.

Now, why am I spending so much time talking to you about a projected shortfall in cruisers and destroyers? Why is this a concern for you? Well, it's a concern for you because, as weird as it may sound, this shortfall, by certain measures, is now a more pressing long-term force-structure problem than the SSN shortfall:

- The SSN shortfall will peak at 8 ships, but the cruiser-destroyer shortfall will peak at 26 ships.
- The SSN shortfall will peak at about 17% of the requirement, but the cruiser-destroyer shortfall will peak at about 30%.
- And while the SSN force will eventually get back up to its force-level goal, the cruiser-destroyer force never will, and it will remain about 20% below the required number.

As I mentioned earlier, eliminating the SSN shortfall will require adding 8 SSNs to the shipbuilding plan between now [FY07] and FY22, or an average of one-half additional submarines per year. Eliminating the cruiser-destroyer shortfall, however, will require adding 26 ships between now and FY39, or about 0.8 additional cruisers and destroyers per year.

Consequently, if opportunities do arise to add ships to the shipbuilding plan, supporters of cruisers and destroyers are going to have at least as strong a force-structure argument as supporters of submarines, if not a stronger one. In other words, submarines might not be the first in line for extra ships—cruisers and destroyers might be.

Unless the Navy closes the projected shortfall in cruisers and destroyers, this logic will become more and more prominent over time, which will make it more and more difficult to add submarines back into the plan.

To close the projected cruiser-destroyer shortfall, the Navy can do one or more of the following. First, it can reduce the requirement to something less than 88. But it's not clear what would permit the requirement to be reduced.

Second, it could try to extend cruiser-destroyer service lives beyond 35 years. But it's not clear whether that would be feasible or cost effective.

Third, it could add cruisers and destroyers to the shipbuilding plan. But that would put more pressure on other parts of the plan, including submarines.

And fourth, it could take actions to reduce the procurement cost of its planned cruisers and destroyers.

If you need to rely primarily on this last option, then a possible goal would be to reduce average cruiser-destroyer unit procurement costs by about 31%. This would permit the funding now planned for cruiser-destroyer procurement through FY39 to procure an additional 26 ships.

It's in this connection that I have suggested that the Navy consider the option of transitioning over the next several years from the DD(X) design to a smaller cruiser-destroyer design of about 11,000 tons.

Such a ship would be about 25% smaller than the current DD(X), but it would still be about the same size as the nuclear cruisers of the 1970s, and about 1,800 tons larger than the DDG-51.

As you might imagine, this suggestion has not put me at the top of the DD(X) program office Christmas card list.

The Navy has argued that an 11,000-ton ship can't meet all the requirements that are to be met by the DD(X). That's true, but a cruiser-destroyer force that falls to 62 ships, and then grows back to no more than 70, would fall well short of the Navy's requirement for a force of 88. You can't talk about one side of this situation without talking about the other.

Now, I can only suggest a general strategy to the surface community. I don't have the technical resources to flesh out a

smaller cruiser-destroyer design in detail, or to show how such a ship, though less capable in some respects, could still fill the surface community's most urgent capability gaps.

But you have those resources. And you've got some recent experience doing something like this. When you shifted from the Seawolf design to the smaller Virginia-class design, you reduced certain areas of performance while holding others constant. And in the end, you came up with a design that is less expensive to build on an apples-to-apples basis, but still capable enough to meet your future needs.

So if you want a challenge from me, here it is: Help your surface colleagues. Help them close their projected shortfall by assisting them in substantially reducing the average unit procurement cost of planned cruisers and destroyers. And by substantially, I mean as close to 31% as possible.

When you return to your place of work, make it one of your first to-do items to get that process in motion. Because unless the surface community's force-structure problem is fixed, it's going to be more difficult to think about fixing yours — or even to think about getting 2 submarines per year, should the shipbuilding plan come under pressure.

Now, when you go to see your surface colleague and you tell him, "Hi, I'm so and so from the submarine side of the house, and I'm here to help," he might look at you a bit funny. He might ask what it is you want to help him with. And when you tell him that you're going to help him close the projected cruiser-destroyer shortfall, don't be surprised if he isn't even aware of the problem, because the focus in the surface community has been on getting the DD(X) into serial production, and a lot of surface people consequently might not have had a chance to look beyond this near-term objective.

And when you tell him that you're going to help him close the shortfall by assisting him in substantially reducing the average procurement cost of cruisers and destroyers, don't be surprised if he gets defensive and takes umbrage. Don't let that bother you — that's just a side effect of DD(X) cheerleading intoxication. You'll need to ease him out of it gently.

But whatever reaction you get, you'll need to persevere. Because

remember, this isn't just a problem for them, it's a problem for you.

Procuring Replacement SSBNs

I want to finish by turning to my final item, about the next SSBN, and here I want to make two comments.

First, the 30-year plan calls for procuring these ships at a rate of 1 per year. I'm not sure that will be affordable. My sense is that you should look at the option of getting 2 every 3 years, or better yet, 1 every other year. That could mean getting the first ones earlier than currently planned, and the last ones later than currently planned, which in turn implies extending the lives of the final Ohio-class SSBNs, if possible, beyond the currently planned figure. So there's another challenge for you.

Second, don't assume at the outset that the new SSBN will use a D-5 sized missile. Instead, do some analysis to understand the implications of missile size for total program cost. Take a D-5 sized missile, a smaller missile perhaps about the size of the C-3, and maybe some other size that might reflect the new knee of the curve in missile technology. Then examine each option against the mission set to see how missile size affects the total sum of missile development and procurement costs, platform development, procurement, and O&S costs, and shore infrastructure costs.

Now, it may turn out that a D-5 sized missile results in the lowest total program cost, or at least a cost that isn't substantially higher than the other options. But at least you'll have an analytical basis for your decision, and some confidence that you didn't overlook a less expensive approach.

Understanding this issue will be important not only for justifying your design to OSD and Congress, but also because of the link with the UK. The UK needs to replace its own SSBNs, and because their ships will age out sooner than ours, they need to make key decisions before we do. Since the UK will likely build fewer platforms, the up-front cost of developing a new missile of a different size may loom larger in their total-cost calculation than it does in ours, which might incline them more strongly to sticking with a D-5 sized missile.

If so, and if it also turns out that a D-5 sized missile would mean a substantially higher total cost for us, then you'll need to have a dialogue with the UK on the issue. The UK's views deserve respect,

but their decision on preferred missile size should not predetermine the U.S. decision, if that would mean a substantially higher cost for the U.S. program. If there needs to be a dialogue with the UK to resolve differences on preferred missile size, then you'll need that study to show the UK why the best solution for them might not be the best solution for us, or for the two countries jointly.

I said earlier that the submarine community already has a lot of challenges on its plate, without me adding any more. But I've added a couple anyway, because I thought they were important for you to consider.

As always, I hope you found my comments helpful, at least in helping to move your own thinking forward. Thank you.■

**NAVAL SUBMARINE LEAGUE
SUBMARINE TECHNOLOGY SYMPOSIUM**

**WHY MARITIME SUPERIORITY?
HOW DO YOU ESTABLISH A FORMIDABLE NAVY AND
MAINTAIN MARITIME SUPERIORITY?**

**REMARKS BY J. GUY REYNOLDS
VICE ADMIRAL USN, (Ret)
16 MAY 2006**

Vice Admiral Reynolds is President of the Naval Submarine League. He had a distinguished career in both operational and acquisition sides of the Submarine Force and held high office in the Intelligence Community. Since retirement from uniformed service he has been active in industry and government as both a consultant and as chairman or member of governing boards and special panels.

Good Morning,

The program indicates you are about to hear from Admiral Donald. I am not Admiral Kirkland Donald. He is on TEXAS SSN 775 sea trials. TEXAS is the second Virginia Class Submarine. As much as I enjoy being here this morning, I would rather be with Admiral Donald.

With the next seven graphics, I will discuss the importance of Undersea Superiority and what is necessary for the USA to establish and maintain a Formidable Navy.

First, why should you listen to me? Mature, and good looking but, most important, I have either made or observed lots of mistakes - you should strive not to repeat those mistakes. My naval career can best be described as unusual. Operationally, I commanded submarines and surface ships, a squadron and eventually was Commander Submarine Force, US Pacific Fleet. In the intelligence world I was director of Collections at the Defense Intelligence Agency. Although

not an acquisition professional, I spent seven years in acquisition including five as a flag officer. Since leaving active duty I split my time between working with the government, the private sector and pro bono activity.

In the early 17th century, Sweden was building an empire around the Baltic Sea. They understood a strong Navy was essential to a world power. By 1620 Sweden was at war with Poland. In 1625 King Gustavus Adolphus ordered new warships. He already had the most powerful Navy in the world; he wanted to make it more formidable. One of the ships ordered was the 64 gun VASA.

The VASA Disaster



On 10 August 1628, VASA set sail on her maiden voyage. She fired a salute honoring the king, and hundreds of spectators and foreign diplomats on hand for the event; then rolled over and sank in Stockholm harbor. At the time Sweden was the center of the world economic system and was recognized as the most powerful Naval Force in the world. The loss of VASA started the decline of the Swedish Navy and subsequent loss of economic power. I contend the two events are related. The dimensions of the ship were according to plan a King Gustav II authorized. No one was held responsible for the loss.

I am not giving you a history lesson. I am answering my own first question. Why Maritime Superiority?

The lesson is, to be a world power and the economic leader of the world, a country must possess the most formidable Navy in the world. Sweden learned that lesson too late.

Sweden was followed by Spain, France and then the United Kingdom by 1900 as the world economic leader supported by a formidable Navy. In the 20th century, the UK was replaced by the USA.

If the USA is to remain the economic King of the Hill, it must maintain superiority on and below the sea.

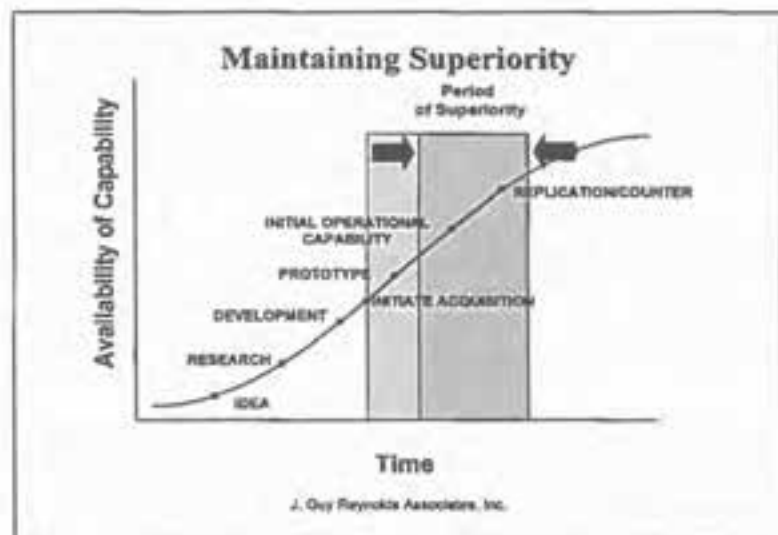


Figure 1

Now to the second question. How do you establish a formidable Navy and maintain Maritime Superiority?

The answer is, to have a formidable Navy you must have a combination of people, training and equipment. I will focus on equipment. The Cold War taught us that others have access to fine people and good training. Figure 1 shows the progression of technology and how it leads to superiority. It also shows the transient nature of technology based superiority. On or before there is replication or a counter, you must have developed the next technology or you are no longer superior. This is not a trivial matter.

SUPERIORITY

- Superiority means you have capability the enemy does not have and cannot counter
- Technology that provides Superiority must be developed; it cannot be bought
- Superiority based on Technology is temporary
- At the point of "Replication" new technology must be available to maintain Superiority

Figure 2

Figure 2 summarizes the briefing to this point. Having a formidable Navy is not enough to be the world economic leader. You must enjoy Maritime Superiority. That means you must have capability that an enemy does not have and cannot counter. This tasks us to the crux of the matter. Superiority cannot be bought. The best you can be with acquired technology is on a par with the developer or others who buy the technology. Decision makers must decide if parity is good enough for America. I am on the side that says America must be superior, particularly in a maritime sense. That means America must devote the resources to develop the technology necessary to be superior. As shown on the previous figure, Superiority is temporary.



Figure 3

Many of you remember Figure 3.

America won the Cold War in large measure because of US Undersea Superiority. That Superiority was carried by the prowess of the nuclear Submarine Force. Our SSBNs held the Former Soviet Union mainland at risk and our SSN neutralized their SSBN Force.

The Former Soviet Union continued to improve its submarines for five decades. Through continuous research, development, design and construction, the US improved every class of submarines; the US advantage was maintained.

The rest is history.

CONCLUSIONS

- Maritime Superiority is the Foundation of Economic Strength
- USS NAUTILUS (SSN 571) ushered in the era of Undersea Dominance
- The combination of Stealth, Unlimited Endurance, Missiles and Nuclear Weapons make Undersea Superiority a Necessary Element of Maritime Superiority
- Superiority cannot be Bought, It Must be Developed
- All technology and thus Superiority is Perishable
- Continuous R&D followed by Design and Construction is Necessary to Maintain Superiority

I began this presentation saying this was not a history lesson. More correctly, it is a lesson in economic strength. History has borne out that Maritime Superiority is key to a country's economic strength. What defines Maritime Superiority changes with the evolution of technology. Hulls went from wood to steel, weapons went from picks and clubs to smooth bores to large caliber guns and missiles. Submarines introduced a new dimension to warfare. When USS NAUTILUS (SSN 571) went to sea, Undersea Dominance became a key element of Maritime Superiority. If you take anything away from this presentation, I hope it is the realization that the three legs to Superiority are:

1. Superiority cannot be bought, it must be developed.
2. Superiority is Perishable.
3. Superiority requires continuous R&D followed by design and construction.

THE WAY FORWARD

- Gain Acceptance of the Connection Between Maritime Superiority and Economic Strength.
- Get on with Building Capital Ships in the Numbers and with the Timing Necessary to Maintain Maritime Superiority.
- Reinforce the Concept that Capability, Numbers and Volume Count!

The connection between Maritime Superiority and economic strength is not well understood. Acceptance of that connection would go a long way in convincing our elected officials they need to support the maritime design industrial base and number and type ships needed for superiority.

Part of the equation must be an understanding of what constitutes Capability; Endurance, Payload, and Signature are all important and require volume.

So, where is VASA today?

VASA Today



She is in a museum in Stockholm, a footnote in history. Sweden has gone from the most formidable Navy in the world to a much lesser position; her economic position in the world matches her naval prowess. The real question is "Where will the USA be on the naval and economic stage in 2100?"

QUESTIONS

What defines a Formidable Navy?

Vice Admiral Reynolds: A navy comprised of capital ships. Ships that by the nature of their capability cause potential adversaries to either pause or change intended courses of action. Adversaries must be unwilling to confront your capital ships.

What constitutes a capital ship?

Vice Admiral Reynolds: Ships with reactors! Seriously, CVN and SSBN are capital ships in the eyes of the world. SSGN, with its awesome payload, stealth and endurance is the new capital ship. SSNs are capital ships because they put other countries' capital ships at risk. Major surface combatants are capital ships to the degree they protect the Battle Group and support the land war.

It is my opinion that in the next decade platforms that provide robust Ballistic Missile Defense will make the capital ship list.■

ARTICLES**AIP FOR DUMMIES**

by CAPT James H. Patton, USN(Ret)

Captain Jim Patton is President of Submarine Tactics and Technology, Inc., a consulting firm in North Stonington, CT. While on active duty he commanded USS PARGO (SSN 650). He is a frequent contributor to THE SUBMARINE REVIEW.

BACKGROUND

Much has been printed regarding the impact *Air Independent Propulsion* (AIP) has had, and will have, on Undersea Warfare (USW). Simplistically, AIP frees a submarine from the necessity to ingest air, at or near the surface of the ocean, to support some energy-generating process that then both propels the vessel and powers its sensors and life support systems. The ultimate in AIP, of course, is a nuclear reactor.

In addition to nuclear power, many lesser forms of AIP exist. There are:

- Stirling engines, an external-combustion engine fired by diesel fuel and oxygen (O₂) stored aboard in some form, whose low-pressure products of combustion are pumped overboard.
- Closed-cycle diesels that essentially *reuse* exhaust air after stripping out (then pumping overboard) the carbon dioxide (CO₂) and replenishing the oxygen (O₂) consumed by combustion.
- Closed cycle turbines (the French MESMA system) with similar CO₂ and O₂ issues.
- Fuel cells, which produce electricity and water by allowing stored O₂ and H₂ to combine through a permeable membrane.

Although there are significant differences between these various AIP systems, one significant commonality is that a large amount of O_2 must be somehow stored aboard, and is generally the limiting factor to the total quantity of energy stored.

