

THE SUBMARINE REVIEW



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EDITOR'S COMMENTS

Our SPECIAL FEATURE for this April '07 issue is the vision of a retired, very experienced, submariner onboard USS HAWAII, one of our newest Virginia class submarines. His comments on the operability of this new class are very telling. The centralization and modernization of observation and control, made possible by technology advances in sensors and processing as well as the giant step in arrangements due to elimination of the optical periscope, give the present day submarine skipper advantages which could not have been dreamed of in the Cold War and before. To single out just one of Admiral Reynolds' notations during his ride on Hawaii, the improved use of infra-red imaging greatly enhances the submarine's inherent stealth by adding more asymmetric advantage.

Several policy statements and comments on current goings-on in the ever changing world of American submarining are covered in the three FEATURES taken from the League's Corporate Benefactors' Day presentations in late January. All three reflect actions within the submarine community which have been required by events in the greater sphere of national security affairs. The important note here is that the Submarine Force and it's supporters in industry are taking appropriate action. At least three such issues of overarching importance are covered here. The first is the continuing one about shipbuilding money and what is being done to lower the acquisition cost of the Virginia class submarines. Life cycle costs are not necessarily considered when shipbuilding decisions are being made at the Navy, Defense and Congressional levels, but it can be assumed the Virginia class submarine program already would compete favorably with other Defense major force capital investment programs. Another major issue is the effective, and efficient, use of those capital assets already in-hand. VADM Chuck Munns, in his presentation, addresses that issue squarely in terms of national and maritime security. A third, not so obvious, national issue is the effective use of those human resources within the armed forces and both ComSubFor and RADM Van Mauney, Director, Submarine Warfare in OpNav mention what is happening in that arena.

The lead article in this issue is by RADM Jerry Holland and is about Submarines in the New Maritime Strategy. Jerry has provided a unique perspective for us in that this article is a particularization of a more general piece he has in the current issue of the Naval Institute's Proceedings. The articulation of the Navy's new *strategy* paper is of importance to the submarine community and it is up to all of us to stay abreast of all that is happening in that endeavor. It cannot be assumed that all naval officers, or academics writing in the naval field, are sufficiently aware of what is being done, or more importantly *what can be done*, with submarines.

A bit of a different type of submarine lore is provided by Jim Bloom with his look at Submarines in Literature, Film and TV. For some it will be a trip down memory lane with some old friends or, in some cases, with those we would rather not have known. In any case, it is interesting to note the obvious popularity of the submarine world as a background for drama and even comedy. It seems to indicate a recognition by the media folks of the public's interest in submarines and the folks who go down in the sea in them.

In this issue we also have a very welcome summary of the good works being done for the children of submariners by the Dolphin Scholarship Foundation. There are some interesting statistics of the range and depth of support given those kids and there is news of some highly impactful support recently given to the Foundation.

Jim Hay
Editor

FROM THE PRESIDENT

In late March I spent four days at sea on Pre Commissioning Unit (PCU) HAWAII (SSN 776). It was a wonderful trip into the future of undersea warfare. A summary of the trip is in this issue. I thank everyone on PCU HAWAII for making my visit such a wonderful experience. The nation is well served by the post Cold War VIRGINIA class of submarines.

The Naval Submarine League completed its fiscal year on 31 March 2007. Generous support by the Corporate Benefactors allowed the League to contribute approximately \$60,000 to the corpus while maintaining robust programs and some grants. The Board approved the budget for the next fiscal year that will maintain the corpus of \$500,000. The revenue generated from this base will be used to promote programs that educate the general public in the importance of submarines to national defense. The League will continue to support a Studies and Analysis program to identify ways and means of increasing the capabilities and employment of submarines.

The Corporate Benefactors continue to be the life blood of the NSL. This year they underwrote much of the costs associated with the Corporate Benefactor Recognition Days, receptions held during the Annual Symposium, and sponsored large contingents of their employees to attend League events. We added six new benefactors during this fiscal year. When you see a Corporate Benefactor at one of the League events, please thank them for their continued support of the organization. Individual name tags identify Corporate Benefactors.

The Corporate Benefactor Recognition Days held 30 to 31 January 2007 set a new record in attendance. With 46 of our 74 benefactors represented, and more than 20 principal executives, this event was a success in every measure. The active duty submarine Flag Officers' participation and guest speakers were the highlights of the event. Over 240 members of the League's submarine support community attended. The opportunity to interact with the active duty Flag Officers at a reception following Admiral Kirk Donald's remarks was appreciated by all. Deputy Assistant Secretary of the



Navy for Ships, Allison Stiller, spoke to the luncheon attendees on her approach in managing costs to increase the submarine build rate. At the Congressional breakfast Congressman Randy Forbes addressed his assessment of the need for two VCS submarines per year. He is a strong supporter of the Submarine Force.

By the time you receive this *Review* the Cold War Submarine History Seminar, "*How Submarine Intelligence Collection Made A Difference - Lessons from the Past*", will be completed. This was one of the most anticipated and best attended seminars in the NSL history series. The project team is already working on another part of our submarine heritage for the 2008 seminar. This event is important to preserving the legacy of the Submarine Force. The event was sponsored by Northrop Grumman Corporation, Marine Systems Division.

The Submarine Technology Symposium will be held at The Johns Hopkins University Applied Physics Laboratory on 15 to 17 May 2007. The theme is "*Enhancing the Submarine's Military Value*" and features five sessions chaired by experts in their field. Keynote speakers include Admiral Ed Giambastiani, Admiral Kirk Donald and Vice Admiral Jay Donnelly. This year Session Five features six international submarine force presentations. The full agenda is available on the registration website, <http://www.jhuapl.edu/sts/index.html>. This classified event is limited to the first 500 attendees because of the size of the auditorium. Please register early to ensure you have a seat.

The final NSL event for this year will be the Annual Symposium held at the Hilton McLean Tysons Corner on 31 October to 1 November 2007. This year the Submarine Force Fall Cocktail Party will be integrated into the program. Please look for the mailing to all members this summer and participate in the election of NSL Board of Directors.

Your Naval Submarine League leadership is focused on increasing membership. We continue to launch initiatives to recruit active duty, retired and former members and submarine advocates. The online Membership Directory identifies a number of members who have been dropped from our rolls because of the lack of a good address. Assistance in updating the address file would be appreciated.

I ask each of you to recruit a new member by asking friends if they are interested in becoming a submarine advocate by joining. Jan joins me in wishing you a healthy and refreshing spring.

J. Guy Reynolds
President

Save The Date

**31 October - 1 November
2007**

**The 25th Anniversary
Naval Submarine League
Annual Symposium
Hilton McLean
Tyson Corner**



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SPECIAL FEATURE**A VOYAGE INTO THE FUTURE OF
UNDERSEA WARFARE
UNDERWAY ON A VIRGINIA CLASS SUBMARINE (VCS)**

*by J. Guy Reynolds
Vice Admiral, US Navy (Retired)
President, Naval Submarine League*

At 0800 on 16 March 2007 I was met on at the Trident pier Port Canaveral, Florida by PCU HAWAII (SSN776) Executive Officer, LCDR Mike Quan, and the Chief of the Boat, Master Chief Bob Bentley. I was piped aboard and started a voyage into the future of undersea warfare. The HAWAII is the third ship in the Virginia class.

Captain David Solms invited me to the bridge for the underway. The climb to the bridge from the control room was a full deck higher than on other submarines. Non-penetrating mast technology allowed the designers at General Dynamics Electric Boat to locate the control room, the heart of the ship, at the most effective location, the forward compartment middle level. Technology has overcome the century long tyranny of the optical periscope on submarine design.

Some of what I found on HAWAII was much the same as on other submarines; dedicated, knowledgeable, well trained professional crew; strict adherence to procedure; exacting attention to detail and an immaculately clean ship.

There was much that was new and exciting. The things that jumped out at me were the visualization of information and simplification of routine tasks. The Control Room was a wonder of easy to read and understand large screen color, flat panel displays. Information was not only displayed, it was recorded for analysis and reconstruction when appropriate. The Officer of the Deck (OOD) stands his watch at the Command Work Station (CWS). From that position he can observe every piece of information needed to conn the ship submerged. When taking the ship to periscope depth the

OOD has tactical aids not even dreamed of before the VCS. Multiple cameras in each photonics mast provide the OOD color, black & white, and infra-red views of his surroundings. The infra-red camera turns night into day and allows for early detection of surface contacts. In fact, on HAWAII and other ships of the Virginia class, the Control Room does not rig for black during periscope depth or surface operations at night. Need a range to a contact to verify that mental calculation? Not a problem. Each mast is equipped with a laser range finder. The display at the CWS presents a graphical overlay to indicate which direction the mast is pointed, the field of view in use, and contact icons from the ship's BYG-1 Fire Control System placed at the correct bearing along the edge of the screen.

The Diving Officer of the Watch, Chief of the Watch and the two Planesmen are now part of submarine history. The ship is guided through the three dimensional undersea battle space by the most senior, experienced enlisted men aboard; the Pilot and Copilot. The steering and diving yokes of the past are replaced with joy sticks. Switches, dials and levers are replaced with easy to understand and operate touch screen displays.

The Captain fights the ship from the CWS. The AN/BQQ-10 sonar shack is located along the port side of Control and is fully integrated with the watch team vice sequestered in an adjoining space. To starboard is the ship's fire control system. The Captain can easily view all sonar and fire control displays from his vantage point or he can call up a specific fire control display at the CWS. The CWS is not a repeater – it is a fully functioning station where the Captain can manipulate the data to obtain the information needed to best fight the ship.

There were no sound powered phones in use. Watchstanders and administrative personnel alike were connected wirelessly throughout the ship. This sounds like a small thing. Not so; it reduces the number of watchstanders, eliminates noise and increases watchstanders mobility. There were no clipboards for watchstanders to lug around and record log readings. Rather they used Palm Pilots and then dumped the data into a server for analysis and retention.

HAWAII showed me that the VCS can do every traditional submarine mission - just better.

Covert Intelligence, Surveillance and Reconnaissance: The VCS's advanced electronic sensors will collect critical intelligence; locating radars, missile batteries and command sites; monitoring communications and tracking ship movements. Minefields will be detected, while other threat targets will be monitored to ensure that mission objectives are met.

Special Warfare Operations: The VCSs will support the spectrum of special warfare requirements; search and rescue, reconnaissance, sabotage and diversionary attacks, directing fire support and strikes, and other clandestine assignments. The submarine's integral nine-man lock out chamber can host the Advanced SEAL Delivery System mini-sub or dry deck shelter for Special Forces' vehicles and equipment. In addition, the VCS's torpedo room can be reconfigured to accommodate a larger number of special operations troops.

Anti-Submarine and Anti-Surface Warfare: With its advanced combat systems and flexible payload of advanced torpedoes, anti-ship cruise missiles and naval mines, the VCS is equipped and prepared to destroy hostile ships and submarines.

Covert Precision Strike and Direct Support of Forces Ashore: Launching land-attack missiles from its vertical launchers and torpedo tubes, the VCS will strike with complete surprise from coastal waters, multiplying its effectiveness. Initially, the VCS will employ the war-proven Tomahawk Land Attack missile.

Having served on four submarines including four years in command of USS PINTADO (SSN 672) and riding submarines as Commander Submarine Squadron Three and Commander Submarine Force US Pacific Fleet, getting underway on a submarine was not a new thing for me. Getting underway on HAWAII was an adventure. I disembarked HAWAII at 1200 on 19 March 2007. The entire ride on HAWAII was a trip into the future!

Characteristics

Displacement 7,800 Tons
Length 377 Feet
Beam 34 Feet

Speed In excess of 25 knots

Depth In excess of 800 feet

Payload 38 Weapons, (includes Vertical Launch System),
Special Operating Forces

Weapons Launch 4 - 21 inch Torpedo Tubes
12 - Vertical Launch System Tubes

Propulsion S9G Pressurized Water Nuclear Reactor

Weapons Tomahawk Land-Attack Missiles
Mark 48 Advanced Capability Torpedoes
Advanced Mobile mines
Unmanned Underwater Vehicles

Sonar Spherical Active/Passive Array
Light Weight Wide Aperture Arrays
TB-29 and Future Towed Arrays
High-Frequency Sail and Chin Arrays

Countermeasures Internal (reloadable)
14 external

HAWAII

SSN 776

Dominating the seas and coastlines, intelligence, deploy special forces, and

Advanced SEAL Delivery System (ASDS)

The "ASDS" is a mini submarine designed to be deployed with a Special Forces combat assault team. HAWAII carries the type of crew of the more conventional Dry Deck Shelter.

Ballast/Tank Tanks

Tanks, both forward and aft, are loaded with water to submerge the sub. The water is ejected in order to surface. Other tanks, "trim tanks," help compensate for variations in weight, stabilizing the sub.

Reactor Compartment

State of the art reactor, packs provides fuel for the life of the ship.

Sonar All Around

HAWAII has vastly improved sonar capabilities. The HAWAII will accurately map the ocean floor and mine fields using a combination of the chine and sid arrays. Additionally, the three sonar arrays on each side and towed arrays provide quick target location information.

Salt array

Towed arrays eliminate much of the blind area behind a sub.

Side mounted arrays

gather
targets.



Lockout Trunk

HAWAII employs a tactic in Navy SEAL staging areas: This new main deck chamber will allow an entire Special Forces team to exit and enter the sub while maintaining the crew bar with water just one time.

Land Attack

Swing Vertical Launching System (SVL) tubes, combined with four torpedo tubes permit HAWAII to launch land attack missiles.

Command & Control

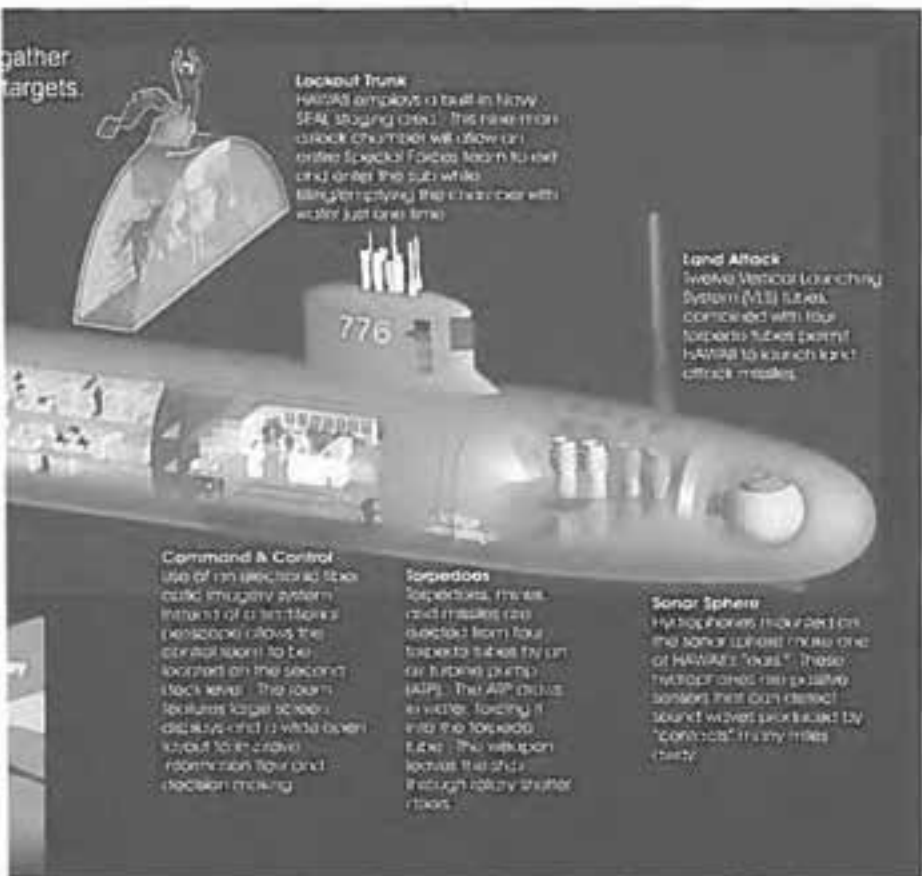
Use of an electronic flat-panel imagery system instead of a binocular periscope allows the control room to be located on the second deck level. The room features large screen displays and a video overlay board to enhance navigation, target acquisition and decision making.

Torpedoes

Torpedoes, missiles and missiles can be ejected from four torpedo tubes by an air turbine pump (ATP). The ATP draws in water, forcing it into the torpedo tubes. The weapon leaves the ship through rotary shutter doors.

Sonar Sphere

Hydrophones, mounted on the sonar sphere (also one of HAWAII's "eyes"), these hydrophones are passive sensors that can detect sound waves produced by "contacts" many miles away.





Conversation monitored by submarine reveals location of terrorist training camp.

Intel relayed to Tactical Command, strike ordered.

Submarine programs missile, launches strike.



Submarine commander reports direct hit.

Today, in their own very quiet way, U.S. Navy submarines are involved in more critical covert operations than ever before. From the gathering and sharing of real-time intelligence with joint operations to the ability to serve as sea bases for ballistic missile defense and more, submarines' contribution to the big picture remains absolutely vital. For a detailed overview of how Electric Boat is quietly expanding the range of stealth, visit www.gdeb.com.

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FEATURES**LUNCHEON ADDRESS
2007 CORPORATE BENEFACTOR
RECOGNITION DAY****Ms. Allison Stiller****Deputy Assistant Secretary at the Navy (Shipbuilding)**

Admiral Reynolds, thank you for that kind introduction. VADM Donnelly, RADM Mauney, RADM Hilarides, active duty and retired Flag Officers, Corporate Benefactors, industry partners, ladies, and gentlemen.

Good afternoon. It is indeed an honor for me to stand before you today, representing the Assistant Secretary of the Navy for Research, Development and Acquisition, Dr. Delores Etter. Dr. Etter wished she could be here with the great folks of the Naval Submarine League on this important occasion, but other duties would not permit her to attend.

I've structured my remarks today so that there is time for questions and answers. I always find an interactive session more rewarding than me talking for 30 minutes.

The Navy/Industry shipbuilding team accomplished a great deal in the last year: we christened four ships, commissioned nine, and returned two to service. My office led the acquisition team's input to the Navy's 30-year shipbuilding plan and examined its associated Industrial Base impacts. We have also continued to spend considerable time dealing with the impacts from Hurricane Katrina and the ships being designed and constructed on the Gulf Coast. Our acquisition programs saw great progress as well. The DDG 1000 class dual lead ship acquisition strategy was approved by OSD. LPDs 22-24 were put under contract. The LHA(R) program successfully completed Milestone B. Both CG(X) and the Ship-to-Shore Connector have commenced Analyses of Alternatives. LCS (Littoral Combat Ship) 3 and 4 and T-AKE 9 were placed on contract. So, you are probably thinking...enough about targets, let's talk about submarines.

Specifically within the submarine programs, the Navy has seen tremendous progress. The final SSGN, USS GEORGIA (SSGN 729), was placed under contract for its conversion. The second and third SSGNs, USS FLORIDA (SSGN 728) and USS MICHIGAN (SSGN 727), were both *Returned to the Fleet* following their conversions and overhauls at Norfolk Naval Shipyard and Puget Sound Naval Shipyards, respectively. And USS TEXAS (SSN 775) and USS HAWAII (SSN 776) were both delivered to the U. S. Navy. The Navy presented the Meritorious Unit Commendation to both the PEO Sub's SEAWOLF Class Submarine Program Office and the Supervisor of Shipbuilding in Groton, for their meritorious service between February 1999 and January 2005. The on-time design and delivery of USS JIMMY CARTER (SSN 23) and its unique Multi-mission Platform in December 2004 contributed to this commendation.

Another notable achievement is the Atmospheric Dive Suit (ADS) completed certification and has already accomplished a successful rescue of the pilot of its French counterpart.

But there have been challenges. The Submarine Rescue Diving and Recompression System (SRDRS) continues to make slow progress. RADM Hilarides and I hold regular Executive level reviews on this program. It has been a struggle, but I believe the end is in sight.

Unfortunately, during this past year we also saw the cancellation of the Advanced Seal Delivery System (ASDS) program. However, the Navy, SOCOM, and OSD are working to develop draft Analysis of Alternative guidance for the ASDS follow-on acquisition program. And the Reliability Improvement Program for ASDS-I continues its testing evolution.

This year promises to be just as busy. USS VIRGINIA (SSN 774) will be *Returned to the Fleet* from its Post Shakedown Availability period. The return part is notable because rarely do we deploy a ship before PSA. VIRGINIA certainly proved herself and the PSA will only continue to enhance her capabilities. USS TEXAS (SSN 775) just entered its one-year Post Shakedown Availability period at Electric Boat. NORTH CAROLINA (SSN 777) will be christened in April, and USS GEORGIA (SSGN 729) (the final SSGN of a total of four) is expected to be *Returned to the Fleet* in September. The

remaining submarines of the VIRGINIA Class, which are currently under contract, will be in various stages of construction by both General Dynamics and Northrop Grumman. We must continue to demonstrate learning and convince folks we understand the costs for these follow submarines.

Now you may be wondering - why has the Navy been waiting so long to get to a point where we can start procuring 2 submarines per year? My office led efforts to develop the Long Range Shipbuilding Plan, which, in part, evaluated the impact of accelerating the VIRGINIA Class submarines within the FYDP and examined the capability risk incurred if we stayed with the program of record. The option to accelerate the procurement of two SSNs per year to 2009 instead of 2012 was considered. This option, however, was rejected since it would add three submarines at a cost of \$7 to \$8 billion across the FYDP at the expense of other Navy shipbuilding acquisition programs, which also have fragile industrial bases.

As you know, the Navy, however, does plan to enter a follow-on multi-year contract for VIRGINIA-class submarines and government-furnished equipment beginning in Fiscal Year 2009. Budget estimates for VIRGINIA-class submarines for Fiscal Year 2009 and beyond are predicated on Multi-Year Procurement authorization. The current multi-year procurement for five ships (FY 2004-2008) saved \$400 million, or an average of \$80 million per ship. The second Multi-Year Procurement for the next seven ships (FY 2009-2013) is anticipated to save in excess of \$1 billion for the shipbuilders' effort, plus more than \$250 million for the government-furnished combat systems, resulting in an average savings of over \$190 million per ship. We are trending in the right direction.

As you know, the Fiscal Year 2012 procurement of two submarines a year has a requirement that the unit cost per submarine be less than 2 billion dollars. To achieve this, the Virginia Class submarine program has undertaken Design Cost Reduction initiatives. A secondary effect of these efforts will in part sustain many of the submarine designers and engineers. The Navy also examined the projected savings associated with procuring two Virginia Class submarines per year in Fiscal Year 2012. We've determined the

savings to be about 1 Billion dollars, necessitating additional savings elsewhere.

The Navy identified five areas that *must* be addressed to achieve the remaining cost savings. First, the shipbuilding team must continue to work to maximize efficiencies. Second, the Navy must refrain from making requirements changes to the Virginia Class design. Requirements creep can add significantly to the cost of a submarine. Third, the Navy and the shipbuilders must continue investing in producibility improvements through the capital expenditure funds set aside in the current Multi-Year Procurement contract. Fourth, the Navy is investing in design changes that will make the submarines more producible, and therefore less costly to build. These must have measurable returns on investment. Finally, the Navy is exploring the option of purchasing materials on a *portfolio* basis, rather than separately for each acquisition program. This area is broader than submarines. Potential savings come in the form of economic order quantity purchases, regional savings, and commercial leverage. This would potentially allow the Navy to reduce the SCN costs associated with material, which accounts for \$38 Billion or 57% of the SCN budget (FY07 dollars). These actions will help the Navy achieve the \$2B (in FY05 dollars) per boat target planned for in Fiscal Year 2012. And one more interesting tidbit – while folks normally think that Hurricane Katrina impacted construction of surface combatants and amphibs, subs are going to benefit from the Hurricane Katrina Supplemental. The Navy recently announced the intent to negotiate with several shipyards on the Gulf Coast for infrastructure improvements. One shipyard is Seeman Composites of Gulfport, Mississippi. This shipyard manufactures the fiber-optics for the Light Weight Wide Aperture Array components for the Virginia class. The facility improvements proposed will help production efficiencies and should lead to price reductions on the LWWAA. Every little bit helps!

I would also like to highlight some of the submarine initiatives that are allowing the Navy to be better positioned for the future. First, the TANGO BRAVO initiative is a Joint DARPA/Navy technology development program that we are using to demonstrate the feasibility of technology concepts that reduce costs while maintaining the current capability of the Virginia Class submarines.

Three concepts currently being evaluated are shaftless propulsion, external weapons, and a broader use of electric actuators. These evaluations are on track to produce measurable results and future savings once implemented.

Lest you think we are only concerned with new construction, I did want to briefly mention submarine repair and modernization. As you may be aware, the Naval Sea Systems Command introduced the *One Shipyard* concept in 2001 to achieve more efficient ship maintenance. One Shipyard focuses on cost, schedule and quality through standardizing processes, sharing resources among public yards, and partnering with private yards. Other vital elements are a corporate approach to resolving critical skill shortages. This is done through loaning and borrowing skilled workers rather than having each yard hire, train, and employ capacity to execute peak workload. The industrial base today has adequate worker capacity, but the workers must be carefully managed and moved to where the work is geographically. This facet of ship maintenance is unique in the depot industry – all other depot repairs are conducted by moving the units to be repaired to where the workers are employed. We value our industry partners in this relationship and strive to continue to make the One Shipyard team more efficient.

It is a dynamic time in Navy shipbuilding. We have a lot of new designs on the drawing board or in the conceptual stage. We've been through the lead ship pain on the Virginia Class, so I'm sure you have sympathy for what the LCS program is going through right now. We are applying the lessons learned from VIRGINIA to other ship classes. While VIRGINIA isn't in the limelight right now, the sub community must continue to press for the 2 for 4 in 12 goal. I'm sure VADM Greenert will stress this as well. The Navy needs 313 ships in 2020 to meet our warfighting needs. Our job is to help procure and deliver these ships in the most cost effective manner. If there are good ideas that you haven't heard discussed, I'd love to hear from you.

You will continue to hear the Department stress the need for program stability. As you well know, the Navy is the only buyer of complex warships. We understand that many companies exist solely as suppliers for the U.S. military, due to the unique requirements of what we buy and how we buy it. We recognize the need for predict-

ability in our plan so that corporate investments can be made accordingly. We are committed to the 313 Shipbuilding Plan and the \$13.4B annual investment required to achieve this plan. We understand the impact of our actions on our industrial base throughout the Department and we are continuing to press for program stability across the shipbuilding portfolio. We recognize that predictability drives efficiency and effectiveness in the industrial base. *We get it – stability is key!*

I commend your commitment and support for all our shipbuilding and repair programs, especially the submarine portfolio.

Thank you again for inviting me to speak to you today. I welcome your comments and questions. ■

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**Naval Submarine League
Corporate Benefactor Recognition Day**

31 January 2007



VADM Chuck Munns
COMNAVSUBFOR

COMNAVSUBFOR

Detect, Describe, Defeat, Dissuade, Defeat

I'm happy to be here participating in my third Naval Submarine League Corporate Benefactors Days celebration as COMSUBFOR. Two years ago, this event was my first major speaking engagement after taking this job. These Corporate Benefactors Days have served as book-ends to my tour as Commander Submarine Forces. With my change of command and retirement this Saturday, I have a little bit of a different take on the future. Let me describe that vision:

It's many years in the future, after our current COMNAVAIRFOR, VADM (Jim) Zortman, passed away and enters the Pearly Gates, where God takes him on a tour. The tour takes them up a little cul-de-sac and past several small bungalows. They walked by Terry Etnyre's bungalow with an old, faded Surface Warfare flag out front, and past Jimmie MacArthur sitting on the front porch of his Coral Pink Key-Wester under a tattered NETWARCOM banner. Then God shows Jim to a little 2-bedroom cottage with faded aviator wings decorating the little, ivy-entwined front porch.

"This is your home, Jim. You can be proud. Most people don't get their own house up here," God explains.

Jim looks at the house, then turns around and looks at one sitting atop the hill. It's a huge three-story mansion with white marble columns and a balcony under each window. Submarine Force flags line both sides of the circular driveway leading up to the portico, where a huge Gold Dolphin banner hangs between the towering columns.

"I appreciate your consideration, God, but I'm a little puzzled. How come I get this little 2-bedroom cottage with faded banners, and Chuck Munns gets a columned mansion with new banners and flags? What's so special about him????"

God smiles mischievously: "That's not Chuck Munns' house, Jim that's mine."

After I spoke here last year I got some requests to be a little more specific or technical, so...



Fractured Physics

- $F = MA$ and $\sum F_{\text{net}} = 0$
- $\frac{dx^2}{dt^2} + \frac{c}{m} \frac{dx}{dt} + \frac{k}{m} x = 0$
- $\sum_{i=1}^n A_i > A_1 + A_2 + \dots + A_n$
- $\frac{dx}{dt} \gg |x|$ or X_{max}
- $m \Delta v \Delta y = \frac{h}{2\pi}$ quantum mechanics
- $X \neq Y \neq Z$

COMBUSTION

DETECT, DESCRIBE, DETOUR, DISSEMINATE, DEFUSE

here's how we make Submarines work today. I'll just let you absorb that for a minute – do you want the test now, or after I explain each effect?

Ok. While all those expressions are actually concepts that apply to us – and I used them at an American Society of Naval Engineers talk a few months back, I'll relent and agree we don't have to study them today.



Agenda

- *Global Security*
- *SUBFOR Relevance*
- *Year in Review*
- *2007 Initiatives*
- *Summary*

COMNAV/SUBFOR

Direct, Describe, Defeat, Destroy, Debat

So, if you'd rather, I will actually speak about the role we fill in today's world and how we accomplish it.