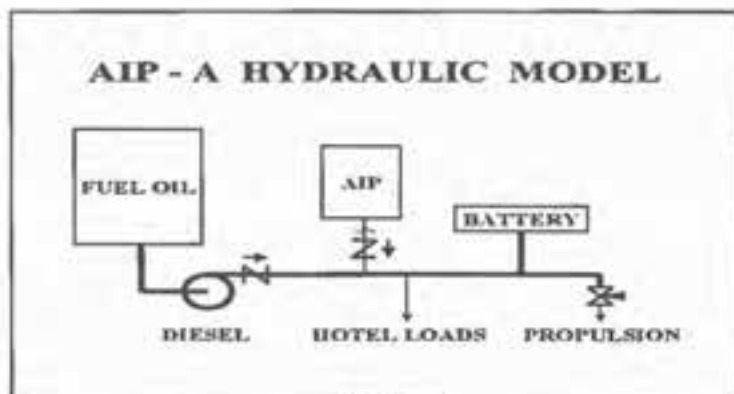


FIGURE 1

DISCUSSION

Everyone deals with *plumbing* issues every day, and complex systems can sometimes be simplistically modeled and understood more easily if represented through a hydraulic analog. Figure (1) is just such an analogue meant to represent, in a general sense, a submarine AIP system. In explanation, *fluid* (energy) is expended through two paths—the relatively small but steady drain due to *hotel loads* (lights, heating and cooling, sensor suites and combat systems, etc.) and propulsion loads which can vary over a very wide range. This fluid can come from three sources—a battery, which stores a significant quantity of energy and can supply hotel loads plus maximum propulsion power for perhaps an hour; an AIP system representing many times the battery's capacity but *limited in the rate at which power can be generated* (it can supply hotel loads and some limited degree of propulsion for several weeks); and a large capacity *pump* (diesel) which draws from a very large source (embarked fuel

oil) and can supply hotel loads, propulsion and replenish the battery, but not the AIP system. To put things in perspective for a theoretical system, the fuel oil might represent a total of 300 MWHR of usable energy, the AIP system some 30 MWHR of (non-rechargeable at sea) stored energy, and the battery about 3 MWHR when fully charged.

As stated there are several different types of (non-nuclear) AIP systems. The first to operate at sea was installed on six Swedish submarines and is based on the *Stirling* engine. The reciprocal motion from this repetitive *external combustion* cycle is mechanically converted to rotary motion to drive a generator. The Swedish Gotland class submarine (the GOTLAND itself now operating under contract out of San Diego as a *target* for U.S. ASW forces) has two Stirling units, each rated at 60 KW. Tested contemporaneously with the Swedish Stirling AIP boats in the late 80s but only recently deployed is the German fuel-cell based AIP system as installed on their recently delivered 212 class (the export version will be designated the 214 class). This system, drawing heavily from NASA-based research on fuel cells—particularly as regards PEM (Proton Exchange Membrane) technology, which reduced costs while greatly enhancing the efficiency and safety of fuel cells. The 212 has two fuel cell modules each rated at 120 KW. The *closed-cycle* diesel was also tested by the Germans in the early 90s, and it's reported that MESMA, a similar but steam turbine-based system of French design is currently being developed aboard a Pakistani test submarine. There are several things that all AIP systems have in common. All involve a low-power conversion device, all require that a significant supply of O₂ be stored aboard—typically cryogenically, and except for fuel cell-based systems, all need to pump some gaseous products of combustion overboard, which means that increased backpressure reduces the usable power with depth.

To best appreciate the operational limitations of an AIP-equipped submarine, consider Figure (2). This again is a hypothetical, though credible, *upper echelon* boat of about 1400 or so tons, maximum submerged speed of about 21 KT's with a main propulsion motor of about 3300 KW, 50 days worth of fuel oil (assumed to support 10 days transit at 10 KT's, 30 days on-station at 5 KT's or less, and 10 days transit home at 10 KT's, and two 120 KW fuel cell

modules with about 30 MWHRs of stored energy in the form of liquid O_2 and hydrogen (H_2 – in the form of off-hull cylinders of metal hydrides). Its battery is capable of supporting maximum submerged speed for about an hour (although battery capacity can be 2-3X greater at substantially lower discharge rates. This boat essentially represents the 300/30/3 MWHR model described earlier.

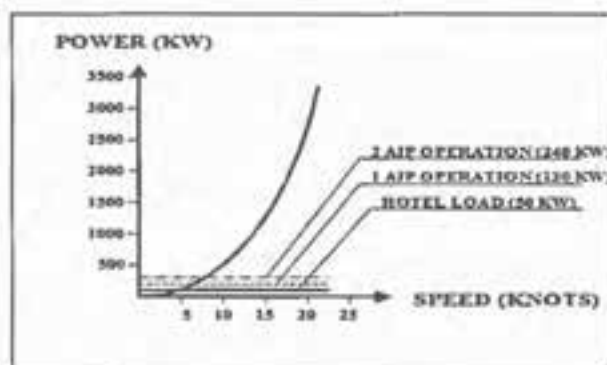


Figure 2

What is readily apparent is that above 5-7 knots, the use of AIP makes little sense for several reasons—its maximum output quickly becomes but a small part of the power required at that speed (there is a cubic relationship between speed and power required—doubling the speed requires eight times the power); a much higher depletion rate of AIP consumables since the advertised several weeks of air independence is based on carrying hotel loads and *small* (less than hotel load) propulsion demands; and the expenditure of a valuable tactical asset for little apparent gain (at higher speeds there would be only a marginal difference in the time between having to recharge batteries by snorkeling. Some likely operational *truths* would emerge from this logic.

- Transits of any length will likely be conducted in a *classic* manner, with AIP secured and somewhat frequent, but short snorkeling period to keep the battery at, say, 50% full charge or so.

- When on station, be fully on AIP at very low speeds (2-4 KTs), with battery kept at 100% to best support attack maneuvers or to evade prosecution. A developmental goal clearly would be the ability (stored AIP capacity) to maintain such a covert stance for an entire on-station period (i.e. ~30 days).

Both the battery and AIP capacity used in the above examples are probably a bit high, particularly if the concern is what an AIP submarine would look and act like if it were a third world older model brought back to its builders yard for an AIP *plug* to be installed. In that case, there would more likely be but one *module*, and economics would likely dictate that it be Stirling engine-based vice fuel cell. Clearly a limiting path to all AIP submarine is just how much O₂ (plus H₂ for fuel cells) can be carried, and in what form. Some fairly recent and dramatic experimental evidence exists that carbon nanotubes are capable of storing literally hundreds, if not thousands as much H₂ in an equivalent space and/or weight of other methods. If the same is true for O₂ storage, there could be dramatic developments in the wings. Presently, however, the production costs of carbon nanotubes of the specific sizes and diameters that would be required are in the order of thousands of dollars per gram. Furthermore, there are emerging some medical concerns that these nanotubes, being incredibly tiny and non-biodegradable, represent even more of an asbestosis-like threat to human lungs than asbestos itself, and may find far less industrial exploitation than is now projected.

Hotel loads are also liable to vary significantly, but some truths do exist—solid state electronics in the sensor and combat systems in themselves use less power *per circuit element*, but the vast reduction in component volume has resulted in huge increases in total processing power that not only consume large quantities of power in themselves, but more significantly, are very intolerant of high ambient temperature and humidity. Perhaps the most demanding aspect of hotel loads for non-nuclear AIP concepts is the issue of atmosphere control—not just for people, but more stringently for the electronics. The mental image of hot and sweaty (or wet and freezing) submariners effectively fighting their ship is a thing of the



past. Add to this the requirement to keep the air breathable for up to 30 days divorced from the atmosphere, and hotel loads are non-trivial. Many concepts use stored AIP O_2 for internal atmosphere replenishment—a use which draws down on this critical AIP consumable at a rate of about 1 standard cubic foot per person per hour. Every submarine casualty atmosphere study shows that CO_2 is the limiting parameter, and that a submarine's atmosphere can become incapable of sustaining life very quickly (a day or so) if this product of respiration is not removed. Choices include the absorbent lithium hydroxide (LiOH) in spreadable granular form (messy), canisters through which fans circulate the air, or by closed cycle machinery called *scrubbers* where such as cold monoethylamine absorbs CO_2 from an air stream, is then heated to boil off the gas which is pumped overboard, then cooled before being sprayed into the air stream again. All of this, of course, increases the electrical hotel load.

Back to Figure (1) for a moment for a diversion, it would appear that an extremely simple algorithm could *model* the propulsion dynamics of any non-nuclear AIP. Given the fixed maximum capacities of the three energy storage *bins* (fuel oil, AIP, battery), the values associated with its hotel load, diesel (pump) rating, and maximum AIP conversion rate (orifice size), all that would remain to have a continuous state of the plant would be to specify whether or not the diesel was running, whether or not AIP was on-line and how *open* the propulsion throttle valve was. Real-time outputs of the model would be how much fuel oil and AIP (consumables) were left, and what the state of charge of the battery was. Accepting the fact that a modern US nuclear submarine is quieter than any SS at equivalent speeds (yes Virginia, it's true!), an option would exist to then acoustically augment the SSN to credibly emulate that specific AIP (SS) class it is representing. This would not be a difficult task, when one considers that of the millions of MWs running around inside of a modern SSN, all that ends up being coupled to the ocean as acoustic energy is measured in only milliwatts. Exercise sponsors would direct the *tactics* the SSN/AIP (SS) would employ, such as "transit at a speed of 10 KT, snorkel to recharge batteries when they drop to 50% capacity, but never snorkel longer than 2 hours, go on AIP at minimum steerageway when on station, keeping the battery

at 100% except as necessary to attack or evade, and conduct continuous passive (listening) communications to support ASCM launch within 2 minutes of receiving targeting data" ... or whatever was needed to be experimented with or exercised against. A huge collateral benefit of such operations would be that US submariners faced with having to act as an AIP (SS) for an extended period, with all its pros and *laws of physics* cons, would emerge with a far greater appreciation of what their prospective adversaries can and cannot do, and which of these platforms' limitations can be exploited, and how.

CONCLUSIONS

Non-nuclear AIP submarines are a reality, and are on the verge of rapidly proliferating as older boats are *upgraded* by the installation of an additional hull section. This does not necessarily represent an overwhelming ASW challenge as long as it is realized just what AIP is and what it is not. It is a means by which an individual unit, having reached its patrol area, can become very stealthy for some significant period of time *if* it remains at very slow speeds. It is, by no means, a warship aspired to by an entity interested in its contributing to global maritime influence, but is of high value (when coupled with the proper weapons and operational concepts) to an entity interested in contesting maritime influence by others in its own waters. ■



43RD INTERNATIONAL SUBMARINERS CONGRESS WITH THE 100TH ANNIVERSARY OF THE RUSSIAN SUBMARINE FORCE

by Mr. Ken Johnson

Mr. Ken Johnson is the webmaster of The International Submariners Association/USA. The website is <http://www.isausa.org>. He attended the Congress held in Moscow this year.

The history of the Russian Submarine fleet extends through the depths of time to those first underwater craft back in the 17th century. It was to take almost 200 years before the first operational fighting submarine, DELPHIN, took its place amongst the ranks of the Russian Navy in 1903. By 1906 the fleet was growing and the submarines of the Russian Navy were moved into a class of their own.

For the last 100 years that fleet has incorporated over 1150 craft including 269 nuclear submarines; and in 2006 the Russian submarine remains in a class of its own to celebrate its centenary.

On May 22-26, 2006 the 43rd International Submariners Congress was held at Moscow, Russian Federation. Representatives from 18 nations attended with a total delegate count of 300. There were 41 members of the U.S. delegation, including Adm. Bruce DeMars, USN (Ret), Board Chairman of the Naval Submarine League, and his wife, Margaret. Another member of the U.S. delegation who amazed just about everyone he met with his stamina was 95 year old Jack Stephenson whose first rate after joining the Navy in 1934 was Sailmaker 3rd Class. Jack had to change his rate in 1937 to Boatswains Mate when the sailmaker rate was abolished. Jack qualified in submarines in 1939 and went on to serve as COB on 3 boats during WW II, making a total of 11 war patrols.

Since 2006 marks the 100th anniversary of the Russian Submarine Force, our hosts went all out to make this a most memorable occasion. Fleet Admiral Vladimir Chernavin, Russian Federation Navy (Ret.) was Chairman of the event and personally

took part in the official events. This event obviously had high level Russian Federation backing as well as significant underwriting support from several Russian businessmen.

The first day's events included a tour of the Moscow Kremlin followed by a special submarine memorial service at the Cathedral of Christ the Savior. This is a spectacular church, originally built over a period of 44 years in the mid 1800s to celebrate Napoleon's defeat in 1812. The original structure was blown up and destroyed by the Bolsheviks in 1931 with the intent of replacing it with a large building and monument to the socialist worker. World War II interrupted this plan and the site became a public swimming pool. The reconstruction of this church began in 1995 and was completed in just 5 years. It represents a significant re-emergence of the Russian Orthodox religion in the present day Russian Federation and it serves now as the center of the Russian Orthodox faith. This service was followed by a luncheon and in the evening an official opening ceremony and program of international entertainment representing music and dancing of not only Russia, but most of the countries represented.

The second day's events included a visit to the Central Museum of the Great Patriotic War with a special ceremonial demonstration on our arrival by a military drill unit and band. This was followed by a wreath laying ceremony in the Hall of Honor and tour of the museum. The Central Museum of the Great Patriotic War, which opened on May 9, 1995, is located in the base of the Memorial Victory Complex on Poklonnaya Hill in Moscow and covers more than 48,000 square meters. The Museum consists of the Entry Hall, the Halls of Glory and Memory, the Picture Gallery and six dioramas devoted to the most dramatic battles of the Great Patriotic War, two movie theatres, a hall for veterans' meetings and an exhibition hall.

The museum tour included a visit to the special Russian submarine 100th anniversary exhibit which was on display from April 21st through June 22nd in the exhibition hall of the museum. Included in this exhibit were 111 scale models of Russian submarines from the extensive collection of Andrey Artyushin. His collection includes models of every submarine design produced by Russia over the 100 year history of its Submarine Force. Andrey also played a major role in organizing the 43rd Congress. A substantial portion of this exhibit

was devoted to the submarine K-19 which suffered a nuclear accident on July 4, 1961. The Hollywood movie, *K-19: The Widowmaker*, was released in 2002 with a story line which was based on this incident. With this year marking both the 100th anniversary of the Russian submarine fleet and the 45th anniversary of the K-19 incident, the exhibit pays special tribute to the surviving 1961 crew members and they are being honored by Mikhail Gorbachev who has nominated them this year for the Nobel Peace Prize. Efforts are also underway to preserve the K-19 as a Cold War memorial rather than scrapping it as was planned.

On the third day of the Congress, we attended the dedication and opening ceremonies for a new submarine museum, a project 641B (NATO Tango) class submarine. This submarine was specially configured for display by the Sevmash shipyard and prepared for dedication as part of the 43rd Congress. Following the dedication the Congress attendees were the very first to tour the submarine. The diesel-electric submarine B-396 was built at the Krasnoye Sormovo shipyard in Gorky (now known as Nizhny Novgorod) and commissioned in 1980. It was based in Polyarnyi and naval base Linakhamari, served in the Mediterranean Sea, South and Northern Atlantic, Barents and Norwegian Seas. In 1984 it was named *Novosibirskiy Komsomolets*. In 1998 it was excluded from the Russian Navy list. In 2000 the designers of Sevmash Design Bureau began preparations for the technical project of reconstruction of the submarine as a museum which was completed just prior to its dedication.

Closing ceremonies were held on the evening of May 25th with a dinner and entertainment program during which formal presentations were made by the various delegations attending.

The celebration did not end in Moscow, but was continued from May 26–28 at St. Petersburg as an informal Meeting of International Submariners. Most delegates who attended the Moscow event also attended this celebration in St. Petersburg which was organized by the St. Petersburg Submariners Club. Arrangements had been made for those planning to attend this celebration to leave the closing ceremony in Moscow early and catch an overnight train to St. Petersburg.

St. Petersburg events included a river cruise on a catamaran

cruise boat and visit to Kronstadt on the first day. The second day, May 27th included a tour of the Central Naval Museum and visit aboard the historic cruiser AURORA. This was followed by a visit to the Nakhimov Naval College adjacent to the cruiser, AURORA and lunch with the cadets. An interesting feature of the Nakhimov Naval College is that the brass railing of the staircase leading to the fifth floor dining hall has the names of each graduate of this college engraved in it. Since this day was also the birthday of the city of St. Petersburg, there were many parades and special events going on in the city and we were taken on a Neva River dinner cruise in the evening where we could see the fireworks display from the vantage of the river.