When I'm done this morning, I'd hope we all have a common understanding of the value Submarines deliver in publicly available terms. I'd ask that you help communicate that to people who may not understand what value Submarines bring to our country and the world.



Maritime Security = Global Security

- 75% of the earth's surface is water
- 80% of world trade moves by sea
- 44,000 commercial ships ply the world's oceans
- Global maritime commerce:
 - > Over \$2000 annually
 - > 200M containers per year
- Over 8300 warships worldwide
- Over 30 nations have navies with "global reach"
- 160 nations have some navy, coast guard, maritime police capability



Global Economy Depends on the Ocean Highways

First of all, let me explain the relationship between Maritime Security and Global Security. They are the same thing. Maritime commerce directly employs 2 million people globally and indirectly makes possible the employment of many times more than that. Taken in total, the world's Trading Fleet displaces more than 598 Million Tons. More than ever before, this economy is driven over the ocean highways, and as before these routes go through and near troubled waters. Ideologies, countries, companies, peoples meet and compete on these highways.

We all depend on the Global Economy. It provides our livelihood; it determines our nation's policies. And the Global Economy depends on the Oceans Highways.

Maritime Security is central to our very existence... it provides for nothing less than our Prosperity and our National Security.



Why Undersea?

-
- **Scout:**
 - Persistent surveillance access
 - **Shooter: Direct Action**
 - SOF
 - IO
 - Missiles,
 - Torpedoes
 - **Enabler:**
 - Home Field
 - Joint Force Access
- Going Where Others Can't
Doing What Others Shouldn't

COMNAVSTANTCOM

Director, Defense, Ocean, Undersea, Office

So we want Maritime Security because we want prosperity and survival. The next point then is we can't have Maritime Security without Undersea Warfare and Operations.

It's National Security and Prosperity, from Maritime Security, from Undersea Warfare. Submarines bring some unique capabilities to bear in delivering Maritime Security. Those capabilities are Persistence, Mobility, Stealth, Power, and Payload – and they are *critical*. Those capabilities allow us to fill many vital roles.

When we go to the other coast, and watch what is happening and fill the role of scout, we do that because of our Persistence and Mobility. We don't just look for a static snapshot of what is there during a short duration flyover. We also aren't limited to a stationary location. Submarines can act on the data they gather to maximize the *take*. The optimum collection location may change over a pretty wide geographic area over a relatively short period of time.

Beyond Persistence and Mobility, Submarines have Stealth, Power and Payload. The common denominator across these roles is the sustained ability to observe without affecting the behavior of the subject – To see what is happening when the bad guys don't think anyone is looking.



To reliably observe without interference or attribution is a pretty powerful capability.

So the answer to Why Undersea? ... Undersea provides Scouts that can act for our national interests and do it with Persistence, Mobility, Stealth, Power, and Payload. Those Scouts provide Maritime Security which ensures national survival and prosperity.

As just one UNCLASSIFIED example, this year a US SSN's Intelligence, Surveillance and Reconnaissance activities made her the Scout for SOUTHCOM Counter Narco-Terrorism operations in the Caribbean. This Submarine's participation led to the seizure of over 2.8 tons of narcotics. Narco-Terrorists are affluent criminals with significant monetary resources and a clear incentive to avoid being observed. Defeating them requires Persistence, Mobility and Stealth. Winning against other terrorist networks requires similar capabilities.



Sphere of Influence



The Submarine Force has come a long way in developing these five capabilities. Sixty years ago the Pacific was a big ocean for us to cover. Shown here are the spheres of influence - sensor and weapon ranges - of five of our World War II submarines.

Their sensor range was essentially visual and it exceeded the acoustic range of their equipment. Even with functioning radar, targets would frequently be picked up first visually if the weather was good. Weapons were effective to less than 2 miles. Our mechanical fire control system could track one target, but some of our heroes could maintain a mental firing solution in their heads for up to 3 or 4 targets.



Sphere of Influence



COMNAVSUBFOR

Detect, Describe, Deter, Dissuade, Defeat

If we plot today's sphere of influence over those same positions from 60 years ago we see quite a different picture. Not only are our sensors much better, but the range of our weapons makes the Pacific Ocean a much smaller place. Acoustic Sensors can reach over 100nm (with processing that allows us to sort the wheat from the chaff), and EM sensors can go even farther depending on the signals and conditions. Conventional weapons can reach out to 1,200 nm.

Our effectiveness within that sphere of influence is enhanced in many other ways as well. We continue to improve our ability to



operate much longer and more reliably because of engineering advances like the engineered simplicity of the Virginia Propulsion Plant and initiatives such as replacing steam evaporators with reverse osmosis units.

Our sonar and fire control systems can now track 50 or more contacts, and with advanced sensing systems like Patriot periscope Radar, Night Owl, Integrated Submarine Imaging System (ISIS), and Automatic Identification System coupled with advanced photonics and non-penetrating scopes, we are improving our situational awareness tools that reduce the risks associated with operations in densely congested maritime environments.

Our newest ADCAP version extends the deep water effectiveness of previous versions into very shallow water and allows us the option to engage targets in a much wider set of environmental conditions.

Our strike capability continues to evolve more flexibility with shorter planning times required and in-flight communications. Our newest version of Tomahawk can be re-targeted in-flight. It can loiter in the vicinity of a target area and await tasking, which can drastically reduce the time to get ordnance on target in response to a changing situation.

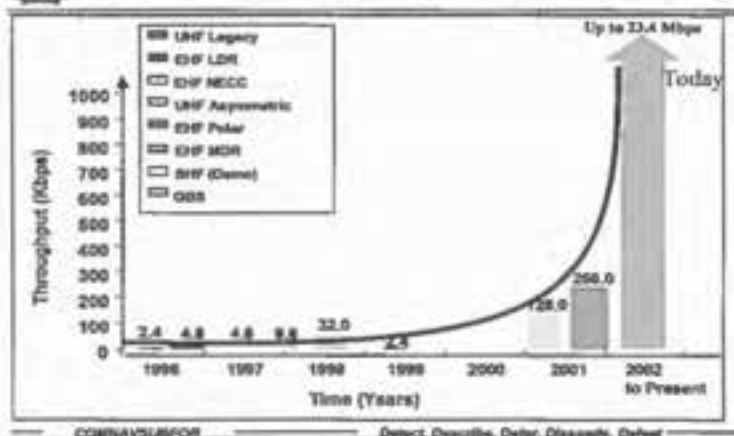
The same improvements have occurred with communications connectivity. While one of our key leverages over Japan in World War II Submarining was the evening Fox long range submarine broadcast, the communications throughput of WWII wouldn't even be visible on this chart (next page). Today's submarines are IP connected; their crew can chat, browse, email, view and send pictures.

We are leading a relentless march toward improving capability in Undersea Warfare. In the last year, we deployed twenty two Submarines across the globe, which conducted fifty missions for COCOMS and National Authority. On any given day last year we averaged about 10 SSNs forward deployed.

Last year we added USS TEXAS, and *Returned to Service* USS OHIO and USS FLORIDA as Guided Missile Submarines. USS HAWAII is very close to being ready, with Sea Trials complete and just entering PSA now. This is the first year that our shipbuilders have delivered two SSNs of the same class since 1996.



Sub Comms Capabilities



Part of maintaining and improving our relevance is to get the most capability we can out of every dollar we have to spend. In the last year we removed USS HONOLULU, USS RICKOVER, and USS DOLPHIN from service. But Force Structure is not where we are looking to save money. Last year, with a wide range of critical reviews of the way we spend our money and how we are maintaining our ships, we were able to reduce our spending requirements by \$215 Million. We didn't just focus on dollars though. That Effects Based approach led us to changes that created over 1000 SSN Days of Operational Availability with the same force size. What we have been and continue to be after is improved operations and optimum availability of our submarines for tasking.



Undersea Enterprise Effects

***Ships at Work,
Properly Aimed,
with Submarine Expertise,
a Healthy Culture,
and Future Capability.***

COMNAVSUBFOR

Chief of Operations, Chief of Assets, Chief of Staff

Shown here is the approach we use not to improve what we are *Doing*, but to improve what we *Get*. This is the construct I will use to tell you about what we are still working on for the coming year.

Ships at Work is about Operational Availability. It's about producing days where ships are deployed or ready to deploy. In 2007, the preeminent challenge is to get our maintenance done in a fiscally austere environment. The maintenance community has been challenged to execute all of the maintenance that had been planned and is required for this year with only 95% of the funding. We are going to be keeping a close eye on how we do that in order to be sure that it doesn't hurt our Operational Availability.

Operational Availability also extends to SSBNs and Integrated Undersea Surveillance Systems (IUSS), both fixed and mobile. We are undergoing a transition this year and IUSS Administrative Control will shift to Commander Naval Meteorology and Oceanography Command. This shift will allow increased flexibility and availability of surveillance assets by combining the capabilities of T-AGOS and SURTASS assets.

The Year 2007 will feature our first Ice Camp since 2003 and will re-initiate a biannual drumbeat of Ice Camps to maintain and expand our ability to operate across all maritime areas of the globe. It will feature an instrumented tracking range and facilitate our continued engagement with allies in the development of arctic tactics as well as international scientific research.

In the area of Synthetic Training, we will follow up our successful pilot of expanded use of simulators and trainers during our Tactical Readiness Evaluations of SSBNs. The surfaced Contact Management evaluation can be conducted in the Attack Center simulator and the Piloting evaluation will be conducted in the SPAN 2000 simulator. These simulators provide the Evaluation Team a method to assess areas that are hard to simulate at sea, especially with the surfaced SSBN security escort vessel requirement.

When I say *Properly Aimed* I mean that the Submarine Mission and activity is guided by effective CO Decision-making. Those CO Decisions are supported by critical skills held by his Officers and Crew, and we have several initiatives that aim to maintain those critical skills and the accession and retention of those who hold them. Those initiatives supplement the ongoing efforts to improve the mariner and critical risk assessment/risk management skills of our Commanding Officers throughout their development pipeline.

Submarine Expertise is about embedding our unique professional knowledge throughout the Joint, Interagency, and Coalition spectrum to ensure that we have educated customers that understand and make the best use of our product. Individual Augmentees are one aspect of this. As of last month, we had 52 Officer and 107 enlisted personnel on assigned missions in numerous specialties in support of operations on the ground in the CENTCOM AOR.

One of the most valuable assets for achieving the effect of Submarine Expertise is the experience base that our Senior O-6s represent. In an effort to improve the retention of that group, we have raised the Nuclear Officer Annual Incentive Pay bonus for serving or post Major Commanders to \$22,000, which they can collect all the way through 30 years of service.

We have several Coalition engagement initiatives that also support this effect. The Diesel Electric Submarine Initiative facilitates deployment of foreign Diesel Electric Submarines to

operate with U.S. Fleets. This year we are committed to providing over 260 SSK days of support to 2nd and 3rd fleet. We are working to develop several new international PMI agreements.

We continue to participate and develop the International Submarine Escape and Rescue Liaison Office, which has grown to 37 nations with over 600 users. ESCAPEX 2006 at SEAFAC off Ketchikan in Alaska was our first live escape from a US Sub in over 40 years and first ever from a US Nuclear Submarine. 2007 will bring us Exercise Pacific Reach, which will include a live rescue exercise and participation of India, Pakistan and the Peoples Republic of China for the first time.

In our effort to promote a healthy Submarine Culture, FORCM (Force Master Chief) Irwin is championing several initiatives. He is working to get the CPOs priorities focused back on the deckplates. To make this point he tells me that "we need them to man battlestations, vice manning laptops". We are planning to send all Senior Chief and above CPOs to Senior Enlisted Academy, instead of just COBs. We place a strong emphasis on Leadership Training Continuum attendance and focus on supervisory qualifications like DOOW, DCPO, and COW to place emphasis on credibility and accountability for the command teams. FORCM Irwin is also stressing to the CPO community the importance of developing Junior Officers.

Our 2007 goals include a reduction of Alcohol Related Incidents and DUIs by 15%, and a 20% reduction in drug attrition. That goal goes hand-in-hand with implementation of a comprehensive workforce strategy to attract, retain, and incentivize a diverse workforce of active duty, reserve, civilian, and contractor personnel.

Finally, we as the current Force are the nurturers and stewards of our Future Capability that will ensure that Submarines remain relevant. The primary initiative towards this effect is the VIRGINIA Class Cost Reduction. It won't matter if we have the most capable ships in the history of the world if we can't afford to build enough of them to maintain adequate presence where it counts. In order to afford a two per year build rate we must get the cost down to \$2B in FY-05 dollars.


In support of the right future capabilities, we are looking extensively at shipboard workload and placing emphasis on technol-

ogy that helps to reduce that.

All the while, we are continuing to Modernize to sustain Undersea Dominance and expand our degree of influence and freedom to operate within those expanded spheres I showed you earlier.

In summary, Global Security means Global Prosperity. All nations of the world are ultimately interested in secure trade facilitated by the rule of law. I hope you will explain to your wives, kids, the guy next to you on the Washington Metro, or Saint Peter at the Pearly Gates that Submarines bring Persistence, Mobility, Stealth, Power, and Payload to the equation in quantities that no other platform can provide. Those capabilities give us the ability to see the bad actors operate the way they do when they think no one is looking, and they give us the ability to do something about it.

The range of initiatives we are working will enhance those capabilities and our ability to employ them in the near and far term future.■



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**REAR ADMIRAL VAN MAUNEY
DIRECTOR, SUBMARINE WARFARE DIVISION,
OFFICE OF THE CNO**

**REMARKS FROM THE 2007
CORPORATE BENEFACTORS DAY MEETING**

It is great to be here today to speak to this audience. This is my first opportunity to attend the Naval Submarine League Corporate Benefactors Day Meetings, and I am honored to have been invited to speak to you today.

I know Admiral DeMars is not here right now, but I want to thank him for his service to the Naval Submarine League, and I would also like to thank the Naval Submarine League for hosting this event. I would like to point out that my first introduction to Admiral DeMars was in Maneuvering when I was a Lieutenant Junior Grade.

First of all, I want to tell you that my role today as N87 is much different from my time here in the 90s. To be sure, resource issues and decisions that need to be made are challenging, but the environment today is more collegial, and the networks among the various stakeholders are open. Let me take the next few minutes and give you a better understanding of the landscape within which the N87 team works, and the kinds of issues facing the Navy and the undersea arena of the future.

I understand the core values that make the Submarine enterprise what it is today; those things that VADM Munns and RADM Walsh talked about, and it is our intention in N87 to foster those core values and educate others on our lessons learned because it is important to the future of the Navy. It is also important that we continue to strengthen and improve on our successes; our open architecture business model, VIRGINIA, combat system modernization (BYG-1) and others.

There are three principle themes I want to cover today: First, who we are in N87, and highlight our continually evolving network of networks. Second, I want to emphasize some important concepts that will help you better understand the Navy strategy, and the importance of aligning our leadership in order to deliver capabilities that

count to the Commander. And third, I want to highlight some of our successes, challenges and opportunities.

Who We Are

In terms of warfighting background, mine is a bit different from most, and I understand the essence of our business and what works... and what doesn't. My commands included USS L. MENDEL RIVERS (SSN 686), Submarine Squadron FOUR, Submarine GROUP 8, CTF 69 and 164, and Commander, Submarines South in the Mediterranean, where I had the unique opportunity to direct NATO submarine operations in that part of the world.

I also served as the Chief of Staff for the Commander, U.S. Naval Forces Central Command (FIFTH Fleet), and was the Executive Assistant to the Commander, U.S. Central Command during Operations Enduring Freedom and Iraqi Freedom.

More recently, as Director, Naval Forces Europe Plans and Operations, I participated in a significant transition and consolidation of U.S. Naval Forces Europe and the SIXTH Fleet. Out of 1,500 headquarters billets we returned almost 1,000 billets back to the Navy. Through the application of transformational business practices with a focus on value, we are now doing the same job the Navy in Europe was doing prior to the consolidation, but with fewer people. It just shows the power of what you can do when you have the opportunity to take and recreate something in a new location. It is more than just moving the water coolers, or moving the headquarters to a new building. It is about sending people off to their next jobs, and bringing in new people and having the power to create a flat and effective organization using new ideas and a formal approach to planning.

Now that I am back in Washington, I have completed the transition from operations and planning to the financial arena, and I want to share with you some of my general observations of what is new since I was last part of the N87 organization. Being back in Washington has also allowed me to spend more time with my family and try to enjoy a little more golf.

In fact just last month, as I was heading out to my car in the parking lot to go home after an average round of golf, an Air

Policeman stopped me and asked, "Did you tee off on the sixteenth hole about an hour ago?"

"Yes Officer, I responded.

"Did you happen to slice your ball so that it went over the trees and off the course?"

"Yes, I did. How did you know?" I asked.

"Well," said the policeman very seriously, "Your ball flew out into the highway and crashed through a driver's windshield. The car went out of control, crashing into five other cars and a fire truck. The fire truck couldn't make it to the fire, and the building burned down. So, what are you going to do about it?"

Obviously I was surprised by what the policeman was telling me so when he asked me what I was going to do about it I told him "I think I'll close my stance a little bit, tighten my grip, and lower my right thumb."

Our objective here at N87 is to not hit the *slice* in our Submarine Force programs. We want to hit the long balls, the short balls, or what ever the Navy needs—and continue to evolve our force capabilities in a direction that will be relevant in meeting the challenges of the future.

OPNAV has reorganized (again) back to very a similar mid-1990s variant; however, the functions of N87 have changed significantly. Today, N87 is a complex network of interlocking authorities, operators, stakeholders and producers. The principle flow is from the CNO intentions (strategy) and resource planning. We are the CNO undersea planning staff, planning how to fund the next Navy, and the Navy after that. Taking the plans, we place resources and provide feedback to CNO and the Undersea Enterprise as to the risk and health of our investments. We are closely linked with other stakeholders—surface, aviation, expeditionary warfare, manpower and logistics. And as I mentioned earlier, the environment is collegial, professional and getting more open. We are working hard to identify and eradicate old practices that are costly and detrimental to the Resource Sponsors and the Navy. We are closing the seams, sharing lessons, and leveraging concepts in Maritime Operations across DoD.

In parallel, the Navy Enterprise construct is working to effectively deliver readiness and operational effectiveness at stabilized,

and when able, reduced cost. The Undersea Enterprise (USE) includes many of you as either direct or indirect members. VADM Munns gave you his perspective as the Chief Executive Officer, and as his Chief Financial Officer, mine is tempered a bit differently. I will talk later on this, but operational effectiveness informed by cost control to deliver capability is vital to our future—and I want to keep this in perspective.

Important Concepts: Understanding the Strategy

It starts with the strategy; the CNO clearly identified his three priorities in 2006, and he reaffirmed them just recently for 2007—he thinks they are about right. We understand his priorities and know how they link to the USE effects and priorities.

Remember, we are a nation at war. We must sustain combat readiness and simultaneously build the next Navy (and the one after that) and on our part, a major effort is building VIRGINIA Class SSNs. As Admiral Donald noted, building the 313 Ship Navy and working to stabilize the industrial base is important. However, we must also engage with our allies to build the CNO vision of a 1000 ship Navy, and the 200 plus coalition submarines that comprise it. Today, there are 43 nations that operate about 360 submarines—300 of which are quiet diesels. Some of these countries are already in our coalition, and we are working on the others. Submarine rescue is a great venue to bring this coalition together, and we are working hard across the globe in this important area.

Speaking of others, last year in Naples we had Navy-to-Navy Staff talks with the Russian Federated Navy. The visiting Russian Federated Navy team was led by a Vice Admiral and included several Russian submarine captains. It was a watershed event that discussed more than just safety at sea.

Another one of the CNO priorities is developing leaders for the 21st century, and this is perhaps one of our most important endeavors. If we do not get that right, little else will follow. We have to develop the 21st century leaders in the right way. N87 is part of VADM Harvey's and RADM Gove's Manpower Cross Functional Team which is charting the future in this important area. This team of Navy professionals is working very hard taking the raw materials

that our society produces and is turning them into sea warriors for the future.

Today, eye watering sailors are doing great things every day in all parts of the world, at sea, overseas, on land and at home. Work in this arena feeds submarine crews and our leadership teams, from our Commanding Officers, Executive Officers, and Chiefs of the Boat, all the way down to leaders on the deck plate. Please be strong advocates in our cities and towns as we work to maintain the vital support to our men and women in uniform.

Many of you know that VADM Munns approved a series of USE effects. They are aligned with the CNO priorities, and we watch progress towards achieving these effects very closely. COMSUBFOR and his team, COMSUBPAC and N87, along with the rest of the Enterprise, work together very closely on activities designed to deliver those effects. In N87, we spend the majority of our time working to plan for the delivery of and fund future capability.

However, the horizon is not clear. We are in an austere fiscal environment, and it will likely continue to be this way for some time. Katrina recovery costs continue, as does the war in Iraq and Afghanistan. Military Health Care is putting stress on the DoD budget, and we will need to recapitalize the Army and Marine Corps over the next few years. Much of their ground equipment needs to be replaced. Add in the reality of a brittle energy production and distribution system contributing to unpredictable energy costs—and you can see the picture. These issues dictate that all of us—Navy, producers, suppliers and customers must all work together—and provide high return on the Nation's investment

We must drive the non-value added cost out of all new and existing systems, and we will need your help. The CNO and our Navy leaders have given us a sound strategy, clear effects and objectives, and together, we must now solidly execute.

Long Term Strategy/Objectives 1996

Some of you may remember N87 strategy from 1996, when Admiral Giambastiani was the Director. It can be categorized by Stealth and Survivability through acoustic and non-acoustic means;

Combat Capability and Affordability through platforms, weapons, sensors, vehicles, tactical development, doctrine, training and operational availability; and finally, it must be affordable. As you can see, these enduring concepts are still applicable today.

Long Term Strategy/Objectives 2007

Our approach and strategy for today is still evolving, but the N87 team is working on the following focus areas. Stealth, persistence and agility are all interlocked and vital to our force. We use an effects-based approach with the desired endpoint in mind. Mission accomplishment is defined in terms of effects—from non-kinetic, to the full range of capabilities when needed. From an operational perspective, if it's not relevant to our future—don't waste our time. We want platforms, sensors and vehicles that extend our reach to achieve the effects, all in the tactical network, and feeding the Joint Commander. And as I mentioned earlier, it begins with the Total Force, all of our people; they continue to be our most important resource.

Future Readiness must include good cost understanding from initial concept through final delivery, and it doesn't end until the lifecycle is completed. Suppliers must help us better balance the cost equation to retain dominance. Mutual understanding on how to take, manage and share risk in our arena is vital. We must understand each other's risk, but one of our goals is to remove as much operational risk from our Commanders as we can.

The USE resource Enterprise is wide—and we are actively constructing business models with our partners in aviation and surface warfare, and many others, building trust and confidence and identifying and fixing problems among ourselves when observed behaviors sub-optimize our collective links. A collaborative approach is important because problems in large acquisition programs affect us all. Barriers to openness and collaboration are still around, but are avoidable with skill.

You will note an emphasis on readiness at cost. We know the pressures of limited resources—and the challenges mentioned earlier. We must strive to look for clarity in our value chains. This can be summarized in the tag line *Capabilities that Count at Cost*

with on Time delivery (C3T). Today, we are challenging the amount of time needed to bring new capabilities to the fleet. The technologies we are going after can be difficult to develop, and they take time. We need to better understand and better appreciate that time scale earlier in the process.

My role as N87 is to guide development and funding of capability following CNO and USE guidance to inform our priorities—the first C in C3T and then team with Program Executive Officers and Program Managers to achieve and deliver the capabilities to our forces. The process starts with integrated but innovative science and technology, moves to research and development with realistic expectation for transition to procurement, and then production. Predicting risk and return on investment are enduring elements of this strategy.

Aligning Leadership

Within Navy, we are part of a good system, not perfect or monolithic, but we remain focused and understand each others' objectives by communicating regularly and openly. We have had notable successes in the past, but our future can be made even better. The requirements generation/validation process of Sea Power 21 and the Joint arena interacts with other processes that are affected, both positively and negatively, by corporate Joint and Navy views. With a compelling need articulated, we can and do respond to innovation.

In the Joint arena we are building a cadre of portfolios and are working the *fit*. The joint capability process is defined. The Joint Staff and the Services are working to make generation of joint capabilities more productive and efficient. Combatant Commanders and Navy Component Commanders have a role to influence the decisions on resourcing capabilities, and on competing in the Navy capability arena. They know how to seek available capabilities and then ask for new capabilities as well. Rear Admiral Mark Kenny and his team at the Center for Submarine Counterterrorism Operations is doing a great job in matching our deployed submarine capabilities to the COCOMs demands, and then circulating knowledge of capability and education to the areas of need. The goal is to provide a good product based on a needed capability, delivered on time, with cost *visibly* under control.

Among the financial and capability process, Joint integration in DoD and approval by Congress are extremely important. And finally, Industry, you are absolutely essential to this process—"no, you are vital"—I cannot say it stronger. You are the producer and supplier of what we need to succeed in delivering national security.

As you can see, there are many lines of communication, and we in N87 must keep those lines open and robust, and the information flowing.

Capabilities that Count

Understanding the battlefields and excursions of tomorrow through campaign analysis is complex and challenging work. But these analytical efforts are important, they inform our leadership, and they ultimately influence the capabilities that are funded. But at the end of the day, these capabilities must be relevant. They must support major combat operations and extend our reach into our environment—the battlespace. From global strike, where our national security demands a secure and dependable strategic deterrent, to intelligence, surveillance, and reconnaissance in support of GWOT operations. The persistence, speed, agility, and responsiveness—all hallmarks of our Submarine Force—and the calculus to develop and produce these capabilities into the future is complex, and it demands the best from us all

Producing Value is Tough

Producing value—to the Sailor on the deck plate and value to the Commander in the theater is tough. Cost control and return on investment are key—instinctively we think that Navy procurement cost increases exist in virtually every program and for many reasons. However, early and continuous integration with stakeholders and suppliers is important in controlling cost and to transmitting value to our Sailors first, and then the taxpayers. We have talked about how important it is to get good initial cost estimates so that we can better understand each other's perspective on the risk equation. Here at OPNAV, we are looking at new tools to access and then manage this risk.

We must continue to focus on capability performance that is underpinned by relevant and effective concepts of operations. It is really important that the CONOPS we develop are practical and fleet endorsed. The Advanced Deployable System (ADS) is not a good example of the marriage between CONOPS and capability. Throughout its development, ADS was supported as a good program. As the program was nearing initial testing, a fleet review determined that the capability construct did not have the practical value desired, and as a result, we cancelled the program. We need to learn lessons on how to better anticipate and reduce such risks.

We need to continue to foster innovation and translate it to research and development, and then on to procurement and production. But we must understand its cost, the risks, and return on investment all supporting tactical relevance.

Building on Successes

We have had some great successes. Admiral Donald and Admiral Munns mentioned a few, but I want to highlight some others, specifically VIRGINIA and our combat system modernization. But first, I want to highlight several key improvements. PATRIOT Radar and the Automated Information System for improved close-in tactical control, and the new and modern Valve Regulated Lead Acid Battery a zero-maintenance battery that doesn't require the traditional battery—support systems, which has helped resolve several vendor supply challenges. Other successes include Information Operations capabilities in support of the War on Terror. An exciting capability—rapidly developed and already at sea today. The Mk 48 MOD 7 CBASS heavy weight torpedo—still evolving and getting better. And finally, the total force—there are numerous training initiatives in the fleet and in our school houses that are preparing our Sailors to operate our submarines around the globe, wherever needed.

We continue to refuel our OHIO Class SSBNs, and we will complete the final D5 missile back-fit very soon. I will tell you, the SSBN Refueling Overhauls have been an understated success. With our great Naval Team—shipyards and Sailors, the program is on track and on schedule, and is returning these wonderful ships to sea in great shape. This program success is a testament to the capability

of our public shipyards and to many of you in this room. The OHIO Class SSBN will continue to provide our Nation with a survivable strategic deterrent capability well into the middle of this century.

The SSGN conversion program is another success story, with three of the four SSGNs delivered back to the Navy. The program achieved a significant milestone on January 24th 2007, when all three operational SSGNs were at sea simultaneously, performing testing, training, and certification. SSGN—what a tremendous new naval capability that will begin operations soon. Now we have to learn how to best employ and continue to evolve these ships as we gain operating experience. And finally, we have 10 fast attack submarines operating around the world at about 70-80% OPTEMPO—they are in high demand and continue to smoothly accomplish their vital missions.

VIRGINIA Class SSN Overview

I promised Admiral Hilarides I would highlight the great work General Dynamics-Electric Boat and Northrop Grumman-Newport News, and the myriad of suppliers are doing in continuing the record of excellence of producing VIRGINIA Class submarines. Construction performance data clearly shows accomplishment and also promise. I was honored to have been in Galveston, Texas for the commissioning of the TEXAS—what a marvelous experience that was 10,000 Texans and others showed up, and it was a great day for the Navy and the Submarine Force.

Assuming Congress approves our request in the President's budget, we will begin discussion for the next VIRGINIA multiyear procurement contract in the fall. This will likely be a seven-ship, five-year contract, ultimately leading to the production of two VIRGINIA's per year in FY 12 for a total cost of \$4B (FY05\$). Team Submarine and our industry partners are working together to achieve the \$2B (FY05\$) per ship cost goal, a nearly 20% reduction.

Combat System Modernization

Combat system modernization is another success story. The Submarine Force open architecture business model is leading the way for the Navy. The Surface Force is looking to leverage the tools of this model to modernize surface combatants in mid-life.