The last day included a solemn military honors ceremony at the KURSK memorial in the Seraphimovskoye Memorial Cemetery. This memorial includes the graves of 38 members of KURSK crew, mostly officers, including that of Capt. Gennady Lyachin, KURSK Commanding Officer. Following the ceremony we were each given two flowers and the opportunity to place them on whichever grave we chose. We were then brought to the beautiful St. Nicholas Cathedral for a public prayer service for lost submariners. Closing ceremonies were held in the Pribaltiskaya Hotel where those who attended this meeting stayed.

Since this Congress I have been asked by several people how I learned about it and was able to attend. As the title of this article states, this was the 43rd International Submariners Congress. This celebration was somewhat unique in that it was followed by a second meeting and celebrated a significant milestone of the host country. These annual meetings began in 1962 with the first meeting in Paris and have been held almost every year since in different cities, mainly in Europe. This was the second such meeting I have attended, the first being at Chatham, UK in 2003. They are open to all submariners or those interested in submarines. There is no central international submariner organization but many nations have their own organization. In the United States, this is the International Submariners Association/USA. Next year's Congress will be held in Cherbourg, France in September 2007, the following year it will be held in Gdinya, Poland and in 2009 it is planned to be held in San Diego, CA for the first time ever in the United States.■

MYSTERY SINKING FINALLY SOLVED

by CDR John D. Alden, USN(Ret)

CDR John Alden, a submarine veteran of World War II, is a prolific writer, most notable for his The Fleet Submarine in the U.S. Navy. He is a frequent contributor to THE SUBMARINE REVIEW and is very respected for his thorough, and thoughtful, commentaries on WW II submarine actions.

It is rather unusual to come up with new credit for a U.S. submarine during World War II this many years after the fact, but I am pleased to report that Captain Hugh H. Lewis and his boat, STERLET (SS 392), deserve credit for downing a 6,919-ton Japanese cargo ship that has not previously been recognized.

STERLET had a rather modest war record. Its first two patrols under Skipper Orme C. Robbins were initially believed to have sunk 10 ships for 36,100 tons, but later analysis reduced the official count to only one and one-third: the 10,241-ton tanker JINEI MARU and partial credit for another tanker, TAKANE MARU of 10,021 tons, shared with two other subs.¹ Four armed former fishing boats under 300 tons each, although confirmed sunk by Japanese records, were too small to be counted in the official tally. These two patrols were unfortunately marked by dissension between the Captain and his Executive Officer, Paul Schratz, to the extent that both were transferred off the boat at the end of the second patrol.²

STERLET's new Commander was Hugh H. Lewis, who had the distinction of being the first of only seven reserve officers to be promoted to Command and make war patrols during WWII. (Lewis was an Annapolis graduate who had resigned his regular commission but stayed in the Naval Reserve). On completion of a regular shipyard upkeep, Lewis took STERLET on its third patrol into Empire waters off the coast of Honshu, where he operated for 66 days between January and March, 1945. During this period many U.S. submarines were called upon to provide lifeguard services for air crews engaged in the shuttle bombing of Japanese cities—essential but often tedious and unrewarding work under

constant threat of attack from the air. Too, most of the larger Japanese merchant ships were already on the bottom, so there were few opportunities for submarines to make any real killings while on lifeguard duty.

Such an opportunity appeared suddenly on the night of 5 March 1945. According to STERLET's patrol report, the trace of a large ship heading northeastward showed up on the radar screen. Approached on the surface, it could be seen only in outline against the sky and was identified as a loaded 10,000-ton tanker with masts on goalposts. Lewis fired a salvo of six torpedoes of which five were believed to have hit, causing the target to break in two and disappear, but nothing further could be confirmed by the assessment team and the sinking was never credited to STERLET.

Long after the war it was revealed that the intelligence center at Pearl Harbor had intercepted an Ultra message reporting that a ship identified as the TAMON MARU #4 of unspecified type and tonnage had been sunk at the time of STERLET's attack. However, no ship of that name could be found in Japanese records. A compilation of Japanese ship losses made under the direction of General MacArthur's staff did list a commercial cargo ship named DAIAI MARU as missing on 4 March somewhere between Tokyo and Muroran, a port on the northern island of Hokkaido, and presumed sunk by a submarine, but there were no other details.³ Errors in the compilation were not uncommon, including numerous other ships listed incorrectly as sunk by submarines, so the loss of DAIAI MARU appeared to be most likely just another erroneous listing.

In 1991 a Japanese researcher named Shinshichiro Komamiya had privately published a book called *Senji Sempaku Shi* or *Wartime Ships History*, in which are compiled the records of thousands of Japanese merchant ships lost during the war. Unfortunately for most U.S. students of the submarine war, this volume has never been published in English translation. However, a few English-speaking *buffs* have learned enough Japanese on their own to make use of this and other Japanese-language sources. I am indebted to Mr. William G. Somerville of Lincolnshire, England for his translation of portions of the Japanese history dealing with Submarine attacks. His account of DAIAI MARU reads as follows:

DAIAI MARU (6,919 tons), Osaka Shosen Co. Completed 22nd January, 1945. At 1600 on the 4th of March, 1945 this ship left Tokyo Harbour bound for Muroran on an independent voyage. On the 10th while off the southern part of Hokkaido during a dark night she was torpedoed and sunk. All on board, 70 crewmen and passengers lost their lives.

Somerville went on to say:

The book *Japanese Merchant Ships at War*, the story of the MITSUI and the OSAKA shipping lines, states: "Japanese records indicate that the ship, while proceeding from Tokyo to Muroran, was torpedoed and sunk on the 10th of March, 1945 off Kamaishi with the loss of all hands; US records carry no mention of the attack."

There are obvious contradictions between the U.S. and Japanese records, but they are of a type common in wartime records and easily explained. The ship that STERLET attacked was brand new and unlisted in any recognition manual, and was seen only as a silhouette in the gloom. That it was misidentified as a tanker rather than a cargo ship was not unusual. The Ultra translators had the name wrong, a common occurrence in reading intercepts that were often incomplete and trying to interpret the ambiguous Japanese Kanji characters. The DAIAI MARU was not sunk on either the 4th or 10th of March; rather, those were the dates when she left Tokyo and was expected to have arrived at Muroran. The port of Kamaishi, on the northern stretch of Honshu's east coast, is near where she could have been on the 9th or early on the 10th. However, the fact that the ship was unescorted and that all hands were lost obviously made it impossible for the Japanese to know positively where and when the sinking actually occurred.

The geographic position where STERLET's attack occurred, 34-56N 140-15E, is indeed where a ship would likely have been a day after leaving Tokyo, rounding the point of Nojima Zaki, and heading northeast. In my opinion, skipper Hugh Lewis and STERLET deserve belated credit for sinking the 6,919-ton DAIAI MARU on the night of 5 March 1945.■

ENDNOTES

1. *Japanese Naval and Merchant Shipping Losses during World War II by All Causes*, The Joint Army-Navy Assessment Committee, U.S. Government Printing Office, February 1947.
2. Schratz, Paul R., Submarine Commander, University Press of Kentucky, 1988.
3. *The Imperial Japanese Navy in World War II*, Military History Section, Special Staff, General Headquarters, Far East Command, February 1952.



FEAR OF THE COBRA

by ENC(SS)(DV) C. Mike Carmody, USN(RET)

Mike Carmody enlisted in the Navy December, 1941 at the age of seventeen. After attending three weeks accelerated Boot Camp at Newport R.I. he volunteered for submarine duty. Due to the shortage of submarine sailors he was assigned to submarine duty without attending Submarine School.

During WWII he made eleven war patrols on submarines as a Machinist Mate. His military service earned him the Submarine Combat Pin with four bronze stars, the Naval Commendation Medal for valor and numerous other awards. During the Cold War era he made several submarine deterrent patrols. He retired from active duty in 1963.

Mike Carmody has written over 20 submarine stories which have been published in several military magazines.

In 1942 all beaches on Oaha, Hawaiian Islands, were barb wired and patrolled. No one could go swimming. In early 1943 the threat of invasion was lifted and the beaches were opened. PAMPANITO's crew just finished two great weeks at the Pink Palace (Royal Hawaiian Hotel). We enjoyed Waikiki beach and three great meals per day. These \$110.00 a day rooms only cost us 25 cents per day. This was our second stay at the Pink Palace. A bus took us to the ten-ten pier at the Submarine Base where we loaded stores for PAMPANITO's 4th patrol. PS: The pier was called ten-ten because it was one thousand ten feet in length. As Fuel King I had to take on 130,000 gallons of #2 fuel oil and 1,000 gallons of lube oil.

This patrol had many memorable happenings take place which makes this story especially interesting. It started when we learned that Pete Summers, our captain, had suffered from battle stress. He had 10 war patrols to his credit and was granted a much deserved

state side leave. As a result, we had no captain. Fortunately, our Squadron Commander, Mike Fanno, a full Captain, volunteered to take command of PAMPANITO on her 4th patrol. He was already a noted naval hero. In March, 1942, as Commanding Officer of USS TROUT, he escaped Corregidor under the nose of the Japanese invaders with seventeen tons of gold and eight tons of silver. The gold & silver was used as ballast, replacing the ammunition and medicine he brought to the trapped defenders of Corregidor.

About 55 days into PAMPANITO's 4th patrol we sank two large ships, one of which we didn't receive credit for until after the war.

We were experiencing heavy seas with 15 to 20 foot waves when our lookouts observed we were leaving an oil slick behind us.

As Fuel King, Chief Merryman and myself had to remedy the problem. We had to convert and repair the #4 fuel ballast tank, which had a broken connection from a previous depth charging attack. The sea was beginning to kick up. During the repair, Chief Merryman, was washed overboard by a freak wave, nearly losing his life. Fortunately, he was rescued.

PAMPANITO was dangerously low on fuel. The Captain asked and was granted permission to terminate the patrol and head to Australia.

Most of the crew were experienced veteran submariners and did not seem to harbor fear of the enemy. However, we were about to experience a fear that was caused by nature, not the enemy.

We weren't part of Admiral Halsey's Third Fleet, but were ordered to accompany when a radio message informed us we were entering a typhoon named *Cobra*. This is when real fear was experienced by the crew.

The fleet was given orders to travel at a particular course thought to be the safest route of travel. However, this Typhoon was unpredictable and kept changing direction. Our IMC was kept on so all hands could hear what was going on with the other ships. What we heard was scary. Every vessel in the seventy plus armada was reporting severe damage and were in great danger. All ships were now on their own and had to keep heading into the sixty and seventy foot waves.

The aircraft carrier, CAPE ESPERANCE, was having trouble righting herself while experience 30 degree rolls. Four hundred men

in the hangar deck were used to correct the rolls by shifting their weight from port to starboard and vice-versa. This didn't help our morale very much.

We had no one topside. The boat was taking on a lot of water through the main induction and conning tower hatch. One man was stationed next to the conning tower hatch. His job was to close it whenever a wave rolled over the bridge. Leaving the hatch open helped to feed the air to our propulsion engine.

Our bilge pump ran non-stop for 72 hours. Our meals consisted of sandwiches and the crew received little sleep. Two thirds of the men experienced sea sickness.

Fear really set in when CAPE ESPERANCE reported her mast and antennas were being carried away by high seas and only VHF transmissions could be broadcast.

CAPE ESPERANCE's Commanding Officer, Captain Backus, requested that destroyers stand by in case the order to abandon ship had to be made. Three destroyers responded to his call. As destiny would have it, all three destroyers capsized and sank that day. USS MONAGHAN lost 300 men with only 6 survivors, USS HULL lost 260 men with 62 survivors, and USS SPENCE lost 280 men with 23 survivors.

Fortunately, USS CAPE ESPERANCE survived the storm. Total damage to the fleet from Cobra was 890 men killed, 200 aircraft lost, and 28 ships damaged. Nine were so badly damaged they had to be dry docked for major repairs.

How PAMPANITO survived, only God knows. She was a wreck. Inside, almost everything had broken loose. The superstructure was caved in and many of her steel deck plates were missing. Many times PAMPANITO quivered on the crest of a wave and we thought she might break in half. We ran on one engine the entire storm.

On the morning of the 4th day, the 80 mph winds started to abate. As PAMPANITO plunged and vibrated through the sea we could feel the difference in the pressure on our ears. The contorted motion of the boat also started to decrease sharply. All hands admitted that this was the worst and most fearsome storm they had ever ridden. We were all thankful to the Portsmouth Naval Shipyard for constructing such a well built boat.

We departed from the 3rd Fleet and made our way heading south to Lombok Strait and Australia. We crossed the Equator and introduced the Polly Wogs to King Neptune, making the entire crew Shellbacks.

On Christmas Eve we entered Lambok Strait, full aware of how dangerous this narrow passage was. Two boats were lost in Lombok Strait during the war.

We traveled through the strait on the surface, at night, at full speed, avoiding enemy small craft and planes. However, we received gun fire from Japanese shore batteries on Bali and Java. After eight hours of battle stations we entered the Indian Ocean, at dawn, on Christmas Day. We had traveled 16,000 miles and were at sea for 65 days. The cooks had one bushel of potatoes left and salvaged enough to make mashed potatoes with canned ham for Christmas dinner.

On 27 December 1944, with little fuel left, we spotted the Northwest Cape and inlet to Exmouth Gulf, Northern Australia, location of a secret fuel barge that was approximately one mile up the channel.

We had just entered the channel when a torpedo fired from a Japanese submarine, ran up the channel, from sea, approximately 50 feet off our port side. We watched in awe as it missed its intended target and ran aground. This was the 5th, but not the last, encounter with a torpedo being fired at us by an enemy submarine.

Exmouth was a secret location because it was the farthest from Japanese controlled air bases. It was a desolate, arid, desert area, with no town. It consisted of a fuel barge, an abandoned radio station, a Quonset hut, and millions of flies.

The fueling detail was run entirely by military convicts who opted for this duty instead of prison. Originally, Exmouth Gulf was intended to be a base similar to Midway Island. It had an airstrip and was the location of the Submarine Tender, USS PELIAS (AS14).

When the Japanese found out about Exmouth, they sent long range bombers and plastered the place. That ended Exmouth as an advanced base. The submarine tender, planes, and radio people all left and returned to Fremantle, Australia. The Lt(jg) in charge of the fuel barge donated three cases of Emu bitters beer from his meager supply of stores. He was a nice guy. That night we all had a large glass of beer with our evening meal.

After taking on enough fuel to sail 750 miles, we departed Exmouth Gulf under the guise of darkness.

On the morning of 30 December 1944 as we were nearing Fremantle, a large Aussie cabin cruiser came alongside and transferred mail, beer, milk, fruit and veggies to us. We dug into the goodies like starving animals.

As we continued on, the lighthouse outside Fremantle Harbor came into view. The city of Perth was 10 miles up the Black Swan River. The crew couldn't wait for liberty.

We stowed our sea bags at the Ocean Beach Hotel. Uncle Sam took care of the bill for the entire two weeks we were there. Many of the POW's we had rescued during our 3rd patrol were waiting to wine and dine us. All the newspapers carried the story about PAMPANITO rescuing 73 fighting men. They made us feel like celebrities.

In 1944 Australian society and technology was known to be at least 20 years behind ours. The outskirts of Perth reminded me of our old American western towns. While passing the King George Hotel, one of Perth's elite establishments, I observed a hitching rail outside the entrance. Saddled horses were tied to it. A Rolls Royce was parked nearby.

Because of a gasoline shortage the taxis pulled a charcoal burner or propane unit for propulsion. They ran well, but didn't have the power to travel up hills. It was common to see passengers pushing these vehicles up hills.

Several crew members and I went on a kangaroo hunt in Bindoon, Australia, 30 miles into the Outback. Our guides were boys from an orphanage run by a Monastery. We donated our five kangaroo kills to their meat supply. We stayed at the Monastery for two nights and indulged in wine supplied by the Monks. They were great hosts. In return, we left all our supplies with them. This included sixty pounds of canned goods and fifteen navy blankets and sheets.

Near the end of our stay in Aussie Land we had another memorable incident. PAMPANITO was tied up at an old dried up wharf which had 15 rickety warehouses on it. Facing us, approximately 300 feet away, was a Panamanian grain ship that had a fire smoldering for three days. Its cargo ignited from spontaneous

combustion. Fire fighters were unsuccessful getting the fire under control.

On the afternoon of the 3rd day, the freighter's side blew out causing the old wharf to start blazing. Men loading our mounds of stores fled the fast spreading flames. Those of us on the boat were trapped. Our only exit was blocked by a British Freighter anchored outboard of us. We only had junior officers onboard and they couldn't move the boat. The paint of the British freighter began to blister from the intense heat. Fortunately, two senior officers somehow got aboard and maneuvered PAMPANITO away from the fire with some of the burning wharf attached. The mooring lines were axed, sending the burning wood adrift.