In the future, the challenge for our combat system modernization program is to continue to scrutinize and apply discipline to the open architecture business model process. We must ensure we deliver Capabilities that Count at *the right-time*, and do it in such a way that we maximize the return on our nation's investment. As of January 2007, 51% of our SSNs have been modernized with open architecture sonar and fire control systems at about one-eighth the cost of new legacy-type systems. Our SSGNs will also receive the latest sonar and combat system capability during their first post-conversion modernization period.

But... Some Challenges

But we also have some challenges coming up. We all recognize Undersea Dominance is about extending our reach and tactical control, and more recently, about being networked at the right time with the right bandwidth. We continue to work on extending our reach with unmanned undersea vehicles (UUVs). Last year at this event, Admiral Walsh mentioned our successes with the Mission Reconfigurable UUV system. We continue to work to deliver this capability.

The Predator UAV is a good example of a model that folks find attractive—an engine with a sensor package that were originally based on a commercial solution set that delivered a significant low-cost capability. To be sure, the undersea environment is substantially more difficult—but we have had some notable successes. We remain committed to a measured risk-based approach for an underwater vehicle capability to extend our reach in the battlespace.

Another one of our priorities is improving our ability to communicate at higher speed and at deeper depths—to better link target and friendly force data and rapidly receive Commander's intent; all important capabilities that enhance operational dominance. At the beginning of this program we ran some experiments and took risk early on, and we learned a lot. As a result, we now have a good sense of the maturity of the technology available and the achievability of the various concepts. We are resetting the program to deliver those capabilities that our experiments validated, and are going back to the drawing board to refine the whys for the other capabilities that have

not yet worked, but remain important to us. We are committed to comms at speed and depth, it is important to Joint Commanders, and it will remain a priority for us.

Congress continues to deliberate on the Conventional TRIDENT Modification (CTM) program. CTM is a STRATCOM initiative to develop and deliver a rapid, global conventional strike capability using conventional munitions on TRIDENT D5 missiles. DoD is working with Congress to communicate the details of this program. Admiral Steve Johnson and his team at Strategic Systems Programs have a solid plan to implement a production cycle that would produce this capability if approved by Congress.

We also have several exciting new concepts that are being worked by teams which will present both technological and production challenges. Unmanned Aerial Vehicles (UAV) for example—Admiral Mark Kenny is working with the Combatant Commanders and Special Operators to develop a UAV launch capability from a submarine in support of operations ashore.

Some of our new sensors, like the sail mounted Low Cost Conformal Array, will enable our Commanding Officers to have better tactical control and awareness of the tactical environment.

Finally, let me mention rapid GWOT capability insertion—thanks to Mark Kenny and his team at the Center for Submarine Counterterrorism, antenna changes, communication equipment changes, and new networks are onboard our submarines today, allowing them to receive relevant information and communicate with joint commanders.

Construction Performance (CAPEX)

Returning to some challenges on VIRGINIA—Capital Expenditure (CAPEX)—we are on the glide slope to reduce the cost of VIRGINIA and CAPEX is one of the reasons. There are many examples of investment by both industry and government that is changing and improving the landscape in production facilities that will reduce the construction cost of VIRGINIA.

How do we take a program like VIRGINIA, a submarine that has already been designed, built and delivered within six weeks of the delivery date on a six year old contract, and then ask the designers, suppliers and builders to produce a 20% cost reduction? Thanks to

the VIRGINIA Program team, Navy and industry, this is a challenge that I think we will meet.

Design for Cost Reduction

Another facet of the VIRGINIA Cost reduction is design changes that will result in lower production costs. We are taking a hard look at the bow redesign and payload interface module—we want to make sure we understand all of the questions associated with this design change. The Shipbuilder, Program Office, and N87 have commissioned an Integrated Process Team to fully develop the concepts. This is an area we need to push hard to produce real capability—but first we need to peel back the onion and fully understand all of the details.

In addition to the bow redesign, we are also looking at electrification of the torpedo room by using two electric motor designs to replace hydraulic motors in 20 applications. This change could ease construction complexity and reduce cost by eliminating high pressure hydraulic piping and components. We are also using a low risk vendor supplied Reverse Osmosis Unit with proven technology to reduce the cost by over \$500,000 per ship.

Commitment to Open Architecture

The USE and our team of science/academic and industry partners pioneered the Open Architecture Business Model. We are extremely fortunate that our predecessors had the foresight and wisdom to demand a more cost efficient and effective way to retain our Fast Attack submarine's edge in undersea warfare for the life of the ship. We remain committed to this set of business processes—they have proven themselves—but we are looking for capabilities that count.

We are delivering improved capabilities in the areas of advanced sensor processing, increased frequency coverage, multi sensor correlation, operator enhancements and bell ringers to improve the operators performance, acoustic communications, Digital Data Collection System, and other capability improvements. Our goal is to more quickly allow the Commanding Officer to impose tactical control in the battle space. We have already included several of these improvements in our latest advanced processor builds and they are out there on the boats.

We continue to expand the open architecture business model to other non-propulsion electronics on our submarines, including electronic surveillance, information operations, communications, imaging systems, navigation, and weapon systems. We are also investigating ways to better tune the information environment in the control room to support the kinds of decisions our Commanding Officers need to make while reducing the need for operator intervention.

Today, we are asking if we have cleared the *low hanging fruit*? Are we delivering the value which will pay dividends to our Commanding Officers and ASW Commanders in the future? Is the cost for each capability understood? Is the rate of capability insertion optimized to foster submarine Operational Availability, and is the degree of technological risk understood and challenged? We in N87 are working with the large team of stakeholders to answer these questions with an end result of C3T in mind.

And Finally Some Opportunities

I will close by highlighting some particularly interesting opportunities in which we can all be involved. I believe our culture is strong, we are fostering an environment ashore and at sea that builds and supports a total force that possesses the core values that make the men and women of our Submarine Force the best in the world.

As Admiral Walsh noted earlier—SSGN is nearing fleet introduction and represents an untapped operational reservoir. We must posture to help the COCOMS and Navy learn how to best employ this new capability and then continue to evolve this set of capabilities. SSGN truly is an impressive accomplishment between government and industry; now it is up to us to get their crews ready to do the Nation's work.

Our Enterprise approach is focused on providing readiness and operationally effective capabilities at an understood cost. This includes the modernization and recapitalization elements with which many of you are directly involved. Navy leadership is committed to the model which aspires to assure freedom of information exchange, and which builds confidence and trust among all of the stakeholders in the enterprise construct.

And finally, the Lean Six Sigma approach to the value chain. Lean Six Sigma is not a panacea; it is a tool for us to use to examine our processes in a way very similar to how we were raised as nuclear trained Officers. Critically looking at how we do business, and if there is a part of our work that does not add value, change the process. This is the direction the Navy is heading.

In closing, in my view, our future is bright. I challenge everyone here to work better with all of the other stakeholders to make our future Navy, and the one after that, continue to exert the dominance in the undersea domain that is needed.

Thank you.

ARTICLES**SUBMARINES AND THE NEW MARITIME STRATEGY¹***by* **RADM William J. Holland, Jr. USN(Ret)**

Rear Admiral Holland is a submarine officer who spent most of his active service in submarines. He has been a frequent contributor to THE SUBMARINE REVIEW since its founding.

The Navy's present effort to write a New Maritime Strategy is described by Captain James Foggo in January's THE SUBMARINE REVIEW. Key to his description and the effort itself is the idea that the answer is not yet known.² The difficulty with such an approach is that the temptation to satisfy the many casual observers obscures the historical experience and technical knowledge of the few experts. When that experience and knowledge resides in a relatively small group, the result of the wide ranging effort can be a broad but shallow policy which over values the immediate and undervalues the future.

The Maritime Strategy of 1980 – 1990 was a masterful document that, resonating with the operators, focused the Navy on its missions against the Soviet Union while providing an understandable rationale for the Navy force structure as well as guidance and justification for program acquisitions. Since the collapse of the Soviet Union, a seemingly unending stream of documents has attempted to duplicate these admirable characteristics for the entire Defense Department.³ Follow-on policy documents issued by the Navy worked on translating these national directives into rational roles for the Navy in the post-Cold War world. An authoritative diagnosis of these policy statements characterized them as, "... framed in terms too general and abstract to serve as useful and meaningful guidance" in war, organization or acquisition.⁴ With little strategic guidance and that so broad as to be of little practical worth, the creation of some long lasting, long range statement of mission becomes crucial to focusing intellectual energy and operational development. For the Navy, only the Navy can create such a plan and in that creation the relatively

unique role played by submarines is likely to be missed if submariners do not fully participate in the plan's construction.

The original Maritime Strategy grew out of real war plans that focused on a coherent naval response to a single opponent. Without such an obvious opponent, writing a similar statement of purpose and utility becomes a challenging task. But such an effort is important because there is no organization or group other than the Navy that can enunciate the importance and meaning of sea power. Failure to undertake this intellectual task leaves the organization stuck in the past, spending resources, money and study on maintaining what it has and not on investments for the future. Just as the Navy possesses the real source for such policy, so do submariners hold that unique understanding of undersea warfare that will dominate any future conflict at sea.

Submarines were the point of the spear in the strategy of 1980, aided by reconnaissance and intelligence operations aimed at a single major opponent², instrumental in establishing the perception that the Soviet Union could not seriously threaten the Western domination of the ocean routes, submarines of the NATO powers were also able to threaten the missile submarines that formed the second strike component of the Soviet strategic nuclear forces. With the demise of the Soviet Union, many, inside as well as outside the Navy, questioned the usefulness of these submarines. Especially vociferous were many of the public media such as the New York Times and critical budget analysts such as the Center for Strategic and Budgetary Assessments. These critics of defense expenditures in general were eager to label these ships as *expensive relics* of the Cold War.

That attitude is not ameliorated by the present embroilment in the Middle East. In these conflicts, the afloat Navy's role is peripheral and supporting. The Construction Battalions and the medical personnel have direct and immediate roles and missions in support of the Marines. Additionally, there are dozens of individual augmentees performing auxiliary but important tasks not because they are Navy missions but in order to relieve the Army and Marines or to utilize unique personal abilities. But in general the Fleet is not central to the combat in Iraq. In particular, submarines have had no vital role other than as arsenal ships able to launch land attack

missiles. At best submarines are on the periphery of the War on Terror. No amount of propaganda will alter the relative unimportance of submarine related operations in this war and the danger is that this relatively low weight in the immediate action will obscure the long term importance of the submarine in future endeavors and operations.

This New Maritime Strategy is intended to be "the ways and means to achieve the ends of the vision contained in a previous document, *Sea Power 21*."⁶ Though submerged in thousands of words *Sea Power 21* repeats the precepts of earlier propositions that the Navy's missions are: Deterrence, Maritime Dominance, Power Projection, and Presence. Even within these guidelines, there is a debate between the proponents of ocean dominance and the coastal and riverine supporters in the War Against Terror. These two groups meet on several contending planes: big ships versus small, threats from potential peer competitors versus those from terrorists, today's wars versus future concerns, current force structure versus future developments, battle-worthy warships versus support of the Marine Corps. Submarines are clearly on one side of this contention. Without a clear threat to national existence, neither of these schools of thought can dominate near term considerations thus further complicating the development of a *strategy* or policy to execute it.

While dominant in today's political center and probably for the near future, the Global War on Terror is only a piece of American strategic positions. To avoid the cliché admonition that militaries always prepare for the last war, the Navy has to avoid designing forces overly optimized for this single aim. Those who understand the role of geography and its relation to the Navy mission must be especially diligent to ensure the concentration on the "wolf closest to the sled" does not obscure the larger tasks or the "bear lurking in the woods".

"What do we need a Navy for?" was not an uncommon question in the interval between the surrender of Japan and the Korean War. Now that there is no evident enemy the argument will arise again. In each age of change, the Navy has to adopt without losing sight of what it *and it alone*, knows. Command of the sea, taken as a given in every war plan or strategy document since 1945 cannot be guaranteed under all circumstances and must be continually achieved

by investment and presence. To overcome the attitudes of "Why Navy?" the Navy has to try to elaborate a systematic operational theory that will convince itself first and then serve as the basis for explaining to others its purpose and utility. "The traditional blue water mission is less acute" but no less important.⁷ This same consideration applies to submarine advocates. Undersea warfare is a demanding intellectual and technical task that few outside the community appreciate and understand the utility and promise.

Because the likelihood of increased resources in the wake of the tremendous costs of the Iraq War is very small, some care must be taken to limit expectations of what the Navy can and cannot do. The New Maritime Strategy ought to avoid overstating both the threat and promise in order that political leaders have some grasp of the limits of the country's reach. At the same time, the Navy will have to try to write a strategy that, while realistic in terms of forces, is not constrained or overly limited to fit some preordained conceptions of resources that will be available. The New Maritime Strategy ought to be a driving function not a following one. Well written, the Maritime Strategy will lead the national strategy to correct conclusions. Admiral Art Cebrowski drove Network Centric Warfare without considering how much money would be available for the end systems. After all, War Plan Orange that described how the campaigns against Japan would be waged was written during the Depression.

In this maelstrom of intellectual fervor to develop the New Maritime Strategy, submarines ought to remain a topic of high interest. A submarine's capital cost cannot be concealed and so will remain a target not only for those outside the service who would like to avoid expenditures but also those within the service who see new submarine construction as source of cash to be raided. On the other hand, the rise of China and her interests at sea have resulted in an almost universal view of submarines as the most appropriate maritime tool in the event of a rise of a peer competitor. Such a competitor need not be a world-wide threat but merely a threat to US dominance in a maritime theater of important US interests. This translates to the Straits of Taiwan and the waters of the Western Pacific. "Thank God we didn't cancel submarines in the 1980's. Asia is a naval sphere..." said Richard Armitage in a review of US global

policy.⁸ Just as submarines were the tip of the arrow in the old Maritime Strategy, the weapons system to establish dominance in waters not under our control, they will remain as the primary mechanism for penetrating contested littorals and for operating against the weapon systems of likely opponents at sea – other submarines.

A favorite scenario for planners involves a fleet action in the Taiwan Straits. Whatever the political motivator for a crisis in this region, the obvious American response will be naval. And rather than a littoral we will be faced with relatively confined waters in which combat units on the surface may be under a severe threat from space and shore based surveillance, coupled with tactical missiles and submarines. The heavy damage to the Israeli frigate off Lebanon by a shore based short range missile presages the difficulties that surface ships will face in the future when in confined waters. In such scenarios, only submarines will be able to penetrate heavily defended areas, close the shore lines and remain there for prolonged periods of time.

The Taiwan Straits is not the only area that may be the scene of conflict. Not every navy can be counted on as being and remaining friendly. The major nations around the Indian Ocean have viable Navies and Submarine Forces and can represent other potential problems. Interestingly the rise of the Western Pacific and Indian Ocean threats to American maritime dominance has not gone unremarked by former proponents of canceling submarine construction. The unique value of submarines has become apparent even to the severest budget skeptics. Andrew Krepinevich, long noted for his stance against submarines, now considers submarines an important investment; saying, "...increasing our submarine production to send a clear signal to China as well as our allies that Beijing cannot expect to threaten US freedom of action in an area of vital national interest or coerce America's friends and allies in East Asia."⁹

Most of the views expressed in these discussions of the maritime strategy so far have been unencumbered by reference to tactics or technology. The education and training of policy writers tend to remain clear of electrons, steel fabrication, antenna sizes and other such factual nuances outside the political and economic sphere. But as Mahan said clearly, technology determines what is possible

tactically and tactics determine what is possible strategically. Ignoring technical dimensions limits both the reality and the promise of any strategic policy. In this area, the participation of submarine advocates is important because few naval officers outside the submarine community appreciate the degree that a nuclear powered submarine can dominate its immediate battle space on the ocean while at the same time able to bring this dominance into areas otherwise totally controlled by an enemy.

In the coming scramble for resources between and among the services, the New Maritime Strategy must try to provide a logical and well founded ground work for naval missions and organizations more than for acquisitions. If the missions are clearly propounded and made public, they will influence force structure and budget. The most knowledgeable proponents of sea power within the government will be muzzled by the requirement to adhere to the Secretary's budget. But those analysts and propagandists who dominate the public press and thereby influence civilian leadership can be persuaded by logic and historical experience when and where that is presented in a useful, forceful and direct manner.

Mahan and the Maritime Strategy were accepted because the time was right – both were synchronized with public mood at the time. The rationale of the original Maritime Strategy appealed to the Reagan administration, a political leadership that was ready to receive its guidance and eager to use it as part of their defense buildup. Gaining a similar foothold on political and national mood now will be very difficult – all the more reason for attempting to craft a serious and dynamic statement of purpose that can endure the test of changing administrations, shifting international relationships and public moods.

Samuel Huntington finished his seminal essay on this subject in 1954, during a previous period in which the Navy was accused of costing too much without commensurate utility, Huntington concluded with the admonishment that "the attitude of 'why do we need a Navy' can only be overcome by a systematic, detailed elaboration and presentation of the theory of a transoceanic navy against the broad background of naval history and naval technology."¹⁶ In this period of concentration on homeland security and terrorist wars, his admonition applies particularly to the rationale for

undersea warfare. Shaping the thinking inside the Navy and among its supporting analytical personnel to influence post 2009 national policy is a major goal for the New Maritime Strategy. In this effort, the unique contributions submarines make to what the Navy should be able to do ought not to be lost in vague generalizations. ■

ENDNOTES

1. Some of this essay is adopted from "Challenges to the New Maritime Strategy" by the same author published in U.S. Naval Institute Proceedings, April 2007.
2. Captain James Foggo, "Mahan Lives! Developing a New Maritime Strategy", The Submarine Review, January 2007, pages 75-88.
3. These include but are not limited to Defense Guidance, National Security Strategy, National Military Strategy and National Maritime Security Strategy. Knowledgeable defense analysts and officials refer to most of these as "glossies" rather than rigorous attempts to focus succinctly on difficult issues.
4. Toshi Yoshihara and James R. Holmes, "Japanese Maritime Thought: If Not Mahan, Who?", Naval War College Review, Summer, 2006, page 46.
5. The 2007 Submarine History Seminar to be held at the Navy Memorial on 11 April will focus on this aspect of the Cold War Maritime Strategy.
6. Maritime Strategy Symposium Naval War College, November 14, 2006.
7. Art Pine, "Laying the Keel for a New Maritime Strategy," U.S. Naval Institute Proceedings, December 2006, page 33.
8. Richard Armitage, Remarks to the US Naval Academy Alumni Association Washington Chapter Meeting, February 15, 2006.
9. Andrew Krepinevich, "The Quadrennial Defense Review". Military Officer, December 2006, page 73.
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**U.S. NAVY AND 20TH CENTURY OCEANOGRAPHY:
SUMMARY 1900-1960
PART II
WORLD WAR II**

by Mr. John Merrill

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

U.S. Navy and 20th CENTURY OCEANOGRAPHY: SUMMARY 1900-1960, Part I appeared in THE SUBMARINE REVIEW, January 2007.

17 Months before Pearl Harbor

In May 1940, Vannevar Bush, former dean of the MIT School of Engineering and then president of the Carnegie Institution of Washington, proposed to President Franklin D. Roosevelt the concept of a National Defense Research Committee (NDRC) to coordinate, supervise, and conduct scientific research for war purposes except for flight. On June 15, 1940, the day after the fall of France, President Roosevelt signed the letter of appointment of the twelve members of the Committee and selected Bush as chairman. The NDRC was established June 27, 1940 under the National Defense Act of 1916. This was seventeen months before Pearl Harbor.

During the summer of 1940, director of WHOI (Woods Hole Oceanographic Institute), Columbus Iselin and President of Bell Laboratories, F. B. Jewett, a member of NAS (National Academy of Sciences), and a director of the newly formed NDRC, concluded that a way of predicting the performance of echo sounders (sonar) was essential and that oceanographers were best suited to work on the problem. NDRC initiated contracts with Woods Hole. Within a year the staff grew from 60 to about 300 with the budget increasing from \$135,000 to almost \$1,000,000.³³ Iselin's pre-war initiatives included collaborative efforts with U. S. Coast Guard oceanographers.

NDRC awarded one of its first contracts to WHOI to investigate transmission of sound in the sea. By October the Institute's first year-round staff was brought together to work on that project and others. In February 1941, Iselin and Ewing completed the study and report, "Sound Transmission in Sea Water."

It was "a treatise on a new and unexplored subject-submarine acoustics. Not only did it set down what was then known about the transmission of sound underwater (and this was later incorporated into manuals for sonar operators), it also pointed out what remained to be learned."³⁴ At this time San Diego destroyer personnel were questioning the interpretation of how oceanographic conditions affected sonar performance.³⁵ In addition to the sound transmission study, in September the Navy sponsored a two-year program at WHOI to broadly investigate underwater sound and its propagation over a wide band of detection frequencies.

A second NDRC contract with Woods Hole in 1940 involved the development of undersea instrumentation. Maurice Ewing, at Woods Hole from 1940-44, with others took over BT development and made it an improved and more efficient instrument.

Columbia, Harvard and California University Underwater Sound Laboratories

On June 27, 1940, the day the NDRC was established, Secretary of the Navy Frank Knox asked the NAS to appoint a committee to advise him on the scientific aspects of defense against submarines and the adequacy of the Navy's preparations. In late March 1941, the advice of the NAS committee's findings, Colpitts Report, was brought to the General Board of the Navy. The findings quickly established the urgent need for broad scientific and engineering investigations to develop equipment and methods essential in submarine and subsurface warfare. An April 10, 1941 letter to Vannevar Bush asked the NDRC to undertake an investigation of submarine detection.

Woods Hole Institute of Oceanography WWII*

Bathythermograph development for use aboard submarines

Investigation and development of Ewing's "Sound Channel"

Studies to predict sea and surf conditions for amphibious operations

Studies of low level meteorological phenomena related to aircraft carrier operations and laying smoke screens

Study of antifouling paints and fouling organisms for the

By July 1941, Columbia, California, and Harvard universities were under NDRC contract to immediately establish civilian laboratories "to function as centers for research on **underwater acoustics** and the design and construction of underwater sound equipment. The Navy had responsibility for all testing and development of such equipments and weapons."¹⁷ The initial NDRC contracts and the follow-on negotiations covered the following four years of war.

At the end of WWII, in addition to the wartime technical contributions to ASW of the three university laboratories, some of the laboratory personnel became a core group of scientists and engineers that addressed the submarine problem (pro and anti) viewpoint at government, academic, and industrial activities. Pennsylvania, Washington, and Texas State Universities were some of the locations that continued pursuing the submarine problem. The New London and San Diego laboratory facilities provided the starting point for continuing civilian-led Navy R&D.

The Columbia University Division of War Research (CUDWR) primary site was a laboratory in proximity to the Navy's Submarine

Base on U. S. Coast Guard property at Fort Trumbull in New London, Connecticut. By 1944, the civilian scientific and non-scientific staff peaked at 330. In addition, 36 officers and 295 enlisted personnel were assigned to the laboratory primarily to man the assigned Navy test vessels. All the university laboratories had ships available to conduct sea tests.

Columbia University's civilian scientific staff at Fort Trumbull grew to 130 by 1944. Engineers were predominant with physicists comprising about ten percent. About one-third came from colleges and universities and represented 25 states

University of California's (UCDWR) contract eventually brought a staff of about 550 to the Navy installation at Point Loma in San Diego, California to pursue antisubmarine research and development including projects on cavitation, attenuation, and underwater noise. Scripps Institution of Oceanography (SIO), located fifteen miles north of Point Loma, provided several oceanographers to the new laboratory and the proximity allowed further cooperative efforts with UCDWR.³⁸

NDRC contracted with Harvard on June 5, 1942 and the Harvard Underwater Sound Laboratory (HUSL) began with the primary activity in Cambridge, Massachusetts. The staff peaked in August 1944 with a total of 462 and additional facilities including a field-testing station in Fort Lauderdale, Florida. F. V. Hunt, director of the Harvard Underwater Sound Laboratory 1941-46, originated the word *sonar* in 1942.

WWII Oceanographic Interests

Prewar oceanography encouraged work in all fields. WWII, with emphasis on subsurface and amphibious warfare emphasized physical, chemical and geological oceanography. Defensive and offensive warfare looked to oceanography for answers and direction. Navy support for WHOI and SIO escalated to resolve significant oceanographic problems. The normal summertime staff at WHOI at 60 increased to a year-round staff of 335; at Scripps and UCDWR the number increased by several hundred.³⁹

Sea Mines

Navies of the world were alerted to the value of sea mines beginning in 1904 with Japan's successful use of fields of mines during the short Russo-Japanese War. In the much longer WWI, mines were broadly used in incredibly large numbers and in different ways. Germany successfully mined and blocked the Bosphorus during the Gallipoli campaign. WWI demonstrated mine ASW capability. During WWII, the mine was again an essential weapon.

Mines are a dual challenge. Planting them as a defensive measure and detecting and destroying mines as a protective one brings about a need for answers to oceanographic questions. Ocean bottom sediment knowledge is addressed when planting mines or when detecting or destroying mines. In the case of harbor protection, detecting their presence is the challenge. Information was needed to understand the bottom penetration of mines dropped by planes and surface ships. Further, what would be the impact of underwater currents and surface wave action on the movement of the mine? Could sediment coloration camouflage enhance mine performance? Oceanographers addressed and answered these questions along with others.

Harbor protection focused on passive detection of ships, submarines and weapons including mines. Detecting mines in shallow water required bottom sedimentary information. In support of Pacific operations in late 1943, Hydrographic Office vessels U.S.S. BOWDITCH and U.S.S. CAPE JOHNSON carried out dredging, soundings and BT profiles at all islands and atolls.⁴⁸

Antifouling Project

Improved marine paint from the antifouling paint research sponsored by the Bureau of Ships at WHOI cited above provided a great number of benefits during the war years. Fouled paint slows ships and increases fuel consumption. Fouling reduction reduces shipyard time. In addition to ship's hulls, buoys, anchors, chains, amphibious aircraft, and ships saltwater piping systems also benefit. Later in reporting on the antifouling investigation the Navy noted "...project increased the overall efficiency of their ships 10% during the war years."⁴⁹

Sonar Charts

At the beginning of the war, BTs were not available in great numbers and needed improvements, including a submarine version. To counter this shortage, WHOI and SIO created charts to aid ship's officers and sonar operators in strategic locations. At SIO, extensive existing Japanese data regarding temperature and salinity of the near islands of Japan were used. At SIO and CUDWR sediment charts of eastern and SE continental shelves of Asia were created from 400,000 bottom notations based on Japanese lead line and bottom sampling data. At WHOI, around 60,000 bathythermograph records of shallow water profiles obtained in the North Atlantic were reduced to monthly charts of temperature to a depth of 200 meters.⁴²

Bathythermograph Development

During the war, the BT became standard equipment on all U.S. Navy submarines and vessels involved in ASW. Improvements made the BT capable of being deployed and retrieved from a surface ship moving at fifteen to twenty knots. Independently, Ewing at WHOI and Reville at CUDWR at Point Loma developed slide rules for speed computing of echo ranges and making echo range predictions from BT data.

The BT for use on a submarine provided sound transmission and ballasting data. Initial production of BTs, BT winches and SBTs (submarine BT) took place at WHOI along with BT training for USN ensigns.⁴³ Submarine Signal Company of Boston became involved in the production of the BT needed on destroyers, destroyer escorts, and some navy transports in addition to submarines. Oceanographers and physicists worked aboard ships and submarines in the training of Navy operators on BTs, sonar and other new systems and instruments.

Wave Prediction

U.S. military planning for amphibious attacks required oceanographic information on wave and surf forecasting, beaches, shorelines and coasts. In 1942, SIO was asked to study the problem of predicting surf conditions. The work supported Operation Torch, the trans-Atlantic invasion of Vichy French North Africa planned for October of that year.

At Scripps the useful concept of significant wave height and periods evolved. Oceanographers started by creating wind maps and observing the connection between wind patterns and swell size. By 1945, oceanographic and geophysics personnel had been consulted regarding the kind of landing craft and surf conditions best for making landings and securing beachheads.⁴⁴ "If during the war, the greatest number of oceanographers worked to solve problems related to submarine warfare, then certainly the next greatest number were concerned with amphibious warfare."⁴⁵

The Navy's Hydrographic Office in 1943 was tasked to furnish relevant oceanographic information to military services in all parts of the world. In preparation for the 1944 invasion of Normandy, a network of 51 wave-reporting stations was established along the south and southeast coast of England. Similar steps were taken for the invasions of Burma and Indonesia.

A Sound Pipeline

At WHOI in 1942, Maurice Ewing with J. L. Worzel resumed work on *deep sound channel* signal propagation proposed by Ewing in 1937. Ewing correctly theorized that low-frequency waves, which are less vulnerable than higher frequencies to scattering and absorption, should be able to travel great distances if the sound source is placed correctly. Ewing theorized that low-frequency waves should be able to travel great distances, if the sound source is placed correctly. In analyzing the results of this test, they discovered a kind of sound pipeline, which they called Sound Fixing and Ranging (SOFAR), channel, also known as the *deep sound channel*.⁴⁶

An additional test was conducted in the spring of 1944 aboard the research vessel *R/V Saluda* operating in the vicinity of Eleuthera in the Bahamas. A deep receiving hydrophone was hung from *R/V Saluda*. A Navy ship dropped 4-pound explosive charges set to explode at 4000 feet in the ocean at distances up to 900 miles from the *R/V Saluda's* hydrophone. The Navy ship's operations were limited to this distance. Receivers located in Dakar on the west coast of Africa easily detected the underwater explosions at a range of the order of 3,200 km (2000 miles). Ewing and Worzel heard, for the

first time, the characteristic sound of a SOFAR transmission, consisting of a series of pulses building up to its climax.⁴⁷

During the war, an application of Ewing's deep sound channel involved setting up coastal hydrophones to listen for the sound bursts from small explosives set off by pilots downed at sea to provide bearings for their location and retrieval. It was not until 1947 that permanent listening stations were ready for use.⁴⁸ Ewing's deep-water channel discovery provided a basis for the mid-century Sound Surveillance System (SOSUS) widely used during the Cold War.

Navigation System

A NOAA summary of electronics (1923-1945) asserts: "Perhaps the most important innovation to come out of the war, however, was the evolution of electronic navigation systems as an outgrowth of radar development. These navigation systems were used for precision aerial bombing navigation, but by the end of the war, both the British and U. S. Coast and Geodetic Survey were using them to conduct hydrographic surveys."⁴⁹ It should be noted that the Loran radio navigation system developed at MIT during the war has also been cited as providing a significant navigational tool for the oceanographic community.

The oceanographic work at Woods Hole, the University of California Laboratory at Point Loma, Scripps at La Jolla, and Columbia University at New London, Connecticut heavily contributed directly to naval warfare and also advanced the basic understanding of the ocean environment. In addition, the participation of colleges, universities and industry should not be overlooked.

After WWII

Peace in 1945 did not end the Navy's requirements for further information about the seas. Shortly after several years of an uneasy peace, international politics and technological innovations applicable to ships, submarines, aircraft, and weapons collectively brought additional high priority Navy oceanographic needs. Encouragement to continue advancing ASW tactics and systems was stimulated when the details of German submarine developments near the end of the war were recognized. Increased underwater submarine speed and the schnorkel provided new challenges with oceanographic implica-

tions. Interest in submarine operating depths of 1000 feet became a consideration.

The arrival of the nuclear submarine in 1954 followed by the Polaris submarines brought additional oceanographic questions to be addressed such as the global topography of the ocean's bottoms, seamounts, maps of the sea floor, earth's magnetic field, gravity, and bottom contours. By 1980, the Navy was spending most of \$20 million on oceanography, an extremely expensive science as noted in *FORTUNE* of November 1980. The nuclear submarine's operating depths and long underwater capability and a potential enemy with a long coastline on the Arctic Ocean made under-ice operations a reality with major oceanographic significance and additional oceanographic needs.

Research Support

With the end of the war, many marine scientists returned to prewar status at universities and private industry. Private science and government science boundaries reappeared. Fiscal support for oceanography or related research government support was encouraged at oceanographic institutions. At this time, NRC, the active arm of the NAS, perceived a need to encourage continuation of wartime anti and pro submarine research by establishing a Committee on Undersea Warfare.

In the evolution of the place and direction of United States science research in post WWII, respected and successful wartime head of the NDRC and Office of Research and Development, Vannevar Bush, strongly advocated, "Civilian scientists should work in parallel with the military, but not within the Services."⁵⁰ Washington took note of his discussions and writings. The two new government agencies discussed below in some ways reflect Bush's views in their organization and goals.

The new Office of Naval Research (ONR) established in August 1946 and the National Science Foundation (NSF) created in 1950 by an Act of Congress provided a national environment for the support of science in the United States. In 1949 prior to the advent of NSF, ONR was the principal supporter of fundamental research by U.S. scientists. This was in addition to its military research employing



1000 scientists at three naval laboratories.³¹ The successes of federally-sponsored oceanographic research and U.S. leadership that followed was due in part to government-university-industry relationships engendered by ONR and NSF. By 1969, federal interest and substantial support brought new oceanographic vessels, new laboratories, and universities and colleges having courses in oceanography.

Office of Naval Research (ONR)

Initially ONR broadly supported science. NSF's creation in 1950 with extensive funds to support a variety of scientific endeavors caused ONR to focus more heavily on supporting oceanographic research. Three of the country's leading oceanographic institutions (WHOI, SIO and Columbia University's Lamont-Doherty Geological Observatory, founded in 1956) depended heavily on ONR support. ONR turned out to be an exemplary military patron of marine science research.

ONR addressed fundamental problems, basic and applied, particularly in physical oceanography and geochemistry. Support by ONR included academic research ships and development of new tools and instruments. Between 1946 and 1965, the Navy provided 80 to 90 percent of the funding for American research in oceanography. The breadth of ONR's contractors' autonomy is seen in an ONR 1959 contract with SIO that promised, "to permit investigation of all phases of oceanography."

National Science Foundation (NSF)

Looking to the future, success in WWII from wartime scientific research indicated that continuing support for scientific research was essential to national defense and welfare. With the National Science Foundation Act of 1950, Congress established the Foundation as the role of advisor to the government to promote the advancement of science in all its branches regardless of its applications. It is the only federal agency whose mandate includes science and engineering research and education at all levels and across all fields. NSF organization was modeled after the successful ONR.

NSF has direct access to Congress for funds. The researching organizations contracting with NSF meet the criterion of not being

subject to control or direction from any operating organizations whose responsibilities are not exclusively those of research.⁵²

The NSF assumed major federal responsibility for developing academic and institutional capability in ocean science research in the sixties. Ocean science programs were established at John Hopkins University, Texas A. & M., Oregon State, University of Miami, Rhode Island, and others. In the 1970s, the Navy in-house program had no fewer than 34 ships in its ocean science program with 18 academic and private institutions engaged in Navy-sponsored work.⁵³

Sputnik October 4, 1957

The success of Soviet technology's Sputnik marked the starting point of a technology race for space with overtones for oceanography in the United States. NSF'S budget, growing slowly from its establishment in 1950, doubled two years after Sputnik. Two significant documents appeared during the two years post-Sputnik: the Navy's oceanographic needs and goals were made known in TEN YEARS IN OCEANOGRAPHY and the National Academy of Sciences Committee on Oceanography landmark report OCEANOGRAPHY 1960-1970. The NAS document assented to basic research, applied research and surveys. "The key to the growth of oceanography in the United States lies in basic research—research that is done for its own sake without the thought of practical application..."⁵⁴ Oceanography would be supported in the years ahead.

Submarines and Gravity

With ONR's support between 1947-55, scientists participated in conducting regional gravity surveys aboard Navy submarines in a variety of ocean locations. Columbia University's Lamont Laboratory personnel rode more than twenty boats over the nine-year period on two dozen separate gravity cruises. Submarines involved included SEADOG (SS-401), BERGALL (SS-320), ARCHERFISH (SS-311), BALAO (SS-285), CONGER (SS-477), CORSAIR (SS-435), DIABLO (S-479) and TORO (S-422).⁵⁵

A 1960 quote from director Maurice Ewing of the Lamont Laboratory ties the need for the gravity surveys to the newly-operational Navy submarine fired nuclear missile Regulus, "... These

data are necessary for the precise direction of guided missiles.³⁶ Between the years 1952 and 1958 Regulus moved from experimental status to a fully operational weapon system. Regulus was installed on five missile submarines and eleven guidance submarines. During the Cold War years, the Regulus equipped submarines made more than 40 strategic deterrent patrols. With the advent of Fleet Ballistic Missile submarines in the 1960s, the Regulus submarines stopped operations 14 July 1964.

In 1995, the Navy declassified data concerning the earth's gravity that had been held secret. The Navy launched Geosat in 1985, on a near-polar orbit at 500 miles, to survey the altitude of the sea surface all over the world. This data provides information relative to sonar shadows and more importantly identifies gravity variations information essential to the submarine's staying on course while underwater and sailing blind. Most significantly, gravity information assists in setting an underwater-fired missile on the correct path to its target.³⁷

Summary

The first half the 20th century gradually brought the Navy from a modest interest in marine science to a role in the last half as the primary supporter of oceanography in its broadest sense. The Navy's surface and subsurface constituencies required oceanographic support to be successful operationally.

The U-boat's success in WWI and WWII and its *guerre de cours* strategy contributed to the need for knowledge of the sea, the environment of submarines. WWII operations on all the oceans evoked attention to a variety of challenges in addition to those of special interest to submarines.

The 20th century with its overabundance of maritime wars and technology explosions that never ceased brought attention, focus, and fiscal support to marine science. Oceanography brought together two somewhat disparate professional groups, naval officers and marine scientists. Navy interest was invariably practical and looked for answers to ship operation questions. Marine scientists aimed at a careful search for new scientific knowledge about the sea. Common understanding had to be found. Navy officers whose career paths included strong oceanographic interests aided the search.

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EMPLOYMENT OPTIONS FOR THE SSGN AND RELATED C'I SHORTFALLS

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

Captain Jim Patton is President of Submarine Tactics & Technology of North Stonington, CT. He is a retired submarine officer who commanded USS PARGO (SSN650). He is a frequent contributor to THE SUBMARINE REVIEW.

Background

As the *one remaining superpower*, and in the absence in the short to mid-term of a credible near-peer competitor, it is incumbent upon the United States not merely to match any potential adversary's naval capabilities, but to set the standards by a wide margin—the very essence of deterrence. The emergent SSGN fleet, with its multispectral offensive capability, will provide the means to field a ubiquitous, persistent and pervasive global maritime presence not so much on a *see, it's there* basis, but rather on a *prove it isn't there* paradigm—much as every Soviet SSBN that deployed in the final three decades of the Cold War had to assume there was a U.S. SSN in its wake.

Discussion

No one operational capability of the SSGN—which include land attack, ASW, ASUW, ISR and SOF injection/recovery—is revolutionary in itself, but the fact that *all* of them can be simultaneously deployed and conducted by a single platform from a covert stance in contested inshore waters is. In both exercises *Giant Shadow* and *Silent Hammer* these and other capabilities were demonstrated or implied. They also allowed a glimmer seen of the ultimate impact that a force of 4 double-crewed such warships would have on the U.S. ability to provide lasting security upon the global maritime commons and in their littorals ashore. However, many of the roles and missions the SSGN is intuitively capable of accomplishing are, in reality, either not possible because of, or are greatly constrained by, present Command, Control and Connectivity deficiencies.

For example, with as many as 75 Special Operating Forces (SOF) embarked, and realizing that SOF works best in small units, it is entirely feasible (and desirable) that several teams of six or so individuals be covertly put ashore many tens of miles apart along an adversary's coastline as nearly simultaneously as possible. However, the coexisting requirement to remain persistently connectable to each unit ashore as the ship transits between drop-off points raises a conflict. If the ship remains at periscope depth for connectivity reasons, it is seriously constrained in speed, and hence a greater time elapses between SOF team injections. If it goes deep to get to subsequent injection points more quickly, it loses connectivity with those teams already ashore. This is somewhat a subset of existing CSD (*Comms at Speed and Depth*) issues, but with the special twist that unlike the shore establishment or large Battle Groups, the injected SOF have a very limited set of options and equipment for raising the submarine, so the submarine must adapt to their restricted capabilities.

It is also clear that what used to be called *adjuvant devices* (offboard unmanned things such as UUVs, UAVs and towed, tethered, floating or bottom dwelling objects) will have a large role in enhancing future SSGN operations. As a point in fact, there are presently some 600 known UUVs worldwide, 350 of which would be capable of deployment from an SSGN's D5 tubes using proven encapsulation techniques. There also exist DARPA programs involving aUCAV (Unmanned Combatant Air Vehicle) launched, recovered, refueled and rearmed from and onboard a submerged SSGN. There are those that would argue, however, that the safe *recovery* of such an aircraft would imply that air superiority over the recovery site existed, and if that was the case, why employ such a complex delivery platform? The real take-away here is the need, as almost any mission becomes *possible*, to remain focused on those which other platforms *cannot* do, and not be distracted by that larger set for which there are already adequate options. If one thinks that this too rigidly limits SSGN employment, then there has been insufficient attention paid to what others can't do, but nuclear submarines, especially SSGNs, can. For example:

- Covertly penetrate an *Anti-Access/Area Denial* (AA/AD) minefield.
- From inside of an AA/AD mine barrier, launch mine reconnaissance UUVs to collect detailed mine localization and be recovered well clear of contested waters, enabling follow-on naval forces to maneuver to avoid these threats or to *in-stride* neutralize that small percentage that cannot be avoided by maneuver.
- Covertly transport, inject and recover a dozen or so Special Operating Forces (SOF) teams in contested littoral waters.
- From a single Intelligence, Surveillance and Reconnaissance (ISR) platform, covertly collect and disseminate Electronic Intelligence (ELINT), Communications Intelligence (COMINT), Visual Intelligence (VISINT), Acoustic Intelligence (ACINT), Human Intelligence (HUMINT) and Materials Intelligence (MASINT).
- Provide *as directed* high resolution VISINT from small, low-flying and expendable UAVs.
- Provide *survivable* facilities for a forward-deployed Joint Commander and his staff.
- Conduct Suppression of Enemy Air Defenses (SEAD) operations from close offshore immediately in advance of an air strike, enabling far more of the available airframes to do other than air defense suppression.
- From a single weapons platform, conduct Anti-Submarine Warfare (ASW), Anti-Surface ship Warfare (ASUW), land attack, and soon to be, Anti-Air Warfare (AAW) and even Anti-Theater Ballistic Missile Defense (ATBMD).
- In some cases, as political situations deteriorate, the SSGN could, on short notice from a covert stance close offshore, enter restricted waters to conduct a Non-Combatant Evacuation Operation (NEO) bringing many hundreds of people to safety (perhaps to coalition surface ships well offshore) before returning to resume the above operations.
- Conduct all of the above during a single deployment period without returning to port or otherwise reconfiguring.

In many of the mission segments above, the *long poles in the tent* which complicate an otherwise doable event are issues involving *connectivity* between the SSGN and other entities. For example:

- During the process of *picking one's way* through an AA/AD minefield, information concerning the observed location and distribution of detected mine-like objects would be invaluable to follow-on naval forces. This information could easily be data-like in nature, extensive, and might necessitate a high data rate low-probability-of-intercept (LPI) transmission from within the AA/AD zone.
- The routing and designated rendezvous point for the mine-localization UUVs launched from within the AD/AA zone could easily not be determinable until after successful penetration, and would need to be transmitted via LPI means to coalition forces waiting in open ocean.
- The SSGN would need to monitor the well being of *each* SOF team inserted, and if several teams were to be inserted as quickly as possible along a significant reach of coastline, an as yet unavailable means would be required for persistent radio frequency (RF) monitoring at significant speeds below from periscope depth.
- Although the SSGN possess an extraordinary degree of computer processing power to reduce all of the ISR products from data to information and perhaps even further to knowledge, much of that processed and distilled material will be volatile in nature and will need to be quickly passed, via LPI means, to other entities both afloat offshore, at regional headquarters, and in the continental US (CONUS).
- Although there are better ways to link the ISR of an expendable UAV to the ultimate user(s) than by going through the launching submarine, the quick response nature of getting the launch off could require a persistent, 24/7 means of passive (listening) receipt not unlike that employed for alert SSBNs for the half century of the Cold War. It would be of great benefit to the execution of the other missions if this link could be maintained at operationally meaningful depths and speeds.
- As non-intuitively demonstrated in Operation *Silent Hammer*, the more senior the command entity aboard the SSGN, the *less* emphasis there is on sheer quantity of *active* (transmitting) connectivity, and the more there is on passive. This plays well to the SSGN's inherent capabilities and limitations, but still argues

for a persistent receive capability at operationally meaningful depths and speeds.

- Of importance in the SEAD mission, especially considering the *cultural* differences between warfare specialties, is that the SSGN would probably be required to acknowledge a rather complex *Air Tasking Order* (ATO), and report the successful launch of each weapon in real time as the air strike is inbound. All of this, again, would require high bandwidth passive receipt and an LPI active capability. Since the strike would be planned well in advance and the launches conducted from periscope depth, there would not be an emphasis on Comms at Speed and Depth (CSD) for this mission subset, but LPI active would, as always, be critical for the covert platform that an SSGN is.
- For the overt combat *anti-*missions addressed, there are a panoply of *most important* connectivity issues, and without detailing every one for each task, it is enough to say that in the aggregate, all of the variables of LPI, high data rate, passive/active CSD connectivity and persistency (or lack thereof) are stressed in one or another of them.
- The Non-Combatant Evacuation (NEO) operation is the least connectivity stressing of all the situations discussed, and for the first time in this discussion physically limiting variables such as oxygen bleed rates, sanitary tank capacities and the ability to cope with carbon dioxide generation come to the fore. However, a careful analysis and relative weighting of these variables will remain to be thoroughly discussed by qualified personnel in an altogether separate paper. Let it be enough to state that the intuition of at least one submariner is that 500 people could be taken aboard and moved more than 500 miles in a 24 hour period without ventilating, with carbon dioxide being the limiting factor. This parameter, along with oxygen consumption, could be mitigated by encouraging passengers and non-watchstanders to sleep (if not be sedated in the case of the evacuees) to reduce the aggregate metabolism, oxygen consumption and carbon dioxide production.
- There is no other single platform in anyone's military portfolio that can aspire to conducting such a broad spectrum of activities without extensive refit/reconfiguration. The task before the

Submarine Force and its supporting governmental and commercial entities is to remove any *connectivity* barriers that could impede this revolutionary capability.

Conclusions

Now that we are well beyond the *Gee, wouldn't it be nice to have...* point of imagining the new missions and capabilities enabled by an 18,000 ton submarine with 24 vertical 8 x 40 foot cylinders, it is appropriate that not only the *Concept of Operations* (CONOPS) of these SSGNs be more fully defined and refined, but to also identify where such CONOPS are precluded or constrained by shortcomings in related C⁴I capabilities. Having thus identified these capability gaps is the first step in eliminating or at least mitigating them. Although this effort is similar and related to the ongoing *Comms at Speed and Depth* (CSD) effort, some SSGN mission-unique considerations are quite likely to call for SSGN-specific solutions. It has been the goal of this paper to stimulate thought and discussions about the possible responses to such SSGN mission-unique considerations and present limitations. ■

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DO GOOD SUBMARINES COME IN SMALL PACKAGES?

by Dr. Richard B. Thompson

Dr. Thompson is a professor at the University of Maryland, Baltimore and is a frequent contributor to THE SUBMARINE REVIEW.

As it has since the end of the Cold War, the Submarine Force faces a crisis. As nearly all readers of these pages know, the current one ship per year construction rate of Virginia-class SSN's is insufficient to replace the Los Angeles vessels being retired. Unless action is taken, the inevitable result is the shrinkage of the Submarine Force to levels inadequate to meet national needs as stated in Joint Chiefs of Staff and Defense Science Board studies. While heroic efforts are ongoing to reduce the price of Virginias, it may be necessary to consider a different SSN to maintain adequate numbers of hulls.

In considering what type and how many submarines are needed, it is obviously necessary to consider the roles they play in the light of present and prospective future conflicts and missions. The roles submarines play are well known to Submarine Review readers: they include (roughly) antisubmarine warfare, antisurface warfare, ISR, special operations such as SEAL insertion, battle group escort, strategic deterrence, and inland strike. The argument has been made that submarines are very expensive as ISR (Intelligence, Surveillance, and Reconnaissance) platforms compared to aircraft, and that apart from a few Tomahawk strikes and some modest ISR they are poorly suited to the Global War on Terror in which we are currently engaged. Inasmuch as the war in Afghanistan and Iraq has evolved into a counterinsurgency struggle against small groups operating clandestinely using shoulder-fired weapons and improvised explosive devices, the publicly known contribution of SSN's to the fight has now shrunk. While it is correct that an SSN is an expensive platform for the mission, the SSN offers important, indeed unique advantages in the ISR mission, some of which have been highlighted in the Submarine Review and elsewhere. First is its stealth, demon-

strated during the Cold War in a higher threat environment than exists today in almost any theater of operation. Beyond self-protection, stealth avoids provoking or even alerting the quarry; many other ISR platforms such as most aircraft, satellites, and surface vessels are decidedly not stealthy.

Second is its endurance, where an SSN can stay on station for months with impunity, without support of any kind. Third is its payload and power budget, larger than any reconnaissance aircraft, particularly UAV's. Aircraft have substantially less endurance, the best able to stay aloft for two days, with most able to spend less than twelve hours on station. While there are no publicly acknowledged operational stealthy reconnaissance aircraft (Global Star is not yet operational) several are in development. If detected, typical electronic reconnaissance aircraft such as RC-135 Rivet Joint or EP-3 are quite vulnerable to interception by SAMs or fighters. In circumstances where slaughter of innocents is a cornerstone of our current adversary's strategy, we can expect little respect for conventions of war or territorial boundaries to protect ELINT manned aircraft (much less UAV's). During the Cold War, several such aircraft were shot down (often with loss of the crew (A. Price, *History of U.S. Electronic Warfare, Vol. II*, p. 166)), and the attack on the LIBERTY and capture of the PUEBLO are even better known. By comparison the SSN is clearly harder to detect, and hard to destroy even if detected with current systems; it certainly can defend itself against many threats if need be. It is important to add that while many second rate powers can afford (and possess) capable air defense systems, none have made the much greater investment in platforms and training to be credible at antisubmarine warfare. Since the end of the Cold War, airborne ISR has become a harder mission, while ISR from submarines has become easier. Even long-legged reconnaissance aircraft and UAV's require some level of support, usually in theater; base traffic in third world countries may be under surveillance to cue potential targets. These desirable attributes have combined to make SSNs highly valued by commanders and national authorities alike as ISR platforms, as indicated by their increased tasking.

The improving acoustic performance of submarines of many nations provides a strong argument for producing more submarines.

As the radiated noise of current submarines of all nations continues to decline to levels where ambient noise becomes increasingly significant by comparison, we will enter a regime where passive detection becomes more difficult and maximum detection ranges shrink. Particularly in noisy or oceanographically complex waters, enemy submarines may not be detectable at useful ranges even though our ships have an acoustic advantage in radiated noise. This has the effect of enlarging the ocean and making all antisubmarine platforms (including our SSN's) less effective. We're listening for our opponent at a cocktail party, instead of in a library. As a result, the effectiveness of our SSN's in some ASW scenarios would be reduced, even against less capable opposing submarines, such as diesel-electrics. For instance, neutralizing a Chinese SS threat to a carrier battle group in the vicinity of Taiwan would be more difficult if maximum detection ranges were halved, even if we can be confident of detecting the opponent on battery first. Operations research techniques dating to World War II enable one to calculate the likelihood of detecting the target if the detection range is reduced (expressed mathematically as a coverage factor WL/A (see U.S. Naval Institute, Naval Operations Analysis, 2nd Ed., 1977). Thus in such scenarios there is no substitute for more sensors and probably more platforms; for ASW, clearly the platform of choice is the SSN.

While the case can be made (to those who are listening) for an adequate SSN force, it remains a fact that state of the art submarines remain very expensive, with the current Virginia class coming in at \$2.1 billion apiece (R. O'Rourke, Submarine Review July 2006, p.69). It is likely that the Virginias are the cheapest ships that can be built with their capabilities, but inasmuch as one costs a significant fraction of the annual shipbuilding budget, it is perhaps unsurprising that the Government has been so far unwilling to increase production to two per year despite the significant savings that would be realized per ship. Admiral Holland points out that we have not succeeded in making this case to the folks outside the submarine community, but letting the Submarine Force shrink is an easy way politically to afford the other things the DoD and Navy want, inasmuch as the shipbuilding budget is perceived as being a zero sum game and quite regardless of the strategic consequences.

VIRGINIA and her sisters are very flexible and capable ships,



being able to carry out missions in strike warfare and special operations as well as ISR, antisurface and antisubmarine warfare. While smaller than the Seawolf class, they are comparably sized to the Los Angeles class. Estimates (Polmar, *Ships and Aircraft of The U.S. Fleet, 18th Edition*, (2005)) credit VIRGINIA with a speed in excess of 25 knots from her 25,000 horsepower S9G reactor plant, somewhat less than the S6G of Los Angeles and much less than SEAWOLF. LOS ANGELES was designed with high submerged speed in mind (Friedman, *U.S. Submarines Since 1945, An Illustrated Design History* (p. 163, 1994), in part to enable it to keep pace with carrier battle groups.

There are economic and acoustic advantages to building larger submarines: some of these have been discussed by Holland. It may be that some silencing features necessary to go fast and stay quiet are not only costly, but difficult to incorporate in a small hull: it may not be possible to go faster than 20 knots and still be quiet enough to hear in a hull smaller than Virginia's. As in other ship construction, once one has spent the bulk of the money on developing and procuring the sonar, reactor plant, and combat system, there is little money to be saved by building a smaller ship around it that will be less capable. Certainly many different size/capability options were considered in the design of VIRGINIA (Friedman, p. 213). Also, there are the large, essentially fixed overhead costs of the yards themselves, that are also a major cost driver.

Yet for many of the missions the US Navy requires of submarines, a smaller, somewhat less capable but significantly less expensive ship might suffice. A non-nuclear submarine cannot adequately perform nearly all of the missions we require and will not be considered further; readers are referred to Captain Patton's recent article (July 2006 [Submarine Review](#)) for a thorough discussion of the reasons why air independent propulsion (AIP) is not a viable substitute for nuclear propulsion. However, a small (perhaps TULLIBEE-sized) SSN might be worth considering, if we no longer expect it to do 25 - 30 knots but 20 + instead. In particular, it may be possible to get VIRGINIA-level quieting in a < 5,000 ton hull, and still do most of what we deploy subs to do, if the reactor plant is significantly less powerful than VIRGINIA's S9G. TULLIBEE's S2C plant only produced a reputed 2500 shp with her turboelectric

drive, giving her a reported top speed of 16 knots; clearly something larger would be necessary. It may be difficult to make a reactor in this size range that is quiet (perhaps incorporating natural circulation cooling) and still thermodynamically efficient. An SSN with only 20+ knot speed would be much less attractive for the CV battle group escort role, but we note that the vast majority of U.S. SSN's will have adequate speed for this mission into the foreseeable future. Recently (M. Henry, Brief Lesson in Submarine Design, "Submarine Review, January 2006, p. 31) some of the tradeoffs necessary in submarine design were lucidly described, and we do not propose to design a new ship herein, but to consider whether a significantly cheaper albeit smaller ship is feasible.

Particularly for ISR and some special operations missions, smaller size would offer important advantages. For maneuvering in confined waters, or where tides and currents are significant, a smaller hull is desirable. Some areas of current (or future) interest, such as the west coast of Korea, have large (10 meter) tides and fast (8kt) currents, where an SSN (much less an SSGN) might find herself aground. Notwithstanding all the virtues of the Ohio-class SSGNs for special operations, maneuvering them close inshore will remain a challenge due to their large displacement and length overall. The use of thrusters at the bow can address this issue, but at some cost in stealth, and due to their modest power their effectiveness is limited as well. The ability to get close inshore to minimize transit time to and from the submarine to shore can also be important for special operations where hours of darkness, tides, or phase of the moon may be tactical factors for the success of the mission. Similarly, most current US SSN's are relatively *tall*, in that the distance from the keel to the top of the sail is 50 feet or more *versus* about 40 feet for TULLIBEE. While maneuvering submerged in shallow water will always be exciting, a less tall SSN would have a greater margin for error than our current SSN's. For Arctic missions passing through the Bering Strait and shallow Chukchi Sea a smaller height overall can make the difference in the presence of deep ice keels (see W. M. Leary, Waldo Lyon and the Development of the Arctic Submarine, Texas A and M University press, 1999). In a world where the acoustic signature of submarines continues to shrink, active sonar becomes increasingly attractive to many navies;

with other things being equal, a smaller submarine is less detectable.

Magazine capacity was an important driver in the design of SEAWOLF, because she anticipated operating in a target-rich environment (Soviet SSBN "bastions") where resupply would be difficult. The incorporation of the VLS tubes on the Improved LOS ANGELES (and VIRGINIA) classes has greatly improved their utility as strike platforms. Yet for most ISR, ASW, and special operations missions there seems only modest value to carrying many weapons: for ISR and special ops one does not anticipate shooting at all, except as a last resort. Most ASW scenarios today are unlikely to include many targets: SEAWOLF by herself carries enough torpedoes to wipe out the entire Submarine Forces of almost any prospective opponent, and even a LOS ANGELES is unlikely to encounter enough targets at which to shoot twenty torpedoes. For antisurface warfare one also does not anticipate the need for magazine capacity that would have been desirable back in World War II, largely because aircraft and their weapons have become so much more capable that in most scenarios enemy surface ships (transports or warships) are essentially *en prax*. These are some of the reasons the Virginias were reportedly built with reconfigurable torpedo rooms. Moreover, there seems little likelihood that the factors listed above in favor of high magazine capacity (apart from strike warfare) will reemerge. The point is that for many missions a magazine capacity more like TULLIBEE's (reputedly twelve weapons) would suffice, and the submarine might be made correspondingly small.

Are there other advantages to a smaller ship? Are there other opportunities for cost savings? TULLIBEE had a complement less than half that of a LOS ANGELES. While the savings in salary might add up to a significant dollar figure over the life of the ship, the savings in weight, size, and habitability features in having to support a smaller crew might be nearly as significant. It is not at all clear that a modern ship could safely operate with as small a crew as TULLIBEE, or be as survivable, but reduced manning may be worth exploration. Modern sonar is strongly computation-dependent, and certainly the trend (up through ARCI) has been to incorporate as much processing power as possible into the combat system, and to integrate its functions as fully as possible. BSY-1 was large, both in

terms of weight (32 tons) and volume (117 cabinets), as well as power (142 kW) and cooling consumption. Have modern processors gotten to the stage where they have as much computing power as needed? Put another way, have modern computers gotten to the point where the processors and displays at least can significantly shrink in terms of size, power, and cooling consumption? Could you now build a combat system with 90% of the capability of BSY-2 for 1/3 the cost per ship without spending billions developing it?