We docked at another pier and continued to load our stores. The wharf was completely destroyed and the freighter sank along side the dock. Shortly after, we departed Australia en route to the Gulf of Tonkin on our 5th war patrol.■



OF PIGMIES AND PIRANHAS RUSSIAN MIDGET SUBMARINE DEVELOPMENTS

by Mr. Jim Bloom

Mr. Bloom is retired from tax law consulting, but has written extensively on military and naval historical topics over a 40 year period, with some 60 articles in military and naval journals and several encyclopedias. His book on the Roman-Jewish war was published in 2002. He lives in Silver Spring, MD with his wife.

It is not very well known that the Russian Navy operates midget submarines. Or at least it did up until a few years ago. Detailed descriptions, as well as tactical and technical characteristics, were found in the military and naval press and in the pages of *Janes All the World Warships* between 1989 and 1997. After that, we are told, the Russians laid up the two little vessels of this class in reserve. This is difficult to comprehend, as the leading designers of air independent propulsion (AIP) engines had, in 1991, perfected a propulsion unit expressly intended for the PIRANHAS.

It would be remarkable if the subs were indeed scrapped and the design defunct. In fact, the Russian model, called PIRANHAS, is far superior to counterparts listed in the inventories of rogue nations and the terrorist groups they support. Midget subs are among the favored instruments of the anti-Western jihad as well as the outlandish North Korean histrionics. It is possible that an improved PIRANHA, being assiduously hawked by the Russian shipyards, has secretly found its way into the hands of America-hating ultra national *mafiosi*. In 1996, one of Russia's criminal chiefs, Ludwig Tarzan Feinberg, was arrested in Miami while negotiating the purchase of a PIRANHA to smuggle drugs from Colombia to the Southeastern U.S. It is not implausible that someone else with international underground funding has managed to purchase this praiseworthy stealth sub. Moreover, recent interest was expressed by the governments of Indonesia and the United Arab Emirates.

Janes enumerated the particulars of the Pyran'ya (in the Cyrillic transliteration) from 1989, when they first appeared, up through

1997, after which they disappeared from view. According to the respected Federation of American Scientists *Military Analysis Network* the subs went missing because *the design was apparently not considered particularly successful*. I differ with this negative assessment. Before getting into the particulars of the PIRANHAS, it might be enlightening to know how the Russians even became interested in subs at the low end of the displacement scale.

It's a nautical enigma how today's Russian midget submarines, called PIRANHA, emerged full-blown in the late 1980s. During the heyday of the midget submarine in World War II, the only nations that were known to operate these stealthy diminutive craft were Italy which was paramount in their design and use, Japan, Great Britain and Germany. The then—Soviet Union built and operated ocean-going fleet submarines modeled after successful Kriegsmarine classes deployed in Wolfpack hunter-killer formations. After the war, the Soviets continued to adapt their wartime high seas models until the advent of nuclear powered strategic subs and sub-hunters in the late 1950s.

In late summer, 1942, the Germans, who had recently captured Sevastopol, invited representatives of their Italian ally to visit Feodosia in the Crimea to examine and give their opinion on a small submarine that had fallen into their hands during mopping up operations. Experts from the 11th Squadron of CB midget submarines of the Royal Italian Navy (*XI Squadriglia Sommergibili CB Regia Marina Italiana*) were quite shocked at the discovery, since they had assumed that they, the Italians, were supreme in this particular branch of naval science—i.e., the midget sub.

Evidently this sub had been a top-secret project in the USSR, code named Project APSS (special-purpose autonomous submersible vessel). Some idea of the radical nature of the design is derived from other Soviet documents that dub the project a *telemechanical submarine*, *radio-controlled TV-equipped submarine* and even a *telecontrolled self-propelled vehicle*.

APSS was a midget submarine with a surface displacement of 7.2 tons and underwater displacement of 8.5 tons, armed with one forward mounted torpedo tube. It could be operated in two basic modes: standard mode (by one man) and remote-control mode. The design bureau studied the possibility of controlling the submarine



from surface ships and aircraft (the so-called *drivers* under the latter mode. A special wave control was achieved by means of a *Kvarts* system installed on board the *drivers*. While utilizing the telemechanical mode, the sub carried a 500-kg explosive charge instead of a torpedo.

APSS construction began in 1935 at the Sudomekh Shipbuilding and Mechanical Plant in Leningrad. Two prototypes were built which underwent manufacturer trials in 1936. These concepts were quite bold for the time; in fact too audacious. A project report asserted that *the problem of the submarine remote control was far from being solved*. The robot concept was not confined to the midget subs. The bureau had a whole fleet of these ships: a destroyer, mine sweepers, and a torpedo boat as well as flying boats to carry out various experiments. The sub (APSS) project was never tested with these ships or with the aircraft. Both submarines were dismantled in 1936.

Later in 1936, the same department designed a second miniature submarine. It was designated APL (autonomous submarine) and nicknamed PIGMEI (Pygmy). Initially, this vessel was to be an autonomous undersea vehicle controlled from an aircraft as was the predecessor. However, continuing problems with the remote control convinced the office to concentrate on manned versions. In June of 1936 a prototype of the PIGMEI midget submarine was built in Leningrad.

The submarine was transported by rail to the design bureau base in Sevastopol on the Black Sea. In October 1936, PIGMEI, piloted by a young naval officer from the Black Sea Fleet, went through a whole range of experimental trials. Even though the PIGMEI sea trials disclosed flaws that needed to be worked out before commissioning, Red Navy leaders nevertheless decided to build a fleet of ten submarines of that class.

The first six boats were to be completed by the end of 1936, while the entire fleet was supposed to enter service in 1937. The construction of several PIGMEI submarines was launched at the Sudomekh plant in Leningrad. But due to reported design drawbacks and *the objective complexity of fundamentally new technological problems*, not a single boat was made combat ready. All of them were probably taken apart. Consequently, not a single production-

version PIGMEI-type midget submarine entered service and ultimately there was only one experimental PIGMEI midget submarine in the Navy.

The PIGMEI was 16 m (52.8 feet) long and 2.62 m (8.65 feet) wide and had a standard surface displacement of 18.6 tons. It could develop a maximum surface speed of 6 knots and a maximum underwater speed of 5 knots. The boat's full-speed range amounted to 290 miles on the surface and between 18 miles (full speed) and 60 miles (economical speed) underwater. The boat's maximum diving depth was limited to 30 m (100 feet) and its maximum endurance was about three days. Pigmei main armament included two 450mm (18 inch) 45-15 type torpedoes fired from side rack-type launchers. In addition to it, the submarine four-man crew was armed with a 7.62mm machine gun.

There were just a few more experiments with compact submersibles before the German onslaught. After the abortive APSS and PIGMEI projects, the same designers produced a new blueprint: a small submarine with a standard surface displacement of 60 tons. By that time, however, the VI-series (Malyutka) small submarines, with a standard displacement of 158 tons, had been in serial production for several years. The Malyutka transcended the 60-ton *Ostekhbyuro's* submersible vessels in terms of seaworthiness and habitability, although it had a long way to go in those respects. Consequently, Russia's third underwater compact vessel project, like the first two, fizzled out.

It is likely that given a couple of years more, the *Ostekhbyuro* (agency charged with design and development of the secret craft) might have produced a successful minisub. Just about all of the bureau's top officials, including those directly involved in design and testing, fell victim to the Stalinist Purges of 1937-38. The Show Trials alleged that the chief designer's blueprints were treasonously deliberately flawed.

On the outbreak of World War II, the People's Commissariat of the Navy (NK VMF) described PIGMEI as an experimental submarine, neither officially commissioning it nor assigning it to a fleet. Some sources, state that PIGMEI was left at the former *Sevastopol Ostekhbyuro's* base in Balaklava, while other sources say that it was transferred to Feodosia and kept at the NK VMF naval

armament test base. In any event, in the summer 1942, the Germans captured PIGMEI and nobody can say where the boat is now.

As noted above, in August 1942, PIGMEI was shown to Italian submariners. They described it in their records, and it later attracted the attention of Italian naval historians. According to the naval history department of 11th Squadron of CB midget submarines of the Royal Italian Navy:

It was the newest unit in the final outfit stage. Its dimensions did not differ much from those of the Italian CB-type submarine, but its hull was better proportioned and longer. The submarine trapezoidal house was rather large but narrow. There were two long recesses at the boat's hull mid-height which served to accommodate torpedoes.

So far no reports have been discovered about the submarine being found either ashore or sunk at sea after the liberation of the Crimea and the rest of Russia Black Sea region. Reliable authorities maintain that the Germans had tried to transport it from the Crimea to Germany. They were motivated to import the sub because they were actively involved in the development of their own midget submarines at that time and welcomed the acquisition of the advanced Russian design. Nobody has discovered any records that German shipbuilders inspected the captured Soviet midget submarine. It is likely that its new owners abandoned PIGMEI somewhere on the European railways. Thus it happened that in 1945 the first midget subs formally commissioned into service with the Soviet Navy were German *Seehunds* (Seals) captured by the Soviet Army. The SEEHUNG is arguably Nazi Germany most successful, or at least promising, midget submarine design. It is interesting to speculate whether or not the Germans may have had the benefit of data obtained either directly or from the Italian inspectors in formulating their SEEHUND concept.

It is thus inaccurate to say that the Russians were novices in the field of minisubs when PIRANHA was first noted in 1989. In fact, they had already been experimenting with bantam subs in 1918.

NATO designated the PIRANYA (Project 865) or Piranha as *Losos*. It is about 95 feet long, with a 16-foot beam and 17-foot draft.

It displaces 218 tons surfaced and 390 tons submerged. It was intended for special operations and to engage surface ships located offshore out to and even beyond the 200-mile economic belt. It is very durably built and is almost completely silent. The hull is comprised of a titanium alloy, which reduces the effectiveness of enemy mines. It is especially suited for deploying divers on sabotage missions. The divers remain in contact with the submarine, which is capable of supplying them with oxygen for breathing and with electricity and warmth. The sub four-man navigational crew is able to monitor to ensure that the swimmer underwater equipment is operating properly. The PIRANYA 1200 kW lead-acid batteries allows the submarine to remain underway for ten days and the submarines at sea replenishment capabilities allows the submarine within 8 hours to receive enough food, fuel and lubricants, and air for an additional ten days. In 1991 the St. Petersburg-based Special Boiler Design Bureau (SKBK) completed development of the Kristall-20 AIP system for the PIRANHA. The AIP underwent comprehensive testing and was accepted by the customer—the Ministry of Defense. However, the Federation of American Scientists asserts that AIP systems were never installed in submarines due to reductions in defense spending.

Nonetheless, in May of 2000 the Russian Navy announced a new upgrade in the PIRANHA mini-submarine, though the intended client was not specified; the report stated that the PIRHANA was used for reconnaissance and hit-and-run raids. While not specific, it is likely that the improvements entailed the installation of an improved version of the Kristall-20 AIP propulsion system developed in the early 1990s specifically for the PIRANHAS. The Malachite Design Bureau in St. Petersburg was actively promoting sales of the PIRANHA as recently as the end of 2005. The press releases are coy as to any purchasers—as successful bidders would most likely not want it known that they had such a potent implement of war in their arsenal.

However, some interested customers include the United Arab Emirates, Saudi Arabia and Indonesia. The last named nation in particular was quite interested in purchasing some of the improved models as a way of patrolling the notoriously pirate and terrorist infested Straits of Malacca. The Malakhite Design Bureau and the

Russian naval export consortium were also negotiating with France to co-produce the PIRANYAS, but as of late 2005, they were awaiting the approval of the French authorities.

More recent versions of the PIRANHA, such as the PIRANHA-T are on a par with such successful contemporary craft as the Italian designs of the Kosmos midget submarine being purchased by Iran, North Korea and agents for the Palestinian groups. The T is about five feet longer than the original and displaces about 20 more tons. Its range is stated as 2000 miles on the surface and 260 dived, both at economical cruise speed. Operational endurance is given as 20 days. There is a crew of four plus up to six combat swimmers who utilize propulsion gear stowed in recessed pods along the upper hull, which also contain airlocks for the disembarkation and recovery of the swimmers. The original PIRANHA is also among those offered for sale, but the specified 1450 mile surface and 250 mile submerged radius is an improvement over the specs listed in *Janes* for 1995/96, the last time the boats were mentioned.

As for the actual method used to deliver the combat swimmers to their designated targets, the literature is rather vague, only noting that the men and their equipment are carried in external pods on the sub's hull and that the swimmers remain tethered to the sub during the mission, whether by a form of cable or perhaps a signal. The unspecified tethering method provides the swimmers with oxygen and warmth while the PIRANHA provides navigational and other mission support. It is possible that some form of modified SCUBA or wet suit system is used, though the boat-swimmer link and the relative comfort of the swimmers indicates that the commandoes are more protected than is the case with SCUBA; the ability to launch the swimmers at depths up to 200 feet (the sub's maximum navigational depth is just short of 700 feet) indicates that an innovative type of airlock chamber is used.

For comparative purposes, a word is in order about the US Navy Advanced Seal Delivery System (ASDS). Prior to the development of the ASDS in the early 1990s, the SEAL delivery teams have been using the wet submersibles called the SEAL Delivery Vehicles or SDVs. With the SDVs, however, SEALs often have to spend extended periods of time in cold ocean water during long offshore transits, donning only a wet or a dry suit. They would thus arrive at

their shoreline landing points exhausted, cold and not at their best form.

Promotional material for the ASDS provides the following information:

The ASDS is battery-powered, shock-hardened and stealthy. It is approximately 65 feet in length, 8 feet in diameter and weighs 60 tons. It can be transported in C-17 or C-5 military cargo airplanes. When it's attached to a submarine, it can submerge in waters as deep as 800 feet. The main electric propulsion system is used for high-speed transit and a thrusting capability is available for low-speed maneuvering. The ASDS can travel at approximately 8 knots to about 125 nautical miles.

The pilot is an experienced submariner, and a SEAL navigator sits next to him. Additionally, the ASDS can carry six to eight fully equipped SEALs.

The submarine platforms that transport the ASDS will be specifically configured SSN 688-class boats. According to the Rand report, two 688 SSNs are currently being modified for this mission. The mini-sub has a hyperbaric chamber that is used to lock swimmers in and out from a bottom hatch at a variety of depths. It also serves to create a passageway to the host submarine-mating trunk when the ASDS is attached to the submarine's hull. ASDS sensors include multiple sonars and its navigation system has both a global positioning system and an inertial guidance system.

It can be seen that this operational concept differs from the PIRANHA design in that the ASDS will only accommodate its two crew and 6-8 SEAL's for the transit between an offshore position of the large mother sub and the target. The SEALs can be discharged while the vessel is submerged, but in relatively shallow waters. With a maximum range of 125 miles, or a maximum onboard stay of around 12-15 hours it is more of a ferry than an autonomous vessel. As such, it is admirably suited to the task. This is an updated version

of the system used by the celebrated British X-craft in World War II. They were towed to their target and on arrival, a combat crew would be substituted for the transit crew. The PIRANHA, on the other hand, is to serve as both lodging and delivery vehicle for the 3-4 man crew and 5-6 combat swimmers for patrols of up to three weeks and passages of up to 2000 miles, allowing for one at-sea replenishment operation. In fact, the berthing and messing facilities for the 10-man crew are comparable to a full-sized ocean-going boat. The PIRANHA could be more properly described as a coastal submarine. In fact, that is the concept behind the design. The PIRANHA is intended to operate on the coastal shelf, where depths rarely exceed their 650 foot submergence limit.

The U.S. model is better adapted to clandestine insertions on a hostile shoreline, while the Russian counterpart is more suited for patrolling terrorist or pirate-infested straits and attacking enemy shipping or port facilities at chokepoints at a distance from the host country. The external panniers atop the hull accommodate the diver/swimmer equipment as well as torpedoes and/or mines, and latterly, short-range anti-shipping or ship-to-shore missiles. Accordingly the PIRANHA is more suitable for the anti-shipping function, albeit on a limited hit-and-run mission. Most worrisome is the use of such a potent sabotage weapon by terrorist networks. Fortunately, such groups have thus far been unwilling or unable to operate and maintain the PIRANHA.

All indications are that the PIRANHA, like its namesake PREDATOR FISH, is very much alive and deadly.■

THE DISTORTED HISTORY OF USS PUFFER (SS268)

by Mr. Craig McDonald

My father was on PUFFER during WWII, I became interested in the history of PUFFER around 1999, near the 100th anniversary of the U.S. Submarine Service. I have compiled and written the history from primary sources: PUFFER Vets' interviews, war patrol reports, letters and diaries from the period, and other documents written by the crew.

In the six year process of researching and writing a history of PUFFER, I have discovered an error in the initial writing of the boat's history. The written history began with the unpublished United States Naval Administration in World War II—Submarine Commands compiled and written in 1945 and 1946 by Richard G. Voge, W. J. Holmes, W. H. Hazzard, D. S. Graham, and H. J. Kuehn. It was later published in 1949 in condensed form as United States Submarine Operations in World War II by Theodore Roscoe. Both suggested a large number of crew members were transferred from PUFFER after the first war patrol. Hard data will prove the historians wrong. The events during the first war patrol of PUFFER that led to this false conclusion are open to interpretation. I have interviewed crew members that were there and read the history, and will give my interpretation of the events.