We have tried to consider some of the issues involved in the development of a smaller, less expensive, but ultimately less capable submarine. This smacks of Admiral Zumwalt's *high-low* approach to escort design which led to the Perry-class frigates, and which was not well thought of in many quarters. Yet the alternative would appear to be an inadequate number of submarines to carry out even current missions for the foreseeable future, much less fight a major conflict. In view of the long lead time needed for producing some submarine components and the reduced construction and overhaul capacity and labor force for nuclear submarines compared to the 1960's, quickly ramping up production significantly in the face of a growing threat would appear problematic. At that point the question may not be can we afford two SSNs per year, but are we able to build four (or six) per year at all.■



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EX-TAXI DRIVER HAILS A-SUB

by CAPT. Daniel A. Curran, USN(Ret)

Dan Curran is a former submarine officer who has been a contributor to THE SUBMARINE REVIEW for a number of years.

At-sea rescues take all forms and result from various causes. An interesting rescue involved USS GEORGE BANCROFT (SSBN-643 -Blue), operating out of the Holy Loch in the late 1960s. The BANCROFT, one of the Benjamin Franklin Class (we called it the 640 class), was named for President James K. Polk's Secretary of the Navy. George Bancroft was also the greatest American historian of the 19th century. While serving as Secretary of the Navy in 1845, Secretary Bancroft helped establish the United States Naval Academy. The midshipmen's dormitory at the Naval Academy carries Bancroft's name.

It was springtime. I was the Weapons Officer with a weapons department consisting of three nuclear trained officers. Conducting a shakedown cruise after refit at Holy Loch, BANCROFT was heading out of the Clyde area on the surface. Traveling into the North Channel waters between Northern Ireland and Scotland, the lookout reported a flare coming out of the morning fog so prevalent in the area. As the officer of the deck, I immediately called the Captain to the bridge. We then proceeded toward the spot where the flare originated. By this time, the fog lifted and we observed a fishing boat, hull down, near the Irish coast. We came along side and hailed the boat's crew.

"What's your problem?" I asked.

"We're sinking" one of fishermen called back.

"How long can you stay afloat?" I asked.

"About twenty minutes." He answered.

This called for quick action. The Captain relieved me of the Deck and I headed to the missile deck. The first thing we did was to call

away members of the ship's crew who worked the deck area during refit. Since we had not battened down (welded) the deck hatches, we proceeded to pass lines from the deck stowage areas, securing the fishing boat to BANCROFT's hull. At this point, the radio room contacted the British rescue service who informed us it would take a couple of hours to arrive at the scene.

The next action was to hook up a submersible pump and pass the pump and hose out a hatch and down the side of BANCROFT into the fishing boat's bilge. If anyone remembers the capacity of the submersible pump, he will know how much water we pumped out. The pump ran for 45 minutes and the hull came straight up as its bilge emptied.

The third action involved two requests to the mess area. The first order was to provide sandwiches and hot tea to be passed down to the fishing boat crew. The second asked the cooks to provide two large empty milk cans to be passed up to the deck.

Meanwhile, I asked the men what had happened.

"I sold me taxi and bought a fishing boat with the money."

The spokesperson, who was obviously the Captain, responded in a Cockney accent.

"Where do you hail from? I asked.

"We sailed from Hull, England, heading to Greenland" the fishing boat captain replied.

I thought to myself, "Hull is on the eastern side of England."

"What happened? I asked.

The fishing boat captain responded, "We got a day out into the Atlantic when the engine stopped. We then found out that the only pump we had was operated by the boat's engine. We drifted north between England and Ireland with the leak in the hull adding water to the bilge all of the time. Every time we saw a ship, we fired a flare. The flare you saw was our last one."

Since we had time to wait, I made another request to BANCROFT's Captain. BANCROFT, like all missile submarines, has four sets of bullets and launchers. The big bullets and launchers, of course, were the sixteen Polaris A-3 missiles (later Poseidon) housed in the missile tubes. The medium sized bullets and launchers involved the four torpedo tubes, forward, and the MK-14s, Mk 37s,

and the one Mk-45 torpedo comprising the self defense armament. Some smaller bullets came with the counter-measure launchers.

The smallest bullets and launchers were stowed in the armory and were the direct responsibility of the Weapons Officer and the ship's Armorer. This armory, as I remember, consisted of M1 carbines (7.62 X .33 mm caliber), Thompson type machine guns (.45 caliber) and Colt 45 automatic pistols (.45 caliber).

The crew of BANCROFT, like all naval ships' crews, had the responsibility to be prepared to conduct any type of naval warfare. I asked and received the Captain's permission to exercise the ship's boarding party and marksmen on deck during the wait for the rescue ship. The two milk cans went over the side opposite the moored fishing boat. I explained to the boat crew that we were going to conduct small arms training during the wait for the rescue service. We then started practice with each of the small arms using the milk cans as targets (both cans had drifted away from BANCROFT's hull by this time).

At the completion of the practice, we collected the brass and secured the exercise. The rescue boat arrived and took the fishing boat under tow.

Later, I looked at a map of the British Isles. The fishing boat had sailed from Hull, a city located about halfway up the east coast of England, then south down the English Channel into the Atlantic Ocean, heading west for Greenland. When the engine failed, the boat drifted with the wind and the currents, north, up through the St. George's Channel, between the west coast of England and Wales and the Irish coast. The boat then passed into the Irish Sea and up into the North Channel area between the Northern Ireland coast and Scotland. The boat had drifted for about 250 nautical miles without a single ship investigating the flares until BANCROFT came along.

Those who remember navigating the North Channel and leaving the lee of the land at the tip of Ireland know the treacherous sea that faced the drifting boat.

When we arrived back in the Holy Loch after the shakedown, the tender people gave us a copy of a Glasgow newspaper with an article headlined: "Ex-Taxi Driver Hails A-Sub".

BANCROFT's crew members were not heroes in the classic sense, but I expect that the fishing boat crew and their families

thought we were a great bunch. We had upheld the ancient tradition of the sea to render assistance to those in trouble and saved the lives of three mariners who were certainly *those in peril on the sea*. In the meantime, we had a chance to hone some little-used military skills. ■

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.

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USS296

SAGA OF SS-296 & COMMANDER ELLIS BERT ORR

by Mr. Don Messner

Mr. Messner is a former submariner who served in DIODON in the fifties. He stays in touch as a Life Member of both the Naval Submarine League and US Sub Vets, Inc. He is an associate member of WWII Sub Vets.

My interest was drawn to this story when I first met Bert Orr, Captain, USN (Ret), at a WWII Sub Vets function back a few years ago. Bert, at age of 90, didn't give the appearance of a retired naval officer as he had this over abundant crop of long, white, flowing hair coupled with a quiet demeanor; a dichotomy in itself. He quietly chatted with his wife and friends, and I didn't pay much attention, that is, until he stood and took his turn at the introductions. From the silence in the room, I knew he commanded respect of the group and I had better *listen up*.

Bert casually reflected on his service in the Submarine Force starting with his first boat, PORPOISE (SS-172) in Subic Bay on 8 Dec 1941, followed by being a plank owner on RASHER (SS-269) and her first four war patrols, followed by LANCETFISH (SS-296) as PCO (Prospective Commanding Officer), and, oh by the way, it sank pier side in Boston Navy Yard, andhe continued but my mind was still back at the pier in Boston.

Two years later I had the opportunity to visit with Bert and his wife of 68 years, Mariane, at their home in the Rio Grande Valley in southern Texas. I heard more of the story and became more deeply intrigued. What follows took more than a year to put together, but it is something worth sharing.

The start of this narrative is usually found at the finish of most - the epitaph. But the epitaph for USS LANCETFISH, SS-296, tells a tale unique unto itself. No other WWII Fleetboat's story parallels that of LANCETFISH.

EPITAPH of USS LANCETFISH SS-296

Authorized by Congress: FY '42

Contract to Cramp: 24 Dec '41

Keel Laid 30 Sep '42

Launched 15 Aug '43

Towed to Boston Navy Yard for Completion 19 May '44

Commissioned: Cmdr. Ellis B. Orr in Command: 12 Feb '45

Sunk Pier Side: 15 Mar '45

Raised: 23 Mar '45

Decommissioned: 24 Mar '45

Struck 09 Jun '58

Sold for Scrap 20 Aug '59

LANCETFISH was named after a voracious, deep sea fish (*Plagyodus ferox*) described as having long, lancet-like teeth and a high dorsal fin—a great name for an attack submarine. It was one of the first 30 of 150 authorized by Congress in FY '42. This included hull numbers SS-285 through SS-314 with 12 assigned to Portsmouth Navy Yard, 12 to Cramp Shipbuilding Company, 4 to Mare Island Navy Yard and 2 to Electric Boat (EB).

The Navy in their endeavor to bring more qualified submarine builders on line during WWII, awarded Cramp a contract to build 12 Balao class submarines in December 1941. At this time there were four builders—Electric Boat, Portsmouth Navy Shipyard, Mare Island Navy Shipyard and Manitowoc Shipyard. The Navy's effort in developing Manitowoc as a supplier of subs (hull numbers SS-265 to SS-274) with EB's assistance was remarkably successful.

The contract to Cramp was for hull numbers SS-292 through SS-303, which included DEVILFISH, DRAGONET, ESCOLAR, HACKLEBACK, LANCETFISH, LING, LIONFISH, MANTA, MORAY, RONCADOR, SABALO and SABLEFISH respectively. Unlike Manitowoc which used the EB design, Cramp was to use the Navy design commonly referred to as a Portsmouth Boat. Cramp's only previous experience in building submarines was back in 1914 when they built and commissioned SS-26, USS THRASHER (G-4), a one-of-a-kind boat designed by an Italian firm, Laurenti. Cramp subsequently received two follow-on contracts, one for hull numbers

SS-425 through SS-434 and the other for hull numbers SS-530 through SS-536. Only SS-425, TRUMPETFISH, and SS-426, TUSK, were completed. The rest were cancelled as a result of the wind down of WWII.

At the time the tow to Boston Navy Yard was effected, 19 May '44, Cramp had completed two of the twelve boats to the point where the Navy assigned crews and commissioned them. It took Cramp an agonizing 30 months to bring DEVILFISH, SS-292, to that point and 23 months for DRAGONET, SS-293. Contrast that with 17 months each for the first two boats completed at Manitowoc, PETO (SS-265) and POGY (SS-266). The best effort Cramp ever achieved from the time of Keel Laid to Commissioning was 21 months and that was for MORAY (SS-300). Manitowoc, on the other hand, improved their learning curve with every subsequent boat taking only 10 months for ROCK (SS-274) the last of the original order of 10 boats. Thus the efficiency hoped for at Cramp, with Manitowoc as the model, never materialized.

BOSNY was not known as a builder of submarines (as they weren't), but they were awarded their *first ever* submarine construction contract in mid '43 to build four Tench class boats, SS-522 thru SS-525, AMBERJACK II, GRAMPUS III, PICKEREL III and GREDADIER II. All four boats had the same recorded Keel Laid date of 08 Feb '44. So when the tow of LANCETFISH and LING was made in May '44, BOSNY had four subs on the ways but not a one in the water.

In any event, back to the epitaph. The next item *Commissioned: Cmdr. Ellis B. Orr in Command, 12 Feb '45* doesn't raise much curiosity as it is the next normal, sequential event in bringing a ship alive. But the next three items taken together are show stoppers. Sunk Pier Side: 15 Mar '45; Raised: 23 Mar '45 and Decommissioned: 24 Mar '45. This is what truly makes LANCETFISH's history unique. It was sunk at the pier only one month after commissioning, raised eight days later and decommissioned the next day. What happened?

The Deputy Naval Inspector, a Commodore was assigned the task of conducting the IG investigation.

INSPECTOR GENERAL REPORT

The Inspector General's date is stamped 05 Apr '45, serial 095, and has two multi-page attachments, (A) Facts and (B) Discussion of Facts. The subject is "USS LANCETFISH SS-296 - Sinking of".

In brief narrative form, attachment (A), Facts, indicates that LANCETFISH sank due to flooding through #10 torpedo tube when a yard worker opened the breech (inner) door unaware that the interlock mechanism between breech door and muzzle (outer) door had been defeated and that the muzzle door had unknowingly been opened by another yard worker assigned to check out the hydraulic system, a separate task. The pressure of the inflow of water was so strong such as to prevent the closure of the breech door. Additionally, shipyard rigging such as ventilation ducting, air hoses and power lines had been led down the after torpedo room hatch and through the after and forward bulkhead doors of maneuvering room thus preventing them from being secured. In short the after torpedo room could not be isolated and water tight integrity could not be achieved in a timely manner. LANCETFISH filled with water at pier side, flooded and sunk to a depth where all hatches save the conning tower hatch were awash.

Attachment (A) also discloses a major shipyard systemic problem which contributed to the flooding of LANCETFISH, and which was phrased as *lack of thought, foresight and coordination*. The shipyard had scheduled three different crews on the swing shift for three independent tasks, all dealing with the torpedo firing system, and none of the crews was aware of the other crew's assignments. Additionally, the ship itself had not been informed of the work scheduled. These tasks were:

1. testing the hydraulic service line
2. joining the two hydraulic pipes between the control valve and the power cylinder on the after torpedo room tubes
3. adjustment of the breech and other mechanisms on the after torpedo tubes

A third major factor identified in Attachment (A) was *lack of training, experience and procedures*. LANCETFISH, as previously mentioned, was the first submarine scheduled to be completed at BOSNY. LING was to be the second subsequently followed by the four Tench Class boats under construction. Recognizing this,

BOSNY had sent a number of officers and men to Portsmouth for one-on-one training.

Attachment (B), Discussion of Facts, presents this probable scenario as to what occurred:

The Task 3 crew had been testing the jack nuts, interlocks, rollers and breech doors of all four after tubes and, of course, at the time all were dry. They broke for dinner and were going to finish upon their return. They inadvertently left the jack nut for #10 tube in a half way position and never picked up the error upon their return from dinner.

In the mean time, Task 1 and 2 crews, were aware of each others presence but didn't realize their testing various parts of the torpedo tube hydraulic system conflicted with each other's assignments. Their assigned tasks took them from the After Torpedo room to the After Engine room so they weren't always in visual range of each other. The testing didn't go as programed due to some valve positions being changed unknown to the other crew thereby being aligned improperly for a particular test, and the dinner hour caused a disjoint in the work effort to further allow Murphy's Law to rear its ugly head.

Task 2 crew had completed testing the hydraulic *supply* line before the dinner break and were in the process of testing the *return* line after the dinner break. This involved pumping oil in the contrary direction using a small hand pump. Inadvertently, with some of the valves set in the wrong position, the oil flowed in such a manner as to open the muzzle door breaking the interlock chain in the process - and no one noticed.

Task 3 crew returning from dinner continued their testing unaware they had left the jack nut for #10 tube in the wrong position which along with Task 2 crew's pumping allowed the muzzle door to open half way (the jack nut jammed against the stop preventing it from opening further). The crew noticed water in tube #10's sight glass but still believed it to be dry. Now here's where DUMB kicks in. To prove the tube was

dry, the *yardbird* opens the breech door with a member of the ship's crew (a qualified QM2) watching. The rest is history.

From the information given in the Inspector General's report, the conclusions and recommendations make sense except for one, and that is the recommendation to take disciplinary action against the Commanding Officer, Commander Ellis B. Orr. As was pointed out previously, Commander Orr's name was only mentioned in the documents, Facts and Discussion of Facts, once, and that was in regard to a very positive action to maintain the safety of the ship and with which the shipyard refused to comply. One can only surmise that the Inspector General's Office had become accustomed to a long Navy tradition wherein when a naval ship has a serious accident, the Commanding Officer must bear the responsibility and must pay the penalty, regardless of culpability—normally being assigned to a career ending desk job.

The 5th document is a cover letter from CinCUS/CNO to Commandant First Naval District. It is date stamped 02 May '45, serial 01239, and also has two multi page attachments, (A) Record of Proceedings of Court of Inquiry re: LANCETFISH and (B) Navy Inspector General Serial 0945 (which was document #4 with the two attachments, Facts and Discussion of Facts.

COURT of INQUIRY REPORT

This report is significantly different from the Inspector General's (IG) conclusions and recommendations as previously discussed - mainly in the recommendation of disciplinary action to ship's company. It is dated 25 Apr '45, 20 days after the IG report.

Note: The Inspector General's findings are advisory in nature whereas the Court of Inquiry's findings are lawful and legally binding.

The Facts section of the report reiterates the facts substantially the same as the IG report but adds an extra clause delineating the budgetary costs for raising (\$18,000) and repair (\$450,000) of LANCETFISH.

The Opinion section deviates from the IG report in that it finds the below decks watch, a GM1(SS), culpable stating he did not note the condition of the torpedo tubes on his 2200 hour inspection tour. The curious thing is that the IG report only mentions the below decks watch in one paragraph regarding the condition of the ballast tanks being full or empty—it never follows through on this item and the comment just dies.

Continuing, it finds Commander Ellis B. Orr in no way responsible, and it continues with the comment, "he took extra precautions not required by existing orders to prevent any casualties to his ship". This was fascinating in that it was completely contrary to the IG recommendation. It appears that the Court of Inquiry dug a little deeper than the IG.

Finally it finds the OD partially responsible for the same reason as stated in the IG report.

The Court of Inquiry then recommends the following:

- No further action taken in case of Commander Orr.
- The ships DO (an Ensign) be admonished.
- The below decks watch (GM1(SS)) be disqualified.
- The Yard worker who opened the torpedo tube be reduced in rate.
- Indoctrination of Shipyard supervisors be more thoroughly carried out in the future.

The next to final section of the Court of Inquiry report is interesting. It is drafted by the Convening Authority, Commandant 1st Naval District (Rear Admiral) where he reiterates the above and basically approves the *proceedings, findings, opinions and recommendations* stated in the report. No where in his comments does he address the issue of administrative discipline to shipyard personnel other than the worker who indeed opened the door.

But the Commandant doesn't have the last say, a Captain (F-05) on the CNO's staff does. He appends the Court of Inquiry report with:

"In my opinion the action of the Court of Inquiry is a typical example of failure to fix responsibility on those in authority; they must accept the responsibility. In general the Commandant approved this whitewash. The submarine sank as a direct result of the action of a yard workman who acted

contrary to the advice of the SS's QM. Because of yard equipment, hoses and the like, the ship's personnel were thwarted in their efforts to isolate the flooding, although it is indicated they acted properly after the initial yard mistake. The Captain, and others in authority attached to the SS, cannot escape the responsibility for the safety of that command, but, in this case, there were extenuating circumstances resulting from the failure of yard personnel, both senior and junior. The IG's recommendations include disciplinary action to be taken in the case of the Production Officer and others attached to the Yard. I consider the IG's recommendations to be just and complete with one exception—I do not think that Commander Orr merits censure; quoting from Record of Court of Inquiry, "Commander Orr — is in no way responsible for the sinking — he took all proper precautions for the safety of his ship — In addition — he took extra precautions not required by existing orders, to prevent any casualties —" (This was obviously meant for the CNO's eyes)

In summary, eight shipyard personnel, 4 Navy and 4 civilian, received letters of admonition, one ship's personnel, the Duty Officer, received a letter of admonition and one ship's personnel, the below decks watch, GM1(SS), was recommended for disqualification in subs.

The rest of LANCETFISH's tale is anti climatic as she was transferred to the Atlantic Fleet Reserve in uncompleted condition only to be struck from the Navy's register in Jun '58 and sold for scrap in Aug '59 to Yale Waste Company. Typical scrap value of comparable sales was shy of \$100,000. So ends the saga of SS-296, USS LANCETFISH.

But that's not the end of the story. What remains to be explored is the rationale for the different recommendations by the Inspector General's Office and the Court of Inquiry with regard to Commander Orr's fate. Why didn't the Court of Inquiry follow the IG's recommendation, i.e., *appropriate disciplinary action*? The 42 pages of documents available from LANCETFISH's BOAT BOOK are silent on this subject so one must look elsewhere or speculate.

Rather than speculate at this point, a look at Commander Orr's credentials is in order.

In 1914 Orr was born in Detroit, MI, where he subsequently grew up and went through the usual schooling processes. Orr's father through the years encouraged him to think seriously about his life's goals so after high school, he enrolled at Michigan State University at East Lansing. While still a freshman he was awarded a congressional appointment to Annapolis.

After graduation, class of '36, the young Ensign Orr reported to the battleship OKLAHOMA (BB-37) for his first duty assignment. OKLAHOMA was based in San Diego, but shortly after Orr reported aboard she was assigned to take midshipmen on a European training cruise. The cruise was interrupted with the outbreak of civil war in Spain, and OKLAHOMA was tasked with rescue operations of American citizens and other refugees which she carried to Gibraltar and French ports. She then returned to Norfolk and back to the West Coast.

Orr was then assigned to a destroyer, USS CONYNGHAM (DD-371) operating out of San Diego. Two years to the day after his graduation from the Academy, he married the love of his life, Marian, whom he had been courting since the academy days—got spliced as Orr phrases it. A Navy chaplain whom he knew from the OKLAHOMA, then in San Diego, performed the ceremony. Shortly after that, Orr applied for sub school and by 1939 he and his new bride were in New London.

Upon graduation from sub school Orr was assigned to USS PORPOISE (SS-172) stationed at Cavite in Manila Bay and, as regulations allowed it, accompanied by wife Marian. It's amazing that dependents were still allowed as *war fever* was definitely building. As an example, during the next year, Orr watched the Asiatic Submarine Force under Admiral Thomas C. Hart grow to a total of 29 boats when 16 Salmon, Sargo & Seadragon class boats (SS-182 thru SS-197) were transferred en mass from Pearl Harbor along with the sub tender HOLLAND (AS-3) in Oct '41. These 16 relatively modern boats beefed up the contingent of 6 S class boats (S-36 thru S-41), 7 P class boats (SS-172 thru SS-178), 2 sub tenders (CANOPUS (AS-9) and OTUS (AS-20)) and one sub rescue vessel, ASR-6, USS PIGEON already stationed there. This seriously depleted the sub force left at Pearl Harbor to 21 boats, 11 of which were state side in ship yards for overhaul / modernization, repairs or

on shakedown cruises on 7 December. The transfer was understandable, however, as the US political and military leaders knew that Japan coveted the Netherlands East Indies and the Philippines were right in their path.

PORPOISE was a fairly modern boat having been commissioned in 1935. It was a class leader and was the last class to have partially riveted hulls giving it a test depth of 250 feet. It was the first class to have 4 tubes forward and two aft, electric reduction gears and high speed Winton diesels. All 4 of these Wintons were being overhauled on December 8, 1941 in Subic Bay Navy Yard while undergoing a refit, but by working around the clock, the work was finished and they were steaming for Cavite in 12 days. On 22 December PORPOISE embarked on her first war patrol. Orr's wife and other dependents had been evacuated with only 24 hour notice back to the states on a transport ship. Marian headed for Detroit where Orr's parents were and landed a job in Civil Service.

Orr, now Lieutenant Orr, did three war patrols on PORPOISE, his *Qual* boat, as commissary and communications officer. The first was in and around Lingayen Gulf in north east Luzon where the Japanese had landed invasion troops just days prior on the 21st. This was a hot spot indeed with PORPOISE being one of seven boats assigned to the area. Six boats actively engaged the enemy with S-38 credited with sinking a Maru and SALMON getting a possible on a destroyer. A typical comment from the COs was "couldn't penetrate destroyer screen—destroyers all over the place". STINGRAY spotted the invasion force but didn't engage, and the skipper was relieved of command for being too cautious. According to Clay Blair in *Silent Victory*, there were 9 other boats within striking range but none were called up.

PORPOISE continued her patrol off Camranh Bay, French Indo China, but around the 22nd of January, she was repositioned to the northern neck of Makassar Straits separating the islands of Borneo and Celebes. She was one of 10 subs positioned in and around the straits to intercept the Japanese invasion force heading for the oil rich seaport of Balikpapan, Borneo. She attacked two ships without results but fortunately the US Destroyer Force (DesRon 59) played hell with the invasion fleet by sinking several Maru troop ships, but not enough to prevent the invasion and occupation of Balikpapan.

After 39 days on patrol, PORPOISE transited the treacherous Makassar Straits and tied up at Surabaya, Java on the last day of January where her skipper, showing *extreme fatigue* was relieved of duty.

Admiral John Wilkes, Commander Asiatic Submarine Force, had ordered the Submarine Force in Cavite to be evacuated in late December and established temporary headquarters in Surabaya as Manilla was about to be over run by the enemy—and it was on the 2nd of January. Later, when Surabaya's fate became questionable, the Sub Force moved to Perth/Fremantle, Australia in early March for the duration of the war.

Nine days after getting to Surabaya, on 9 February, PORPOISE left on her second patrol with her new skipper. Her area this time was called the *Barrier* in the Netherlands East Indies. More accurately, this is the Malay Barrier which encompasses the mountainous chain of islands stretching from Malaya, Kra Peninsula (Singapore), south and east to Timor. It includes Sumatra, Java and the dangerous Lombok Straits. This area was expected to be teeming with activity as Balikpapan, Borneo was overrun in January, Singapore fell in mid February, Java was invaded in late February and the Netherlands East Indies were declared *lost* in early March. But after 49 days of disappointing results, PORPOISE tied up at the new sub base established in Fremantle on 30 March.

On 26 April PORPOISE left Fremantle for her third patrol. Once again the area was the *Barrier*. Enemy activity in the region was scarce as the islands of Bali, Timor and Celebes were already occupied by Japanese troops as well as Borneo, Malaya and Java mentioned earlier. The Japanese had their hands full in the Philippines with Baatan in April and Corregidor which was about to fall (May). Their other major front was the push for Port Moresby, New Guinea, but this task force came from Rabaul and Kavieng far to the east of of PORPOISE's assigned patrol area. All was not a washout, however, as PORPOISE was credited for rescuing five airmen off the enemy held island of Ju (the author was not able to locate this island). Admiral Charles A. Lockwood was now ComSubSoWesPac having relieved Adm. Wilkes in May.

Lockwood ordered PORPOISE to proceed to Pearl Harbor via Midway Island as the Battle of Midway was imminent. At least 18

subs were positioned in an arc to the west of Midway to intercept the enemy. PORPOISE was stationed in the extreme southwest area and was nowhere near the Japanese fleet. It was strictly an aircraft battle in which the Japanese Navy lost four front line carriers all of which had been in the Pearl Harbor strike force.

PORPOISE tied up in Pearl Harbor on 17 June '42 to end her third patrol. She was then sent on to Mare Island for a long overdue overhaul at which time Lieutenant Orr was transferred to new construction and sent to Manitowoc, Wisconsin and assigned to USS RASHER (SS-269).

This was a dream assignment for Lt. Orr. New construction of a Gato Class boat in Manitowoc, and best of all, his wife, Marian, who was still working in Detroit after her evacuation from the Philippines, could join him. RASHER was the fifth of sixteen Gato class boats being built by Manitowoc. Its keel was laid in May of '42 and it was commissioned in June of '43. The Gato class boat became the standard Fleet Boat of the Submarine Force for the duration of the war. The big differences between Lt. Orr's qual boat and the Gato boats were test depth of 312 feet vs. 250, ten torpedo tubes in a 6/4 arrangement vs. six in a 4/2 arrangement, two separate watertight engine rooms as standard design, and slightly higher submerged speed of 8.75 knots.

By the time RASHER was commissioned, Orr earned his Lieutenant Commander stripe. His seniority earned him the position of Engineering Officer on RASHER at commissioning time. As Engineering Officer, LCDR Orr drew the duty as Diving Officer for RASHER's first trim dive as well as her initial test depth dive in Lake Michigan.

After transiting the Chicago Sanitary canal, Illinois River and Mississippi River, Navy acceptance of RASHER was in New Orleans where she shortly set sail for Brisbane, Australia. She continued on to Fremantle arriving in September '43 and set out on her first war patrol in the same month—destination Celebes Sea and the ever dangerous Makassar Straits, not unfamiliar territory to LCDR Orr. Hunting was good for RASHER and under the command of an aggressive CO, sank 4 enemy ships in 8 attacks during the 61 day patrol. Out of torpedoes, she headed back to Fremantle only to be bombed by a friendly navy patrol bomber. Fortunately no serious

damage was sustained. RASHER received the PUC (Presidential Unit Citation) for outstanding performance in combat during this patrol as well as earning the combat patrol pin.

Under a new CO, RASHER left for her second patrol in December '43, a joint patrol with BLUEFISH (SS-222) - main mission, plant mines along the approaches to Saigon harbor. This accomplished she continued her mission stalking Japanese shipping in the South China Sea off Borneo. In spite of premature torpedoes and vigilant enemy escorts, she sank one tanker with another possible before returning to Fremantle after a relatively short patrol of 36 days.

Admiral Ralph W. Christie was now ComSubSoWesPac having relieved Admiral Lockwood who had moved to Hawaii to become ComSubPac. In mid February, Christie sent RASHER back to the Java Sea area on her third patrol. Hunting was good again as RASHER sank two cargo ships off Bali after an alert from the code breakers about a convoy in the area. RASHER then transited Makassar Straits into the Celebes Sea where she sank another cargo ship. Out of torpedoes, she returned to Darwin, Australia for a reload and patrolled the ever dangerous Molucca Passage for eighteen days during which she sank her fourth freighter before retiring to Fremantle after six weeks on the line. RASHER received her second PUC for this patrol and another combat patrol pin for a successful patrol.