There are four questions that must be answered to clarify the history. The answers to the first and second questions are intimately related.

1. Did Commander Jensen or other officers mentally lose control of themselves, of the crew, or both? Similarly, did some crew members fail to follow orders or lose control of their mental faculties?
2. Were the officers and crew broken up?
3. Were other crews broken up after similar situations?
4. Were new crew members welcomed or shunned?

After torpedoing a tanker, a severe depth charge attack by the escort forced PUFFER to a depth in excess of 500 feet. The boat was submerged for nearly 38 hours. The crew hung on enduring additional depth charges, sauna like temperatures and humidity, lights and hope faded as the batteries died, and oxygen in the air dwindled.

1. In order to conserve oxygen men were ordered to lie down in their bunks. For a man in a hypoxic environment (low oxygen) to return to activity was very difficult - it was both mentally and physically painful to merely return to a standing position let alone to do work. Men were literally unable to stand their watches. The ability to follow orders was more *could not* than *would not*. As the effects of adrenaline (insomnia, mood changes, helplessness and depression) heightened the mental consequences of hypoxia (negativity, indecision, disorientation, and belligerence), the Commanding Officer and some crew members became morose. Some men were angry at first and later gave up any hope of survival. Four crew members totally lost control of their mental orientation.

Thirty one hours into the ordeal, Jensen complimented the crew in the war patrol report:

Due to tension, bad air, heat, humidity, hard work on the bucket brigades, etc. the crew were practically out on their feet, but carrying on like veterans.

A decision had to be made. Reasoning and emotions were affected by the low oxygen condition. Commander Jensen, unable to make a decision, decided to take a vote among the officers and crew with three choices: a) scuttle the boat; b) fight it out with the deck gun; and c) wait it out until darkness. Democracy became anarchy as emotions ran wild and crew members argued for their choice or could not decide. Somehow the decision to wait until darkness prevailed. Jensen retired to his cabin for a few hours rest with the words to the crew, "I've done all I can do boys. If you know how to pray, pray." These words further demoralized the crew. Although in a state of extreme exhaustion other officers and crew, who had remained active, sustained a better mental orientation and persisted.

To Jensen's credit he directed PUFFER and crew as it surfaced, evaded the waiting escort and returned the boat to Darwin.

The original historian on Voge's staff (H. J. Kuehn interviewed Jensen) alluded to the problems Jensen and some crew suffered under the physically harsh and mentally stressful conditions. The history stated:

Be careful and slow to form an estimate of men's value until he had been observed under stress. To a great extent the men who were on their feet, working to save themselves and the ship, when the long dive was over, were not the normal leaders of the crew.

According to Blair in *Silent Victory*:

When PUFFER came into port, Christie had nothing but praise for the ship and her captain. He wrote in his diary that 'strength of character...skill and experience and knowledge, the excellent state of training, saved the ship...A brilliant job carried through by guts, determination and the inspired example of the Commander Officer.'

Christie's staff, meanwhile, conducted a thorough investigation of the episode. Those taking testimony then discovered the extent to which Jensen had lost control of the crew.

2. Commander Jensen was relieved of his command. That fact was certain. The statement that the officers and crew were scattered is false.

The original history text by Voge and staff reported:

There were several important suggestions by the officers. When a submarine had gone through such an experience, the crew should be broken up. The common experiences of such an ordeal knits them together in such a bond that no one else can penetrate the inner circle. Men who subsequently made several patrols on PUFFER were still not members of the gang, if they hadn't been through "THE depth charging."

Why did the original historians invent a break up of the crew, when it simply did not happen? Are officers included in the *crew*? Why was the psychological bonding effect on the crew invented to justify the break up of the crew? I conjecture it was the desire to present immediately after the war as positive an explanation as possible and avoid including the negative aspects of the first patrol events. A *scientific* explanation served well by diverting attention from the real command issue and enlarged the situation to include the crew.

Roscoe paraphrased the original text; the bond became stronger as *knits* became *welded*; the *officers* became *PUFFER's officers*.

PUFFER'S officers arrived at a number of conclusions, and these were noted by Force Command. When a submarine had gone through such an experience, its crew should be broken up. The sharing of PUFFER's ordeal welded her men in a fraternal, almost mystic bond, and no new comer was able to penetrate the inner circle. Men who subsequently made several successful patrols on PUFFER were still 'outsiders'—not members of the gang. They hadn't been through "THE depth charging".

From the first two accounts it is not completely clear if Submarine Command took action. Command took *suggestions* and *noted* conclusions from PUFFER officers. However, Blair in *Silent Victory* amplified on the earlier texts, made the breakup a reality, and extended the breakup of the crew to explicitly include the officers. "In view of this and other factors, one PUFFER officer suggested that the wardroom and crew be scattered to other boats." Blair continued by quoting a letter (written in the early 1970's) by Frank Gordon Selby, the new Commanding Officer of PUFFER, "...I had at least a 50 percent turnover in officers and in crew." With the addition of this information, the scattering of the crew and officers became a *reality*.

The record shows there was less than a 50% turnover in officers. Lawrence Bernard was supposed to stay on PUFFER, but was replaced four days before the start of the second war patrol. Bernard had been taken off the S-39 a year earlier with pneumonia like

symptoms. His breathing problems returned after the extended submergence of PUFFER. Selby very nearly had only one new officer. Excluding the change in command, PUFFER received a two out of six new subordinate officers, Frank Golay and S. Morrow Decker. Franklin Hess, Carl Dwyer, William Pugh and Kenneth Dobson remained. In reality the suggestion to scatter the wardroom was ignored and greatly exaggerated.

Selby's sentence quoted by Blair was structured in such a way that it was easily interpreted to mean at least 50% of the enlisted crew was transferred. In the nearly 30 years that passed between 1943 and the early 1970's, Selby may have read and believed the two earlier histories of PUFFER, re-circulating and confirming the inaccurate transfer assumption back to Blair. John Allen (MoMM2c), interviewed by Blair, estimated a 25% turnover in the crew, but Blair ignored his recollection.

My father joined PUFFER for the second war patrol. As a result of researching his history on PUFFER, I found the muster roll lists simply do not verify the scattering of the crew. The muster reports clearly show that only 20 of the 71 crew (about 28%) were transferred to new construction, other submarines, or relief crew duty. Five of the 20 returned to PUFFER after a one patrol respite. At this time in the war with an expanding number of boats, about 25% of a crew was routinely rotated off a boat after a war patrol—PUFFER'S total was only two or three more than typical. Four crew members had broken down mentally under the stress of the first patrol—they probably accounted for the slightly larger than usual number of men transferred.

Even though the muster rolls were available to recent authors, the transfer of PUFFER crew persisted as reality. William Tuohy, Pulitzer Prize winning author, in *The Bravest Man—The Story of Richard O'Kane & U.S. Submariners in the Pacific War*, also relied heavily on the Voge text in 2001. Tuohy paraphrased the original text and revived the breaking up of the crew.

The Force Command concluded that when a submarine had been through such an ordeal the crew should be broken up; otherwise newcomers would be considered 'outsiders' by those who went through "THE depth charging".



The myth was repeated in 2006. In an extremely well documented text Michael Sturma in *Death at a Distance—The Loss of the Legendary USS HARDER* concluded PUFFER transfers had occurred. Sturma wrote, citing Blair and Roscoe, "The PUFFER's captain was subsequently relieved of command and more than half of the crew reassigned to other submarines."

3. In *USS PAMPANITO: Killer-Angel* published in 2000, Michno paraphrased Roscoe's account of the first patrol. His account leads a reader to believe the entire crew of PUFFER was sent to other boats or duties.

In fact, after the depth charging PAMPANITO took, it was possible that her entire crew might be redistributed. Such was the experience of USS PUFFER (SS268) ...after studying the situation, submarine command determined that when a boat had gone through such an experience, its crew should be disbanded and sent to other boats. The sharing of the ordeal welded the men together in a mystic bond, and no newcomer would ever be able to penetrate the circle, for he had not gone through the experience.

PUFFER's crew, PAMPANITO's crew, and no other crew underwent a complete dispersion during the war.

4. 72% of the crew continued on the second war patrol. My father, Donald B. McDonald (S2c) joined the crew for the remainder of the war. He was welcomed to the forward torpedo room by Fred Clouse (TM2c), William Willie Wilson (S1c) and Russell Tidd (S1c). He did torpedo training as Mike Punchy Kutscherousky's (TM2c) understudy. Jobs still needed to be done; the *outsiders* were as important to the survival of the boat as *THE* first war patrol crew. There was not talk about the first war patrol; it was the *Silent Service*. After a year and a half, dad still knew virtually nothing about the first war patrol. Wilson did not talk about it during seven war patrols; dad did not ask about it. Dad suspected the crew had been ordered not to talk about it. But dad found no mystic bond among the crew.

Selby wrote in the Personnel Section of the second war patrol report:

The crew conducted themselves like the veterans they are. No Commanding Officer could ask for a finer group of men to work with. It is considered remarkable that only two or three of the crew were still showing signs of the nervous ordeal they underwent on the previous patrol. These men will be left in for a rest.

Of the seventeen new men who came aboard without previous war patrol experience all but two fitted into the crew very nicely. The high caliber of firemen received was particularly noted. The two mentioned are not temperamentally qualified for submarine duty and will be so designated.

Selby's endorsement of the crew spoke highly of the first patrol crew, verified the small number of new men who came aboard for the second patrol, and debunked the mystic bond myth. Fifteen of the new crew members were welcomed and *fitted into the crew nicely*.

The continued historic inaccuracy that the officers and crew of PUFFER were dispersed must be corrected. This myth, which has been propagated by various authors, casts a shadow on the heroic actions of the officers and crew members who saved PUFFER. These actions should not be forgotten or in any way diminished.■

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SUBMARINE NEWS FROM AROUND THE WORLD

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From the January 2006 Issue

SOUTH KOREA - Timetable for Future Procurements

In early January 2006, AMI received information from industry sources concerning major programs for the Republic of Korea Navy (ROKN). The information received updates current and future programs that are identified in AMI International's South Korea country report as well as new programs that have been identified as of January 2006. Highlights include:

- The KSS-II submarine program (Type 214) has been expanded from six to nine units. The first three units will be completed by 2010 with six additional units under later MTDPs 2010-2015 and 2016-2020.
- A new submarine program identified as KSS-III will be started beginning in 2010 and will end in 2022. Sources indicate this program will run in parallel with the final units of the KSS-II. Indications are that this is the 3,500-ton SSX submarine program that will be designed indigenously.

INDIA - Naval Update

DSRV Program:

In late January 2006, AMI received information that the IN was in final contract negotiations with Ocean Works International of Canada for a Remotely Operated Rescue Vehicle (RORV) system. The RORV was apparently chosen to satisfy the IN's DSRV requirement. It appears that a construction contract would be complete by late 2006 or early 2007 for the acquisition of one RORV although a second unit could be ordered at a later date. The first unit could be ready for service by 2008.

The RORV is tethered to the surface by an optical/electrical

umbilical cord with all command and control being done by pilots on the surface. The RORV is a manned pressurized vehicle built to carry two crewman and up to sixteen rescued personnel. The RORV configuration was initially developed for the Royal Australian Navy (RAN) REMORA rescue system delivered in 1995. The same RORV is also being developed for the US Navy, which is called the Pressurized Rescue Module System (PRMS).

INDONESIA - Searching for More Combatants and Submarines

Reporting in early January 2006 indicated that the Indonesian Navy (IN) continues its search for additional surface combatants and submarines in order to modernize its fleet. The IN is currently operating under a US\$1.95B ten-year (2004-2013) modernization plan that began in 2003. The first acquisition under the ten-year plan occurred in January 2004 when an engineering and construction contract was signed on 06 January 2004 between the IN and Schelde Naval Shipbuilding for up to four new Sigma class corvettes with the option contract for units three and four signed on 30 January 2006 with deliveries scheduled in 2008.

Reports also indicate the IN is still investigating the acquisition of additional submarines in order to add to its current Submarine Force of two Cakra (Type 209) class submarines. Naval requirements call for a fleet of at least six submarines. Indonesia considers Germany the premier submarine builder in the world. This follows the logic train for the procurement of Chang Bogo (Type 209) class submarines from South Korea, which was reported in 2003. Although not final, the IN was in negotiations with South Korea for at least two units of the Chang Bogo class when they could possibly begin decommissioning at the end of the decade, when South Korean Type 214s start entering service.

CHINA - Russian Deliveries, Round Two

On 2 December 2005, the third Kilo class (project 636) submarine of an order for eight was officially turned over to the Peoples Liberation Army - Navy (PLAN) at Severodvinsk, Russia. A second submarine was turned over on 30 December 2005 in a similar ceremony. The project 636 submarines are equipped to fire torpedoes as well as the Klub-OS anti-ship missile.

On 03 May 2002, the People's Liberation Army-Navy (PLAN) concluded a US\$1.5B contract with Russia's export agency, Rosoboronoexport for eight Kilo (Project 636) class submarines. All eight units of the class are scheduled to be delivered by 2007. This procurement follows a 1994 deal in which four units of the Kilo class (two Project 877EKM and two Project 636) were delivered to the PLAN from 1995 through 1998.

The final four units of the US\$2B order are being constructed at Admiralteiskie Verfi FGUP and will be delivered, two in 2006 and the final two in 2007.

The second wave of major surface combatant and submarine deliveries to the PLAN seems to reinforce China's two-track policy of procuring foreign systems while at the same time developing its own technological base in order to further develop its indigenous capabilities to produce modern warships as well as their associated systems. Acquisition of Russian Sovremenny destroyers and Kilo submarines in conjunction with location production of Yuan class submarines, Type 051 and 052 class destroyers and Type 054 class frigates indicates that the PLAN is beginning to benefit greatly from this policy.

VARIOUS - Did You Know?

- **PORTUGAL** - On 07 December 2005, the Portuguese Navy decommissioned the Albacora (Daphne) class submarine FEFIM (S 166).
- **UNITED KINGDOM** - On 21 December 2005, the Royal Navy (RN) decommissioned the Swiftsure class submarine SPARTAN (S105).

ATLAS ELEKTRONIK PURCHASED

On 30 December 2005, it was reported that both European aerospace group EADS and Germany's ThyssenKrupp Technologies would acquire sonar equipment maker Atlas Elektronik from BAE Systems. It is reported that the companies will purchase Atlas Elektronik for a total of US\$172M. ThyssenKrupp will hold a 60% stake in the company, with EADS acquiring the remaining 40%.

BAE Systems had put Atlas up for sale in early 2005, with bids coming from EADS, ThyssenKrupp, and Thales. However, Thales

encountered some political objections to a foreign firm obtaining a majority stake in the company. The sale comes at a time when Europe's shipbuilding industry is being forced to consolidate in response to stiff global competition.

ThyssenKrupp had already purchased the German submarine manufacturer HDW in 2004. This latest acquisition of Atlas is a further step in the consolidation of Europe's shipbuilding industry. This is further evidenced by the fact that Thales acquired a 25% stake in French shipbuilder DCN in early December 2005.

With the recent release of the UK's *Defence Industrial Strategy* (DIS) in December 2005, it is evident that the European shipbuilding industry is also realizing the need to consolidate in order to better compete on a global scale. It can be expected that in the coming years, the shipbuilding industry as a whole will continue to consolidate with companies such as EADS, ThyssenKrupp, Thales, and BAE Systems leading the way.

From the February 2006 Issue

THAILAND - Naval Requirements Revealed

In early February 2006, AMI received information concerning the Royal Thai Navy's (RTN) equipment requirements through 2016. The requirements include surface vessels, submarines, aircraft and missile systems that are being planned by the Thai Naval Staff. However, due to the limited funding that is expected over the next decade, it can be anticipated that some of these programs will not occur in the window identified by the sea service. It is also possible that some of these requirements will be met by the used international market even though the RTN typically procures new equipment.

- Two submarines from 2012 through 2017. This requirement has come and gone with the change of Navy chiefs. The current requirement calls for two diesel submarines displacing up to 2,500 tons with the ability to attack surface and subsurface targets as well as perform mine-laying and special forces operations. Assuming that the two frigates and four OPVs are fully funded and near completion, it is possible that the RTN could procure two submarines toward the end of the timeframe and will probably require a special funding package, similar to the frigate program. The RTN could also utilize the used

international market to meet this requirement and has considered used submarines in the past.

PAKISTAN - Looking for New Submarines

Press reporting in early February 2006 indicates that the Pakistani Navy (PN) is in consultations with Direction des Construc-tions Navales (DCN) of France for the design of up to five new construction submarines. Pakistan has a requirement for a new submarine class to follow the third Khalid class (AGOSTA 90B) that will be commissioned in 2006. The requirement is for up to five submarines that are Air Independent Propulsion (AIP) capable.

The PN has an immediate requirement for additional submarines as the sea service decommissioned all four units of the Hangor (Daphne) class (HANGOR, SHUSHUK, MANGRO and GHAZI) submarines in December 2006. The PN Submarine Force now consists of two HASHMAT (Agosta) and two KHALID (Agosta 90B) class submarines in commission with a third KHALID expected to commission by the end of 2006.

Sources have identified the new design as the MARLIN. Although details on the MARLIN design are not public, it could possibly be an offshoot to the successful SCORPENE design, which has resulted in two export sales (Chile and Malaysia). DCN appears to be the latest stop for Pakistan in its quest to obtain new-construction submarines. AMI has received information that the sea service has also approached Navantia of Spain, ThyssenKrupp Marine (HDW) of Germany and China concerning new construction submarines.

In the case of DCN, Navantia and HDW, reporting indicates that there may be several sticking points that could very well stall any near-term construction program. First and foremost is funding. Fresh off an April 2005 contract for four F22P frigates from China, the PN financed the entire US\$750M program through Chinese sources. In order to procure new construction submarines in the near term, Pakistan would again require an extremely attractive financing package.

A second sticking point in regards to DCN is the transfer of weapons to Pakistan. Sources indicate that DCN has yet to receive permission from the French Government to offer the MARLIN submarine to Pakistan. Apparently most recent applications to

transfer weapons to Pakistan have been vetoed by the government's high-level defense sales panel (Commission Interministerielle pour l'Etude des Exportations de Matériels de Guerre) on the grounds that such sales could heighten tensions between Pakistan and India.

Although the press reports cannot be confirmed, it is evident that Pakistan is in the market for new and used submarines to bolster its fleet following the commissioning of the third and final unit of the Khalid class in 2006. AMI received information in January 2006 that Pakistan was also looking into used-ship possibilities to fulfill its near-term submarine and surface combatant requirements.

For submarines, Pakistan was apparently considering the German Type 206A submarines as an interim replacement for the four Hangor class that were decommissioned in 2005. Although the German Type 206A submarines and Pakistani Hangor class were built in the same time frame, the German Type 206s are probably in much better material condition than the Pakistani submarines, and could provide the sea service with a dependable platform until new submarines could be procured.

From the April 2006 Issue

IRAN — Various Capabilities Demonstrated

In April 2006, the Iranian Navy (IN) conducted the naval exercise *Holy Prophet* in the Arabian Gulf and Strait of Hormuz. During the exercise, the Iranian Government made a point of televising portions of the exercise in order to highlight its newest hardware to the world. Likely geared at showing the US and its allies that Iran truly is a force to be reckoned with, press coverage was provided for the following systems:

- **NAHANG Class Coastal Submarine:**
First introduced on Iranian national television on 07 March 2006, the first indigenously built submarine was unveiled in Bandar Abbas. The submarine NAHANG 1 (Farsi for whale) is approximately 20 meters (65.6ft) in length, displaces around 100 tons and will be manned by a crew of four.

Although relatively small, the submarine is reportedly able to launch both torpedoes and anti-ship missiles. The likely load out for the NAHANG I is two weapons. The submarine is said to be diesel-electric and "fully adapted to the Persian Gulf" according to Iranian Admiral Sajjad Kouchaki. The small size makes it an ideal weapon for use in the shallow and restricted waters of the Strait of Hormuz as well as in the Arabian Gulf.

It is likely that following successful sea trials, the IN will build up to 5 additional units of the class.

- "Hut" Rocket Torpedo: Two tests in early April of Iran's newest underwater weapon show a conical shaped rocket powered torpedo similar to Russia's Shkval torpedo.

The weapon, fired from a test barge was said to have reached speeds of over 100 meters per second (200 knots) and carries a significant warhead. Footage from the test showed the torpedo entering the water and travel at extreme speeds toward a target vessel. Within just a few seconds, the weapon hit the target, which was destroyed.

From the May 2006 Issue

ALGERIA—Russian Submarines Ordered

On 18 May 2006, press reporting indicated that the Algerian National Navy (ANN) had agreed to procure two Kilo class (636) submarines from Russia for an estimated US\$400M. The deal between the ANN and Russia's Admiralty Shipyard is scheduled to be concluded by the end of June. The first submarine will begin construction by the end of 2006 followed by the second unit in 2007.

Part of the agreement includes the modernization of two Kilo class (877EKM) submarines currently in service with the ANN. The submarine agreement follows the mid-March 2006 announcement by the new Navy Commander General Malek Necib (assumed command in Aug-Sep 2005) that the sea service would soon begin acquiring new equipment for its maritime force (frigates, corvettes, FAC and submarines) as well as the modernization of existing units.

Although the source for the new naval equipment was not announced in March 2006, it was known that Russia made an offer to General Necib upon assuming command of the ANN in late 2005. The Russian offer included new construction Kilo class submarines, Steregushchiy class corvettes and up to fifteen new FAC.

It appears that the new Navy Commander's plans to re-equip the sea service is beginning to move forward although the total package will primarily depend on how long Algeria's oil and natural gas windfall lasts. As an example, it was anticipated that the ANN would only modernize its existing Kilo's in the near-term with a new construction replacement in the next decade. With a new Commander combined with oil and natural gas revenue, the ANN is procuring two new construction units immediately while modernizing its two existing units at the same time.

From the June 2006 Issue

PAKISTAN — French Gov't Clears Armaris Submarine Offer to Pakistan

Press reporting in June 2006 indicates that the French Government has cleared Direction des Constructions Navales (DCN) (under Armaris) to offer three new construction submarines to Pakistan. In February 2006, DCN offered its newly designed Marlin class submarines (based on the Scorpene design) to Pakistan, however, the French Government would not approve the sale.

The sticking point in February was the French Government's disapproval of DCNs and other recent requests to transfer arms to Pakistan. Apparently most recent applications to transfer weapons to Pakistan have been vetoed by the government's high-level defense sales panel (Commission Interministerielle pour l'Etude des Exportations de Matériels de Guerre) on the grounds that such sales could heighten tensions between Pakistan and India. However, it appears that the French Government has had a change of heart in regards to the transfer of weapons to Pakistan and will now allow the sale to go through. This change is probably related to the completed contract between Armaris and India for the procurement of six Scorpene class submarines for the Indian Navy. With that contract now complete, the French Government and Armaris now likely feel

it will not offend India, although this is still a possibility.

DCN received its official invitation to bid from Pakistan on 10 May and is now the latest supplier to compete for the Pakistani Air Independent Propulsion (AIP) capable submarine program. Reporting indicates DCN will join Navantia of Spain, ThyssenKrupp Marine (HDW) of Germany, Fincantieri of Italy, China and Russia as potential suppliers concerning new construction submarines.

Pakistan has historically utilized France as its supplier of submarines receiving the Hangor class (Daphne) in the early 1970s, the Hashmat (Agosta) class in the late 1970s and the Khalid (Agosta 90B) since 1999. These submarine deliveries were prior to the testing of a nuclear warhead by Pakistan in 1999 and the subsequent stringent French Government reviews on the export of weapons to Pakistan and India by French companies.

Since DCN has now been cleared to offer its Marlin design to Pakistan, they will more than likely be the leading contender for the program since France has been the leading developer of the Pakistani submarine service since its inception. However, other contenders may still be in the running if they can offer an extremely attractive price and financing package or can take advantage of potential sticking points in a DCN-Pakistan deal.

Even considering French Government approval, there are still several potential sticking points that may arise, with the first being an objection by India. India, although just completing the Scorpene deal with DCN, still has several major arms acquisitions in which French companies are contenders. India in retaliation, could select alternative suppliers rather than the French solution. A second point could be if Pakistan requests a technology transfer agreement for the Marlin class. DCN would probably not look favorably on transferring technology on its latest submarine design.

A third yet small sticking point for Armaris could be the announcement by the Pakistani Navy that it prefers to utilize the US-built Harpoon anti-ship missiles (ASM) in the Marlin class rather than the French MM 40 Exocet. Armaris will attempt to utilize an all-French solution in this program although it may have to accept an almost all-French solution. Earlier in 2006, Pakistan requested up to 130 Harpoons from the US including 30 units of the submarine launched version.

Based on the official release date of May 2006 for the invitation to bid in the program, a design selection could be made by 2008 with a construction contract for the program by 2009 assuming there are no more sticking points.

BANGLADESH — Submarine Procurement Close to Fruition?

Press reporting continues to indicate that the Bangladeshi Navy (BN) is in the process of acquiring submarines. Reporting from late June 2006 indicates that Pakistan may be the source of the submarine procurement, and two of the recently decommissioned Pakistani Hangor class (Daphne) submarines are being offered to Bangladesh.

Comments by the Bangladesh Ministry of Defense (MoD) since 2004 indicate that the sea service was considering a multi-dimensional fleet that included the procurement of submarines. In early 2006, MoD officials publicly acknowledged that the BN was in the process of acquiring a single submarine and that a crew was already being trained to operate the vessel. The most recent press reporting in June 2006 suggests that two units of the Hangor class were offered to Bangladesh when the Bangladesh Prime Minister visited Pakistan in early February of this year.

Although the price and term of agreement have not been made public, it is known that the Pakistani's will refurbish the two units (more than likely the ex-MANGRO and ex-GHAZI) at the Karachi Shipyard & Engineering Works Ltd (KSEW) prior to transfer to the BN. Both submarines were built in the 1960s and considered antiquated by any standard.

However, Bangladesh's options for a Submarine Force is extremely limited due to historical budget shortfalls and the fact that the sea service has no experience in operating submarines. Bangladesh probably considers the offer to good to pass up, with Pakistan providing the submarines, the refurbishment and the training at probably little to no cost to Bangladesh. Additionally, Bangladesh probably believes that there are literally no other options to realize a Submarine Force other than the offer that is already on the table.

Pakistan may also be the source for lower cost new construction submarines in the event that the BN is able to successfully operate

the Hangor class and eventually migrate to new construction units (if funding ever becomes available).

VARIOUS — Did You Know?

SOUTH KOREA — 09 June 2006, the first Type 214 submarine was launched from Hyundai Heavy Industries (HHI) Ulsan Yard in South Korea.

UNITED KINGDOM — On 26 May 2006, BAE Systems of the United Kingdom announced 08 June 2007 as the launch date for the first Astute (HMS ASTUTE) class submarine.■

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, accompanying 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.

DISCUSSION**ABOUT "TODAY'S SUBMARINE OFFICER"**

by CDR John C. Brons, USN(Ret)

CDR Brons served in four SSNs highlighted by bookended tours as Commissioning Engineer of STURGEON, the first of the 637 class and Commissioning CO of Richard B. Russell, the last of the 637 class. After retiring as Deputy Senior Member of the LntFlt ORSE Board, CDR Brons spent an additional 25 years in a variety of management positions associated with commercial nuclear energy.

The July and October 2005 issues of *The Submarine Review* have brought an interesting exchange of articles stemming from the grounding of SAN FRANCISCO. In July, Captain Bill Clautice wrote about sound lessons learned earlier regarding safe navigation. As a final thought he opined, "I suspect the best path to nuclear submarine command is still through engineering assignments. ... The top performing officers are most likely assigned as Engineer Officers." In October, Commander Mike Bernacchi responded providing many perspectives about current emphasis and innovations in training. He also included information regarding the selection of officers for command.

Specifically, CDR Bernacchi noted that in his PCO class of 13 there were only four officers who had served as engineer. Two of those had served a split department head tour and two had served their entire department head tour as engineer. CDR Bernacchi stated that, "gone are the days when preferential treatment is given simply because you are the ENG." In his brief response to the article Captain Clautice said that he was *delighted* to hear that. I do not think anyone should be given *preferential* treatment but rather treatment based on merit, but CDR Bernacchi's statistics suggest a bias against officers who serve as Engineer. I am not so sure that this is a good thing.

It seems to me that the Engineer's job is the most difficult of the department heads. The engineer has the largest department by far. The number of people to manage and to train is almost universally recognized as a good measure of the degree of job difficulty. Unless things have changed radically, the number of discrete training requirements per man in the department is also substantially greater than for weapons and navigation. I suspect this training and management aspect is even more difficult today than when I experienced it for several reasons. One is the current emphasis on rotating division officers into and within the department. All new Submarine Officers are expected to pass the engineer officer exam in their first sea tour. Given the requirement that they have spent a certain amount of time as an engineering division officer and the relative numbers of officers in each ship's pipeline, today's ENG does not have the benefit of long term, highly experienced division officers supporting him in the management of the department. More of his division officers are in a learning mode more of the time than they were in the past. When they are trained and qualified, they are *rewarded* by being sent forward.

In addition, it seems from my conversations with current submariners that the Engineer has less support in the way of *highly experienced* chiefs. I do not mean in any way to demean today's CPOs, but the fact is that the Navy's current practices can accelerate the time in which an individual can become a CPO through incentive promotions, exam performance, etc. A sharp petty officer can be a staff pick-up at the prototype, make second class before he sees his first boat and make chief before his second boat. There is no doubt that the people who achieve the grade of CPO at 10 year's or less service are sharp and aggressive. But there is something to be said for experience as well. Although, I do not have any statistics to support me, I would say that most CPOs in my day had the benefit of more than 13 or 14 year's experience and probably less shore time than their counterparts of today. They were in a better position to be highly supportive in the management of the department and to serve as role models and trainers for the developing junior officers as well as for the enlisted members of their divisions.

The engineering department is also the *beneficiary* of the most *help* in the form of outside observers checking administrative and



technical detail from the squadron, the Naval Reactors field office and others. There are also the visits from almost everyone in preparation for safeguards examinations and the well established norm of self reporting even the most minor occurrences within the nuclear part of the department. The effect of all these things is that the entire chain of command is aware of all of the even slight shortfalls in performance in the engineering department. I do not think that there are equivalent parallels in other submarine departments.

All submarine engineers share these two aspects of the their demanding job, lots of *help* in managing a major department from above, and little in the way of experienced, stable officer and senior enlisted help working for them. The SSN engineer faces some additional factors. The very best that he can hope for in classroom training of his department is carved out of the always concurrent requirements for watch standing and maintenance. When he finally trains a junior officer to the point that he might actually be useful, the officer is sent away for several months to engineer's school to be prepared for the Naval Reactors examination. But these difficulties are relatively minor compared to the problem caused by too few SSNs and the current ops tempo.

From everything I read and hear, there are far more demands for SSNs than can be met. It seems that today's submarines are seldom blessed with much, if any, time for independent steaming. When the boats go out they are doing something in an operational sense. There is simply too much demand for the boats to allow them the luxury of a few weeks a quarter in which they have dedicated time at sea to work on purely internal ship's training like engineering and other ship's drills. It is my thesis that today's times at sea are better suited to the needs of navigators and weapons officers in the training and development of their departments than they are for the engineer because of the nature of the concurrent exercises, the ship's tactical configuration and exercise constraints. Again the difficult job of the engineer is made more difficult because he has to train more people with less experience on a catch as catch can basis. In all likelihood he has to do this while also serving as one of the preferred forward watch officers as well. (Please note that I do not suggest that he be taken off the forward watch bill, it is probably what preserves his

sanity and is probably the part of being a submariner that he loves the most.)

In view of all these things I suspect, as did Captain Clautice, that the submarine chain of command, Naval Reactors and BuPers continue to choose the most promising JO's for assignment as engineer. In addition, beyond this selection, there has always been a sub-selection for those chosen to take on assignments on submarines that are in trouble or for key, post engineer jobs. One would expect that a significant percentage of these young men would be sufficiently successful to compete for assignment as XO or CO.

I don't mean to infer that the job of the Navigator or the Weapons officer is without difficulty or that the officers in these billets aren't deserving of a good shot at the command job. With all these things in mind though, especially the high degree of performance-based selectivity for the engineer job and the degree of difficulty inherent in the job, I wonder why there aren't more engineers represented in the PCO ranks? I am sure that the statistics presented by CDR Bernacchi are representative and not an isolated example or he wouldn't have said, "gone are the days..." and provided statistics that show that proportionately fewer engineers are selected for command.

My bottom line. Can it be that the difficulty of the engineer's job and the relative abundance of emphasis on even the most minor problems in the engineering department exposed by self disclosure and by an army of outsiders are inappropriately reflected in the fitness reports for these young officers and inappropriately influence the selection process to XO and CO? If so, what does this mean for the long term? Selection to XO and CO should be available to all officers and good performance should be recognized in all jobs but if the screening and selection process for engineers remains in place as it was years ago, and I believe it does, then I am very surprised to see less than one-third of officers selected for command level billets be engineers and I have to wonder why?■

THE SUBMARINE COMMUNITY**STILL ON PATROL**

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

Rear Admiral Robertson is a retired submarine officer who currently lives on Amelia Island. He wrote this allegorical essay several years ago at the request of a Writers and Poets Society working on a book of such essays about the various branches of national security roles in the latter part of the twentieth century. The book, entitled Bullets and Tears will be published this year.