The next was the last patrol on RASHER for LCDR Orr it was her fourth. She departed the last day of April to join seven other Fremantle boats assigned lifeguard duty surrounding Java in support of a US air strike on Surabaya's oil refineries. Enroute she sank a freighter while experiencing a myriad of torpedo problems such as deep running and faulty magnetic detonators. The air strike was a success and the lifeguards were not required so RASHER headed for the Celebes Sea via Makassar Straits after reloading eighteen torpedoes at Darwin. On this seven week double header patrol, hunting was again good as she torpedoed and sank two enemy freighters, one tanker and a converted gun boat. For this action she was awarded her third PUC and another combat patrol pin.

After RASHER's fourth patrol, Orr received orders to report to Boston Navy Yard and assume command of USS LANCETFISH.



Note: Bert recalls the orders were originally for him to be the PCO, but by commissioning time he had received his next stripe and as a full Commander the records indicate he was the CO.

In any event, this brings us back to the question of reconciling the differences in the Inspector General's report and the Court of Inquiry report with regard to Commander Orr.

From the evidence available, the author concludes that the Inspector General's Office simply took the traditional approach, i.e., the Captain goes down with the ship, regardless of the circumstances. The Court of Inquiry, although privy to the IG's report, delved deeper into the events and found in Commander Orr, a highly decorated officer, veteran of seven war patrols with a distinguished track record. A similar look at Boston Navy Yard revealed a shipyard immature in the art of submarine construction and not having adequately established the necessary procedures and safety measures, i.e., essentially running *out of control*. The Court of Inquiry had the courage and conviction to buck tradition and render a just recommendation.

EPILOGUE

Commander Orr continued his career in the Submarine Force after the LANCETFISH experience. He did a tour as PCO on Sea CAT (SS-399) and then returned to the shipyard, this time Mare Island, as CO of REMORA (SS-487) where he guided her through her Guppy II conversion, the second Guppy on the west coast with POMODON (SS-486) being the first. This was followed by desk jobs at Newport, RI, the Pentagon, CNO Staff in Washington DC and now as Captain Orr, his final assignment was CO of US Naval School of Mine Warfare in Yorktown, VA. In 1959 when the School of Mine Warfare was relocated to Charleston, SC, Captain Orr put in for retirement as it was time.

Even in retirement Captain Orr was not to be denied his love of the sea. His retirement ceremony was held dockside at the naval school where he and his crew consisting of wife, Marian, and children Mar, Jean and David were piped aboard their 39½ foot cabin cruiser Viking where they laid a course for the Gulf of Mexico

and the Rio Grande Valley. Final destination—their citrus farm in La Feria, TX.

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SUBMARINES IN LITERATURE, FILM AND TV

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.

Although I haven't discovered any statistical validation, I have no doubt that submarines far surpass contemporary surface vessels as topics for popular entertainment. In presenting my survey of submarines in literature and mass media, I realize that my selections are far from comprehensive, and I will no doubt overlook some reader's favorite. I trust that I have covered the most significant examples. The more fundamental cases are presented in some detail, giving plot summaries, and key issues, while others are briefly annotated.

Originally I intended that this article would consist of an inventory of fictional submarines, underwater vessels that have been identified by name in imaginary tales, cinema or television but do not really exist as such (often sections of a real submarine are used as stage sets, but the real name is not used). However, readers will note that I have included some books and films that purport to describe actual boats; however, poetic license, the demands of the market (especially with respect to the exorbitantly expensive production costs of movies), or simply the constraints of censorship (disclosure restrictions) on ex-servicemen, has transformed these epics from documentaries to *docu-dramas* or *faction* (mixture of fact and fiction).

I got the idea for this feature while working on my article, *Nemo's Nautilus* that appeared in the April, 2006 issue of THE SUBMARINE REVIEW. Another incentive was my acquisition of a rare 1910 book by one *Captain Danrit* titled *The Sunken Submarine*, which is actually an English translation of a work by Emile Driant a prolific French author of *future war* fiction of the 1890s and

early 1900s—the run-up to the Great War—when such cautionary tales were in vogue. Since there is no credit given to the French original, the book may or may not be a compilation of the French author's *La guerre fatale en sous-marin*, *Les exploits d'un sous-marin*, *Robinsons sous-marins*, and *Le sous-marin : le Vengeur* all of which were published in France circa 1902-1904. The book concerns only the episode wherein the mythical French experimental submarine, DRAGONFLY, suffers a disaster while on trials off the coast of Morocco and only the journalist/guest survives the episode to tell of his miraculous escape from the doomed boat. I am an aficionado of these pre-WWI tales of the looming conflict, several of which feature submarine warfare as extrapolated from the Holland, Norenfeldt and Lake boats that were running trials during this period. As fascinating as this literature is, it requires a bit more research (and translation) on my part to deal with the early prophets of undersea combat. I note that Jules Verne's *TWENTY THOUSAND LEAGUES UNDER THE SEA*, published in 1870 was not, contrary to popular belief, the first instance of the submarine in fiction. That honor goes to Theophile Gautier, another Frenchman, who had a short story published in 1848 with a submarine integral to the plot: *Les Deux Etoiles*. The exploration of this literature, which would include such gems as the popular juvenile fictional work *Tom Swift and His Submarine Boat* or, *Under the Ocean for Sunken Treasure* by Victor Appleton, even though its technology is daffy, and Gaston Leroux's *La Bataille Invisible* [translated as *The Veiled Prisoner*, London: 1923] a knock-off of Jules Verne, featuring a submarine filled with bizarre gadgetry, will have to await an article dedicated to this genre. Meanwhile, I decided to provide a quick tour of the invented worlds of undersea adventure.

I freely mix literature, film and television, since many submarine epics straddle all three media. I refer readers to my aforementioned article on Verne for detailed consideration of the earliest fictitious *Nautilus* from both a technical and literary aspect.

The first category that caught my attention is the wave of more or less propagandistic films that appeared during World War II to galvanize Americans behind the home front effort by demonstrating *why we fight*, to borrow from Frank Capra's inspirational series under that title.



One propagandistic film, Delmer Daves' quintessential submarine feature film *Destination Tokyo* (1943), starred Cary Grant as the captain of a submarine crew on a dangerous mission to Tokyo Bay.

The captain of the fictitious submarine USS COPPERFIN and his crew accept the secret mission of infiltrating Tokyo Bay in order to supply intelligence for the up-coming Doolittle Raid, (see *Thirty Seconds Over Tokyo* another wartime propaganda film from the aviators' viewpoint). Scenes inside the submarine were shot in soundstage sets (which were constructed to be very unrealistically spacious). Exterior shots frequently use miniatures; a few show different Gato-class boats. Made during the early phase of World War II when the US Navy was on the defensive, the film was effective propaganda.

As the submarine nears Tokyo Bay, the Captain informs the men that the ship must negotiate the mine fields on the bay's perimeter. When a returning Japanese cruiser and two destroyers approach the bay, he decides to follow them into the bay and thus avoid the mines. That night, Wolf, Raymond and Sparks go ashore to make the observations necessary for a future air attack on Tokyo.

While the men are away, Tommy is discovered to have a ruptured appendix, and Pills operates with the help of an instruction book and improvised scalpels. When the men on shore finish their surveillance, Raymond, who was reared in Tokyo, broadcasts their findings in Japanese. Despite this precaution, the Japanese decide to investigate the broadcast location, and the men narrowly escape discovery. Using the radioed information, the air attack on Tokyo begins, and the men of COPPERFIN watch it through their periscope.

After the attack, the submarine again slips through the mine fields by following a Japanese ship. The submarine's position is later revealed when the crew torpedoes a Japanese aircraft carrier. Other Japanese ships bomb COPPERFIN, which is badly damaged. When the submarine is unable to evade the destroyer that is following it, Cassidy orders the men to attack. The destroyer is sunk, and the submarine heads back to San Francisco, where Cassidy's wife and children are waiting at the dock.

When this film was being produced, Gato class subs were, in fact, beginning long-ranging commerce raiding forays deep into the heart of the Japanese maritime lanes, but this feature was not known to the

public at the time, so the film makers had to fall back on the Doolittle-type undersea *lone wolf* raiding counterpart.

The above film has been discussed in more detail than of those covered in the balance of this article, because it is a prototype of the modern submarine saga.

Archie Mayo's hard-hitting *Crash Dive* (1943) starred Tyrone Power as an ace PT boat skipper whose assignment to a submarine (commanded by Dana Andrews) led to victories against the Nazis in the North Atlantic, replete with the obligatory romantic adventure subplot (with love interest Anne Baxter). Alfred Hitchcock depicted eight survivors from a torpedoed boat adrift in *Lifeboat* (1944), which portrays enemy submarines from the victim's viewpoint as a patriotic survival epic. Director Dick Powell's *The Enemy Below* (1957) dealt with submarine warfare in the Atlantic as a cat-and-mouse chess match between two dueling commanders (Robert Mitchum as the captain of an American destroyer, and Curt Jurgens as the captain of a German U-boat). Another seminal submarine film was Robert Wise's *Run Silent, Run Deep* (1958) with Burt Lancaster and Clark Gable as two clashing submarine officers. In the same year, *Torpedo Run* (1958) starred Glenn Ford as an obsessed and merciless WWII submarine commander. You can see a pattern emerging here: the confined, cramped, and isolated sub as a pressure cooker, setting off all the psychotic quirks that might otherwise lie dormant.

World War II (lite) continued to be represented in a somewhat humorous vein in a few forgettable films. USS STINGRAY (SS-161) is a fictitious U.S. Navy diesel engine submarine featured in the 1996 comedy film *Down Periscope*. The Stingray was played by the USS PAMPANITO (SS-383), a still-seaworthy World War II Balao-class submarine that is now a memorial and museum ship in San Francisco.

The 1959 movie *Operation Petticoat*, starring Cary Grant and Tony Curtis, and the short-lived 1977-1978 television series of the same name, were set aboard a fictional SEA TIGER. The sub was most-closely based on the actual WWII-era submarine USS SEALION (SS-195), which like its film counterpart, was sunk at the pier at Cavite Navy Yard, the Philippines, on 10 December 1941 with the loss of 5 crewmembers. The SEA TIGER in the movie was

portrayed by three different American WWII era submarines: QUEENFISH (SS-393), in the opening and closing scenes (circa 1959), in which the "393" on the conning tower is visible, ARCHERFISH (SS-311), for all the WWII scenes where the boat was painted the standard gray and black, BALAO (SS-285), for all the scenes in which SEA TIGER was painted pink.

On a more sober note, two notable recent films provided a relatively sophisticated, high-tech experience of what it must have been like to live and work aboard a World War II boat. Both are worth considering at some length as taking the WWII sub film to a new level.

U-571 is a 2000 movie directed by Jonathan Mostow, and starring Matthew McConaughey, Bill Paxton, Harvey Keitel, Jon Bon Jovi, Jack Noseworthy, Will Estes, and Tom Guiry.

In the movie, a German submarine is boarded in 1942 by disguised American submariners seeking to capture its Enigma cipher machine. This movie was shot in and around Malta.

The film is loosely based on the capture of U-110 by the British Royal Navy. The film was slammed in the UK for its portrayal of an Enigma capture by an American, as opposed to British, crew. A German U-Boat, designated U-571, sights a British supply ship in its periscope and sinks it with a torpedo. Seconds later, a British destroyer moves in, forcing U-571 to dive. The destroyer drops depth charges which disable the submarine. The destroyer moves away believing it sunk the enemy. U-571 resurfaces but is stranded. The captain who had lost his engineering team following the attack orders his radioman to signal the Lorient U-Boat base to send a resupply ship using the Enigma.

Meanwhile, the officers of the US Navy are celebrating the wedding of Larson. During the party, Lieutenant Tyler comes in with a solemn look on his face because he didn't get his own submarine to command. After complaining about it to Captain Dahlgren, he's rebuffed and upset. Suddenly other Navy officers come in saying their shore leave's over. All the men go to the submarine docks to find their boat, the S-33, being converted into a U-Boat. Tyler rounds up Radioman Wentz who can speak German as well as English, a Marine named Coonan, and another Navy sailor named Hirsch who's fluent in German too. The ship goes off to sea and

Hirsch explains to everyone what the mission is. The Navy encoders detected radio signals from the disabled U-571 and they are going to be the resupply ship it called for. Coonan says that the Enigma device is onboard and that he will lead a boarding party to capture the U-Boat and liberate the Enigma. Then they'll scuttle the ship so the real resupply sub will think U-571 was too late. Tyler is skeptical about this but goes along.

Back on U-571, the repairs are not going smoothly and the captain is alerted that there are other men out in the water. He sees several survivors, from the merchant ship he sank, on a lifeboat asking for asylum. He orders his men to shoot them which they reluctantly do.

During a rainstorm, the S-33 comes across U-571 and sends its boarding party over. They take the ship by force, losing some sailors in the process. Larson is injured during the fighting later. They capture the Enigma and begin rounding up the prisoners including the captain. Afterwards, the S-33 is torpedoed and sunk by the real resupply sub and the captain is killed. Coonan, Larson, and many others are lost as well so Tyler takes command and orders his men to dive the ship and look for the enemy. They fire a salvo of torpedoes that destroys the enemy U-Boat leaving only one torpedo in a busted tube.

Tyler and his men search for survivors and find two: the black cook from the S-33, Eddy, and the captain of the U-571.

Critics were quick to point out some historical inaccuracies. In reality, the first capture of an Enigma machine and associated cipher keys from a U-boat was made in May 1941 by the British, who captured U-110. There were some 15 captures of Naval Enigma material during World War II, of which the Americans and Canadians carried out one each (U-505 and U-774, respectively), while the British performed the rest. The U.S. Navy did not seize German Naval Enigma material until June 1944, when it captured U-505. The British captures provided critical information for breaking Naval Enigma, so that by the time of the U-505 capture the Allies were reading Naval Enigma routinely.

Thus, the film caused irritation and anger in Britain. The film was discussed at Prime Minister's Question Time where Tony Blair agreed with a questioner (a Member of Parliament) that the film was

an *affront* to British sailors. In response to a letter from a British MP, US President Bill Clinton wrote assuring that the film's plot was only a work of fiction. David Balme, the British Naval officer who led the boarding party aboard the U-110, was positive about the U-571 ("a great film", arguing that the movie would not have been financially viable without being Americanised. Controversy aside, the film is quite good at conveying the atmosphere and conditions aboard WWII vintage boats.

In 2006, screenwriter David Ayer admitted that U-571 distorted history and stated that he would not do it again. Ayer told BBC Radio 4's *The Film Programme* that he *did not feel good* about suggesting Americans captured the Naval Enigma cipher rather than the British.

"It was a distortion... a mercenary decision... to create this parallel history in order to drive the movie for an American audience," he said. "Both my grandparents were officers in World War Two, and I would be personally offended if somebody distorted their achievements."

The movie has also been criticized for a scene in which the U-boat crewmen machine-gun Allied merchant crewmen who have survived their ship's sinking, killing them in cold blood as they float helplessly in their lifeboat. The implication is that the killing of survivors was typical U-boat behavior; critics of the U-571 movie, however, point out that this is an incorrect depiction of typical U-boat crew behavior. In contrast to the depiction of U-boat men in the movie, U-boat crewman almost universally followed the accepted rules of war; in a number of incidents, they helped survivors with food, directions and occasionally medical aid. Assistance to survivors only stopped after Admiral Karl Dönitz issued the *Laconia order* following a US attack on U-boats transporting injured POWs under a flag of truce. In fact, out of several thousand sinkings of merchantmen in World War II, there is only one documented case of a U-boat crew deliberately attacking the ship's survivors: that of the U-852, whose crew attacked survivors of the Greek ship *Peleus*.

There was a real German submarine designated U-571, but that vessel was never involved in events depicted in the film.

Das Boot, released in 1981, is a feature film directed by Wolfgang Petersen, adapted from a novel of the same name by

Lothar-Günther Buchheim. Hans-Joachim Krug, former first officer on U-219, served as a consultant, as well as Heinrich Lehmann-Willenbrock, the actual captain of the real U-96.

The movie has a strong anti-war message. One of Petersen's stated goals was to guide the audience through a *journey into madness*, showing *what war is all about*. Petersen heightened suspense by very rarely showing any external views of the submarine unless it is running on the surface and relying on sounds to convey action outside the boat, thus showing the audience only the claustrophobic interior the crew would see. The original 1981 version cost DM 30 million (US\$40 million in 1997 dollars) to make; it was at the time the most expensive film in the history of German cinema. The director's meticulous attention to detail resulted in an extremely realistic and historically accurate movie. The movie is the story of a single mission of one U-boat, U-96, and its crew. It depicts both the excitement of battle and the tedium of the fruitless hunt, and shows the men serving aboard U-boats as ordinary individuals with a desire to do their best for their comrades and their country. The story is based on an amalgamation of the exploits of the real U-96, a Type VIIC-class U-boat commanded by Heinrich Lehmann-Willenbrock, one of Germany's top U-boat *tonnage aces* during the war.

When the U-96 launches into the sea, Werner is in awe and takes a lot of photos of the submarine and its crew. He gets to know the rest of the crew, like Johann, the Mechanic (Erwin Leder), Chief Bosun, and some crewmen like Ullmann, Pilgrim, Frenssen, Dufte or Schwalle. He marvels when the submarine makes its first dive to 150 meters. But time passes, and he begins to realize the routine of being crammed together with 40 people in a small space with almost no ventilation. There is an unhealthy undercurrent of sweat, filth and boredom, fuelled by the fact that there is nobody to fight against. Werner has no one to talk to. He cannot relate to the battle-hardened Captain, the quiet LI, the Nazi IWO, the cynical 2WO or the tough crew.

The U-96 crew look forward to returning home to La Rochelle, but then the High Command orders that their new destination be La Spezia in Italy, meaning the U-96 must cross the bottleneck at Gibraltar, which is crawling with British ships.

In Gibraltar, the U-96 attempts to break through the British barrier, but it is shot at by British forces, forced to dive and—heavily damaged—starts to sink to its doom. The U-96 falls to 280 metres in depth, but just before the hull breaks, the submarine lands on a sand bar on the ocean floor. Numerous hull breaches occur, water floods in, and the battery cells and the water pumps are damaged, but the crew manages to make repairs and to resurface just before they would have suffocated. Seriously damaged, the U-96 returns under cover of night to its base in La Rochelle.

The crew gets a heroes' welcome in La Rochelle, but during their reception, allied fighter planes bomb and strafe the facilities. Several crew members are killed, among them Johann and the 2WO. Werner finds the Captain, also seriously wounded, who sees his boat sinking to the dock's bottom. When the submarine disappears, the Captain dies.

The movie drew high critical acclaim and is seen as one of the best German movies of all time, classed together with *art films* such as *Nosferatu* by F.W. Murnau, *Metropolis* by Fritz Lang and *Der blaue Engel* with Marlene Dietrich. It is rightly regarded as highly important among the subgenre of submarine movies.

There were a few quibbles. In the movie, there is only one ardent Nazi in the crew of 40, namely the First Lieutenant (referred to comically in one scene as *Unser Hitlerjugendführer* or *Our Hitler Youth Leader*), and the rest of the crew remains either indifferent or openly anti-Nazi (the Captain). Some have stated that this scenario is quite unlikely as most U-Boat crews were allegedly selected from those naval service members with strong belief in the Nazi Party. One has only to look at the difficulties experienced with POW camps set aside for captured U-Boat crews. At this stage in the war, morale was high and this degree of scepticism would have been unlikely.

There are a number of good "Cold War" era films.

Ice Station Zebra, a novel by Alistair MacLean published in 1963, begins as Drift Ice Station Zebra, a British meteorological station built on an ice floe in the Arctic Sea, is in trouble. The station has

had a fire, and men have died. The rest are holed up in one hut with no food or heat, and little liquid water. If help does not reach them soon, they will die.

The (fictional) nuclear-powered submarine USS DOLPHIN is dispatched on a rescue mission. Just before it departs, the mysterious Dr. Carpenter, an apparent expert in dealing with frostbite and other deep-cold medical conditions (and the narrator of the story), is sent to accompany it.

At first, Captain Swanson is suspicious of Carpenter; even though he receives an order from NATO instructing him to obey Carpenter's every command, except where crew safety is at stake. Swanson tells Carpenter he is still inclined to refuse. Carpenter reveals that this is not simply a rescue mission—the station is actually a highly equipped listening post, keeping watch for nuclear missile launches from the Soviet Union. Swanson then allows Carpenter to come along.

Soon DOLPHIN is under the Arctic ice pack, searching for a place to surface and attempt to contact Zebra, whose radio signals are becoming weaker by the hour.

The ice there is still too thick to punch through with the sub's *sail*—but maybe it can be opened with a torpedo. Disaster strikes. The crew attempts to load a torpedo into one of the tubes, but when the inner door is opened, a torrent of water rushes in, killing a crewman and sending DOLPHIN into a nearly catastrophic dive. Only by heroic measures is DOLPHIN able to save itself. After successfully cracking the ice, the sub finally emerges just two hundred feet from Zebra.

Finally, the survivors are aboard, Zebra is abandoned, and the Dolphin heads back, but not without several further incidents. The ship's doctor is knocked into a coma. Carpenter himself is severely hurt in another apparent accident. Then, a fire breaks out in the engine room and the sub is forced to shut down its nuclear power plant. Without power for heating or air purification, the Dolphin looks set to become a frozen tomb trapped under the ice pack. Only the ingenuity of the captain and dedication of the crew saves the ship.

The book was made into a film in 1968 featuring Rock Hudson, Ernest Borgnine, Jim Brown and Lloyd Nolan.

Perhaps the most famous *breakthrough* film is the one based on Tom Clancy's first novel, *The Hunt for Red October*, published in 1984, notably the U.S. Naval Institute Press's first work of fiction and still the most successful. The story follows the intertwined adventures of Soviet submarine captain Marko Aleksandrovich Ramius, and CIA analyst Jack Ryan.

The novel is sometimes referred to as the first real example of the techno-thriller, a hybrid between the spy thriller and science fiction, in which attention to technical and operational detail about military and intelligence activities is paramount. Research for *The Hunt for Red October* was conducted using the Harpoon board game developed by Larry Bond.

The Hunt for Red October was inspired by a real incident. On November 8, 1975, the Soviet Navy frigate Storozhevoy mutinied, which at the time the West believed was an attempt to defect from Latvia to the Swedish island of Gotland. The mutiny was led by the ship's Political Officer, Captain Valery Sablin. The mutiny was unsuccessful; Sablin was captured, court-martialed and executed. Some faulted the Swedes for failing to assist the mutineers, but this was unrealistic given Sweden's neutrality and their proximity to the USSR.

Marko Ramius, a Lithuanian by birth, who has risen to high levels of trust in the Soviet Navy, intends to defect to the United States with his officers and the experimental nuclear submarine Red October. The Red October is equipped with a revolutionary stealth propulsion system (in the movie, a magnetohydrodynamic drive) nicknamed the caterpillar drive, making it extremely difficult to detect with regular methods. Ramius' defection is spurred by several factors, in particular the death of his wife due to a doctor's incompetence. Because the doctor was the son of a Politburo member, he was beyond reproach. This, in conjunction with a long-standing dissatisfaction with Communism and the callousness of the Soviet establishment towards its sailors, ultimately exhausts Ramius' tolerance for the Soviet system's failings.

Ryan, a naval historian turned CIA analyst, deduces Ramius' plans. The U.S. high command meanwhile comes up with contingency plans in case the Soviet Fleet has intentions other than the cover. As tensions rise between the U.S. and Soviet fleets, and the

crew of a U.S. attack submarine stumble on the secret to detecting the Red October, Ryan must contact the Red October's rebellious captain to prevent the loss of a decisive technological advantage. Through a combination of circumstances, Ryan becomes responsible for seeing the sub, and Ramius, to safety from the pursuing Soviet naval fleet. After a clever diversionary tactic, the Americans find a way to help the Red October safely reach the coast of Virginia. The film, released in 1990, with Sean Connery in the role of Ramius, Alec Baldwin playing Ryan, Scott Glenn as the American sub commander, and James Earl Jones as US Admiral James Greer, was true to the novel and very adept at simulating the tensions besetting both the Soviet and American officers and crew.

Crimson Tide, is a 1995 submarine film starring Denzel Washington and Gene Hackman and directed by Tony Scott. It is a typical submarine film, in that it focuses on the tension that occurs between the men who must not only endure the scarce and dangerous space aboard an Ohio-class nuclear submarine, but also the weight of responsibility for the nuclear SLBMs they are trained to deploy, and the mental stress of the dire consequences that could result from a miscalculation. The film takes place in 1995 (judging from several references made in the story) during a period of instability in Russia. An ultranationalist has taken control of a nuclear missile installation and is threatening nuclear war if either the Americans or the Russian government attempt to confront him.

The United States nuclear strategic missile submarine USS ALABAMA is given the mission to go on patrol and be available to launch its missiles in a pre-emptive strike if the Russian nuclear installation attempts to fuel its missiles, in which case they can be launched one hour after the fueling process begins. Captain Frank Ramsey (Hackman) is the commander of the sub, one of the very few Captains remaining in the US Navy with any experience in combat. He chooses as his new executive officer (XO) Lieutenant Commander Ron Hunter (Washington), who has an extensive education in military history and tactics, but no combat experience.

ALABAMA eventually receives an order to launch its missiles on the Russian nuclear installation, based on satellite information that the missiles are being fueled. However, before the Alabama can launch its missiles, a second message begins to come through, but is

interrupted by the attack of a Russian Akula-class attack submarine friendly to the ultranationalist cause, which is destroyed in open combat. The communications systems are damaged in the attack, the remainder of the message cannot be received, and the message cannot be authenticated. Cut off from communications, attacked by the hostile Akula and with an order in hand to launch, Captain Ramsey decides to proceed with the launch. XO Hunter refuses to concur as is procedurally required for launch, and instead tries to confirm the second message, which he believes is a retraction of the previous launch order. Eventually, Hunter orders the arrest of Ramsey for attempting to exceed his authority, Ramsey escapes confinement to confront Hunter with charges of mutiny, and the two men struggle for control. Eventually, the crew divides into those loyal to the captain and those who do not want to risk nuclear war. Ramsey (white) and Hunter (black) exchange overt allusions to race as the command crisis escalates, and Ramsey portrays the XO as an upstart Harvard graduate who does not respect his place in the chain of command. In the end, the communications equipment is repaired and it turns out that the Russian army has the situation under control and the rebellion is subdued, eliminating the need to launch the missiles.

The movie culminates in a review at the Pacific Fleet headquarters in Hawaii where several Admirals express grave concern about the breakdown of nuclear launch operations in wartime. While the elder Ramsey voluntarily retires and the young Hunter is given a command, the movie aims to present the intractably uncertain nature of the launch scenario, in essence placing full blame on neither character. A gentlemen's reconciliation between officers occurs at the closure of the film.

Although the film does not claim to be based on a true story, events that transpire throughout the plot are strikingly similar to one of the most tense periods of the Cuban Missile Crisis. On October 27, 1962, a Soviet submarine officer named Vasili Alexandrovich Arkhipov reportedly refused to comply with the launch of a nuclear warhead while being closely tracked by a U.S. warship near Cuba. In order to initiate such an attack, Soviet naval procedures stated that the captain and two other officers must concur. The other officer on duty agreed to the launch, but Arkhipov convinced the captain to

wait for instructions from Moscow before proceeding.

Reverting back to the perilous early days of Soviet-American undersea competition, *K-19: The Widowmaker* is a movie released in 2002, starring Harrison Ford as Captain Alexis Vostrikov and Liam Neeson as Captain Mikhail Polenin. It purports to depict the first of many disasters that befell the Soviet submarine K-19. It is based on the factual situation confronting the officers and crew of an early HOTEL-class Soviet sub...one of the first nuclear-powered Russian subs and one plagued with shoddy workmanship and poor design resulting from a rush to catch up with American undersea developments and to create a Soviet nuclear presence on America's littoral doorstep. The movie's script aroused considerable ire when it was read by the original crew of K-19. Two open letters were sent to the actors and production team, one from several officers and crew members, the other from the boat's captain. Many complaints, based on preliminary screenings and perusal of the screenplay, centered on what was felt to be the incorrect and stereotypical portrayal of the Soviet crew sailors as disorderly, drunken, illiterate and rebellious.

The producers made significant changes to the script and the revised portrayal of the Soviet crew was more respectful. Several scenes were cut and the names of the crew were changed at the request of the crewmembers and their families. When the film was premiered in Russia in October, 2002, 52 veterans of the K-19 submarine were flown in to the St. Petersburg premiere. Despite many technical and historical issues that remained (caused by the need to appease the general theatre-going audience), the film and Ford's performance in particular received high marks from them.

I will conclude the article with a quick look at *science fictional* subs as a kind of postscript to my Nemo/Nautilus piece. *On the Beach* is a post-apocalyptic end-of-the-world novel written by British author Nevil Shute after he had emigrated to Australia. It was published in 1957.

The novel was adapted for the screenplay of a 1959 movie featuring Gregory Peck (USS SAWFISH Captain Dwight Lionel Towers), Ava Gardner (Moirra Davidson), Fred Astaire (scientist Julian - John in the novel - Osborne) and Anthony Perkins (Australian naval officer Peter Holmes). It was directed by Stanley Kramer.

The story is set in what was then the near future (1963 in the book, 1964 in the first movie, and 2000 in the television production) in the months following World War III. The conflict has devastated the northern hemisphere, polluting the atmosphere with nuclear fallout and killing all life. While the nuclear bombs were confined to the northern hemisphere, global air currents are slowly carrying the fallout to the southern hemisphere. The only part of the planet still habitable is the far south of the globe, specifically Australia and New Zealand, South Africa, and the southern parts of South America.

From Australia, survivors detect a mysterious though incomprehensible Morse code radio signal originating from the United States. With hope that some life has remained in the contaminated regions, one of the last American nuclear submarines, USS SAWFISH (USS SCORPION in the book), placed by its Captain under Australian Naval Command, is ordered to sail north from its port of refuge in Melbourne (Australia's southernmost major mainland city) to try to contact whoever is sending the signal. The American Captain, Dwight Towers, leads the operation, leaving behind a woman of recent acquaintance, the alcoholic Moira Davidson, to whom he's become attached, despite his feelings of guilt regarding the certain deaths of his wife and children in the U.S. He refuses to admit that they are dead and continues to behave as though they are still alive, buying them gifts and writing them letters. In the novel, he remains faithful to his wife, while in the film, he has an affair with Moira.

Typically for a Shute novel, the characters are remarkably stoic and avoid the expression of intense emotions. They do not, for the most part, flee southward as refugees but rather accept their fate once the lethal radiation levels reach the latitudes at which they live. Finally, most of the Australians do opt for the government-promoted alternative of suicide when the symptoms of radiation-sickness appear.

In the book (though this is not mentioned in the original film), the war is said to have involved the bombing of the United Kingdom by Egypt. The aircraft used were obtained from the USSR and so the attack was mistakenly thought to have been led by the Soviets, leading to a retaliation on the USSR by the NATO powers. The book also hints at a strike by the People's Republic of China against the

USSR, aiming at occupying Soviet industrial areas near the Chinese border; this strike leads to a Russian retaliatory strike. This may have been a reference to the then-contemporary Suez crisis. In the later television movie, the Third World War is sparked by the People's Republic of China launching an all-out invasion of Taiwan that brings the United States to Taiwan's defence. After the U.S. deploys its forces to attack the Chinese with conventional weaponry, the Chinese launch an all-out nuclear missile attack on North America, which results in the United States launching a nuclear strike against mainland China.

Much of the novel's action takes place in Melbourne, close to the southernmost part of the Australian mainland. Shute is said to have despised the first movie version (which was released little more than a month before he died), feeling that his characters had been altered too greatly. However, the film shoot in and around Melbourne (with some of the racing action shot at Riverside Raceway) was a great novelty for that city at the time. It was claimed that Ava Gardner described Melbourne as 'the perfect place to make a film about the end of the world'; the purported quote was actually invented by journalist Neil Jillett.

Voyage to the Bottom of the Sea is a film released in 1961 based on the novel by Theodore Sturgeon, also published in 1961. Walter Pidgeon is the nominal star of *Voyage to the Bottom of the Sea*, portraying Admiral Harriman Nelson, the designer of the submarine Seaview, a glass-nosed research submarine. The sub embarks on her shakedown cruise under the polar ice cap as the movie begins. Upon surfacing, however, the crew discovers that the entire sky is on fire – the Van Allen radiation belt has been ignited by a freak meteor shower, and the Earth is being slowly burnt to a cinder. Nelson and his colleague, Commodore Lucius Emery (Peter Lorre), devise a plan to extinguish the belt using one of the Seaview's nuclear missiles, but they are denounced at an emergency meeting of the United Nations. Disregarding the UN vote against him, Nelson decides to go forward with his plan before the Earth is destroyed, hoping to get the approval of the president of the United States while his ship races from New York to the Marianas in the Pacific to launch its missile on time and target, with the world's navies hunting her down and communication with Washington impossible because

of the fire in the sky. Nelson must combat not only the threats from other ships but also the doubts of his own protégé, Commander Lee Crane (Robert Sterling), the captain of SEAVIEW, about his plan and his methods, and the growing suspicion—being spread by Dr. Susan Hiller (Joan Fontaine), a psychiatrist who was visiting the vessel—about his sanity, as well as the growing discontent of the crew, who would like to see their families before the end of the world, and the presence of one religious fanatic (Michael Ansara) who thinks the fire in the sky is God's will. Worse still, there appears to be a saboteur—and possibly more than one—aboard. The plot is episodic in pacing and features elements that were clearly derived in inspiration from Disney's 1954 production of *Twenty Thousand Leagues Under the Sea*, such as Nelson's eccentricity and the *outlaw* status of his ship; but the undersea maneuvers to tap the trans-Atlantic telephone cable (in order to reach Washington), the battle with a giant squid, a duel with an attack submarine, and a harrowing tangle with a WWII mine field would become standard elements of the series of the same name that followed this movie two years later. Pidgeon brings dignity if not a huge amount of energy to the role of the admiral, and Lorre, Fontaine, Ansara, and Henry Daniell (playing Nelson's scientific nemesis) added some colorful performances, and Barbara Eden, as Nelson's secretary, is easy on the eyes. The real star of the movie, however, is the submarine SEAVIEW and the special effects, which, to be fully appreciated, should be seen in a *letterboxed* televised presentation of the movie. ■

**SUBMARINE MINE PLANT
A FIRST PERSON ACCOUNT
OF
TMC(SS) PATRICK MEAGHER, USN(Ret)**

The Author, TMC(SS) Patrick Meagher USN(Ret), qualified and served on USS CUSK SS-348, USS ANDREW JACKSON SSBN-619B, and USS BARBEL SS-580. Chief Meagher served on active duty with the Submarine Force from 1960 through 1977. He is a Life Member of USSVI, and an Associate Member of USSVWWII.

A submarine mine plant is a very different experience from a torpedo shoot. First of all, mine plants occur infrequently as compared to torpedo shooting. Second, a mine plant is, in reality, a navigation, piloting, and plotting exercise for the attack center. There is no fire control problem to be solved, and no weapons input unless mobile ground mines are employed. The real challenge of a mine plant occurs in the torpedo rooms. The rapid pace of shooting mines and reloading tubes requires a high degree of coordination by the torpedo gang and reload parties, and the torpedo tube battery to operate flawlessly.

1962-USS CUSK SS-348

My first experience with submarine mine plants took place in early spring of 1962 onboard USS CUSK SS-348. At that time I was TM2(SS) assigned to the After Torpedo Room. CUSK was the designated submarine minelayer during the period we were in WesPac. We had just finished participating in *OPERATION TALUNGAN*, a major amphibious exercise in Philippine waters, as part of the Opposition Force. We arrived at Subic Bay with over 100 other ships taking part in that operation. Shortly after arrival we received word that we would be shifting berths the next day to Cubi Point, to offload torpedoes and load drill mines. Following our move the next morning we offloaded all our MK 14 Mod 3 air-steam torpedoes. We retained three Mk 37 Mod 0 homing torpedoes in the

Forward Torpedo Room and two Mk 27 Mod 4 homing torpedoes in the After Torpedo Room. We kept the homing torpedoes as a defensive load *just in case*.

The next day we loaded four Mk 27 mobile ground mines and eighteen Mk 10 moored mines. These were *drill Mines* without live warheads but with actual detonators and working influence features. The Forward Torpedo Room received the Mk 27's which were immediately loaded in torpedo tubes 1 through 4. This was followed by twelve Mk 10's with two loaded in torpedo tubes 5 and 6 and the remaining ten double loaded in empty reload skids. The After Torpedo Room received six Mk 10's. Four were immediately loaded in torpedo tubes 7 through 10. The last two were double loaded on a skid and moved to the reload position behind torpedo tube 8.

The Mk 27 mobile ground mine was developed from the Mk 18-Mk 28 series electric torpedoes. It was 21 inches in diameter and 20 and a half feet long with magnetic and acoustic influence features. It had a small propeller which drove it on a gyro stabilized course to its final location where the propulsion motor shut down and the mine sank to the bottom. Running distance up to 4500 yards was set mechanically with the torpedo tube depth setting spindle used with the mechanically set Mk 14, Mk 18, Mk 23 and MK 28 torpedoes.

The torpedo tube OP contained a conversion scale for converting running depth to running distance. Running distance was set during torpedo tube final preparations for firing. The Mk 27 mine propulsion battery was charged prior to arrival on the boat, and as I recall we did not apply a *top-off* charge to the battery prior to launching.

The Mk 10 moored mine was about ten feet in length and 21 inches in diameter. It had two sections, the anchor and the mine case which were connected by a wire anchor cable. There was a spring loaded *arming bar* on the top of the mine along with two arming pins attached to lanyards. The pins were pulled as the mine was loaded in the torpedo tube. The arming bar rode in the torpedo tube guide-stud groove. A retaining screw which held the arming bar in place was also removed as the mine was loaded in the torpedo tube. When the Mk 10 mine was shot out of the tube, the spring loaded arming bar popped off and the mine case separated from the anchor. The anchor went to the bottom while the mine case went to a preset hydrostatic depth where the cable reel stopped paying out.

We left Subic and set course for Buckner Bay Okinawa. The mine laying plan was for CUSK to shoot the four MK 27 mobile mines into Buckner bay as we lay off the entrance. We would then enter the bay submerged and plant a field of eighteen Mk 10s. This would be followed by an additional field of forty four Mk 10's dropped from Navy P2V-7 Neptunes. On the day of the mine plant CUSK approached the entrance to Buckner Bay submerged at periscope depth and went to Battle Stations. The skipper and the navigator were shooting bearings to landmarks ashore to pilot us into position to shoot the MK 27's. Ordered range was cranked into the mines and they were ejected one at a time. Sonar tracked them until they shut down. Following the launch of the MK 27's, Torpedo Tubes 1 through 4 were reloaded with MK 10's. Reloads were then positioned behind the torpedo tubes in the forward and after torpedo rooms with reload parties standing by.

Water depth by this time varied between 85 to 115 feet with CUSK at periscope depth of 51 feet. We would alternate shooting mines from forward and aft which allowed several minutes to drain a torpedo tube and reload with a mine. I believe we planted two rows of nine mines each. Making the turn to set up for the second row allowed an additional couple of minutes for draining torpedo tubes and reloading. After mine number 12 was fired, the Forward Torpedo Room would shoot the remaining 6. They would have to increase their firing rate as the After Torpedo Room was empty, however they would only have to reload two tubes for the final six. Tubes 5 and 6 were only used once due to the difficulty of reloading those tubes from the *pit*.

The mineplant went off without a hitch. At one third speed depth control was maintained throughout without difficulty. The Forward Torpedo Room only had to dump a half-a-Torpedo Tube of water in the bilges at the very end in order to reload and shoot the last mine on time. Following the last shot CUSK cleared the mine field area while remaining at periscope depth. The skipper and the OOD then observed the P2V-7 mineplant through number 1 and 2 periscopes. The next day we *ran* the minefield on the surface with sonar counting detonator *pops* as they occurred.

We had to put a lookout on the bow to watch for floating MK 10 mine cases so we wouldn't run them down and damage the BQR-2B



bow mounted sonar array. We then departed Okinawa, returned to Cubi Point RP and reloaded our Mk 14 Mod 3 torpedoes.

1974-USS BARBEL SS-580

My next mine plant took place in the fall of 1974 onboard USS BARBEL SS-580. At that time I was Chief-of-the-Boat and the torpedo gang was very experienced and well lead by TMI(SS) Warren (Pops) Pospisil. Both Pops and I had previous mineplant experience. Our Gun Boss was Lt. John Morgan Jr. Upon receiving word from Squadron One that we would be making the first submarine mine plant in Hawaiian waters in a number of years (and also the first mine plant from a 580 class boat) Lt. Morgan retrieved the Submarine Mine plant NWP and discovered it was completely out of date. There was little or no data on newer classes of submarines. Almost all the information pertained to mine laying from Fleet type submarines using older submarine launched mines many of which were no-longer in service. This was new territory for all of us. BARBEL had one Torpedo Room and only six torpedo tubes. The 580 Class were also fast, able to make 3 knots at a *dead-slow* bell of 37 shaft RPM further complicating mine laying. With only six torpedo tubes and one Torpedo Room to handle all the mines it was going to be a real challenge. On the plus side BARBEL's Torpedo Room was very roomy with weapon stowage well laid out and easy to access coupled with power loading for all torpedo tubes and a hydraulic hoist to move weapons between levels.

The week before the mineplant we went over to West Loch and loaded eighteen MK 57 moored mines. Loading went very fast. We had all eighteen loaded within an hour, got underway and arrived back at Sub base by lunch time. The following Monday morning we departed Sub base enroute to Lahiana Roads where the mine plant would take place. We would be followed by a YTB with a barge and crane. Configuration of the MK 57 Moored mines upon ejection was for the mine to go to the bottom. After a short delay (I believe it was 10 minutes) the mine case would separate from the anchor by explosive charge and go straight to the surface. This allowed for a quick visual of the entire mine field as well as rapid recovery of the mines and anchors by the crane and barge. On Tuesday we conducted a rehearsal run for timing of shots, sequencing of torpedo

tubes by firing 36 water slugs, piloting and plotting the mine field. On Wednesday morning following a battery charge we submerged and went to battle stations. I was battle stations diving officer. We got a good trim at dead slow and lined up for the initial run. The skipper, LCDR John Regan and the OD were on number 1 and 2 periscopes.

The following description of the Torpedo Room action is provided by TMC(SS) Warren (Pops) Pospisil USN(Ret).

"The following *Conditions* prior to commencement were all torpedo tubes loaded with a mine.

All tubes flooded and equalized; all tube muzzle doors shut; port and starboard impulse tanks flooded; port and starboard ejection pump doors open; WRT tank empty; mines in reload positions 1 through 4 with power loaders engaged; air banks charged to 3000PSI with an air charge in progress. The firing sequence was plant a mine; simulate planting a mine by shooting a water slug; plant a mine, shoot a water slug; plant a mine; shoot a water slug; and so on. Firing interval was approximately every two minutes. Torpedo tube firing sequence was predetermined and the TM's were pretty much operating on their own. With 18 mines and 18 water slugs the noise of the ejection pumps cycling 36 times rendered the normal practice of obtaining permission and reporting status of tubes impractical. With the noise and pace of the action in the torpedo room only essential communications were passed between the attack center and the torpedo room. This consisted mainly of which tube was next to shoot and when it was ready. FTG3(SS) Cummings was the torpedo room phone talker. I was on the upper tube deck between tubes 1 and 5 and operated the muzzle door and tube equalizing manifolds, tube blow and vent manifold, and tube drain valves. TM2(SS) Sluzarski, TM2(SS) Cox, and TM3(SS) Pharr were all over opening and closing breech doors, operating power loaders, moving mines from stow



to reload, removing straps and directing the reload party. MNI Rupp from the MOMAG at West Loch was in the torpedo room pulling pins from the mine safety bars during tube loading. The reload party moved mines from stow into reload positions, removed straps and cradles. Everyone knew what they had to do and even though it appeared chaotic, it was well organized and a great team effort. Two mines were fired from each tube along with two water slugs for a total of 24 shots. The final 6 mines and 6 water slugs were fired from tubes 5 and 6 (center line torpedo tubes serviced by the hydraulic hoist and power loaders). We had to dump a partial torpedo tube of water into the bilge before it was completely drained about every third or fourth shot in order to reload and have the tube ready in time. The drain pump was pumping the forward room bilges during the entire shoot. Since we started with WRT empty we only had to use WRT/FTT overflow a few times."

We had no problems maintaining ordered depth and maintaining a decent trim throughout the entire mine plant. The only excitement was shortly after we made our second turn and started planting the third row of mines. A sport fishing boat spotted our periscopes and headed our way to get a close-up view. There was no way to warn him that he stood a good chance of getting his bottom knocked out by a mine case as it ascended to the surface. There was a *Notice to Mariners* sent out a week earlier warning all to stay clear of a Naval Exercise taking place in Lahina Roads. Apparently this guy didn't get it. He was very lucky and sheared off in time to clear the minefield before being *mined*.

The first submarine mine plant in Hawaiian waters in a number of years went perfectly and *set the performance bar* for future submarine mine plants¹. It was another *first* for the Torpedo Gang on BARBEL and more importantly, another generation of submarine junior officers and torpedoman trained-up for mine laying. Following the mine plant and return to Sub base, Lt. Morgan provided a very thorough report and a detailed *Markup* of the Submarine Mine plant NWP which was well received by ComSubRonOne and ComSubPac.

In 1975 I transferred to ComSubPac Tactical Weapons shop (N61). Shortly after Reporting aboard I was tasked to provide a training assist for the next submarine mine layer which was USS SARGO SSN-583. Following the training assist I was on SARGO as an observer during her mine plant which turned out to be a very interesting experience. That however, is a subject for another story....

Many thanks to VADM John G. Morgan Jr. USN, and TMC(SS) George Cox USN(Ret), for their input and review of my manuscript. A special thank you to TMC(SS) Warren (Pops) Pospisil USN(Ret) for his amazing recall of those events in the Torpedo Room over 33 years ago. ■

ASSOCIATE

CDR Scott A. Chester, USN(Ret)
Mr. Charles A. Hansen

ADVISOR

Mr. James McNaughton
Mr. Clinton L. Phillips
CAPT Robin J. White USN(Ret)

SKIPPER

CAPT James R. Maris, USN(Ret)

LIFE MEMBERS

Capt Robert C. Barnes, USN
LT Carl R. Berg, USN(Ret)
CAPT William G. Clautice, USN(Ret)
CAPT William Hughes, USN(Ret)
Mr. H. Eugene Johnston
LCDR Robert P. Kenner, USN(Ret)
Mr. Paul L. Kidd
Mr. James McNaughton
LCDR Michael G. Smith, USN(Ret)
Mr. Michael J. White
CAPT Robin J. White, USN(Ret)

SUBMARINE NEWS FROM AROUND THE WORLD

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From the January 2007 Issue

TURKEY**Submarine Force - Construction In, Modernization Out****A. New Type Submarine Project:**

On 28 December 2006, the Turkish Undersecretariat for Defence Industries (SSM) issued a Request for Proposal (RFP) for the acquisition of six Air Independent Propulsion (AIP) submarines for the New Type Submarine Project (AMI Project Report Future AIP Submarine dtd January 2006). The closing date for the purchase of the RFP was 31 January 2007. A decision on the preferred supplier will probably occur no later than 2008 as the Turkish Navy has scheduled the first submarine to enter service in 2013.

The RFP release follows a 29 March 2006 Request for Information (RfI) that was posted in order to gather administrative, financial and technical information from companies willing to participate in the program. The closing date for the RfI was 15 May 2006 in which there were 26 respondents including:

- Armaris of France
- Tubitak-Mam of Turkey
- Aydin Tazilim ve Elektronik Sanayii AS of Turkey
- Kongsberg Defense & Aerospace of Norway
- Kollmorgen Corporation of the US
- Lockheed Martin Maritime Systems & Sensors of the US
- Calzoni Submarine Systems Department of Italy
- Rafael Armament Development of Authority of Israel
- BMT Defense Services of the UK
- Aspire Consulting of the UK
- Gate Elektronik San Tic of Turkey
- Israel Aerospace Industries of Israel
- Howaldtswerke-Deutsche Werft of Germany
- Milsoft Yazilim Teknolojileri of Germany
- Fincantieri Cantieri Navali of Italy

- Rohde & Schwartz of Germany
- Selex Kominikasyon of Turkey
- Navantia of Spain
- Whitehead Alenia Sistemi Subacquei of Italy
- Thales Systems of France
- Aselsan of Turkey
- Roketsan of Turkey
- Lockheed Martin Sippican of the US
- EADS Astrium Limited of the UK
- Elbit Systems of Israel

Of the 26 respondents to the RfI, all will most likely submit responses (either independently or as part of a team to the RfP including the four major shipbuilding entities of Armaris, HDW, Navantia and Fincantieri. As in the past with Turkish submarine programs, Istanbul and Golcuk shipyards can be expected to do the majority of the work with the foreign supplier providing design, construction and integration assistance for the program as well as the majority of the subsystems (engineering, electronics, weapons etc) on the submarines.

Although the Turkish Navy has historically utilized German solutions for its submarine programs, it is apparently investigating all of its potential options before making a decision on the preferred supplier for the New Type Submarine.

B. Atilay Class Submarine Modernization Program:

In mid-January 2006, AMI received information that the modernization program for the Atilay class submarine has been cancelled. The modernization of the four units (BATIRAY, YILDIRAY, DOGANAY and DOLUNAY) was expected to start in 2007 at a cost of around US\$200M. It appears that the Turkish Navy made the decision to forego the modernization program at this time in order to fund the New Type Submarine Project that will likely begin in 2008.

AMI's sources indicate that the modernization program for the Atilay class was terminated in mid-December 2006 just prior to the release of the RfP for the six new construction submarines. With the Turkish Submarine Force already at fourteen units, it can be

anticipated that the new submarines will begin replacing the oldest units of the Atilay class when they begin entering service in 2013.

PORTUGAL

Naval Update 2007

In early January 2007, AMI International received updated information regarding several on-going projects of the Portuguese Navy (PN):

A. Type 209PN Submarine: According to the PN, the first U209PN that was ordered from ThyssenKrupp Marine on 21 April 2004 will be delivered to the sea service in February 2010 followed by unit two in September of the same year. This is about six months later than originally anticipated.

The AIP submarines will be equipped with the WASS Black Shark torpedoes and according to PN sources, may also be equipped with the Interactive Defense and Attack System for Submarines (IDAS) (developed by Diehl/HDW/Kongsberg) as well as the submarine-launched Harpoon missile.

IDAS, based on the IRIS-T air-to-air missile, is a fiber-optic guided missile that can be launched while the vessel is submerged in order to engage anti-submarine warfare (ASW) aircraft. The missile has a reported range of 20km (12.4 miles) and is carried four per torpedo tube in a revolving launcher.

In addition to evaluating the possibility of these two weapon systems, the PN is also analyzing the possibility of procuring a third unit of the class. As always, funding will be the driving factor as to whether a third unit will actually be built. With a total defense budget of around €2B (US\$2.58B), it will be extremely difficult to fund the additional unit if the PN is to continue forward with its other planned programs. However, if the third unit is approved, it can be expected that unit three would be commissioned around 2013 equating to a 2007 or early 2008 order date.

B. NPO-2000 Offshore Patrol Vessel (OPV): In June 2006, AMI reported that the first two units of the NPO-2000 class were launched in October 2005 and were scheduled for commissioning in

2006. However, AMI's sources continue to report problems with the program. It is now anticipated that the original two units of the class will commission by the close of 2007 and the six (down from eight) follow-on units that were to start construction beginning in 2007 will be delayed by an additional 18 months. The original plan for a total of ten units has been trimmed to eight in order to help finance the two Karel Doorman class frigates that will be delivered to the PN in 2008 and 2009.

The delays in the program have been caused by problems in the Estaleiros Navais Viana do Castelo (ENVC) Shipyard, which is the main contractor for the program. In total, it appears that only eight OPVs will be delivered under this program and the delivery schedule will slip to the right with the final units not entering service until around 2013. The delays in the OPV program are now beginning to raise flags within Portugal. What was once considered the premier naval yard in Portugal is now being questioned especially in light of other programs planned for the yard such as the naval transport dock (LPD). Prior to the problems of the NPO 2000 OPVs, there had been talk of ENVC being part of a consortium for international defense projects, similar to the FREMM program between Italy and France.

FRANCE - Barracuda Submarine Program Underway

On 22 December 2006, the French Defense Procurement Agency (DGA) formally announced they had awarded an initial €1B (US\$1.3B) contract to Direction des Construction Navales (DCN) group and partner Areva-TA for the construction and delivery of six Barracuda class new generation nuclear powered attack submarines (SSN). The total contract for the class of six SSNs is estimated to be approximately €8B (US\$10.4B) including through-life support during the first five years of operational service.

The first unit will begin construction at DCNs Cherbourg yard (current builder of the Le Triomphant class SSBNs) in 2008 with commissioning in 2013. Units two and three will probably commission in 2014 and 2015. A second batch of three units (4-6) will probably be funded in 2010 under MPL 2009-2014. Unit four will probably begin construction at DCN in 2011 with commissioning in 2016 followed by unit five in 2017 and unit six in 2018.

The new SSN will be far more than a mere follow-on to the existing Rubis Amethyste class. Rather, the Barracuda class will be a completely new design, larger than its predecessor (displacing 4,000 tons vice the 2,670 tons of the Rubis Amethyste class); and possessing improved stealth characteristics, a deeper diving capability, and improved combat systems.

The class will be armed with dual-purpose heavyweight torpedoes (probably a follow-on to the current ECAN L5 Mod 3) and submarine-launched SM 39 Exocet ASMs. Additionally, MBDA is developing a submarine launched version of the Naval SCALP land attack cruise missile for launch from torpedo tubes. The missiles are scheduled to reach the production state in 2007 and will be incorporated in the Barracuda class.

UNITED STATES

Contracts for Ninth and Tenth Virginia Complete

On 28 December 2006, the US Navy awarded General Dynamics Electric Boat a US\$1.3B contract modification that provides funding for the ninth Virginia class submarine and advance procurement for the tenth ship of the class. The award modifies the August 2003 contract for the construction of six Virginia class submarine at a rate of one per year from Fiscal Year (FY) 2003 through FY 2008 bringing the total value of the contract to US\$8.4B. The latest modification provides US\$1.1B for construction of SSN-782 and US\$175.2M in advance procurement for SSN-783.

To date, three units have been commissioned and three additional units are currently under construction at Electric Boat and Northrop Grumman's Newport News with one additional unit (seven) to start in 2007 and one (unit eight) in 2008. Although the program has been running smoothly since the first commissioning in 2004, the true test for the Virginia program will come in 2012 when the Navy intends to begin funding two units per year.

UNITED STATES

Rough Waters for Littoral Combat Ship (LCS)

On 12 January 2007, the US Navy ordered Lockheed Martin to stop work on the second of its two-ship Littoral Combat Ships. The stop work order was placed for 90 days in order for the US Navy

Program Management Assistance Group (PMAG) to conduct a review of the cost increases that the program is experiencing.

The PMAG (made up of NAVSEA, SUPSHIP, and OPNAV) will investigate how the cost of USS FREEDOM (LCS-1) (the first LCS constructed by the Lockheed Martin team) increased so significantly beyond the CAIV (Cost As an Independent Variable) target of the contract. Initial assessments are expected to be provided during the first week of February 2007.

AMI has tracked the LCS program since its inception. In June of 2003 AMI International was quoted in a National Defense Magazine article

(http://www.nationaldefensemagazine.org/issues/2003/Jun/Navys_Littoral.htm) stating that a realistic price range for the Littoral combat Ship was somewhere between USS300M and USS350M. A realistic CAIV would have been USS280M to USS320M. These figures were based on a brief comparative assessment of the costs associated with ongoing corvette programs worldwide and those of the Littoral Combat Ship RfP.

The US Navy Acquisition Leader - NAVSEA - was driven to lower naval shipbuilding costs and therefore invoked a CAIV target. The problem was that their CAIV was unrealistically low, especially given their push for such complex requirements (high-speed). During AMI's assessment of past and current corvette programs costs, AMI uncovered that no ship had ever been built that met the stringent requirements of the Littoral Combat ship RfP. So comparative costs estimates had to be modified based on the additional costs of the speed requirements.

The US Navy needs to come to grips with what it really costs to build complex surface combatants! AMI International's past studies on worldwide naval shipbuilding (results presented in London in November 2005) has shown that for complex surface combatants, the majority of costs are in the ships systems. Therefore reducing requirements as well as the complexity of systems, is where cost savings will truly be gained.

The US Navy would do itself a favor by performing an in-depth comparative assessment of its naval ship design and construction capabilities with other nations in order that they would have a clearer respect for the strengths and capabilities that exist here in the U.S.

AMI's initial assessment demonstrates that the US is within a 10% cost window (total ship cost) of other worldwide leaders in surface combatant construction, including Germany, the Netherlands, France, Italy and even South Korea.

DID YOU KNOW?

United Kingdom - On 07 February 2007, steel will be cut for the fourth Royal Navy (RN) Astute class submarine at BAE System's Barrow Shipyard in the United Kingdom.

Japan - On 06 November 2006, the eleventh Oyashio class submarine, MOCHISHIO, was launched from Kawasaki Shipyard in Kobe Japan.

United States - In December 2006, the Los Angeles class submarine USS HYMAN G RICKOVER (SSN-709) was decommissioned.

From the February 2007 Issue

UNITED STATES

2008 Budget and 30-Year Shipbuilding Plan

On 05 February 2007, President Bush released his proposed Fiscal Year (FY) 2008 budget request. Of the proposed US\$481.4B defense budget, which is an increase of 11.3% (US\$49B) over FY 2007, the US Navy (USN) is slated to receive a total of US\$119.3B. The US\$119.3B proposed for the Navy is a 9% increase over last year and of this amount, US\$14.4B will be for the procurement of new ships for the sea service. A total of seven ships will be procured in FY 2008, which will include one CVN-21 (Gerald R. Ford class) aircraft carrier, one Virginia class submarine, one San Antonio class Landing Platform Dock (LPD), one Lewis & Clark class T-AKE, and three Littoral Combat Ships (LCS).

According to the Navy's six year Future Year Defense Plan (FYDP) (FY 2008-FY 2013) the USN plans on procuring a total of 67 new construction ships. Under this FYDP, the Navy would acquire seven ships beginning in FY 2008 (as listed above) and increase to 11 in FY 2009, 12 in FY 2010 and 13 vessels in FY 2011 before dropping to 12 in both FY 2012 and FY 2013. From the

proposed budget of US\$14.4B in FY 2008, the Navy's Shipbuilding and Conversion (SCN) budget would need to increase to approximately US\$17.5B by FY 2013 to meet these goals.

Along with the submittal of the proposed defense budget, Navy Secretary Donald Winter approved the latest update to the Navy's 30-year shipbuilding plan. The shipbuilding plan sets the stage for the Navy's goal of attaining a 313-ship fleet by FY 2020. Although the USN has a ship force requirement of a 313-vessel fleet, this number should be considered notional as over the course of the outlying years this number will shift above and below the 313-ship fleet that is envisioned.