I was there, unseen, throughout the long Cold War and still today—a silent force and sentinel—the **American submariner**. Along with my brothers in arms, numbered now in the thousands, we hounded the Soviet Navy mercilessly wherever they tried to operate—in the Barents Sea, Sea of Japan, under the ice, in the Indian Ocean, the Mediterranean.

I didn't just arrive on the 50s scene out of nowhere, as new kid on the block. I came from the legacy laid down by the thousands of submariners who took the offensive to hostile Japanese waters when the rest of the Fleet lay in shambles at Pearl Harbor. They swept Japan's maritime forces to the bottom of the Pacific, leaving a ghastly percentage of our own *still on patrol*. From all this came the spirit, the tactics and technical know-how to deal with the challenge of a new era, a new danger to America.

For us it was always looking ahead, mindful of the comrades and lessons that got us through the Pacific war as victors. A vision of the perfect submarine, one freed from the atmosphere at the surface of the ocean and independent of logistic support, became a real thing. I was there working tirelessly behind the scenes at national laboratories, dedicated manufacturers and shipyard complexes. From that came the technological breakthrough of robust nuclear power driving a steam propulsion plant. It seemed like a miracle even for the heady 50's. The perfect machine, ala Jules Verne, "what others have only dreamed!"

Vision became tactical reality with a handful of nuclear attack submarines placed in service in the 50s. Not just mere research platforms, they were real, tough warfighting breakthroughs. First USS NAUTILUS, but quickly leading to the true submersible hull form of the SKIPJACK Class. These submarines with essentially unlimited endurance and mobility altered the equation, drastically increasing the submarine's versatility and tactical advantage. Such characteristics set the stage for building a program of far-reaching submarine deployed operations in those backyards most dangerous to America. They quickly wrote a new book, one whose chapters are being rewritten and expanded still.

There was little argument about the breakthrough capability of nuclear submarines. Everybody wanted them! The problem was the vast technology and resources needed to build them, not to mention maintain them. The Soviets plunged desperately into building programs with little regard for safety and quality control. Soon they would have noisy attack submarines testing their underwater wings. The British, resource constrained, moved cautiously to establish a fine small program closely allied with U.S. operations and technology. Ever since, they have been our steady and only partner in submarine-operations, sharing vital intelligence, technical and operational deployment data.

I made those initial submarine deployments with an eye to the past and the future. Gruelling as they were, week after week in distant waters on constant edge, they could never be as gruelling as those of our comrades in the Pacific war. We learned quickly how other capabilities could be trained on the Soviets to guarantee our national security. A program to deploy limited range guided missiles against Soviet land targets became possible and then became reality. The missions were brutal, risky and definitely not in friendly waters. A better idea was on the horizon and I was ready!

I was the submariner, the naval architect, the ordnance engineer, the space scientist, the corporate leader, the manufacturing technician, the shipyard journeyman who came together as the 50s closed to deliver the nation's greatest scientific achievement under duress since the Manhattan Project. Delivered on time, on spec, on budget, on target! The message flashed from sea: "Polaris, from the deep, on target."

I deployed on POLARIS patrol before 1960 ended, as mandated by the urgency of getting strategic missiles to sea pointed at the Soviet Union. The first five strategic submarines, SSBNs or *Boomers*, were marvelously adapted attack submarine hulls and they were soon deployed in Atlantic waters. The stage was set!

As the 60's accelerated I was part of the seemingly impossible challenge of finding and training the thousands of bright young officers and sailors to man a force to win the Cold War—near 40 new attack submarines and a fleet of strategic submarines later named the “41 for Freedom.” At an incredible delivery pace exceeding one ship per quarter, I was on patrol in all “41” in the Atlantic and Pacific before the 60s ended. They were quickly recognized as the only survivable leg of the strategic triad—bomber, ICBM and SSBN. Our nation's leaders could agree on at least one thing across partisan lines: stated simply, ‘our strategic missile submarines were our single most important national security asset.’ We understood, and that drove us as we took up our constant strategic presence in the unknown reaches of deep ocean. We were the Soviets never-ending headache.

We watched as the Soviets responded with massive building programs for new attack submarines, for their own strategic missile submarines, and for a new threat—submarines designed to sink our carriers with cruise missiles. Their numbers would be far greater than ours but their training, operational legacy and day-to-day engineering practices were impediments. We saw the 60's end and the 70's bring the ever-expanding Soviet Navy out into blue water. The submarines came too. A threat to America and a challenge we had prepared for! Now we were ready to give the Soviets a bad toothache as well!

With the “41 for Freedom” built we had been able to focus on new classes of attack submarines, SSN's, with vast improvements in stealth and modern integrated combat systems. STURGEON Class submarines took the new capabilities into the Soviet backyard. Our relentless presence was a ghost to them, unnerving, unseen and unheard. We followed them into the deep oceans and drove their strategic missile submarines into protective canyons of the deep. We tracked down their distant deployers and they knew it. We were humble, grateful, and thankful we had the best training and resources

in the world.

Our attack submarines were the tip of the spear, creating paranoia in the Soviets from what they could feel but not find. The SSN became the key to a new Forward Strategy for wartime. We would be the first to go in harm's way to deliver a knockout punch to the Soviet fleet in their own backyard. They knew it, and knew they couldn't stop it!

Later, in the 80's, we would deploy in a still more capable Los Angeles Class attack submarines. None too soon! The Soviets could never catch up but they could stay one or two steps behind. Their seven ship design bureaus and industrial espionage worked around the clock. They had a flush handful of new submarine design projects ongoing when we could barely sustain a single one! But we kept our shoulders to the wheel, keeping the pressure on. I was there, studying Soviet capabilities, checking their steady progress, evaluating their weapons, an ever-present thorn in their side. It seemed that we would be at the task forever, and we were determined to do so as necessary. We would remain ready and prepared!

The headache we gave the Soviets with our strategic missile submarines never went away. POLARIS was followed by POSEIDON, then Trident missiles vastly improved in range and capability. Our designers and builders brought us the Ohio Class submarine built with new precision and efficiency by independently completed hull sections. I went to sea in the new ship that exceeded all specs. By the 90's Trident had fully taken over our strategic shield in the Atlantic and Pacific, operating from the world's best naval bases in Kings Bay, GA and Bangor, WA on Puget Sound. The "41 for Freedom" had finished their vigilant mission and I joined the nation saluting them. Job well done, nation secure!

The Soviet toothache didn't go away either. We wrangled through the 80's over the Soviet's capabilities, resiliency and durability. Were they ten feet tall? Were they only six feet tall? What more could they do to close the gap? What more were they willing to do? I fought hard to design a new attack submarine, one clearly stating that we would maintain undersea supremacy and would stay the course as long as necessary. We pressed forward against competing needs of the 80's. Out of this stress we brought SEAWOLF and still following technologies to design finality. This

even as we started across-the-board cuts of one-third in the programs of each service! In the end though, the quality of our programs and our trained people were the givens we could rely on.

So it was that those unsurpassed qualities of our ships, weapons and people would be the realities from which the Soviets could not escape. The miserable spies that sold out our country ironically served to build on the Soviet's realization that they were forever beaten and bankrupt. Suddenly the walls came tumbling down! What we had always imagined in some distant decade had happened with a crash. The world would now be much different!

I am still out there on the tip of the spear, silent and unseen. My strategic missiles are more ready, more deadly and better concealed than ever before. The eyes and ears of my attack submarines are ever fine-tuned, lurking throughout the oceans wherever there is potential harm to America. We are now joined by the new Virginia Class attack subs, and a handful of submarines specially configured for unique warfare roles. Roles which too are guaranteed to give headaches and toothaches to would-be enemies of America! Rest secure! I will always be out there, "still on patrol."■

ETERNAL PATROL

CAPT WILLIAM H. AYRES, USN(RET)
CDR DANIEL K. BACON, USN (RET)
CAPT JAMES C. BELLAH, USN(RET)
LCDR ANTHONY CIOTTI, SR., USN(RET)
RADM W. N. DIETZEN, JR., USN(RET)
MR. HUGH P. DOYLE
ENCS(SS) RALPH A. KENNEDY, USN(RET)
CAPT RUSSELL B. McWEY, USN(RET)
LCDR WILLIAM W. TALLEY, USN(RET)

RIG FOR DEEP

by Mrs. Chris Moran

It had been a long day at San Jose State University. After painting houses for 17 years, Rick Moran had gone back to college to earn a teaching degree in history. It was his last semester, finals were looming and he had a lot on his mind as he pulled up to his home in Ben Lomond, California.

Turning into the driveway that late May afternoon, he noticed a piece of paper stuck in his front door. Juggling books, coffee mug and a backpack, he plucked a note from the door jamb. Pushing open the door he scanned the words quickly—what he read made him stop. Dropping everything, he sat down and found himself traveling slowly back in time as he re-read each word on that scrap of paper.

"If you are the Rick Moran that served aboard USS HAWKBILL (SSN-666) in 1970 please contact Mike Henry," and it gave a phone number. The note was signed "Mary" with a local number.

Memories flooded his mind—Mike Henry and their time together on HAWKBILL. He could even see his face after all these years.

Moran was 18 years old when he enlisted in 1969. The Cold War was heating up and the Navy was looking for sub-sailors. Following family tradition he signed up for sub-duty. His grandfather, Richard C. Moran had served aboard the R-19, a WWI diesel boat and his father had been a quartermaster for USS PITT, an LST in WWII.

Moran had gone to boot camp in San Diego. A native of Norwich, Connecticut, and a veteran of 18 years of bone-shaking winters, he enjoyed the sunny west coast winter. After boot camp he was sent to New London, CT for 10 weeks of training at Sub school. Upon completion he was sent to the Mare Island shipyard in Vallejo, California and assigned to the new construction sub, USS HAWKBILL, a sturgeon class, fast-attack, nuclear powered submarine. That's where he met Mike Henry, QM3SS- Quartermaster.

Henry was a seasoned salt who had served in USS RATON (AGSS-270), a diesel sub. He had come aboard to build a navigational team and to prepare them for sea trials. He trained the crew for a year. Moran was a striker, a seaman who hadn't been placed in a

specific position, and Henry encouraged him to become a navigator. The job, he said, was interesting and it gave an overview of the sub's operational mission. Working with charts, taking bearings, finding the ships location, securing safe passage, all appealed to Moran, and Henry turned out to be an excellent teacher. In Navy tradition Henry showed Moran the ropes of seamanship (with a few knots). On their time off they enjoyed riding their bicycles over the back roads of Vallejo even visiting Farrow's, a local submarine bar. They served together for a year and then Henry was transferred to USS PINTADO (SSN672) to begin training another crew. That was 1971.

Rick recalled the last time he had seen Mike Henry. While serving aboard different boats they had coordinated their leave to go on a six-day bicycle trip. Leaving the close quarters of the submarine behind, they hit the open road, pedaling through wine country, towering redwoods and onto the rugged coast of California. They covered over 420 miles riding hard during the day and sleeping under the stars at night. They were young, strong and adventurous. That was 34 years ago.

Would they have anything in common now? Moran called his wife at work to tell her about the amazing note. They wondered how Henry had managed to find Rick after all these years. "What do I do now?" Moran wondered out loud. "I guess you pick up the phone and call," his wife Chris, stated simply.

Rick sat looking at the phone, and shook his head in disbelief. What would he say? Would he and Henry have anything in common after all this time? An hour later Chris came home from work to a living room full of laughter—Rick had made the call and it was a great telephone reunion.

Henry had looked for *Rocky* for years. He had contacted six or seven other Richard Moran's over the years with no luck. The previous year Rick, his wife and daughter Shannon, had gone to Hawaii to celebrate their 25th wedding anniversary. Chris, daughter of a navy radioman, Harold Moore, had always dreamed of visiting Pearl Harbor. After returning from the tour they had climbed aboard the USS BOWFIN at the Submarine Museum nearby and spent hours looking at the submarine collection.

Inspired from their trip, Rick had gone online to look up

information about HAWKBILL and after 29 years away from the sub he added his name to the *plank owners* list: Richard Rock-Boy Moran. He also added his e-mail: irisfarm@cruzio.com. (He and Chris have a small iris farm in the San Lorenzo Valley above the coastal town of Santa Cruz).

Mike had been living in Oregon working as a fishery biologist and his passion was perfecting homebrewed beer. He named his brews with submarine themes such as *Submarine Pale Ale*, *Torpedo Room IPA*, *Rig-for-Deep Wheat*, *Combat Lager* or *Conning Tower Cascade Ale*. Occasionally he would check the HAWKBILL website to see who he might know. As Mike perused the list one night the name *Rocky* suddenly jumped out at him. "I couldn't believe it, I knew this was it—the right name, right boat and right time!" Mike e-mailed right away but the message was returned undeliverable—the Moran computer was in the shop. Mike figured that Rick must have something to do with an Iris Farm in Santa Cruz County, California, so he started calling around.

Mary Clark was cashiering at Scarborough Lumber and Garden Center in Ben Lomond, when she received an odd call. The guy on the line was looking for someone named Moran, and was there an iris farm nearby? She thought that the name sounded familiar but said "I don't know of any iris farm around here. A customer standing in line said, "Wait a minute, there's a little iris farm about a quarter mile up the road." Mary took down the information and waited for her lunch hour. Then she searched the neighborhoods until she came upon a beautiful field of blooming iris—this must be the place, and she left the precious note.

Henry's job found him traveling extensively. He was able to visit Moran for the first time in 2002. It had been 34 years. He brought along *Henry's Rocky Reunion Ale* and they toasted to old times. Throughout the year they occasionally talked and e-mailed each other. In 2003 the two families: Mike and his wife Debbie, and Rick, Chris and Shannon met each other half way in Mt. Shasta, California. At an old lodge they spent four days getting to know and reknow each other. Dangling their feet over an old wooden bridge to the sound of the creek they celebrated their new friendship with a new Henry brew *Pintado Pale*. "They are our newest-oldest friends," said Chris Moran. "I had heard about Mike Henry when Rick would tell

his submarine stories (all declassified, of course); I felt like I had always known him. Debbie was icing on the cake."

Both couples have been married for 30 years, their anniversaries only three weeks apart, and each has one daughter. This year they camped together near Ashland, Oregon. Next to the lake they built a bonfire, roasted hot dogs, swam and laughed—old friends comfortable together. Warmed by the embers their bottles clinked as they toasted to old friends with Henry's new brew *Run Silent*.

Note: Mary Clark had heard of Rick Moran, her daughter played softball with Rick's daughter. The Moran's are indebted to Mary for her caring effort in bringing these two old vets together again. Rick is now teaching at White Oak School in Felton, California.■



*Photo taken at Lake of the Woods, Oregon,
on the left is Mike Henry on the right is Rick Moran.
Photo courtesy of Debbie Henry.*

2006 NAVAL SUBMARINE LEAGUE AWARDS

JACK N. DARBY AWARD

FOR INSPIRATIONAL LEADERSHIP
AND EXCELLENCE OF COMMAND

CDR JEFFREY E. TRUSSLER, USN
USS MARYLAND (SSBN 738) (BLUE)

CHARLES A. LOCKWOOD AWARD

FOR SUBMARINE PROFESSIONAL EXCELLENCE

LCDR TRAVIS M. PETZOLDT, USN
USS PENNSYLVANIA (SSBN 735) (BLUE)
ETC (SS) GILDANIEL L. McKETHAN, USN
USS BOISE (SSN 764)

SK1 (SS) TYHEEM SWEAT, USN
USS MAINE (SSBN 741) (GOLD)

LEVERING SMITH AWARD

FOR SUBMARINE SUPPORT ACHIEVEMENT
LCDR WILLIAM M. PRESCOTT, USN
TRIDENT REFIT FACILITY, KINGS BAY

FREDERICK B. WARDER AWARD

FOR OUTSTANDING ACHIEVEMENT

LCDR PAUL J. FRONTERA, USN
USS VIRGINIA (SSN 774)

FRANK A. LISTER AWARD

FOR EXCEPTIONAL LEADERSHIP AND MOTIVATION
WHILE SERVING AS A CHIEF OF THE BOAT
CMDM (SS) ROBERT C. ASHTON, USN
USS CHARLOTTE (SSN 766)

DISTINGUISHED CIVILIAN AWARD

FOR OUTSTANDING PERSONAL CONTRIBUTION
MR. ANDREW W. MARSHALL
DIRECTOR, OSD NET ASSESSMENT

DISTINGUISHED SUBMARINER
RADM ROBERT H. WERTHEIM, USN (RET)

DOLPHIN AWARDS
CAPT ROBERT DONALD KELSO, USN
COMMANDING OFFICER
USS JIMMY CARTER (SSN 23)

MMCM (SS) TIMOTHY JACOBS, USN
USS MARYLAND (SSN 738) (GOLD)

LITERARY AWARDS
FIRST PRIZE
MR. JOE BUFF
"WILL CHINA RULE THE WAVES?"
SECOND PRIZE
MR. JIM BLOOM
"NEMO'S NAUTILUS"
THIRD PRIZE
DR. THOMAS O. PAINE
"LAST VOYAGE OF A SUBMARINE
AIRCRAFT CARRIER"

BEST ARTICLE BY AN ACTIVE DUTY AUTHOR
CDR HOWARD C. WARNER, III, USN
"MILITARY TRANSFORMATION: A FUTURE LOOK BACK"

EIGHTH ANNUAL UNDERSEA WARFARE MAGAZINE
PHOTO CONTEST AWARDS
FIRST AND SECOND PRIZE
WENDY HALLMARK
THIRD PRIZE
EDWARD WILLS
HONORABLE MENTION
CHERYL LOWMAN HUNT

2006 DOLPHIN SCHOLARS

This year the Dolphin Scholarship Foundation will fund 134 Scholarships, including 36 new recipients. Each grant will be \$3,000, totaling \$402,000 in scholarship monies. Of the 36 selected, 28 were high school seniors and 8 were college students; 10 male and 26 female. 10 sponsors were active duty, 20 retired, and 6 discharged. 23 of the sponsors were from the enlisted community and 13 were officers. Congratulations again to the new 2006 Dolphin Scholars!