The Navy's 30-year shipbuilding plan follows the guidelines of the latest *Quadrennial Defense Review Report 2006* that was released in February 2006 (by former Secretary of Defense Donald Rumsfeld). In regards to the USN, the latest QDR stated that the sea service would:

- Build a larger fleet that includes 11 Carrier Strike Groups, balance the need to transform and re-capitalize the fleet, improve affordability and provide stability for the shipbuilding industry.
- Accelerate the procurement of Littoral Combat Ships (LCS) to provide power projection capabilities in littoral waters.
- Procure the first eight ships of the maritime Pre-Position Force (Future) to improve the Department's ability to operate in restricted access environments.
- Provide a Navy riverine capability for river patrol, interdiction and tactical troop movement on inland waterways.
- Return to a steady-state production rate of two attack submarines per year no later than 2012 while achieving an average per-hull procurement cost objective of US\$2B.

The Navy's current ship force level is around 286 vessels and will remain below the target of 313 until FY 2016 according to the 30-year shipbuilding plan. From FY 2016 through FY 2025, the Navy will see a force level above 313 until the decline begins in FY 2026. From that point forward, the Navy's force level will decline to approximately 294 units in FY 2032 before rising back up to 303 units in FY 2037. According to the shipbuilding plan, this will be



attributed to a "complex interaction between retirements, re-capitalization, capability, affordability, design and construction time, and industrial base capacity."

Historically, the Navy has had a difficult time meeting its proposed plans due to restrained budgets and cost overruns with ongoing programs. Already the Navy has been forced to place a stop-work order on one of the LCS units that was under construction due to rising costs. This, coupled with the design and manufacture costs associated with a newly designed destroyer (Zumwalt class) and the goal of acquiring two Virginia class submarines a year (current estimated cost is US\$2.2B) beginning in 2012 should bring into question whether the Navy's goals are obtainable or as in the past, just a bow wave of future orders constantly heading to the right.

In order to meet QDR requirements as well as a 313-ship fleet, the USN will have to drastically cut costs. Only time will tell if, along with reducing costs, the Navy will indeed receive an increase in SCN funding in a time of fiscal restraint if it is to have a chance in attaining a 313-ship fleet.

TURKEY

Five Companies Request New Type Submarine RfP

In early February 2007, the Turkish Undersecretariat for Defence Industries (SSM) announced that five major defense contractors responded to the 28 December 2006 Request for Proposal (RfP) for the acquisition of six Air Independent Propulsion (AIP) submarines for the New Type Submarine Project (AMI Project Report Future AIP Submarine dtd January 2006). The closing date for the purchase of the RfP was 31 January 2007. The five companies that purchased the RfP include:

- Armaris of France - will probably offer the SCORPENE or a new variant
- Howaldtswerke-Deutsche Werft (ThyssenKrupp Marine) of Germany - will probably offer the Type 212/214
- Fincantieri Cantieri Navali of Italy - will probably offer the new Italian/Russian design
- Lockheed Martin Maritime Systems & Sensors of the US - is seeking to be a Prime Contractor or partner
- Navantia of Spain - will probably offer the SCORPENE or S 80

Although only five companies responded to the December 2006 RfP, 21 additional companies responded to the 29 March 2006 Request for Information (RfI) that was posted in order to gather administrative, financial and technical information. Many of the RfI respondents will likely play a supporting role in the submarine program. The March 2006 RfI respondents include:

- Tubitak-Mam of Turkey
- Aydin Tazilim ve Elektronik Sanayii AS of Turkey
- Kongsberg Defense & Aerospace of Norway
- Kollmorgen Corporation of the US
- Calzoni Submarine Systems Department of Italy
- Rafael Armament Development of Authority of Israel
- BMT Defense Services of the UK
- Aspire Consulting of the UK
- Gate Elektronik San Tic of Turkey
- Israel Aerospace Industries of Israel
- Milsoft Yazilim Teknolojileri of Germany
- Deutsche Exide of Germany
- Rohde & Schwartz of Germany
- Selex Kominikasyon of Turkey
- Whitehead Alenia Sistemi Subacquei of Italy
- Thales Systems of France
- Aselsan of Turkey
- Roketsan of Turkey
- Lockheed Martin Sippican of the US
- EADS Astrium Limited of the UK
- Elbit Systems of Israel

A tender conference is currently scheduled for March 2007 with responses to the RfP due to the SSM no later than 04 May 2007. A decision on the preferred supplier will probably occur no later than 2008 as the Turkish Navy has scheduled the first submarine to enter service in 2013. At least six submarines will be built under this program. Originally the program entailed the construction of four units. However, in January 2007, the Turkish Navy officially cancelled the Atilay class submarine modernization effort in favor of building two additional new construction units under this program, bringing its total to six.

According to the RFP, the New Type Submarines will be constructed at the Golcuck Naval Shipyard with maximum use of existing in-country industrial means and capabilities. All bidders are expected to team with local vendors with experience in command and control software to work with the combat systems integrator on the development and installation of the Integrated Underwater Command Control System (IUCCS). Bidders are also expected to assist the local sub-contractor in building up the necessary capability for maintenance, repairs, development and modification of the IUCCS through the life cycle of the vessel.

Although the Turkish Navy has historically utilized German solutions for its submarine programs, it is apparently investigating all of its potential options before making a decision on the preferred supplier for the New Type Submarine.

VARIOUS DID YOU KNOW?

South Africa - On 14 March 2007, the second Type 209 (S 102) submarine is scheduled to be turned over from ThyssenKrupp Marine to the South African Navy.

South Korea - The first Republic of Korea Navy (ROKN) type 214 class submarine began sea trials on 29 January 2007.■

DISCUSSION**SMOKING LAMP STILL LIGHTED***by* **RADM T. J. Robertson, USN(Ret)**

The article on smoking in October 2006 THE SUBMARINE REVIEW was timely and thorough. However this otherwise excellent article by CDR C. J. Jankosky, SUBPAC Medical Officer, begs for the answers to two questions. (1) Why hasn't the Submarine Force taken more bold action? (2) What are the *external pressures* that caused abandonment of smoke-free initiatives? By answering the latter question one finds the answer to the former. The dirty little secret here is Congressional pressure. That then generates still another question: How long will Tobacco State Congressional delegations hold such sway over the Navy?

This is not a new issue. In my PCO class almost 30 years ago we were acutely aware of the health issues. Also there was general belief that a significant percentage of dirt in the ventilation system and throughout an isolated submarine came from tobacco products. I gave considerable thought to initiatives that might address the smoking issue when I took command. Luckily, I concluded that other priorities were wiser targets for a new skipper. As fate would have it the crew's MWR committee was already on the issue because of complaints and discussion aboard. They brought forward a plan for the smoking lamp to be out in messing and habitation spaces. To this I added conditions of reduced ventilation and *rig for black* in control. A starting point!

Eight years later I took command of a submarine squadron and found most ships enforcing a policy of smoking limited to just a few low density spaces. When I took submarine group command another five years later the situation was the same. A difference was that the Force Commander was now openly discussing the problem with the Force. About that time we were aware that some submarines in the Pacific were trying smoke-free policies.

The stage was set for bold action. The story I recall was that a new commission CVN, USS THEODORE ROOSEVELT I believe, implemented a well thought out program to go smoke-free by first deployment. The program started one year in advance in the shipyard

with liberal chance for smoke-cessation programs and transfers for the truly addicted. At a predetermined time the program went into effect, the ship then on station in the Balkans campaign. It wasn't long before some crew members filtered back complaints to well placed congressional staffers. The result was not-so-subtle pressure by certain members of Congress at the very top of Navy to terminate the smoke-free experiment. The CO had to rescind his program. Other smoke-free programs met similar fates. This is possibly the infancy of the now well known congressional declaration: "I support the troops" (but not the commanders).

So progress has been pretty limited over the last 30 years. Where do we go from here? It would be quite interesting if CDR Jankosky's fine article could be followed up by someone, not burdened by official position, who is knowledgeable about the constraints which have limited bolder Submarine Force action. That could provide *The Rest of the Story*.■

ABOUT AN IMPROVED VIRGINIA CLASS SUBMARINE

*by Dr. George Sviatov
Naval Architect, Captain 1st Rank, Russian Navy(Ret)
Independent Analyst in Bethesda, Maryland, USA*

120 weapons is better than 60, but 60 weapons is better than 38. That phrase represents the essence of my proposal.

In my article "Naval Architectural Aspects of American Nuclear Submarines Design" (THE SUBMARINE REVIEW, July 2005) I suggested an improved Seawolf class American nuclear submarine with 120 weapons (92 torpedoes and Tomahawk type cruise missiles in 8 21-inch torpedo tubes inside the pressure hull and 28 Tomahawk type cruise missiles launchers outside the pressure hull in vertical launchers in #2 main ballast tank). It would be a sub with an underwater displacement of approximately 9,500 tons, speed - some 37 knots and diving depth - up to 2,000 feet.

According to the excellent study of the Lexington Institute's "Submarines: Weapons for Choice in Future Warfare," in 2015 the USA will have 61 SSNs (3-Seawolf, 4-Ohio SSGNs, 13-Virginia and 41-Los Angeles classes). In 2025 - 59 SSNs (3- Seawolf, 4-Ohio SSGNs, 30-Virginia, 11-Los Angeles and 11-Future Submarine class.

It seems to this author that this *Future Submarine* should be the proposed above Improved Seawolf class (SSN-211) new American nuclear attack submarine with 120 weapons and a 9,500 tons underwater displacement.

I do not understand why the United States Navy does not accept such a proposal. Maybe it is tacitly accepting it but does not like to do it publicly?

OK! Let us understand its position and purpose, maybe, another easily acceptable idea.

The idea is very simple: to increase by 22 weapons the Virginia class submarine's payload inside of her pressure hull, probably behind the existing reserve torpedoes and cruise missiles. Their total additional weight would be some 80 tons (40 tons - torpedoes and

missiles and not more than 40 tons necessary additional equipment, such as racks, compensating tanks and so on).

The Improved VIRGINIA (SSN-774I) and Regular VIRGINIA (774) would have such basic tactical-technological characteristics:

	SSN-774I	SSN-774
Underwater displacement, t	7,900	7,800
Length, feet	380	377
Beam, feet	34	34
Number of torpedo tubes	4	4
Number of vertical missile launchers	12	12
Number of weapons	60	38
Underwater speed, knots	35	35
Diving depth, feet	1,800	1,800
Complement, (Officers and Enlisted)	128	134

You can see that changes in the shipbuilding characteristics of above mentioned submarines are not especially big, but the ultimate result is very impressive. Everybody should agree that 60 weapons on the improved sub make a huge difference in the battle capacity of these two options.

My friend, a distinguished Naval Architect, Mark Henry, probably will say that it is necessary to do more detailed naval architectural research. No objections. But I am sure that my proposal is correct and very simple in principle.

I could provide additional reasons in favor of my proposal, but I think that brevity is a sister of talent.■

**Laura W. Bush Scholarship
Honors Dolphin Scholarship Foundation**

*by Ms. Randi Klein
DSF Executive Director*

Laura W. Bush Scholarship

Created by two large endowments, Dolphin Scholarship Foundation (DSF) is honored to be administering the *Laura W. Bush Scholarship* established in honor of First Lady Laura W. Bush for children of USS TEXAS (SSN 775). The scholarship, created by an endowment by the 55th Presidential Inaugural Committee, was announced at the commissioning of USS TEXAS (SSN 775) on September 9, 2006. Committee members included Ambassador Jeanne L. Phillips, Chairman, Eric Bing, Bill DeWitt, Brad Freeman, Mercer Phillips and Tom Joseflak.

A second, larger, endowment for the *Laura W. Bush Scholarship* was made by the USS TEXAS (SSN 775) Committee, Inc., of the Texas Navy League. Funds left over from the commissioning were donated to DSF and enables the Foundation to award three scholarships each year to children and stepchildren of plank owners of USS TEXAS. Retired RADM Al Kelln, USN (Ret.), former DSF Board Chairman, and CAPT Zeb Alford, USN (Ret.) played vital roles in getting this endowment for DSF and the *Laura W. Bush Scholarship*. Mr. Marshal P. Cloyd is Chairman, InterMarine and serves as President of the USS TEXAS (SSN 775) Committee, Inc. Other members of the TEXAS Commissioning Committee include C.W. 'Swede' Andersen, Harry Wayne Brown, Joe T. Coleman, Clinton Grosse and Arthur R. Gralla.

Kennedy Bequest

The Foundation is the beneficiary of another major endowment, from the estate of Edith Emily Kennedy, who passed away in May 2006. Captain Skip Hanzel, USN (Ret.) is the executor of the estate, which will be used to establish the *Lisle and Emily Kennedy Scholarship*. Lisle Kennedy rose through the ranks from seaman

recruit to Chief Electrician's Mate to CWO3, retiring after 22 years of naval service. His duty stations included Groton, Hawaii and Boston. He then worked as a supervisor at Electric Boat, Groton, CT, for 12 years. Lisle and Emily Kennedy were married for 27 years before his death in 1975. Mrs. Kennedy, who remained a resident of Gales Ferry, CT, bequeathed her estate to DSF in 1996. Interestingly, Randi Klein, now DSF Executive Director, was then the DSF Liaison for the Submarine Officers' Wives' Club in Groton and assisted Mrs. Kennedy in making the bequest.

MEMORIAL SCHOLARSHIPS

The submarine community lost several family members this past year. One, Katy Chiles, was a former President of the Foundation. Generous family and friends paid tribute to her by donating to DSF in her memory. A scholarship named in her honor will be awarded for the next three years.

The tragic deaths of ETSC(SS) Thomas K. Higgins and STS2(SS) Michael J. Holtz from USS MINNEAPOLIS-ST PAUL (SSN 708) in December 2006 reverberated throughout the submarine community. DSF has named scholarships in memory of these two sailors.

SCHOLARS

DSF will select its 1,000th Scholar in 2008. Nine hundred and fifty six Dolphin Scholars have received assistance since the first Dolphin Scholarship was awarded in 1961 for \$350. A black and white photograph of a young man made Randi Klein, newly hired at DSF, curious about who he was and why his picture hung on the DSF office wall. *Our first scholar*, was the only answer; no one knew anything more about him. A determined search led her to John L. Haines, Jr., the *First Dolphin Scholar*. The \$350 scholarship was a good investment for both the Foundation and the young man in the photograph.

John L. Haines, Jr., was the First Honor Graduate (Valedictorian) in the Class of 1963 at The Citadel in Charleston, SC. He graduated from the University of Virginia Law School in 1966 and passed the Virginia bar exam later that year. He entered the U.S. Army as a First Lieutenant in January 1967, and, after training at infantry and

intelligence schools, was assigned to Panama. After promotion to Captain, he served as Adjutant of the 470th Military Intelligence Group, USARSO, and was honorably discharged in January 1969. He remained in Panama, where his civil service career spanned 31 years.

Mr. Haines served a long and very distinguished career with both the Panama Canal Company and then the Panama Canal Commission from February 1969 through December 1999. He began his career as a General Attorney, was promoted to Deputy General Counsel in 1976 and, in 1983, was appointed General Counsel. Mr. Haines was instrumental in drafting U.S. statutes implementing the Panama Canal Treaty of 1977; subsequently, he assisted Panama in developing its own legislation to govern that country's operation of the waterway, which began on December 31, 1999.

Mr. Haines is an accomplished, self-taught artist. His paintings have been sold and exhibited throughout Panama and the United States. His work may be viewed on the web at www.panamaeste.com/websites/haines/haines03.htm.

DSF Board of Directors and staff had the privilege of meeting Mr. Haines in October 2006 during a visit by John and his wife Esther to Virginia Beach. Also part of that reunion was Martha Grenfell, the Foundation's very first President (1961), and the woman with the vision for the scholarship program.

DSF has created *The Haines Society* as a legacy group for all Dolphin Scholars, and Mr. Haines became the first member with his donation. He is already practicing his golf swing for the upcoming DSF Golf Tournament.

GOLF TOURNAMENT

DSF hosted its Inaugural Golf Tournament in October 2006, netting over \$10,000. Lieutenant Roger Taylor, an avid golfer on the SUBLANT staff, presented the idea of a golf tournament hosted by DSF to Randi Klein, new Executive Director, just three weeks after she started her job. In only three months, LT Taylor and the DSF organization hosted a first class tournament. Ironically, LT Taylor deployed just days before the tournament and was unable to play. Major corporate sponsors included:

Northrop Grumman Newport News
L-3 Communications
The Private Bank, Bank of America
Lockheed Martin
General Dynamics Electric Boat
Dresser-Rand
Oceanneering Engineering
BAE Systems
East Beach Company, LLC
Linda Daniels, Nancy Chandler Associates

Other sponsors and *Scholarship Partners* included Vic Hulina, who donated a set of handcrafted irons; VADM and Mrs. John Grossenbacher, USN (Ret.); RDML Mike Klein, USN; RDML John Messerschmidt, USNR; TPC, International Golf, Golf Galaxy, Ray Johnson's Fireplace and Patio and Navy Federal Credit Union.

Thanks to LT Taylor's initiative, enthusiasm and support in organizing the tournament, the Board of Directors approved the *LT Roger Taylor Scholarship* to be awarded to a Dolphin Scholar for 2007-2008.

The next *Annual DSF Golf Tournament* will be held Friday, October 5, 2007, at Kiln Creek Golf Club and Resort, Newport News, Virginia. Corporate sponsorships are available, and players may register online at www.dolphinscholarship.org.

STAFF CHANGES

The Foundation has seen changes in both staff personnel and infrastructure to take the Foundation to *the next level* of professionalism and operations. In June 2006, Mrs. Randi Klein was hired as the first Executive Director for DSF, replacing Cindy Johannes who had been the Office Manager and Financial Administrator for three years. Tomi Roeske continues as the Scholarship Administrator (14 years and still counting!) with Tracey Majewski, Financial Administrator and Lisa Haggerty, Administrative Assistant, completing the paid staff.

Mimi Donnelly, wife of VADM Jay Donnelly, eagerly assumed her position as DSF President on February 3, 2007, relieving Kristin Munns, wife of VADM Chuck Munns, who had served since

October 2004. Mimi has been involved with fundraising for Dolphin Scholarship since she was a JO spouse, and Mimi and Randi worked together in the Norfolk Dolphin Store in the early 1990's.

WEBSITE

The Foundation is very pleased and fortunate to have website development and maintenance donated by Cesar Gonzales of Synapse Technologies, Virginia Beach, VA. Mr. Gonzales has redesigned and is further developing the website. Please visit the site at www.dolphinscholarship.org to see the new and improved changes.

FOUNDATION GOALS

Board Members of the Foundation continue to serve and lead DSF in new directions: Chairman RADM Charles J. Beers, Jr., USN (Ret.), Vice Chairman RADM Arlington Campbell, USN (Ret.), Secretary-Treasurer CAPT Merrill Dorman, USN (Ret.), CAPT Charles Spence, USNR (Ret.), CAPT James Hay, USN (Ret.), ETCM(SS) John Pierson, USN (Ret.), Maryellen Baldwin, Dr. Roseann Runte and Mr. Vincent Thomas.

Prominent American citizens and retired submarine leaders serve on the Distinguished Advisory Board for Dolphin Scholarship Foundation: Robert Ballard, Ph.D., Rebecca Burkhalter, John P. Casey, ADM Henry G. Chiles, Jr., USN (Ret.), ADM William J. Crowe, Jr., USN (Ret.), ADM Bruce DeMars, USN (Ret.), Martha Grenfell, ADM Frank B. Kelso II, USN (Ret.), John W. O'Neill, Michael Petters, VADM J. Guy Reynolds, USN (Ret.), Eleonore Rickover, Thomas C. Schievelbein, Michael W. Toner, ADM Carl Trost, USN (Ret.), ADM James D. Watkins, USN (Ret.) and John K. Welch.

The Board of Directors has set a goal of incrementally increasing both the number of annual scholarships awarded, from 134 to 140, and the amount of the annual award, from \$3,000 to \$4,000. Thanks to the USS TEXAS and Edith Kennedy endowments, the Board recently approved the first incremental increase to 137 scholarships of \$3,250 each, beginning with the academic year 2007-2008. Students selected this spring will be the first recipients of the larger scholarship.

One of the means by which the Foundation hopes to achieve this goal is to increase the awareness of planned giving and encourage submariners to consider Dolphin Scholarship Foundation in their wills.

THE FUTURE

Joe and Sheila Buff have set the standard high for planned giving to DSF. They recently bequeathed their house in mid-New York State to the Foundation. NSL *Review* readers may recognize the work of Mr. Buff, who won the NSL First Prize Literary Award in 2006 for Will China Rule the Waves? He has also published several novels of submarine warfare. Mrs. Buff writes on health, nutrition and medical issues, including the Atkins and South Beach diets. The bequest demonstrates their strong support of the Navy and the Submarine Force. Mr. Buff commented:

"Submariners and their silent ships, as a primary weapon in the arsenal of democracy, have remained focused and strong for over one hundred years. While they remain hidden under the sea, protecting our interests abroad, they and their families have made many sacrifices. Separated from their families by long deployments, wars, world crises and the cold dark sea, Submariners have missed births, birthdays, anniversaries, graduations, and holidays unmeasured.

"Personally returning something to this wonderful Foundation only seems fair, I believe, in appreciation of having enjoyed all the wonderful day-to-day benefits flowing from our nation's hard-won freedoms—freedoms which Submariners went a long way toward making possible. No human life lasts forever. Planned giving to the Dolphin Scholarship Foundation is thus an outstanding way to create a permanent legacy.

"Having arranged a bequest to DSF gives Sheila and me a feeling of satisfaction that we've done the most we can to assist the families of Submariners who have sacrificed so much to keep us safe in an unstable world."

To help educate and inform potential donors, a planned giving seminar is being organized in the Hampton Roads, Virginia, area, in collaboration with Wings Over America Scholarship Foundation, Anchor Scholarship Foundation and Bank of America.

To celebrate its *50 Years of Scholarships* in 2010, the Foundation is planning several special events. The kick off event next year will honor the 50th Anniversary of the voyage of USS NAUTILUS under the Arctic ice. Called "*The Race to the North Pole*," this novel fundraising event will allow all submariners, past and present, to honor the NAUTILUS and their own favorite U.S. submarine, including diesel boats. The first submarine to *reach* the North Pole will win this virtual race. Watch the NSL *Review* and the DSF website for more information and to donate for your favorite submarine to win.

The future is bright for children of our submarine community, thanks to generous donors and Dolphin Scholarship Foundation.■

BOOK REVIEW**DEEP SOUND CHANNEL, THUNDER IN THE DEEP,
TIDAL RIP, CRUSH DEPTH, STRAITS OF POWER,
SEAS OF CRISIS**

By Joe Buff

Publisher: Bantam, Morrow/HarperCollins

Years: 2000, 2001, 2002, 2003, 2004, 2006

Reviewed by CDR Rob Webber

From my perspective as a submariner who has served on nuclear powered submarines both in the enlisted and officer ranks since 1984, I can say from personal experience that Joe Buff *gets it*. He understands the unique culture and values of the Submarine Force and the nuances of what it means to be a submariner: the way we think, the meticulous way in which we approach operations, training, and drills, and the way we live and work on a submarine. Throughout his writing, he expertly transplants this unique culture completely intact into the submariners and submarines of the future. It is this authenticity, something Buff seems to have worked extremely hard at when writing these books, which will help readers connect more closely with each novel's action, its characters, their challenges, their personal foibles and strategic successes.

SEAS OF CRISIS and the five books which precede it do more than just provide exciting entertainment to the avid reader. Buff underscores the importance and effectiveness of today's U.S. Submarine Force in any possible global conflict, and highlights the technical excellence, outstanding training, bravery and teamwork of the crews that man these tremendous ships. (This approach is entirely consistent and complementary with the tone of Buff's prolific non-fiction undersea warfare analysis and commentary.)

SEAS OF CRISIS is Buff's finest installment of the Jeffrey Fuller—USS CHALLENGER—undersea action thriller series. In this book, it is now 2012, and the next world war between the Allies and the hypothetical *Berlin-Boer Axis* continues to rage across the

continents and under the sea. Buff's main character, Jeffrey Fuller, an ex-Navy SEAL turned submariner and former CO of CHALLENGER, the United States' most advanced ceramic hulled submarine, has just been promoted to Captain and put in command of an undersea strike group comprised of Buff's fictionalized CHALLENGER and the very real USS JIMMY CARTER. Their mission: to penetrate deep into pseudo-neutral but really pro-Axis Russian home waters to deliver a team of commandos who must overcome staggering odds in order to launch a nuclear ballistic missile – against the United States. If successful, the Allies will be able to destroy the missile well before it reaches the U.S. homeland, frame Berlin for the rogue launch, and use what could have been the start of almost certain Armageddon to pressure Russia into an alliance with America and the UK against the German-led Axis.

In SEAS OF CRISIS, Buff spins an extremely complex and exciting yarn that will keep you turning the pages long into the night. From the tension filled control room onboard USS CHALLENGER as she sneaks through a high-tech Russian antisubmarine warfare barrier, to far inland, where dedicated U.S. Commandos make the ultimate sacrifice to infiltrate a Russian silo complex to launch an ICBM, Buff keeps the story moving forward at a blistering pace with a level of excitement that will keep you awake tossing and turning in bed long after you have turned out the light. Even more compelling than the storyline is the way in which Buff seamlessly and believably weaves future undersea warfare technology into what is probably the most sophisticated techno-thriller plot this reviewer has enjoyed to date.

SEAS OF CRISIS, winner of the 2006 Admiral Nimitz Award for Outstanding Naval Fiction from the Military Writers Society of America, is just the tip of an iceberg comprised of five other extremely riveting novels from the series, and represents the pinnacle of a seven year journey for the author and his main character Jeffrey Fuller. Although any one of the novels in the series can be read and fully enjoyed individually, it is valuable to go back in time and look at Buff's work in total, as he develops Jeffrey Fuller from executive officer of a fast attack sub to battle-hardened, highly-effective Navy Captain and Commodore of an extremely lethal undersea strike group.

It is July 2000, and Bantam Books has just published DEEP SOUND CHANNEL, the latest in submarine techno-thrillers by a new and brilliant novelist named Joe Buff. Buff is an MIT graduate, mathematician, and former financial risk analyst. He raised the techno-thriller bar with his first effort, and it immediately established him as one of the day's preeminent submarine warfare novelists. Although the horrific events of 9-11 were still over a year away when DEEP SOUND CHANNEL was published, Buff prophetically took us into a future where a different enemy delivers a surprise punch to the United States, and as a result, civilization teeters on the brink of World War III. DEEP SOUND CHANNEL serves as a reminder to us all of the uncertainty of continued global peace and security, and highlights just one of many possible scenarios that could lead us into almost inevitable major worldwide armed conflict. It is implicit in Buff's storytelling, and made very clear by the *Note From the Author* at the start of his subsequent novels, that this was precisely Buff's intention from the outset.

Buff uses DEEP SOUND CHANNEL to set the stage and provide a context for all of the books in the series. In this first one, the year is 2011, and the war between the Allies and the Berlin-Boer Axis has just started. A reactionary coup has seized control in South Africa and restored Apartheid. In response to a United Nations trade embargo, the Boer regime begins sinking unarmed U.S. and British merchant ships. NATO quickly responds, with only Germany holding back—until another coup in Berlin restores Kaiser Wilhelm's closest heir to power, and Germany nukes Warsaw, then soon after overwhelms France. The pair of coups, it turns out, had been a coordinated trap, led by a secret conspiracy of oligarchs in the military-industrial-financial complexes of the two Axis powers.

Buff doesn't pull any punches in DEEP SOUND CHANNEL. Intense action starts on page one, chapter one, where tactical nuclear weapons have already been exchanged between the Allies and Axis during a devastating nuclear war at sea, in which the Axis is guilty of brazen, unprovoked first use. As in all of the novels in the series, Buff descends comfortably and deeply into his undersea element, armed with a well-researched, well-written technical and geopolitical narrative, which he unfolds masterfully via a character-driven storyline that throbs with authenticity and excitement. From

submarine-on-submarine tactical nuclear tipped torpedo-firing melees that would frighten the most hardened submariners, to harrowing SEAL team operations deep in South African territory, DEEP SOUND CHANNEL's roller coaster ride doesn't end until the very last page.

In this reviewer's opinion, Buff's writing eclipses the likes of Patrick Robinson and Tom Clancy, and the entire series delivers something more intense to readers who want much more than just page after page of gadgetry detail. Buff's main character, Jeffrey Fuller, and his key adversaries, are skillfully drawn, convincingly three dimensional and often noble warriors. Buff's novels are replete with technology that highlights many of the actual future capabilities which the Submarine Force is developing today to deliver to the fleet of tomorrow. He uses this technology so believably that in many ways, it becomes a major character unto itself, and a crucial element of all the novels in the series. Buff's crisp comprehension of sonar science, of global oceanography, meteorology, and geography, and of 20th century world history plus 21st century maritime theory provides an additional vivid background to the tapestry of his saga. So if you are looking for authentic, well written, fully researched and technically accurate military fiction with non-stop submarine combat and admirable heroes, look no further than the six novels in Joe Buff's series. ■

ETERNAL PATROL

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USS WILLIAM H. BATES SSN-680 Aug 11-12, 2007

Amsterdam, MO

Loc: Terry Stanley's farm. Address and direction to follow.

Send your contact info to: billyb_ssn@yahoo.com

USS TIRU SS-416 Aug 16-19, 2007 Norfolk, VA

POC: Chuck Coker, 2705 Country Club Dr., Suffolk, VA 23435

Phone: 757-438-8136/757-435-3315© E-mail:

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POC: Frank Whitty, E-mail: Whitty409@aol.com

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