Student	Sponsor	Home State
Rebekah M. Alford	ETCS(SS) Charles M. Alford	WA
Cara M. Allen	CDR Bradley K. Allen	WA
Chaunté E. Auton*	SKC(SS) Joel L. Auton	MI
Gregory A. Biggs*	MM1(SS) Kenneth Biggs	CT
Samuel J. Buelk*	MMCS(SS) John C. Buelk	SC
Matthew A. Cooper, Jr.	MM1(SS) Matthew A. Cooper	WV
Berlinarea E. Crampton	MMC(SS) Leonard A. Crampton, Jr.	GA
Karalyn D. Dennis	EM1(SS) Danny L. Dennis	MD
Paul M. DiOrto	CAPT David R. DiOrto	VA
Brittany A. Dunn	MMC(SS) Eugene J. Dunn III	NJ
Craig E. Esquivel	MR1(SW) Edison M. Esquivel	VA
Abby R. Feine	MMC(SS) Mark A. Feine	GA
Juliana M. Fernandes	LCDR John C. Fernandes	MD
Cynthia A. Goodson	CDR Scott W. Goodson	TN
Iain P. Greba	ETC(SS) Gary G. Greba	PA
Megan L. Greenwood*	MM1(SS) Riley D. Greenwood	ME
James B. Hosford IV	STSCS(SS) James B. Hosford III	WA
Hilary A. Lipps	CWO3 Jeffery T. Lipps	GA
Kelli A. Luebben	ETC(SS) Donald A. Luebben	SC
Marissa K. Mason	MM1(SS) Nathan G. Mason	NY
Junna A. Matthews*	MMCS(SS) James A. Matthews	WA
Amber C. McColl	CDR Angus A. McColl	CA
James A. Miller	STS1(SS) Richard A. Miller	NV
Madeline V. Moreau	MM1(SS) Jeffery T. Moreau	MI
Justine A. Morris	LT Donald K. Morris II	VA
Angela J. Noakes	LCDR Paul E. Noakes	WA
Stephanie E. Park*	YNCS(SS) Jeffrey J. Park	OH
Philip F. Petersen	FTG1(SS) Lloyd H. Petersen	CA
Brianny A. Richards*	CAPT Randall G. Richards	VA
Kristina T. Saul	CAPT Kenneth R. Saul	HI
Carolyn J. Schuetz	CAPT Robert E. Schuetz	WA
Lithornia A. Simmons	ETC(SS) Lewant S. G. Simmons	GA
Alexandra A. Smrcina	CDR Kurt L. Smrcina	MA
Jessica E. Squier*	ET1(SS) William B. Squier	PA
Sephanie L. Whitson	MMCS(SS/DV) Kenneth J. Whitson	SC
William C. Wright	LT William L. Wright	VA

*Indicates students currently enrolled in college.

NAVAL SUBMARINE LEAGUE
COMPARATIVE STATEMENT OF ACTIVITIES
For The Year Ended:

	<u>Restricted</u>	<u>Unrestricted</u>	<u>31-Mar-06 Total</u>	<u>31-Mar-06 Total</u>
REVENUES				
Contributions	\$ 177,320		\$ 177,320	\$ 149,767
Dues	73,432		73,432	73,087
Annual Symposium	127,355		127,355	122,664
Subtech Symposium	272,712		272,712	224,162
Bank Interest	101		101	108
Dividends	37,126		37,126	16,504
Advertisements	27,255		27,255	29,950
Rent	8,470		8,470	8,400
Realized & Unrealized Market				
Gain (Loss) On Investment		26,028	26,028	5,648
Royalties		3,034	3,034	1,203
Other		2,633	2,633	3,559
Total Revenue	<u>\$ ---</u>	<u>\$ 755,466</u>	<u>\$ 755,466</u>	<u>\$ 635,052</u>
EXPENDITURES				
Awards and Grant	\$ 30,357		\$ 30,357	\$ 18,159
Publishing	70,887		70,887	69,604
Promotion	54,308		54,308	36,489
Annual Symposium	143,625		143,625	128,015
Subtech Symposium	150,803		150,803	121,505
History Symposium	3,762		3,762	
Chapter Support	11,729		11,729	17,432
Total	<u>\$ ---</u>	<u>\$ 465,471</u>	<u>\$ 465,471</u>	<u>\$ 391,204</u>
SUPPORTING SERVICE		\$ 199,061	\$ 199,061	\$ 205,303
Total Expenditures	<u>\$ ---</u>	<u>\$ 664,532</u>	<u>\$ 664,532</u>	<u>\$ 596,507</u>
INCREASE (DECREASE) IN NET ASSETS	<u>\$ ---</u>	<u>\$ 90,934</u>	<u>\$ 90,934</u>	<u>\$ 38,545</u>
NET ASSETS, BEGINNING OF YEAR		303,120	303,120	264,575
NET ASSETS, END OF YEAR	<u>\$ ---</u>	<u>\$ 394,054</u>	<u>\$ 394,054</u>	<u>\$ 303,120</u>

NAVAL SUBMARINE LEAGUE HONOR ROLL

BENEFACTORS FOR MORE THAN TWENTY YEARS

ADVANCED ACOUSTIC CONCEPTS, INC.
AMERICAN SYSTEMS CORPORATION
BAE SYSTEMS (Rockville, MD)
BWV TECHNOLOGIES, INC.
EG&G TECHNICAL SERVICES, INC.
ELECTRIC BOAT CORPORATION
ELIZABETH S. HOOPER FOUNDATION
GNB INDUSTRIAL POWER
KOLLMORGEN CORPORATION
LOCKHEED MARTIN CORPORATION
LOCKHEED MARTIN SIPPICAN, INC.
NORTHROP GRUMMAN CORPORATION - NEWPORT NEWS
NORTHROP GRUMMAN CORPORATION
- OCEANIC & NAVAL SYSTEMS
NORTHROP GRUMMAN CORPORATION
- SPERRY MARINE DIVISION
RAYTHEON COMPANY
SAIC
THE BOEING COMPANY
TREADWELL CORPORATION
ULTRA ELECTRONICS/OCEAN SYSTEMS, INC.

BENEFACTORS FOR MORE THAN TEN YEARS

AETC INCORPORATED
AMADIS, INC.
ANTEON CORPORATION - SEA SYSTEMS DEPARTMENT
APPLIED MATHEMATICS, INC.
CORTANA CORPORATION
CUSTOM HYDRAULIC & MACHINE, INC.
DYNAMICS RESEARCH CORPORATION
GENERAL DYNAMICS -AIS - MARITIME DIGITAL SYSTEMS
HYDROACOUSTICS, INC.
L-3 COMMUNICATIONS, OCEAN SYSTEMS
MARINE MECHANICAL CORPORATION
NORTHROP GRUMMAN CORPORATION - MARINE SYSTEMS
PEROT SYSTEMS
PLANNING SYSTEMS, INC.
RIX INDUSTRIES
ROLLS ROYCE NAVAL MARINE, INC.
SARGENT CONTROLS AND AEROSPACE
SONALYSTS, INC.

SYSTEMS PLANNING & ANALYSIS, INC.
VEHICLE CONTROL TECHNOLOGIES, INC.

BENEFACTORS FOR MORE THAN FIVE YEARS

AMERICAN SUPERCONDUCTOR CORPORATION
BURKE CONSORTIUM, INC.
CURTISS-WRIGHT ELECTRO-MECHANICAL CORPORATION -
ELECTRO-MECHANICAL DIVISION
DRS POWER SYSTEMS
GOODRICH CORPORATION - EPP DIVISION
HAMILTON SUNDSTRAND SEA SYSTEMS
L-3 COMMUNICATIONS CORPORATION
MATERIALS SYSTEMS, INC.
MCALEESE & ASSOCIATES, P. C.
OIL STATES INDUSTRIES/AEROSPACE PRODUCTS DIVISION
PROGENY SYSTEMS CORPORATION
SCOT FORGE COMPANY
SSS CLUTCH COMPANY, INC.

ADDITIONAL BENEFACTORS

APPLIED PHYSICAL SCIENCES CORPORATION (New in 2005)
BURDESHAW ASSOCIATES, LTD. (Returned in 2005)
BUSINESS RESOURCES, INC.
DIRECTED TECHNOLOGIES, INC.
DRESSER-RAND COMPANY
DURATEK, INC.
eMAGIN CORPORATION
FOSTER-MILLER, INC.
L-3 MARIPRO, INC.
MARINE SONIC TECHNOLOGY, LTD.
MICROPORE, INC.
NEKTON RESEARCH, LLC (New in 2005)
NEXUS MEDIA, LTD.
NUCLEAR FUEL SERVICES, INC. (New in 2005)
OCEANWORKS INTERNATIONAL, INC.
PACIFIC FLEET SUBMARINE MEMORIAL ASSOCIATION, INC.
PINKERTON GOVERNMENT SERVICES
PRIME TECHNOLOGY, LLC (New in 2004)
RADIAN MILPARTS
SUPERBOLT, INC.
WHITNEY, BRADLEY & BROWN, INC.

***2006 AWARD RECIPIENTS INDICATED IN BOLD PRINT**

REUNIONS

598 CLASS REUNION Aug 24-27, 2006 Groton, CT Groton Motor Inn & Suites
 Boats: **GEORGE WASHINGTON SSBN-598, PATRICK HENRY SSBN-599, THEODOR ROOSEVELT SSBN-600, ROBERT E. LEE SSBN-601 and ABRAHAM LINCOLN SSBN-602**

POC: Doc McCance, 16 Chapman Lane, Gales Ferry, CT 06335, Phone: 860-464-6758
 E-mail: 11doc@comcast.net Web Site: <http://www.598class.us>

USS QUILLBACK SS-424/USS TRUTTA SS-421/USS PICUDA SS-382

Sep 6-10, 2006, North Little Rock, AR, POC: Lee Davenport, 705 Laidon Street, Haughton, LA 71037, Phone: 318-949-4826, E-mail: davenport2652@bellsouth.net

USS CORPORAL SS-346 Sep 4-10, 2006 Little Rock, AR

POC: Dennis Kauppinen Phone: 860-667-4157 e-mail: ss346crew@hotmail.com

USS DIODON SS-349 Sep 5-10, 2006 North Little Rock, AR

POC: Glenn Boothe Phone: 559-322-6624 E-mail: gbpluspb@aol.com

USS GURNARD SSN-662 Sep 6-9, 2006 Call (760) 757-7894 for details

USS GEORGE WASHINGTON SSBN-598/USS SCORPION SSN-589

Sep 7, 2006 Wyndham Hotel, North Little Rock, AR

POC: Paul Honeck Phone: 501-945-1349 (work)

E-mail: phoneck@centurytel.net

USS BASHAW SS/AGSS/SSK-241 Sep 10-14, 2006 Niagara Falls, Ontario, Canada

Loc: The Brock Plaza Hotel Reservations now accepted at special rate until 11 Aug 2006.

POC: Jim O'Dea, 716-775-3437 E-mail: jrodea@aol.com Web Site:

<http://www.geocities.com/bashawss241/> Send POC an E-mail to receive updates

USS BUMPER SS-333 Sep 18-21, 2006 Odessa, TX

LOC: MCM Grande' Hotel Fun Dome, Odessa Texas 79762

POC: Edward W. Stone, Secretary, 308 Merritt Ave, Syracuse, NY 13207-2713

Phone: 315-469-3825

USS FULTON AS-11 Sep 20-24, 2006 Fairborn, Ohio

Loc: Holiday Inn, Fairborn, OH

POC: Ron Schwartzkopf, President

5028 West Enon Road

Fairborn, OH 45324 Phone: 937-754-0326 E-mail: chris41ron@aol.com

Cost: Hotel, \$79.00 per night (plus tax) Reunion: \$210 per person (includes tours, meals, memory book and entertainment)

USS ALBACORE AGSS-569 Sep 21-24, 2006 Portsmouth, NH

Loc: Albacore Park, 600 Market St., Portsmouth, NH 03801

POC: Jack Hunter, 37 Namquid Drive, Middletown, RI 02842

Phone: 401-849-7282 E-mail: hunter5982@earthlink.net

Web Site: <http://www.usalbacore.org>

USS NAUTILUS SSN-571 Sep 28-1 Oct, 2006 Bremerton, WA
POC: Roland Cave, 370 East Camano Drive, Ste. 5-104, Camano Island, WA 98282-7279,
Phone: 360-387-3874 E-mail: rcave@camano.net

USS HADDO SSN-604/SS-255 Oct 5-7, 2006
Loc: Radisson Hotel, Branson, MO
POC: Ken Brenner Phone: 770-205-6083 E-mail: kwg0913@bellsouth.net

USS BANG SS-385 Oct 5-9, 2006 Albuquerque, NM
POC: Phil Beals E-mail: pebeals385@juno.com
Web site: <http://www.ussbang.com>

USS GUARDFISH SSN-612 Oct 10-14, 2006 San Diego, CA
Loc: Holiday Inn on the Bay
POC: R.E. "Twig" Armstrong, 1626 Encinal Ave., Alameda, CA 94501-4019
Phone: 510-521-5781, E-mail uss_guardfish@earthlink.net

USS CARP SS-338 Oct 12-13, 2006 San Diego, CA
POC: Jim Burkholder Phone: 865-671-6229 E-mail: jimb Burkholder@aol.com

USS ETHAN ALLEN SSBN/SSN-608 Oct 12-15, 2006 Kings Bay, GA
POC: Herb Richardson, 8952 Centerway Road, Gaithersburg, MD 20879
<http://www.ssb608.org/reunion.htm>

USS TRITON SS-201/SSN-586 Oct 18-22, 2006
Loc: Airport Holiday Inn, Jacksonville, FL 32229
POC: Henry Jackson, 2575 Lockmeade Way, Lawrenceville, GA 30043
Phone: 770-682-7935 E-mail: henryjask@bellsouth.net

USS CANOPUS AS-9 or AS-34 Oct 19-22, 2006
Loc: Radisson Hotel, New London, CT
Open to Crewmembers, Supporting Marine Detachments, SUBRON's, ARDM's, & ASR's
POC: Richard Resin, 1755 Rockhaven Drive, Reno, NV 89511 Phone: 775-851-1077
E-mail: usscanopus@mail.com Website: <http://www.usscanopus.org>

USS HALIBUT SSGN/SSN-587 Oct 26-28, 2006 Vallejo, CA
POC: J. D. Corbett, PO Box 30334, Keizer, OR 97303 Phone: 503-304-1700
E-mail: halibut.2006reunion@hotmail.com Web Site:
<http://www.rcn.com/marek/Vas/Page%20Work/Reunion%202006/Reunion%20Page.htm>

USS THOMAS JEFFERSON ASSOCIATION 8TH REUNION
Kissimmee-Orlando, FL Oct 25-28, 2006
POC: Dennis Hudson 9093 South Bay Dr., Haines City, FL 33844
Phone: 863-422-8283

USS PROTEUS AS-19 Oct 26-29, 2006 San Diego, CA
POC: Paul Castle, Phone: 619-237-1314, E-mail: paul1@ix.netcom.com

USS MEDREGAL SS-480 Oct 29-Nov 2, 2006 North Charleston, SC
POC: Terry Trump Phone: 843-873-9563 E-mail: termite1@knology.net